

**AN ANALYTICAL STUDY OF SOME SELECT
CORRELATES OF BIOLOGY ACHIEVEMENT
AMONG SECONDARY SCHOOL PUPILS**

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**THESIS SUBMITTED FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN EDUCATION**

**DEPARTMENT OF ADULT AND CONTINUING
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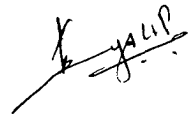
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DECLARATION

I, **PRIYA, K.P.**, do hereby declare that this thesis, entitled “**AN ANALYTICAL STUDY OF SOME SELECT CORRELATES OF BIOLOGY ACHIEVEMENT AMONG SECONDARY SCHOOL PUPILS**” submitted to the University of Calicut for the award of the Degree of Doctor of Philosophy in Education, has not been submitted by me fully or partially for the award of a degree, diploma, title or recognition before.

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CERTIFICATE

I, **Dr. K. KARUNAKARAN**, do hereby certify that the thesis entitled
**“AN ANALYTICAL STUDY OF SOME SELECT CORRELATES OF
BIOLOGY ACHIEVEMENT AMONG SECONDARY SCHOOL
PUPILS”** is a record of bonafide study and research carried out by
Smt. PRIYA. K.P., under my supervision and guidance.

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INTRODUCTION

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 - ❖ *Statement of the Problem*
 - ❖ *Definition of the Key Terms*
 - ❖ *Variables of the Study*
 - ❖ *Objectives*
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INTRODUCTION

Today we are living in the age of science and technology; on the highest step of the ladder of civilization on which, the man has been ascending since the stone age. Now a days, life has become not possible for man without the help of science. Science is the most inexhaustible storehouse of knowledge. Modern science has developed as a springboard for the progress of mankind and enabled us to save time, shorten the distance and many more things in all spears of life. It has improved the conditions and quality of life. Therefore, in the present age of rapid scientific advancement, there is no need to justify the role of science in education, because the heart and soul of educational process is science itself.

Science is more related to life than any other subjects. The benefit of learning science is more helpful for the personal growth and development of the entire community. The use of science is to help the people in bettering the quality and standard of life. It is a fact that after independence, India has attained remarkable progress in various fields such as space sciences, telecommunications, information technology, defence and agriculture. To cope up with the new era of global competition, there is no other option but to reorient our education system, to be vibrant and dynamic, competitive, meaningful and relevant.

There is no doubt that development of any nation mostly depends on the role of efficient and enthusiastic Scientists, Engineers, Doctors etc. For this, it is the duty of the nation to create scientific temper and scientific consciousness among younger generation which would in turn help them to lead a better life in future according to the changing scenario of science and technology. To fulfill this goal, our educationists and policy planners included science as a compulsory subject right from the elementary stage itself. In order to establish a stronger theoretical basis for this statement let us have a glance towards the development of science education in India after Independence.

Science Education in India After Independence

In India, Science was not a school subject even in the beginning of 20th century. To improve the pathetic state of science in our country, Indian Science Congress was formed a few decades ago, but it could not make any suitable and appropriate changes in learning of science in schools. The Report of the Secondary Education Commission (1953) recommended the teaching of general science as a compulsory subject in the high schools and higher secondary schools.

In 1956, the All India Seminar on the teaching of science in secondary schools held at Tara Devi, Shimla Hills, analysed critically, almost all aspects regarding the inclusion of general science as a core subject upto higher secondary level. That was the initial step towards the inclusion of science in

school subjects, including selection of curriculum, identification of equipment and apparatus for learning of science, method of examination, teaching learning aids in science and other related learning materials viz., text books, science clubs, exhibition, science museum etc. It had also made a recommendation for a unique and uniform system of science learning for the entire country suited to its needs and local resources available.

It is a fact that the role of policymakers, administrators and parliamentarians in this regard is crucial for any developmental activities especially science and technology. As such their knowledge and information with respect to this area is inevitable. Hence, a committee was setup in August 1961 under the chairmanship of Late Shri Lal Bahadur Shastri to study the problem encountered in science education. The Committee made a solution to the problem of "Science Education in Schools" with a view to find out the relation between the policies and decision of the center and the states, and the courses offered in the schools.

In 1963, the U.S.S.R. experts under UNESCO Planning Mission visited India to study the feasibility of providing technical assistance on science projects. They made certain recommendations based on different issues of science education in secondary schools. These reports gave the total picture of the position of science and mathematics education in India and suggested various modalities for the improvement of science learning in schools.

As a follow up programme of the Report, a central science workshop was established under NCERT to produce prototypes of school equipment and to develop low-cost learning kits for the primary and the middle school stages.

In this connection, a conference of science education was held under the chairmanship of Dr. D.S. Kothari (1996) to plan an effective programme for the development of a total curriculum of science education for different stages. Moreover Indian Education Commission (1964-66) has also pointed out that our science education is in bad shape and it becomes worse if we fail to adapt with the explosion of knowledge. To meet this immediate threat, the commission recommended upgrading school curricula by research in curriculum development, the revision of the textbooks and teaching learning materials. Moreover, it recommended to include science as a compulsory subject as part of general education.

National Policy on Education (1968) examined the steps taken in this area of education in post independence India. It laid stress on the need for a radical reconstruction of the education system to improve its quality at all stages, and gave much attention to learning of science and technology, the cultivation of moral values and a closer relation between education and the life of the people.

As a follow up of the Kothari Commission Report (1964-66) the

Ministry of Education and Social Welfare appointed an expert group in 1973 to develop curriculum for the 10 +2 pattern.

The Union Minister of Education and Social Welfare (1977) appointed a Review Committee under the chairmanship of Shri Ishwarabhai, J. Patel to review the stage wise and subject wise objective identified in the NCERT document "The Curriculum for the 10 year school" and also to scrutinize the syllabus of NCERT and textbooks.

In January, 1985, the government of India announced that a New Education Policy would be formulated for the country. A comprehensive appraisal of the existing educational scene was made followed by a countrywide debate. The views and suggestions received from different quarters were carefully examined. As a result, a new National Policy on Education was formulated in 1986. The NPE set up under the chairmanship of Prof. Yashpal, stressed the importance of science education as well as inculcation of scientific temper for the improvement of science education.

Now most of the states have established State Councils of Educational Research and Training (SCERT) on the pattern of NCERT. In these states SCERT incorporates the functions of the State Institutes of Science Education (SISE)

SISEs have been set up in all the states with a view to improve the quality of science education in the schools. The major functions of these

institutes are to provide in-service training to equip the science teachers to update the changes occurred in the field of science education, prepare instructional materials in science, conduct research studies in science education of their respective states, provide guidance service in science to school, take up innovative programmes in science education and participate in the national science programmes.

To get these goals fulfilled, our state of Kerala, has also been conducting many science related programmes for the improvement of science education. These programmes include.

- (1) Preparation of instructional materials
- (2) Handbook for science teachers
- (3) Research studies in science education
- (4) Provide guidance service in science to schools and
- (5) Provide opportunities to participate national and international science & developmental programmes.

In short, the views and suggestions made by various commissions like Mudaliar Commission (1953), UNESCO's International Commission (1963), Kothari Commission (1996), etc have put forward pertinent implications in the improvement of science education in our country.

It is worth mentioning that the Education Commission (1964-66) have stressed the need for improving the quality and standard of science education.

“Science has added a new dimension to education and to its role in the life of a nation, but central to all this is the quality of education. If science is poorly taught and badly learnt, it is little more than burdening the mind with dead information and it would degenerate even into new superstition. What we desperately need is improvement in the standard and quality of science education at all levels in country”. Thus for ensuring the quality and standard of science education, we have to do a lot to attain the expected goal.

One of the major roles of learning science is to develop thinking process together with creativity so as to enable them to channelize their ability towards modern development which warrants the setting up of ample facilities and opportunities. But due to various reasons, we have not been able to provide these basic facilities properly so far. Another important goal of learning science in schools is to prepare and equip the students to face scientific as well as societal issues related to their day today life. Further they have to communicate effectively with others about science and scientific problems using their scientific knowledge. But the present system of imparting instructions to the pupils is only a mechanical transmission of contents and processes of science which leads to rote memory. The only solution for this burning problem is to provide ample facilities and conducive learning environment to the students so as to enable them to involve actively in scientific activities such as observation, experimentation, laboratory works etc. As such, our progressive educators like John Dewey, Maria Montessori,

Mahatma Gandhi and Jean Piaget stressed, activity methods, productive methods and experimental pedagogy than traditional method of education.

Thus it warrants that the learning of science must be in a positive approach and quality oriented. But majority of schools in Kerala even now following the traditional methods of teaching which result low achievement in science among our pupils. Moreover majority of our students is not seen capable to apply the knowledge gained through science in new situation or environment. To cope up with the modern developments and changes occurred, the method of learning process, particularly in science subjects, needs thorough investigation to identify the contributing factors related to science achievement among our secondary school pupils.

UNESCO's International Education Commission (1972) recommended that "Science and technology must become essential components in any educational enterprise; they must be incorporated into all educational activity intended for children, young people and adults, in order to help the individual to control social energies as well as natural and productive ones, thereby achieving mastery over himself, his choices and actions and finally, they must help man to acquire a scientific turn of mind so that he becomes able to promote science without being enslaved by it".

Therefore, with its accelerating importance in our society, science has become an increasingly important part of general knowledge. The principle of

activity is the main basis of the learning of science and satisfies the instincts of curiosity, creativeness self-assertion, self expression etc. of the pupils. The attitude once developed in the student proves useful in later life of the child.

Dilip Thakore (2005) reports that science education in India faces the following three pertinent issues that are to be tackled to create scientific temper and creativity among our children.

- (i) Science education is still, far from achieving the goal of equity enshrined in our constitution.
- (ii) Science education in India, even at its best, develops competence but does not encourage inventiveness and creativity.
- (iii) The examination oriented learning system.

But today the activities included in our teaching learning process has become an isolated one which does not encourage children to link knowledge with their life and environmental situations. So while teaching-learning process of science education, proper emphasis has to be provided to develop scientific interest and dispositions of mind rather than merely the transfer of factual subject matter.

One of the major concerns of science education is to prepare the students to adapt with the changing situations. Therefore, in this era of technology, the recent incorporation of new information technologies into our school curriculum offers science education an unprecedented opportunity to

reconsider traditional approaches to science learning. Unfortunately, it is a fact that the inclusion of technologies like computer, LCD etc. in science education does not create positive attitude and interest among pupils upto the desired level of expectations.

According to Jawaharlal Nehru “Science does not simply sit down and pray for things to happen, but seeks to find out why things happen. It experiments and tries again and again and sometimes fails and sometimes succeeds- and so bit by bit it adds to human knowledge”

Science is considered as an intellectual endeavour which consists of two parts namely, process and product. The ‘product approach’ implies the way of transferring knowledge established by the scientists to the students whereas ‘process approach’ stressed by Robert. M. Gagne (1985) includes the way scientists think and do when they solve any scientific problem. The process approach includes hypothesizing, observing, designing experiments, recording, analyzing data, informing etc. In addition to all this, it consists of an awareness of the values underlying science.

Thus learning of science may be amenable for development of the skills related to process of science along with products i.e., scientific knowledge. This is possible only involving the students in manipulation, observation, exploration, experimentation, interpretation, prediction etc. in science classes. Unless the students are involved in using processes of science

during gathering of knowledge, their leaning of science remains incomplete. Therefore, science instruction in our classrooms should be more activity oriented, instead of a theoretical one which might hamper student's Attitude towards Science and Interest in Science.

Even though the process method of learning science has been implementing in our schools, the scholastic achievement of the learners has not been seen considerable improvement due to various reasons. These may be due to certain gaps existing between theories and practice or lack of interest, aptitude and attitude on the part of the students or may be due to the socio-familial variations of the pupils. Various empirical studies have been seen attempted so far on different psychological factors, but nobody has studied the dominant factors responsible for the scholastic achievement in science, especially Biology. Hence it is proposed to investigate with a view to identify the factors responsible for the scholastic Achievement in Biology. Such a study will be helpful to predict the future performance of students in the learning of science especially Biology.

NEED AND SIGNIFICANCE

We are at the threshold of the 21st century. The world is devising innovative ways to usher in the new century. There is a wide knowledge explosion in science and new concepts are being added day by day. The innovations in the fields like communication technology, electronics, atomic

energy, computer science, genetic engineering, etc. made remarkable changes in the student's Aptitude, Attitude, Interest, Intelligence etc. needed for learning science.

To cope with the modern world of science and technology we need persons who have scientific Aptitude, Attitude and Interest to solve problems effectively. Research findings have shown that Science Aptitude is a major factor which determines the Achievement in Science. A student with high Aptitude in Science is expected to get high achievement in all the science subjects. In addition to Science Aptitude there are a number of factors affecting Science Achievement of secondary school pupils like Attitude towards Science, interest in learning science, I.Q. etc. Children are considered as the richest national resources. Therefore, it is necessary to identify their Aptitude in Science, Attitude towards Science, I.Q., their Interest in learning science and also S.E.S. of the students when they are learning in school itself. The identification of these factors will help us to nurture these potentialities responsible for the development of scientific temper, attitude and interest towards science among our school children so as to enable them to acquire more and more sophisticated principles and theories related to science.

Now a days, the trend of science education in India, especially in Kerala is that more emphasis is being given to the student's Achievement in science, while totally neglecting the dimensions like Attitude towards

Science, Interest in Learning Science, Aptitude towards Science, etc. which are the most important factors that determine the achievement in science.

Therefore, it is high time to focus on some progressive steps which would be able to awaken curiosity, interest, Attitude towards Science etc. amongst the learners. But the present teaching learning process is geared towards rote memory without providing practical knowledge. The students are not motivated to learn systematically. Hence it is proposed to study the key factors responsible for the Achievement in Biology and also to suggest some remedial measures to boost these factors responsible for high Achievement in Biology.

Additional reasons that have led to the conduct of the present study are the following:

- (1) Being a Biology teacher and teacher educator for the last four years, the investigator has opportunities to observe that majority of the pupils who are talented in science is not seen scoring high marks in science especially in Biology. This may be due to various reasons. Hence the investigator proposed to conduct a study to identify the reasons for not scoring higher marks in science. The investigator earnestly believes that the findings thus emerged will be highly useful and beneficial to educationists, planners and administrators, while framing curriculum in science subjects especially for Biology in future.

(2) It is considered that the factors which differentiate high achievers from low achievers in different school subjects could be different. The investigator felt that she should take up the challenge to conduct a study to identify the different factors responsible for low and high achievers in Biology and hence the investigator made an attempt to conduct an analytical study of some select correlates of Biology Achievement among secondary school pupils.

STATEMENT OF THE PROBLEM

The study is entitled as “AN ANALYTICAL STUDY OF SOME SELECT CORRELATES OF BIOLOGY ACHIEVEMENT AMONG SECONDARY SCHOOL PUPILS”.

DEFINITION OF THE KEY TERMS

The key terms of the title are defined below for their operational meaning in the study and hence for a better perspective of the study.

Analytical Study: According to Carter, V. Good (1968) analytical study is the purposeful mental activity involving breaking down a problem in to its elements or logical parts.

In the present study, the term analytical study denotes to identify the factors responsible for the prediction of Achievement in Biology.

Correlates: The word ‘correlate’ is defined as “a variable which is correlated with a specified variable” (Wolman, 1975).

Biology Achievement: Refers to the performance in school in a standardized test of Biology. In the present study, the achievement of pupils includes the marks obtained by the pupils in scholastic achievement of Biology.

Secondary School Pupils: Secondary school pupils are those pupils who are studying in standards VIII, IX and X. In this study, IX Std, Malayalam medium schools were considered as the representatives of secondary school pupils.

VARIABLES OF THE STUDY

The study is designed with achievement in Biology as the dependent variable and the below listed psychological variables as independent variables.

The independent variables of the study are the following:

- 1) Science Aptitude
- 2) Attitude Towards Science
- 3) Science Interest
- 4) Intelligence
- 5) Socio-Economic Status of the Pupils

OBJECTIVES

1. To examine the significant effect of each of the select correlates on Achievement in Biology among secondary school pupils, for the Total and subsamples viz., Sex, Locale and Type of Management.

2. To find out the relationship of each of the select correlates with Achievement in Biology among secondary school pupils separately for the total and subsamples.
3. To identify the most significant correlates for predicting Achievement in Biology among secondary school pupils.

HYPOTHESES

Based on the objectives, the following hypotheses were formulated for the study:

- 1) There will be significant effect of each of the select correlates on Achievement in Biology among secondary school pupils.
- 2) There will be significant difference in the relationship of each of select correlates with Achievement in Biology among secondary school pupils.
- 3) There will be most significant correlates for predicting Achievement in Biology among secondary school pupils.

METHODOLOGY

(i) Sample:

The study was conducted on a sample of 600 secondary school pupils of Kerala. The sample was selected from 13 secondary schools of five districts of Kerala by using stratified sampling technique.

(ii) Tools:

The tools used for the study are the following:

- (1) Achievement Test in Biology for Standard IX pupils (constructed and standardized by the investigator)
- (2) Science Aptitude Test (developed by the investigator, 1998)
- (3) Scale of Attitude towards Science (prepared and standardized by the investigator)
- (4) Science Interest Inventory (constructed and standardized by the investigator)
- (5) Verbal Group Test of Intelligence (Sudheeshkumar, Hameed and Prasanna, 1997)
- (6) Socio-Economic Status Scale developed by Kuppuswamy and modified by Pillai and Subrahmanyadas.

STATISTICAL TECHNIQUES USED

Major statistical techniques used for the analysis of data are the following:

1. ANOVA
2. Correlation Analysis
3. Multiple Regression Analysis

SCOPE AND LIMITATIONS OF THE STUDY

The present study is on some select correlates of Biology Achievement

of secondary school pupils. The relationship of Achievement in Biology with each of the select correlates are studied in terms of Pearson's r and its interpretations disclose the extent to which Achievement in Biology is determined by the select correlates.

The sample for the study is a representative group of secondary school pupils drawn by the stratified sampling technique from 13 secondary schools of 5 districts of Kerala. The investigator hopes that the findings of the present study are valid and are generalizable to a considerable extent.

LIMITATIONS:

The purpose of the study is to identify the factors responsible for the prediction of Achievement in Biology of secondary school pupils of Kerala. But the sample studied for identifying the factors was chosen from only 5 districts out of 14 districts of Kerala. But the psychological and socio-economic conditions of pupils of all the districts are more or less the same, it is considered that the data collected is valid and reliable and hence limited to five districts only.

Though 'secondary school pupils' comprise of standards VIII, IX and X, the study was limited to students of standard IX only assuming that it is the representative of three standards.

In the present study, only five psychological variables viz., Science Aptitude, Attitude towards Science, Science Interest, Intelligence and SES

were selected. Other psychological variables may also influence the Achievement in Biology. But the variables included in the present investigation are the major components which influence achievement in Biology. Hence it is considered that the variables included for the study are the contributing factors for scholastic achievement and hence limited the variables.

These limitations are quite natural and are not amenable to bias the findings of the study. Therefore, the investigator earnestly believes that the findings of the present study may be a valuable contribution to the theory and practice of education in the field.

ORGANIZATION OF THE REPORT

The report of the study is organized in five chapters.

Chapter I presents the need and significance of the study, statement of the problem, definition of key terms, variables, objectives, hypotheses, methodology, scope and limitations of the study.

Chapter II consists of two sections. The first section contains a theoretical overview of some select psychological variables of the present study. The second section is a detailed review on the relation of select psychological variables with Academic Achievement.

Chapter III presents the methodology used for the study in detail. This chapter comprises description of variables, tools used for the collection of

data, sample used, data collection procedure and the statistical techniques used for the analysis.

Chapter IV deals with the analysis of the data in detail. Apart from the hypotheses and preliminary analysis of the data, this chapter presents the results of One-Way Analysis of Variance, Correlation Analysis and Multiple Regression Analysis.

Chapter V deals with the major findings, conclusions drawn recommendations and educational implications of the findings and suggestions for further research in the area.

CHAPTER II

**THEORETICAL OVERVIEW
AND REVIEW OF RELATED LITERATURE**

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- ❖ *Theoretical Overview*
 - ❖ *Studies Related to Science Aptitude and Academic Achievement*
 - ❖ *Studies Related to Attitude and Academic Achievement*
 - ❖ *Studies Revealed to Interest and Academic Achievement*
 - ❖ *Studies Related to Intelligence and Scholastic Achievement*
 - ❖ *Studies Related to Parental Education and Academic Achievement*
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THEORETICAL OVERVIEW AND REVIEW OF RELATED LITERATURE

This section consists of two parts, Part A and Part B. Part A presents a brief theoretical overview of each variables responsible for scholastic achievement.

The second part deals with the empirical studies conducted in this area.

PART- A

Scholastic achievement in science depends upon various factors such as Science Aptitude, Attitude Towards Science, Interest in Learning Science, I.Q., Class Room Environment, teaching methods adopted by the teachers, science facilities available in schools, Socio Economic Status of the pupils etc. Among these, the present study highlights the major variables like Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio Economic Status of the pupils. A brief description of each one of the variables is is presented below.

THEORETICAL OVERVIEW

1) Science Aptitude

Science Aptitude designates certain mental abilities which denote the potentialities for future accomplishment in learning Science with regard to past training and achievement. This is illustrated by such cognitive

functioning as reasoning with number, perception, reasoning with language materials etc.

In typical educational practice, the term “abilities” and “aptitude” are used synonymously to denote an individual’s potential for acquiring new knowledge or skill. Information about a person’s potential may be useful in setting reasonable expectations for what he or she can accomplish, designing effective learning difficulties that individuals may exhibit.

It is a fact that individuals vary with regard to their specific mental abilities. An individual may show superior linguistic or verbal ability while being relatively weak at spatial and mechanical reasoning tasks. Such variations among individuals have been a concern to those interested in developing theories and tests of aptitude as well as educational practitioners wishing to optimize, the outcomes of formal instruction, unfortunately, there is no universally accepted theory of aptitude. It is not known how many specific mental abilities there are nor their degree of independence. There are, however, a number of tests which attempt to measure individual differences in general and specific aptitudes.

According to Bloom (1968) if students were normally distributed with respect to aptitude for a subject and if they were provided uniform instruction in terms of quality and learning time, then achievement at the subject’s completion would be normally distributed, further the relationship between aptitude and achievement would be high.

If the students were normally distributed on aptitude but each learner received optimal quality of instruction and the learning time required, then a majority of students could be expected to attain mastery over these subjects. That is, the amount of a student learns is a direct result of the amount of time he actually spends in learning (time on task). The amount of time the student spends in learning is influenced by the quality of a given learning environment, which in turn is influenced by the student's cognitive entry behaviours (such as his aptitude and preparation for this particular task) and his affective entry behaviours (such as his attitude towards and interest in the task).

Cronbach (1970) suggests that aptitude tests can be arranged along a continuum. Tests at one extreme are strictly measures of the outcomes of education, these resemble achievement tests in content and usefulness. Tests other extreme are those whose scores are fairly independent of specific instruction. In general, the more content-oriented an aptitude test, the more useful it is in predicting future school success in the same content area, but the less useful it is in predicting general future learning.

In the opinion of Freeman (1971) Aptitude in Science is not a special talent in the same sense as that of musical aptitude. Scientific Aptitude is the application of general intellectual capacity to scientific materials and problems. A tests of scientific aptitude, therefore should be regarded as a device intended to estimate probability of success in scientific and

engineering occupations without implying that it measures psychological functions that are essentially different in form from those required in other types of mental activity. An early illustration of this type is the Stanford Scientific Aptitude Test (1930) which was intended for high school seniors and college students.

The Engineering and Physical Science Aptitude Test (Moore et al, 1943-1951) consists of a group of previously developed and standardized tests. The six sub tests are Mathematics (algebra) formulation of scientific relationships in algebraic terms, physical science information, arithmetical reasoning, scientific vocabulary and comprehension of mechanical relationships and problems (presented in pictorial form).

Theories of aptitude have been intimately tied to trends and developments in the area of mental testing. Historically there have been two contrasting view points which emphasize general mental ability versus specific abilities. A combination of both view points is represented in hierarchical theories of aptitude and intelligence such as those advocated by Cattell (1971) and Vernon (1971).

Scholastic Aptitude Tests, often referred to as "General Intelligence Tests" include the Binet and Wechsler individual intelligence tests and numerous intelligence and aptitude tests designed for group administration. General scholastic aptitude tests emphasize measures of both G_c and G_f , the crystallized and fluid intelligence factors of Cattell's Theory (1971). Such

tests yield the highest correlations with measures of typical academic achievement. An example is the Differential Aptitude Test (DAT). The DAT reports scores for eight sub tests measuring verbal reasoning, numerical ability, abstract reasoning, clerical speed and accuracy, mechanical reasoning, spatial relations, spelling and language usage.

The tests used for elementary and secondary school decision making would in many cases contain items that measure verbal abilities (eg: vocabulary, opposites, sentence completion) reasoning abilities (eg: analogies, classification, number series, inference) quantitative skills, information and memory (Lennon, 1980).

Aptitudinal variables include intelligence, special abilities like numerical ability, spatial ability, critical thinking, verbal reasoning, retentive memory, comprehension and interpretation etc. all belonging to the cognitive domain. The role of all these in predicting Biology Achievement has been reported in research studies as factors correlated with Biology Achievement.

Conclusion

From the theories, we came to the conclusion that Aptitude is an inevitable factor for strengthening achievement especially in Science. Aptitude is considered as an inborn ability of a student. The above mentioned theories clearly shows that, even though Aptitude is an inborn ability, it can be modified and strengthened through proper training and instruction in appropriate time.

2) Attitude

The term 'Attitude' in the words of Eysenk and Arnold (1972) refers to a learnt predisposition to react consistently in a given manner (either positively or negatively) to certain persons, objects or concepts. Attitudes are cognitive, effective and behavioural components.

In the academic field, study habits and attitudes are of particular theoretical and practical importance. Healthy study habits and attitudes help the individual to surpass the limits circumscribed by his intelligence bringing him to the category of an over-achiever. Unhealthy study habits and attitudes become a hurdle in the way of achievement of the individual and do not let him make the best use of his potentialities, dragging him for poor performance in academic domain and this making him an under achiever.

Attitudes are positive or negative feelings that an individual holds about objects, persons or ideas and are generally regarded as enduring though modifiable by experience. Attitudes are also seen as predispositions to actions.

An Attitude is a dispositional readiness to respond to certain situations, persons or object in a consistent manner which has been learned and has become one's typical mode of response. An Attitude has a well defined object of reference. The degree of strength of a person's Attitude may vary from extremely positive through a gradation to extremely negative. Since Attitudes

are learned and learning presumably is what goes on in schools, study of Attitudes are of extreme importance to education.

Measurement of Attitudes

There are various methods for measuring Attitudes. They are:

- i) Direct questioning
- ii) Observation
- iii) Interview
- iv) Public opinion polls
- v) Survey research
- vi) Panel method
- vii) Projective techniques
- viii) Attitude scales

Among these, the most used method is Attitude Scale

The usefulness of psychological tests in education, industry and research has been amply demonstrated. It has been a similar desire for a quick and convenient measure of Attitudes that could be used with large groups that has led to the development of Attitude Scales. Attitude Scales also provide us with one means of obtaining an assessment of the degree of affect that individuals may associate with some psychological object.

A well-constructed Attitude Scale consists of a number of items that have been just as carefully edited and selected in accordance with certain

criteria as the items contained in any standardized psychological test. The items making up an Attitude Scale are called statements. One of the major assumptions involved in the construction of Attitude Scales is that there will be differences in the belief and disbelief systems of those with favourable attitudes toward some psychological object and those with unfavourable attitudes.

Any way, there exists different techniques of developing Attitude Scales. These are Thurston's Equal-Appearing Interval Scale, Likert's Method of Summated Ratings, Guttman's Scalogram, and Osgoods Semantic Differential Scale. A brief description of each techniques is given below:

Thurston's Scale

In psychology the Thurston Scale was the first formal technique for measuring an attitude. It was developed by Louis Leon Thurstone in 1928, as a means of measuring attitudes towards religion. It is made up of statements about a particular issue, and each statement has a numerical value indicating how favourable or unfavourable it is judged to be. People check each of the statements to which they agree and a mean score is computed, indicating their attitude.

This can be contrasted with a Likert Scale which asks someone to indicate their degree of agreement or disagreement with a single statement eg: a Likert Scale would be "Please rate on a scale of 1(disagree) to 7 (agree) the statement:

“ This software was easy to use”?

The corresponding Thurston Scale would state this question in multiple ways, eg:-

- ❖ I had trouble finding what I wanted.
- ❖ I liked how easy the software was.
- ❖ The software has many convenient features.
- ❖ The software was confusing, etc.

Finally, to choose the statements people respond to, you need to validate them. For instance, you would have expert judges (or pre-testing subjects) rate each of the statements in terms of to what extent they reflect either extreme of the attitude being measured.

Likert Scale

A Likert Scale is a type of psychometric response scale often used in questionnaires and is the most widely used scale in survey research. When responding to a likert questionnaire item, respondents specify their level of agreement to a statement. The scale is named after Rensis Likert, who published a report describing its use (Likert, 1932).

A typical test item in a Likert Scale is a statement. The respondent is asked to indicate his or her degree of agreement with the statement or any kind of subjective or objectives evaluation of the statement. Traditionally a five-point scale is used, however many psychometricians advocate using a seven or nine point scale.

Eg:- Ice cream is good for breakfast

1. Strongly Disagree (SD)
2. Disagree (D)
3. Undecided (U)
4. Agree (A)
5. Strongly Agree (SA)

Likert scaling is a bipolar scaling method, measuring either positive or negative response to a statement. Sometimes Likert Scales are used in a forced choice method where the middle option of “Undecided” is not available. Likert Scales may be subject to distortion from several causes.

After the questionnaire is completed, each item may be analyzed separately or item responses may be summated to create a score for a group of items. Hence, Likert scales are often called summative scales.

Guttman’s Scalogram

A Guttman scale is a psychological instrument developed using the scaling technique developed by Louis Guttman (1944) called Guttman scaling or scalogram analysis. A primary purpose of the Guttman Scaling is to ensure that the instrument measures only a single trait (a property called unidimensionality, a single dimension underlies responses to the scale) Guttman’s insight was that for unidimensional scales, those who agree with a more extreme test item will also agree with all less extreme items that preceded it.

A perfect Guttman Scale consists of a unidimensional set of items that are ranked in order to difficulty from least extreme to most extreme position.

Eg:- A person scoring a “7” on a ten item Guttman Scale, will agree with items 1-7 and disagree with items, 8, 9, 10. An important property of Guttman’s model is that a person’s entire set of responses to all items can be predicted from their cumulative score because the model is deterministic.

Osgood’s Semantic Differential Scale

Charles Osgood (1957) connected the scaled measurement of Attitudes with the connotative meaning of words. He worked with the semantics of words and ideas involved in scaling opinions and created a method to plot a psychological distance between words by mapping a subject’s connotations of the words. These scales differentiated attitudes based on the connotations of words was his idea of a “Semantic Differential”.

Subjects were given a word and asked to rate the word with a variety of opposing adjectives along a seven point scale. Osgood contended that the adjectives picked had to be evaluative in nature. Assigning a value along a 7-point scale between opposing evaluative adjectives was used to define the meaning of a concept as its allocation to a point in the multidimensional semantic space. This space consisted of three measurable attitude dimensions: (1) Evaluation, (2) Power and (3) Activity. These three concepts, transcend language and cultures to evaluation of semantic space in any given social environment.

- ❖ **Evaluative Scales:** These consists of evaluation statements such as good-bad, hot-cold, smooth-rough.
- ❖ **Power Scales:** These measure power and potency of judgmental connotation like, strong-weak.
- ❖ **Activity Scales:** These measure judgements such as active-passive or tense-relaxed.

For the purpose of scoring consistency, we have uniformly assigned the unfavourable poles of our evaluative scales (eg:- bad, unfair, etc) the score '1' and the favourable poles (good, fair, etc) the score '7'- this regardless of the presentation of the scales to subjects in the graphic differential where they should be randomized in direction. We then merely sum over all evaluative ratings to obtain the attitude score.

Some have criticized that Osgood's method makes adjectives seem to have the same meanings for everyone and these assumptions can make the test self-contradictory for subjects who supposedly do not share the same meaning.

Semantic differential is widely used in advertising and marketing research, from questionnaires to interviews and focus groups. The versatility of uses with the bipolar adjectives and the simplicity of understanding them have made it ideal for consumer questionnaire and interviews.

Conclusion

From the theory, we can conclude that healthy attitudes of pupils towards any objects, ideas or persons is an important factor in the academic field, especially in secondary school stages where many of the psychological factors begin to germinate, which helps an individual to surpass the limit of intelligence and lead him to the category of high achievers.

3) Interest in Learning

Interest is a type of feeling experience, which might be called “worthwhileness” associated with attention to an object, or course of action, an element or item in an individual’s make up either congenital or acquired, because of which he tends to have this feelings of “worthwhileness” in connection with certain objects or matters relating to a particular field of knowledge.

Most of the studies revealed the importance of child’s interest in learning as a factor in achievement. They are now considered to be considerably organized having an important part to play in building of more comprehensive personality theory. Interest is an important factor for the success of any achievement. Uninterest becomes a hurdle in the way of achievement of an individual and this will lead him to be an under achiever.

Inorder to measure interest in science, inventory is used in the present study. In this inventory three similar activities (A, B, and C) of which one is

related to science are given. The pupils are asked to prefer one activity according to their interest. If one selects an activity related to science we can assume that he is interested in science.

Conclusion

To conclude, we can undoubtedly say that interest is a very important factor for the successful completion of any achievement. Without interest, we cannot perform well in any field. Here we can quote a proverb “you can lead a horse into a pool but you cannot make it to drink even a single drop of water, unless it feels thirsty”. Similarly if an individual is not interested in learning, we cannot make him to learn.

4) Intelligence:

The term intelligence is hypothetical in nature. Psychologists have been interpreting the term in different ways and are in disagreement on the meaning of the term intelligence. In psychological literature, intelligence has been treated as a hypothetical construct and no one knows what intelligence is. Several definitions have been advanced by psychologists but no two psychologists agree on single definition of the term.

Definition

A number of definitions have been evolved by psychologists according to their own concept of term intelligence.

- 1) Intelligence is judgement, otherwise called good sense, initiative, the

faculty of adapting oneself to circumstances. To judge well, to comprehend well, to rationalize well, these are the essential activities of intelligence (Binet, 1905).

- 2) Intelligence is to judge well, comprehend well and to reason well (Binet and Simon, 1936).
- 3) Intelligence is the aggregate global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment (Wechsler, 1944).
- 4) Intelligence is a fixed inherited cognitive ability (Burt, 1955).
- 5) It is the application of cognitive skills and knowledge to learn, solve problems, and obtain ends that are valued by an individual or culture (Gardner, 1985).

All the definitions have been systematized by Vernon (1962) and Freeman. Vernon (1966) classified all definitions under three main categories. (a) The biological (b) the psychological, (c) the operational.

Freeman classified all definitions of intelligence into three categories as (a) Adjustment or Adaptation ability (b) Ability to learn (c) Ability to carry on abstract thinking but his approach differs from Vernon.

Vernon's Classification

1. Biological Approaches:

Biological approaches give importance to the adaptable and versatile

character of human beings. Thus intelligence has been defined as capacity for profiting by experiences, adaptation to environment, plasticity or ability to learn. Spencer and Binet (1936) thought of intelligence as an inherited and general capacity. But there are many strong reasons against this biological conception of the nature of intelligence. For example, our intelligence tests make no attempts to measure learning capacity of individual. Another reason is that many great men whom we would regard as highly intelligent are not well adapted to physical and social environment.

Psychological Definitions

Many psychologists discarded the biological nature of the intelligence. Binet (1905) frankly regarded intelligence as a complex set of qualities, including: (1) the appreciation of a problem and direction of the mind towards its execution (2) the capacity for making the necessary adoptions to reach a definite and (3) the power of self criticism. Burt (1955) defined intelligence as innate general cognitive ability. Most educational test correlates highly with intelligence tests, but also they depend on how much the individual has been taught and on his retention, which are related with environmental influences. The different views listed overlap considerably and constituted as partial aspect of intelligence.

Operational Approaches

Operational approaches describe abstract concept, intelligence in terms of simple observable procedures, such as scores on mental tests. Spearman

(1960) believed that intelligence was operational, definable factor which emerged from analyzing. The correlation between tests, regardless of particular abilities listed or the theories on which they were based. The best definition that can be given is a rather simple, non specific one, such as 'all round thinking' capacities or mental efficiency r as Burt and Bullard (1958) suggested, general mental ability.

Freeman's Classification

Three Types: A variety of definitions have been given by psychologists, but as a matter of fact, each can be classified in to one of three groups.

- 1) Adjustment or adaptation ability: According to definition of this type intelligence is general mental adaptability to new problems and new situation of life; or otherwise stated, it is the capacity to reorganize one's behaviour patterns so as to act more effectively and more appropriately in novel situations. Thus the more intelligent person is one who can more easily and more extensively vary his behaviour as changing condition demand; he has numerous possible responses and is capable of greater creative reorganization of behaviour, whereas the less intelligent person has fewer responses and is less creative.
- 2) Intelligence is ability to learn: According to this definition a person's intelligence is a matter of the extent to which he is educable in the broadest sense. The more intelligent the individual is, the more readily

and extensively he is able to learn.

3) Intelligence as the ability to carry on abstract thinking.

This means the effective use of concepts and symbols in dealing with situation; especially those presenting a problem to be solved through the use of verbal and numerical symbols. Binet's conception of intelligence belongs largely in this category for he maintained that it is the capacity to reason well, to judge well and to be self-critical.

Types of Intelligence

Thorndike (1938) has divided intelligent activity into three types: 1) Social intelligence 2) Concrete intelligence 3) Abstract intelligence.

- 1) Social Intelligence or ability to understand and deal with persons: High social intelligence is possessed by those who are able to handle people well. Adequate adjustment in social situation is the index of social intelligence.
- 2) Concrete Intelligence or ability to understand and deal with things, as in skilled trades and scientific appliances. This kind of intelligence is measured by performance tests and picture test in which the individual has to manipulate concrete materials.
- 3) Abstract Intelligence or ability to understand and deal with verbal and Mathematical symbols. All tests of intelligence which require manipulation of symbols are tests of abstract intelligence. The role of

ability to deal with ideas and symbols (words and numbers) as a measure of concept formation and abstraction is of increasing importance in tests of general ability (intelligence) as age level increases.

Psychometric Theories of Intelligence or Factor Analytic Theories and Factor Analytic Models

Psychometric theories of intelligence seek an understanding of intelligence in terms of the way it is measured through the use of statistical-mathematical techniques called factor analysis. This involves the examination of a matrix of inter-correlation for a set of cognitive tasks standardized test scores on mental ability to uncover common patterns of individual differences in the performances of these tasks. In psychology, a number of factor analytic theories are available. The basic assumption of factor analysis is that more similar the scores on two or more tests (high correlation) the more likely these tests measure the same ability. Psychometric theories are otherwise regarded as the Factor Analytic theories also.

Factor analytic theory is in the form of dimensional models with Mathematical description of their proportion. Factor analysis used to determine the basic irreducible variables (factors) underlying a large number of inter related variables. When measurements of a large number of variable have been obtained factor analysis reduced them to a smaller number of basic types or factors.

Factor analytic theories analyse the structure of intelligence through the factor analysis technique. The method followed is this, a number of intelligence tests, diverse in character are given to an adequate sampling of the population. The results of each type of test are correlated with those of all others. The coefficient of correlation are then subjected to various techniques of statistical analysis in an effort to discover the external of common ground between them (technically known as communality) and their degree of independence (Freeman, 1971). One deduction from analysis is that tests correlate to the extent of the factors that they share in common. If two tests have no factors in common, their inter correlation is zero.

The particular theory or structure of intelligence reduced from the statistical operation will depend upon the experts interpretation of analysis, and experts differ to some extent in their interpretations.

Theories of Intelligence

Intelligence is one of the most controversial topics in psychology and many theories have been evolved and also failed as a result of the works of researchers and psychologists. The representative theories of Intelligence are given below:

(1) Faculty Theory

Faculty theory is the oldest theory regarding the nature of intelligence. This theory flourished during 18th and 19th century. According to this theory, mind is made up of different faculties like reasoning, memory discrimination

and imagination etc. these faculties are independent of each other and can be developed by vigorous exercise of the difficult subject matter. This theory, of the nature of intelligence, gave birth to a new theory of education, popularly known as mental discipline theory. Faculty theory had been under criticism by experimental psychologists who disproved the existence of independent faculties in the brain.

(2) Two Factor Theory, Spearman's g and s

Spearman (1904) the father of factor analysis in psychology, stated out with the simplest possible factor mode. According to Spearman, all intellectual activities are dependent upon and is expression of a general factor common to all mental activity. This factor designated by the symbol 'g' is possessed by all individuals, but in varying degrees of course since people differ in mental ability (g) and it operates in all mental activity, though in varying amounts. Since mental task differs in respect to their demands upon general intelligence, Spearman (1904) characterized this factor as mental energy, because in the realm of intelligent activity, it is maintained. It has role similar to that of physical energy in the physical world.

Spearman (1904) proposed that intellectual abilities were comprised of two factors, general ability or common ability known as 'g' factor and group of specific abilities known as 's' factor.

Characteristics of 'g'

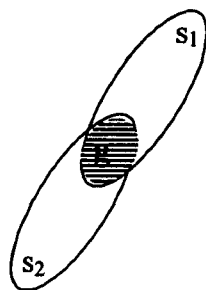
- (a) It is universal inborn ability

- (b) It is general mental energy
- (c) The amount of 'g' differs from individual to individual
- (d) Greater the 'g' in an individual and greater the success in life
- (e) It is used in every life activity

Characteristics of 's'

- a) It is learned and acquired in the environment.
- b) It varies from activity to activity in the same individual.
- c) Individuals differ in the amount of 's' ability.

The following diagram explains relationship between 'g' and 's' abilities.



3) Multifactor Theory

This theory of intelligence was developed by E.L. Thorndike, an American psychologist. According to this theory, there is no general intelligence. He distinguished four attributes of intelligence.

- (a) **Level:** This attribute refers to the difficulty of a task that can be solved.

Level is the important factor of intellect, but we cannot measure it alone.

(b) Range: Range refers to the number of tasks at any given degree of difficulty that we can solve. In intelligence tests, range is represented by items of equal difficulty, we cannot measure attitude without range or width.

(c) Area: Area in a test means the total number of situations at each level to which the individual is able to respond.

(d) Speed: This is the rapidity with which we can respond to test items. Speed and altitude are positively correlated. Speed is much less closely bound up with altitude than the other attributes. We should not, therefore, emphasize speed too much in our intelligence tests.

Every intelligence test consists of these four attributes. Emphasis on the aspect of these attributes varies from test to test.

4) Group Factor Structure of Intelligence

The multifactor theory is based on factor analysis and statistical procedure that attempts to describe as simply as possible the main factors that account for the relationship among several different tests. L.L. Thurstone was the first psychologist who used this procedure by correlating the results from approximately 60 separate tests. The factor analysis of the resulting correlation yielded the following abilities that provide the basis for the construction of the Primary Mental Abilities (PMA) test. According to this theory, intelligence neither consist of two factors as proposed by Spearman

nor multifactors as developed by Thorndike.

The six primary factors emerged are as follows:

1. Number factor (N) : Ability to do numerical calculations rapidly and accurately.
2. Verbal factor (V) : Found in test involving verbal comprehension
3. Space relations (S) : Involved in any task in which the subject manipulates an object imaginary in space.
4. Memory (M) : Involving the ability to memorize quickly.
5. Reasoning (R) : Found in tasks that require the subject to discover a rule or principle.
6. Word Fluency (W) : Involved whenever the subject is asked to think of isolated words at a rapid rate.

Today there is rather general agreement among the psychologists that there are many intellectual dimensions. However, there remains a factor that might be called general scholastic aptitude, a conclusion support by the fact that factors on such tests as the PMA are not completely independent but are correlated to some extent with each other.

5) Structure of Intellect (SOI) by Guilford

Structure of intellect was developed by Dr. J.P. Guilford (1966) and his associates in the psychological laboratory at the University of Southern

California in 1966 on the basis of factor analysis of many tests. They concluded that every mental process or intellectual activity can be described in terms of three different basic dimensions or parameters known as:

- 1) Operations – the act of thinking
- 2) Contents – the terms in which we think
- 3) Products – the idea we come up with

Under each of these three aspects there are several sub categories, and these ultimately constitute the structure of intellect.

OPERATIONS

It consist of five major groups of intellectual abilities

- ❖ Cognition
- ❖ Memory
- ❖ Divergent thinking
- ❖ Convergent thinking
- ❖ Evaluation

CONTENT

There are five types of contents as under.

- ❖ Visual
- ❖ Auditory
- ❖ Symbolic
- ❖ Semantic

- ❖ Behavioural

PRODUCTS

Six kinds of products as follows:

- ❖ Units
- ❖ Classes
- ❖ Relations
- ❖ Systems
- ❖ Transformations
- ❖ Implications.

The structure of human intelligence, according to Guilford's model can be viewed in terms of the three basic parameters along with their divisions into a specific number of factors. There could be $5 \times 6 \times 5 = 150$ factors in all, which may constitute human intelligence. Each one of these factors has a trigram symbol i.e., at least one factor from each category of the three parameters has to be present in any specific intellectual activity on mental task.

Gardner's Theory of Multiple Intelligences

Howard Gardner (1983, 1995, 1998, Gardner & Hatch 1990) believes that there are eight different abilities or intelligences, that are relatively independent of one another. The proposed type of intelligence are as follows:

1. Linguistic Intelligence - The ability to use language effectively.
2. Logical-Mathematical Intelligence - The ability to reason logically, especially in mathematics and science.
3. Spatial Intelligence - The ability to notice details of what one sees and to imagine and “manipulate” visual objects in one’s mind.
4. Musical Intelligence - The ability to create, comprehend and appreciate music.
5. Bodily-Kinesthetic Intelligence - The ability to use one’s body skillfully.
6. Interpersonal Intelligence - The ability to notice subtle aspects of other people’s behaviour
7. Intrapersonal Intelligence - Awareness of one’s own feelings, motives, and desires.
8. Naturalist Intelligence - The ability to recognize patterns in nature and differences among natural objects and life forms.

Gardner presents some evidence to support the existence of Multiple Intelligences. For instance, he describes people who are quite skilled in one area (perhaps in composing music) and yet have seemingly average abilities in other areas. He also points out that people who suffer brain damage

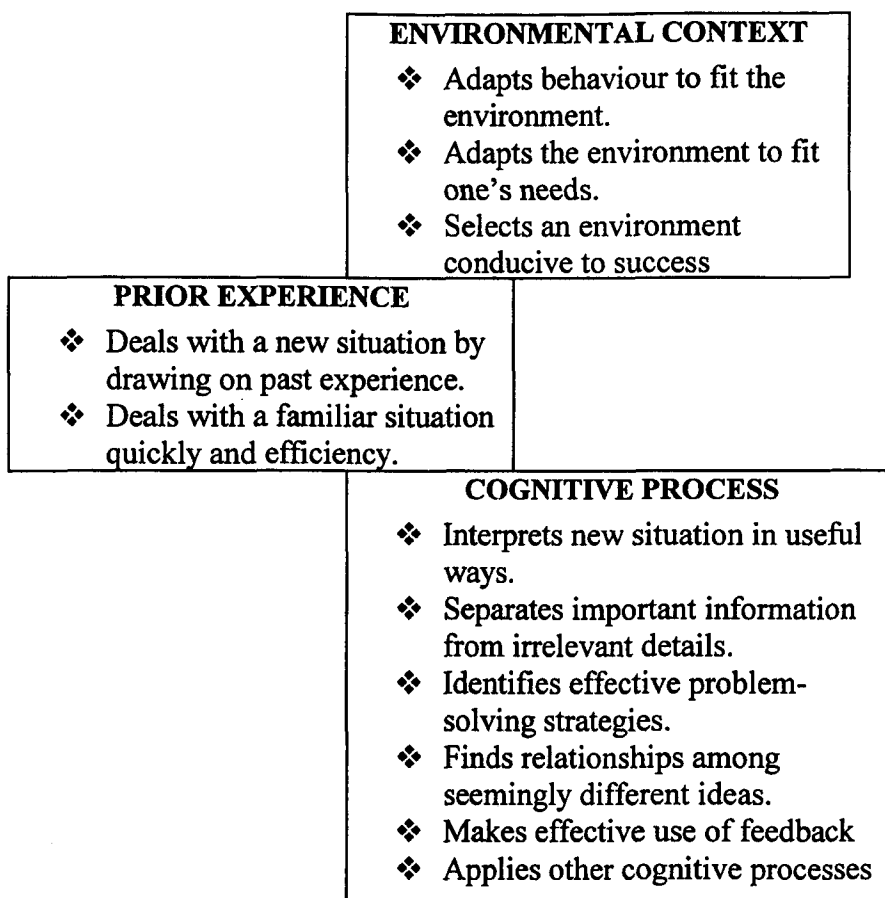
sometimes lose abilities that are restricted primarily to one intelligence; for instance, one person might show deficits primarily in language, whereas another might have difficulty with tasks that require spatial skills. Nevertheless, some psychologists believe that Gardner's evidence is not sufficiently compelling to support the notion of eight distinctly different abilities, many are taking a "wait and see" attitude until more research is conducted (eg: Berk, 1997; Feldman & Goldsmith, 1991)

7) Sternberg's Triarchic Theory

Whereas Gardner focuses on different kinds of intelligence, Robert Sternberg of Yale University focuses on the nature of intelligence itself. Sternberg (1985) suggests that intelligent behaviour involves an interplay of three factors, all of which may vary from one occasion to the next:

- 1) the environmental context in which the behaviour occurs,
- 2) the way in which one's prior experiences are brought to bear on a particular task.
- 3) the cognitive processes required by that task.

These three dimensions are summarized as below:



To date, research neither supports nor refutes Sternberg's belief that intelligence has this "triarchic" nature. At the same time, Sternberg's theory reminds us that an individual's ability to behave "intelligently" may vary considerably, depending on the particular context and on the specific knowledge, skills and cognitive processes that a task requires. Some theorists believe that context makes all the difference in the world- a belief that is clearly evident in concept of distributed intelligence.

The Concept of Distributed Intelligence

Implicit in our discussion so far is the assumption that intelligent

behaviour is something that people engage in with little, if any, help from the objects or people around them. But some theorists point out that people are far more likely to think and behave intelligently when they have the support of their physical and social environments (Pea, 1993; Sternberg & Wagner, 1994; Perkins, 1995). For example, it's easier for many people to solve for x in $\frac{4}{5} = \frac{x}{30}$ if they have pencil and paper, or perhaps even a calculator with which to work the problem out. That is, anyone can perform more difficult tasks when he or she has the support structure, or scaffolding to do so.

This idea that intelligent behaviour depends on people's physical and social support systems is referred to as distributed intelligence. People can "distribute" their thinking in at least three ways (Perkins 1995). First, they can use physical objects, and especially technology (eg: calculators, computers) to handle and manipulate large amounts of information. Second they can work with other people to explore ideas and solve problems. And third, they can represent and think about the situations they encounter using the various symbolic systems that their culture provides- eg:- the words, diagrams, charts, equations and so on that help them to simplify complex topics and problems.

IQ Scores

Scores on intelligence tests were originally calculated by using a formula involving division; hence they were called "Intelligence Quotient" or IQ scores. Eventhough we still use the term IQ, intelligence test scores are no

longer based on the old formula. Instead, they are determined by comparing a student's performance on the test with the performance of others in the same age-group. A score of 100 indicates average performance, students with this score have performed better than half of their age-mates on the test and not as well as the other half. Scores below 100 indicate below-average performance on the test, scores above 100 indicate above-average performance.

Emotional Intelligence Quotient (EQ)

Emotional Intelligence enables one to learn to acknowledge and understand feelings in ourselves and others and that we appropriately respond to them, effectively applying the information and energy of emotions in our daily life and work.

According to Cooper and Sawaf (1995) "Emotional Intelligence is the ability to sense, understand and effectively apply the power of emotions as a source of human energy, information connection and influence.

EQ becomes the aid of IQ when there is a need to solve important problems or to make key decisions. Emotions awaken intuition and curiosity, which assist in anticipating an uncertain future and planning our actions accordingly. I.Q. is more or less stable and constant, whereas E.Q. is learned and developed through experiences.

Conclusion

From the above theories, we can conclude that no two psychologists

agree on single definition of intelligence. So unfortunately, there is no universally accepted definition of intelligence. Any way we all know that intelligence deserves a prominent place in every field especially in academic field. New ideas are being added day by day to the theories of intelligence; even though, nobody can argue that intelligence has no relation with academic achievement especially in science.

5) Socio-Economic Status

Socio-Economic status denotes a person's status or position on within the society or any social group by social class or wealth or income.

The term socio-economic status refers that the social class in which an individual is a member. It is grouping of people into different classes on the basis of occupation. Traditionally society was divided into upper, middle and working classes according to Socio-economic grouping.

Socio-economic background includes all aspects of income, profession, culture, religious, beliefs, family relations and standard of living. If individual has more salary than others and leading a high profession like engineering, doctor or judge, then he has a high status in the society.

Among the early parental factors studied were parental occupation, level of parental education, and parental income, which were then categorized into levels of "social class" or socio-economic status.

Researches show that there exists a significant relationship between

family variables and scholastic performance of the students, especially at the school level. It has been found that children from a high socio-economic background are more likely than children from a low socio-economic background to remain at school to the secondary stage. This is true even when children's level of general scholastic ability is controlled (Greaney and Kellaghan, 1984; Halsey et al; 1980 Sewell and Hauser, 1976). For example, Sewell and Hauser found that socio-economic variables accounted for 15 percent of variance in educational attainment.

Parents in the upper middle class used a variety of resources to promote their children's educational achievement. These resources included the activities such as spending time in their children's classroom and talking to teachers; spending money on tutors in problem subjects; using their status and education to argue with and influence teachers to change their children's reading or some other aspect of classroom programme and working with their children on both school and school like tasks at home.

Family school relationships and inequalities in educational opportunities are distinct for working class and middle class families. Although the educational values of the two groups of parents did not differ, the ways in which they promoted educational achievement did. In the working class community, parents turned over the responsibility for education to the teacher. In the middle class community, however, parents saw education as a shared enterprise and scrutinized, monitored and supplemented the school

experience of their children (Lareau, 1987).

The most frequently supported conclusion that can be drawn from a review of the literature on the effects of maternal employment on children since 1960s is that, taken by itself, a mother working out-side the home has no universally predictable effects on a child (Abbot, 1991). Some researchers have hypothesized that maternal employment may result in negative effects that emerge in adolescents. But frequent shared activities between mother and child may compensate for disruptive features of mother's work and may transmit psychological benefits of work to children (Moorehouse, 1991).

Thus level of social class or socio-economic status is positively but not very strongly related to a variety of measures of scholastic ability and achievement. Children who come from homes in which parents have been educated to a high level perform better on such measures. High educational attainment of parents were found to be associated with better school performance of their children (Patrick, 1993). It is also true that more highly educated mothers have greater success in providing their children with the cognitive language skills that contribute to early success in school, than less well educated mothers (Benjamin, 1993).

In studies that used income as the index of family circumstances, variation in background has been found to account for an average of under 10 percent variance in a variety of measures of school performance. An average of about four percent variation in school performance was found in studies

that used occupation as the family index (White, 1982).

The influences of the parents, as measured by socio-economic background on scholastic achievement may not be as great in developing countries, particularly in low income one's as it is in industrialized countries. In a study of achievement in science in India, 27 percent of variance was attributable to variation in school factors, while only three percent was attributable to variation in background characteristics (Heyneman and Loxley, 1983).

Conclusion

It is concluded from the theories that there exists a significant relationship between socio-familial variables like parental education, parental employment, parental income and scholastic achievement among pupils especially at the secondary school stage. Further most of the studies revealed that children who came from families of high economic status perform better than the children who came from low economic status. It is found that children coming families of highly educated mothers are seen with high performance than children from families of less education mothers. Therefore, the study warrants women education, because educating women means, the future of next generation is made safe and prosperous.

General Conclusion on Theoretical Overview

Thus from the above all theories of different variables, it can be

concluded that all the selected variables like Science Aptitude, Interest in learning science, Attitude Towards Science, Intelligence and SES have high influence on Achievement and also the relevance of these variables are pertinent at any time.

PART- B

This section deals with the survey of related studies of each variable selected for the present study.

Studies Related to Science Aptitude and Academic Achievement

Stinson and Morrison (1959) using DAT and Wechsler Adult Intelligence Scale on a sample of thirty six boys and thirty three girls chosen at random from a senior class in Maplewood found significant sex difference in numerical reasoning with higher mean scores for boys.

While standardizing the Kerala University Test of Science Aptitude, Nair, Pillai and Ramanadan (1968) found sex difference at 0.01 level in science aptitude.

Pillai (1969) using the Kerala University Test of Science Aptitude on a wider sample, found sex difference in Science Aptitude consistently in favour of boys, which is true for the whole sample, subsamples and an equated groups of boys and girls.

Shanthibai (1971) while standardizing a numerical aptitude test for secondary school pupils in Saurashtra found that the null hypothesis regarding

difference in mean performance of boys and girls is rejected in favour of boys.

Sreekumar (1972) made a comparative study of science aptitude. Science interest and science achievement of science club members. In this study he found a close relationship between science aptitude, science interest and science achievement.

Wentling (1973) conducted a study on aptitude treatment interaction in a learning model of instruction but not offered any clear cut conclusions. Similarly Conteras (1975), Fagen (1975), Jones (1976), Ward (1979) also conducted the same study but they also failed to offer clear-cut conclusions.

Berton and Perry (1975) in a study of predictive value of Stanford Scientific Aptitude Test found that the Science Aptitude Test can be employed for predicting science achievement.

In a study on biology achievement and its correlates Joseph and Nair (1978) obtained a correlation of 0.59 between achievement and science aptitude.

Burrow and Okay (1979) conducted a study on the effect of mastery learning strategy on Mathematics achievement. The results indicated significant differences in achievement between students in the high and low Mathematics aptitude groups.

Skaria (1984) in a study of the attainment of essential conception in

biology in relation to science aptitude found out that there is significant positive relationship between two variables, for the total sample, boys, girls, rural urban and three levels of science aptitude.

A study conducted by Pillai (1986) on the relative efficiency of science aptitude and intelligence to predict biology achievement reveals that positive and significant correlation exists between science aptitude and biology achievement.

Ghosh (1986) found that while boys and girls did not differ on scientific attitude and aptitude, there was a positive relationship between scientific aptitude, attitude and academic motivation.

In a study conducted by Reap and Cavallo (1992) an investigation was designed to reveal, describe and assess the rote-level and meaningful level understanding students attained as they progressed through the learning of new concepts. This study used an assessment technique and also explored factors that may be related to student's acquisition of conceptually interrelated meaningful understandings, specifically (1) aptitude (2) need for achievement (3) meaningful learning orientation and (4) gender.

Analysis of data from the Differential Aptitude Test and need for achievement questionnaire indicated significant gender differences between males and females. Male students scored higher than female students.

Wang Lin (1993) conducted a review and critique of Differential

Aptitude Test (DAT). It is a multiple aptitude battery designed to measure junior and senior high school students' and adults' ability to learn or succeed in certain areas. The findings revealed that the DAT has remained one of the most frequently used batteries, is a tribute to its quality, credibility and utility.

While standardizing Science Aptitude Test with a sample of 753 IXth standard pupils selected by stratified random sampling techniques from Kozhikode, Malappuram, Kottayam and Trivandrum districts of Kerala. Priya (1998) found that subsample such as boys and girls, rural and urban pupils and government and private pupils differ significantly in their mean scores. Boys are superior to girls in their science aptitude. Similarly urban and private pupils are superior in science aptitude to rural and government pupils.

Meera (2000) conducted a study on interaction effect of language aptitude and attitude towards English on achievement in English with a sample of 680 secondary school students of Std IX drawn from Malappuram, Kozhikode and Palakkad district by means of stratified random sampling technique. The results indicated that language aptitude has significant effect on achievement in English. At the same time it is reported that Achievement in English has no influence on Attitude. The result again shows that Achievement in English is not influenced by the combined effect of 'Language Aptitude' and 'Attitude Towards English'.

Mumthas (2001) in a study on certain psychological variables as predictors of Achievement in Mathematics of secondary school pupils of

Kerala found that there exists significant relation between Aptitude and Achievement in Mathematics.

Studies Related to Attitude and Academic Achievement

Sabar and Kaplan (1978) in a study of the effect of a new seventh grade biology curriculum on the achievement and attitudes of intellectually and culturally heterogenous classes of Israel came to the following conclusions:

- (i) Incorporating individualized instruction in heterogenous classes has positive influence on achievement.
- (ii) After the biology programme the experimental group showed a more favourable attitude.

Good (1979) in a study of attitude towards science and scientists of students and teachers in India obtained a correlation coefficient of 0.98 which is highly significant indicating that persons high on attitude towards science has high understanding of science also.

Study by Pillai (1981) revealed that for high school students the correlation between achievement in Biology and attitude towards science is low.

The study conducted by Hough and Piper (1982) investigated the relationship between elementary pupil's attitude towards science and their science achievement. It revealed that there exists a significant relationship

between the pupils residualized gain scores on the high attitude inventory.

Nair (1984), Thampy (1984) and Valsamma (1984) studied the interaction of attitude towards science on Achievement in Biology and found that substantial, positive relationship exists between Attitude towards science and Achievement in Biology.

The study by Varghese (1986) on the relationship between science interest, attitude towards science and Chemistry achievement found that there is significant difference between high achievement group and low achievement group in their attitude towards science.

Sujatha (1987) studied on the relative efficiency of science aptitude, science interest and attitude towards science in predicting Biology achievement, and found that there is real and significant correlation between attitude towards science and achievement in Biology.

Mandila. S.S. (1988) examined attitudes of secondary school students towards their own science curriculum and its relationship with achievement motivation. He concluded that all students from urban and rural areas possessed favourable attitudes towards the science curriculum.

Indira (1989) studied the relation between attitude towards science and achievement in physics with a sample of 500 secondary school pupils of IX Std in Kerala and found a significant relation between two variables.

Noushad (1989) in a study to find the effect of sex, locale and attitude

towards problem solving and process outcomes in Biology got significant relation between Attitude towards problem solving and process outcomes in Biology.

Varghese (1989) in a study of Affective correlates of process outcomes in Biology, found that process outcomes in Biology can be predicted by using the score of attitude towards problem solving, attitude towards science and achievement motivation.

Malvia. D.S. (1991) examined attitudes towards science and interest in science. The study showed that high scores on attitude towards science favour higher scientific interest.

Jayashree (1991) found that the coefficient of correlation between attitude towards science and biology achievement is positive and significant.

Good J.K. (1992) and his student's at the regional college of education, Ajmer have studied attitude towards science and scientists among students and teachers. His study revealed significant relationships between the public understanding of science and attitude towards science.

Study conducted by Sreelatha Amma (1992) indicates that there is significant relation between Attitude Towards Science and Achievement in Biology

Prameela (1993) in a study to find efficiency of some cognitive and affective variables in predicting achievement in Physics found that attitude

towards science can be used as a predictor variable in predicting achievement.

Sujatha's (1994) study on the relationship between adjustment and process outcome in Biology is significant at 0.01 levels for Personal Adjustment, Social Adjustment and Total Adjustment separately with process outcomes in Biology.

Kumar (1998) carried out a study on the relationship of attitude towards mathematics with achievement in Mathematics and found attitude towards mathematics is positively and significantly correlated with achievement in mathematics. It was also found that 'high attitude towards mathematics' group is significantly superior in the achievement in Mathematics in comparison to the 'low attitude towards Mathematics' group.

Blenis, Debra. S. (2000) conducted a study on the Effects of Mandatory, Competitive Science Fairs on Fifth Grade Student's Attitude Towards Science and Interest in Science. The results indicated that attitude was not significantly affected by different award structures, however, students who participated in the non competitive fair did display an increase in attitudes.

Vineetha (2000) studied the relationship between science studying approach and Attitude towards science with process outcomes in physical science of secondary school pupils and found that there exists a significant relationship between the process outcomes in physical science and each of the independent variables.

Freedman, Michael. P. (2001) studies on the influence of laboratory instruction on science among Ninth Grade Students across Gender differences. The findings showed that.

- a) Students who had regular laboratory instruction scored significantly higher in science achievement test than those who had no laboratory experience.
- b) Female students who had regular laboratory instruction scored significantly higher in science achievement test than female students who had no laboratory experience.
- c) Female and male students within the treatment group did not differ significantly on the science achievement test effect of attitude towards science on achievement in chemistry is significant.

Sabitha (2003) studied the relationship between process skills in science and Attitude towards science of 500 VIII Std pupils in Kerala. The findings revealed that process skills in science was significantly correlated with Attitude towards science.

Studies Revealed to Interest and Academic Achievement

A study by Edwards and Wilson (1958) found that for boys and girls of near identical science interest, there is significant difference in the basic interest patterns and orientation.

In a study of eleven to fifteen year old students in England, Meyer

(1961) found a sharp contrast between the scores in science interests. The study noticed that 16 percent of those who disliked science were boys while 84 percent were girls. Equal number of boys and girls were found different to science. This sex difference occurred inspite of strong attempt by the staff to encourage girl's science interest.

Torrance (1963) evaluated the behaviour of fourth, fifth and sixth grade boys and girls in 1959 and again in 1960, with reference to scientific tasks. In 1959 he noticed that boys demonstrated ideas and explained more ideas and principles than girls, but in 1960 no such difference, was seen between the sexes.

In a descriptive survey conducted by Weaver and Desico (1965) no significant difference in scientific interest of eleventh grade students was noticed.

Wallberg (1967) factor analysed scored obtained by administering Cooley and Reed Inventory on a sample of 725 boys and 132 girls. In the study, girls scored significantly high scores in three dimensions, but obtained low scores in two dimensions. Girls were supposed to have more interest in the animate aspects of science.

Balasubrahmaniam and Visweswara (1970) reported that among other factors, interest of the students to study English is a significant factor that affect the performance of the pupil.

In the studies of Gopalan (1971), Thomas (1971) and Sumathykuttu Amma (1973) interest is considered to be one of the most important non-intellectual factor in achievement.

Pathak (1974) showed that high achievers and low achievers did not differ significantly in regard to their interest patterns.

Vishnoi (1977) made a study on 184 male students belonging to different intermediate colleges in Allahabad Municipal Corporation and reported that academic achievement of high and low achievers have no relationship with the area of interest except in literary activities.

In a study Rowlands (1978) concluded that more girls were found to enter courses in Biology as compared with boys.

Sreekumaran (1981) conducted a study using a sample of 582 IX std pupils and found that positive negligible relationship exists between science interest and achievement in Biology for the total and sub samples based on sex and locale.

Varghese (1986) investigated the relationship between science interest, attitude towards science and achievement in Chemistry of secondary school pupils of Kerala. The study revealed that there is significant difference (at 0.01 level) in science interest between high and low achievement groups.

Study done by Sujatha (1987) on a stratified random sample of 568 Std IX students of Ernakulam district revealed that the relationship between

science interest and biology achievement is positive and significant at 0.01 level.

Sundarajan and Krishna Murthy (1989) studied the higher secondary student's interest and achievement in history. It was found that there is a significant difference in scientific interest and achievement.

Prameela (1993) carried out a study using a sample of 502 students of Std IX and found that significant relationship exists between the criterion variable Achievement in Physics and science interest.

Gafoor (1994) studied the relationship between science interest and science achievement and found that there exists significant relation between science interest and science achievement for the total sample and for subsamples based on sex and locale.

Cuccio-Schirripa, Santine (1999) conducted a study on Science Question Level and its relationship to Seventh Grader's interest and achievement in Science. They describes a study of student's (n = 106) written questions about topics they considered extremely interesting and not very interesting. Results revealed that there were significant positive relationships for questions written for high and low interest level and also significant positive relationship between question level and achievement in reading, Mathematics and Science.

Mumthas (2001) studied the influence of secondary student's Interest

and Achievement in Mathematics. It was found that there is a significant difference in Student's Interest and Achievement in Mathematics.

Sally (2005) conducted a study on igniting Girl's Interest in Science careers and concluded that Science place a greater role in everyone's lives than ever before and students who have a solid foundation in science are prepared to persue a wide range of opportunities in high school, college and the work place.

Studies Related to Intelligence and Scholastic Achievement

A large number of studies have been conducted this area all of which revealing significant positive relation between Intelligence and school achievement. Some of the studies reviewed are presented below.

Kulshreshta (1956) in a study to find out the relationship between intelligence and scholastic achievement of secondary school pupils found that there exists positive correlation between intelligence and scholastic achievement.

Dasojh (1958) investigated with progressive Matrices Tests as Tests of Intelligence and obtained coefficient of correlations 0.60, 0.60 and 0.39 respectively with achievement in Mathematics, General Science and first language, the sample being secondary school pupils.

Kundu and Chakravarthy (1964) in their study got a correlation of 0.46 between progressive matrices test of intelligence and Mathematics.

Rastogi (1964) studied the relationship between intelligence, interest and achievement in English and Science of high school students found that the relationship between intelligence and interest in English and that between intelligence and achievement are significant.

Rao (1965) identified the relationship of intelligence, study habits, Socio-Economic Status and certain attitudes towards the school with academic achievement of grade VIII pupils of Delhi found that intelligence, study habits and school attitudes are significantly related to scholastic achievement.

Bhavaar (1966) while constructing a non-verbal group test of intelligence for IX, X and XI standard school pupils obtained the following correlations with achievement of pupils in various subjects like Hindi (0.46), Gujarati (0.51), Social Studies (0.35), English (0.37), Science (0.70), Mathematics (0.6) and for total marks of all subjects as 0.49.

Nair (1968) in his study of relationship between Academic Achievement and Intelligence using a sample of 702 pupils of Std V, VII, and IX found positive correlations between intelligence and academic achievement.

Gowrikutty Amma (1968) in her study found high correlation between intelligence and academic achievement.

In another study conducted by Nair (1970) on the efficiency of verbal

intelligence and non-verbal intelligence in predicting scholastic achievement got a significant correlation of 0.528 between intelligence and achievement.

Nair (1970) in another study obtained a correlation of 0.45 between non-verbal test of intelligence and school marks in science.

Jha (1970) in an exploratory study examined the nature of relationship between intelligence, science aptitude, adjustment, anxiety extroversion, study habits and socio economic status on one hand and achievement in science on the other. He obtained positive and significant relationship between achievement in science and general intelligence.

Mathew (1971) conducted a study on the relation between intelligence and achievement in science and got a significant correlation between the two variables.

Gupta (1972) in his study of 'Backwardness in Mathematics and Basic Mathematics Skills' found that there exists significant, positive correlation between Achievement in Mathematics and Intelligence.

Lalithamma (1973) found some factors affecting achievement in Mathematics. Using Raven's progressive Matrices Test, to measure Intelligence, she found that Achievement in Mathematics is related to intelligence positively.

Mathew (1974) measured the effect of intelligence and anxiety on Mathematics Achievement using sample of 470 secondary school pupils

found positive and marked relationship between Intelligence and Mathematic Achievement.

Abraham (1975) in a study on the effect of intelligence and study habits on English Achievement at secondary level found intelligence as a significant predictor of achievement in English.

Seetha (1975) in a study on the psychological and social factors affecting academic achievement found that high achievers excel low-achievers in intelligence.

Ramkumar (1975) in a study of relationship between Self-Concept and Achievement in School subjects of prospective University entrance found a positive relationship between intelligence and achievement.

Rao (1977) in his study on academic achievement and intelligence found a significant correlation between intelligence and achievement.

Jacob (1977) in her study of intelligence and science aptitude as determinants of Achievement in Biology found that significant correlation exists between intelligence and Biology Achievement.

Pandey and Singh (1978) in a correlational study of school examination marks and intelligence got significant positive correlation between verbal intelligence scores and school examination marks in elementary Mathematics and Social Studies.

Chauncy (1980) found a correlation of 0.593 between intelligence and

achievement of 9th grade pupils.

Mathew (1981) got a significant correlation between non-verbal intelligence and Biology Achievement in a study to find out cognitive and affective correlates of Biology Achievement of secondary school pupils.

Sreekumaran (1981) obtained a correlation of 0.372 in a study on the "Relation between Intelligence, interest and achievement in Biology of IX Std pupils.

Swain (1984) studied academic achievement of High School students in relation to the instructional design, intelligence, Self-Concept and Achievement motivation. It was found that high intelligent students score significantly better than low intelligent students and students with high Self-Concept achieve higher than those with low Self-Concept. Also students with high achievement motivation gained significantly higher than low-achievement motivated students.

Sugathakumar (1985) in a study on attainment in Biology of secondary school pupils of High, Average and Low intelligence found that Biology Achievement was highest for the High Intelligence groups followed by average and low intelligence groups.

Mehna (1986) studied the factors affecting academic achievement in science of Std IX students of greater Bombay found that verbal intelligence is a significant predictor of science achievement.

Sontakey (1986) found that high-achievers are more intelligent, self-reliant and realistic than low-achievers in biological sciences.

Kulwindersingh (1987) explored the relationship of creative thinking and intelligence with academic achievement of high school students found both creatives and high intelligent students to be high achievers.

Naseema (1989) found the effect of intelligence and School learning approach on achievement in physics proved that there is significant and positive relationship between intelligence and achievement in physics.

Gupta, et. al. (1993) in a comparative study of the factors affecting academic achievement found that intelligence is the most important factor affecting academic achievement. The study also found achievement motivation to be significantly related to academic achievement in the case of girls but not boys.

Srivastava (1993) in a study to find predictability of Verbal Test of Intelligence to science and mathematics found that verbal intelligence measure is a high predictor of success in Mathematics and Self-Concept.

Sudheeshkumar (1993) in a study on the interaction effect of intelligence, cognitive style and approaches to studying on Achievement in Biology of secondary school pupils found that significant main effect on achievement exists only for intelligence. But the interaction effect of intelligence, with the other two variables viz., cognitive style and Approaches to studying is not significant.

Singh (1994) found that there is a positive relationship between academic achievement and intelligence.

Sujataha (1994) found that intelligence has a significant positive relation with Achievement in Biology of secondary school pupils.

Schaefer, et. al. (1999) assessed the complementary ability of Childhood Intelligence and learning related behaviour to explain variation in Achievement outcomes. Results reveal that substantial proportion of assigned grade variance explained primarily by learning behaviour and Achievement test score explained by intelligence.

Maree, et. al. (2002) in their study emotional intelligence and Achievement, examined the meanings of the construct, 'emotional intelligence'. Two case studies of adolescent males are presented and indicate the emotional intelligence has a significant impact not only on the qualitative level of intelligence actualization but also on the quantitative level of intelligence measurement and Scholastic Achievement.

Aruna (2004) studied the influence of cognitive style, intelligence and classroom climate on process outcomes in science of secondary school pupils and found that intelligence has significant major effect on process outcomes in science.

Studies Related to Parental Education and Academic Achievement

In a study of certain Socio-Familial correlates of achievement in Hindi

using a sample of 500 students of Kottayam district, George (1989) found that Achievement in Hindi and parental education are related in the case of subsamples based on locale and sex.

Kelu (1989) found that parental educational level and achievement in total language skills related significantly at 0.05 level, but the relation was negligible ($r = 0.070$).

Lohani and Mohit (1990) found that positive relationship exist for variables such as education of mother and education of father with academic performance.

Muralidharan (1990) studied the relationship between variables related to socio-economic status of parents and achievement of children in school. The sample was 664 students of class I, II and V of schools in Delhi. Both father's and mother's education was found to be significantly related with achievement in reading and arithmetic. Mother's education related with child's achievement more than father's education, and the relationship decreased as the child advanced in education.

The effect of family characteristics on Indian primary school children's academic learning was studied by Desai (1991) in a sample of students who dropped out before completing primary schooling. It was found that literary status and schooling completed by father is related to academic performance of children.

The study of Bhatanagar and Sharma (1992) indicated that children whose parents attended school performed at a significantly higher level than children whose parents did not attend school.

Using three long term studies of American high school students during 1972, 1980 and 1988, Drazen (1992) conducted an investigation into the relation of family factors to the student achievement. The result indicated that the most potent factor in student achievement in reading during 1972 and 1988 was level of parent's education. In Mathematics achievement also, both 1972 and 1988 data suggested parental education and family income as factors important in affect it.

In a study of the problems of girl's education in Dhenkanal district of Orissa and comparative analysis of various factors influencing female education, Ray (1992) surveyed ten percent of the total primary, middle and secondary schools in the district. It was found that parent's education had a positive and direct influence on the number of years completed by a female child in the school. Mother's education was found to be more influential than father's education.

A study of the socio-familial correlates of secondary school science achievement, by Usha (1992) using 850 pupils of standard IX from four revenue districts of Kerala, revealed that parent's educational level (both father and mother) significantly associated with the physical science achievement.

Data from a 20 year longitudinal study of 125 males and 126 females born to Black mothers in a Baltimore hospital between 1966-68 was analysed by Baydar et al. (1993) to identify early childhood, middle childhood and early adolescence determinants of functional literacy. Family environmental factors identified as being predictive of literacy included maternal education along with family size and income.

Mental development as a function of maternal economic status, literary and occupational level was studied by Mukerji and Sharma (1993) in a sample of 100 children. A high degree of association between the mental development of children and literary status of mother was found.

Mumthas (1993) found a significant relation between parental education and achievement in Mathematics of Std IX pupils of Kerala.

In a meta-analytic study of the effects of various characteristics of measures of student achievement, using students in grade seven, Debaz (1994) found positive relationship between science achievement and mother's education.

The study done on a sample of 520 secondary school pupils of the backward area and 290 secondary school pupils of non-backward area, Sheeja (1994) found that there existed significant relation between concept attainment in biology and parental education for backward and non-backward samples.

Investigation about the relationship between intellectual abilities and socio-economic status of parents in a multiple random sample of 300 pupils in Vellore town of North Arcot Ambedkar district of Tamil Nadu, Venugopal (1994) found that achievement is related to parental status.

In a study of the effect of household factors on the achievement of ST children at primary level, Ambasht and Rath (1995) found that parent's education had significant effect on the achievement of students both in language and Mathematics.

Rath and Saxena (1995) studied the effect of pupil and school level variables on the achievement of a sample of 17,771 non-SC/ST students studying in class IV/V selected from eight Indian states. It was found that mother's education played a major role in the achievement of these students.

The effect of pupil's background on their mathematics and language achievement was studied by Singh and Saxena (1995) in an extensive sample of 23,700 students and 4879 teachers who were randomly selected from 1746 schools of different states. It was found that mother's and father's education had a positive association with pupil's achievement and were mostly consistent across states.

In a study to identify the role of different factors in demand for education, Srinivasan (1995), using a sample drawn from three taluks from Dharmapuri and Tirunalveli districts of Tamil Nadu, found that in both rural

and urban areas father's and mother's education decided their children's education.

The study done by Thampuratty (1995) with a sample of 771 pupils of standard IX in Kerala, selected by stratified sampling technique, revealed that the mean scores of parental education of creative high achievers were significantly higher than those of creative low achievers.

The factors which affect the learner's achievement of government and private schools in Kerala was examined by Varghese (1995). A total number of 3089 students from 113 schools of three educationally backward districts of Kerala- Malappuram, Kasargod and Wayanad. It was found that children belonging to poorer social background and with less educated parents lagged behind others in achievement.

Differential predictors of the educational achievement status of homeless children were studied by Holden and Danseco (1996). The results of the study provide support for maternal educational level as important predictor of academic achievement in school aged homeless children and adolescents.

A study using data from 347 seventh graders and their parents, done by Melly and Conger (1996), found that parental educational level was related to involvement and academic performance.

Nagalakshmi (1996) studied the relationship between problem solving

ability in Mathematics and parent's educational qualification using a sample of 1000 students of class X, selected from schools of Hyderabad. It was found that, the higher qualifications of the parents, the better was the performance of students in problem solving ability in Mathematics.

Children's competencies in the context of family resources and their home activities were studied in a sample of 307 children in the Wellington region of New Zealand. In this study Wylie et al. (1996) found that family income and mother's educational qualification were most strongly associated with differences in levels of children's competencies.

The relation of parent's educational level to only children's academic achievement in China was studied by Xie (1996) in a sample of 186 middle class parents of fifth and sixth graders of 10-13 years age, from one Beijing elementary school. The study found that there was no relationship between parent's educational level and school achievement.

A study conducted on a sample of 276 rural girls of standard X in Fardikot district of Punjab, by Kaur and Goyal (1997) found no significant association between parent's education and academic aspiration of children.

Minnalkodi (1997) in a sample of randomly selected 900 students of standard IX in Cuddalore educational district, found that children belonging to parents of differing educational levels differed significantly in their achievement.

The causes of under achievement in Mathematics of standard VIII pupils were ascertained by Patel (1997) in a sample of 500 pupils from six schools of Gandhi Nagar, selected using stratified cluster sampling technique. It was found that socio-economic level of parents, in terms of parental income, occupation and education had high impact on the student achievement.

Ahamed (1998) in a sample of 120 students belonging to the age group of 13 to 18 years, selected from Jorhat district of Assam, found that parental education was highly effective in bringing differences in achievement motivation among adolescents.

An investigation on the relation of the intellectual abilities with selected personal social variables in three regions of Andhra Pradesh was conducted by Madhvilatha and Mayuri (2000) studied with a sample of 878 children covering the age group 6-18 years. Correlational analysis showed that intellectual ability was significantly related to father's education and mother's education.

Parental Employment and Academic Achievement

A study on the link between selected family demographic factors, home environment and academic performance conducted by Lohani and Mohite (1990) found positive relationship between occupation of father and academic performance in school subjects.

Muralidharan (1990) found that 12 out of 18 correlations obtained between father's occupation and reading and arithmetic achievement of students of class I, II and V were significant. The correlations tend to decrease as the child's age increases. As regards the mother's occupation none of the correlations obtained with the reading and arithmetic achievement of children was significant.

The effect of maternal employment status on 63 adolescent girls in the area of academic achievement was examined by Abbot (1991). The results showed no difference in achievement outcomes for girls whose mothers were employed full time, employed part-time and not employed.

While examining the effect of family characteristics on Indian primary school children's academic learning in students who dropped out before completing primary schooling, Desai (1991) found that father's work and academic performance of children were related.

David (1992) compared the influence of working and non-working mothers of high socio-economic status on self-concept and achievement motivation among their adolescent girls. The children of working mothers were found to be more intelligent, mentally healthy, emotionally stable and possessed good personal habits. They were also motivated for higher jobs in comparison to girls of non-working mothers.

In a study on certain socio-familial correlates of secondary school

science achievement in a sample of 850 standard IX pupils selected from four revenue districts of Kerala, Usha (1992) found that parent's occupational level is significantly associated with physical science achievement.

Mental development as a function of mental economic status, literary, occupation and feeding pattern was studied by Mukerji and Sharma (1993) in a sample of 100 children. A high degree of association between mental development of children and occupation of mother was found.

Girija (1994) found a positive relationship between occupation of father and academic achievement in Mathematics.

Sheeja (1994) studied with a sample of 520 secondary school pupils of the backward areas and 290 secondary school pupils of non-backward areas of Malappuram district, found that there was significant relation between concept attainment in biology and parental occupation for backward and non-backward samples.

Investigating about the relationship between intellectual abilities and socio-economic status of parents, in a sample of 300 pupils of Vellore town of Tamil Nadu, Venugopal (1994) found that achievement of middle school pupils is related to parental occupation.

Panda and Samal (1995) compared the adolescent daughters of working and non-working mothers on their personality and academic achievement. The sample of the study comprised 60 adolescent girls each of

working and non-working mothers studying in class VIII, IX and X, selected randomly from high schools of Bhubaneswar. The daughters of working and non-working mothers were found to be equal in the achievement of Oriya, Sanskrit and Social Studies but differed in achievement of Mathematics, Science and English.

The effect of pupil and school level variables on the achievement was studied by Rath and Saxena (1995) using a sample of 17,771 non SC/ST students studying in classes IV/V, selected from eight Indian states. Probing on pupil's background variables revealed that father's occupation played a major role on the achievement of these students.

A study conducted by Sindhu (1995) using a sample of 510 pupils of standard IX showed that the main effect of parental occupation on achievement in Biology is not significant.

The effect of pupil's background on their mathematics achievement was studied by Singh and Saxena (1995). The sample comprised 23,700 students who were selected from 1,746 schools, adopted from Baseline Assessment Studies. It was found that father's occupation had a positive association with pupil's achievement and were mostly consistent across states.

With a sample of 771 pupils of class IX in the secondary schools of Kerala selected by stratified technique, Thampuratty (1995) found that mean scores of parental occupation of creative high achievers was significantly

higher than that of creative low achievers.

The relationship between problem-solving ability in Mathematics and parental occupation was studied by Nagalakshmi (1996) in a sample of 1000 standard X students selected from schools of Hyderabad. The study found that subjects whose fathers were gazetted officers or intellectual excelled in performance with reference to problem solving ability in Mathematics.

In an investigation of parenting characteristics that mediate relation between employment factors and achievement using 240 ninth graders and their parents, Paulson (1996) found that maternal employment did not influence adolescent achievement or parenting style.

In a sample of 700 students of standard IX of ten schools from three districts of Kerala state, Raju (1996) found that there existed significant positive relationship between parental occupational level and Mathematical aptitude.

Minnalkodi (1997) in a randomly selected sample of 900 students of standard IX in Cuddalore educational district of Tamil Nadu found that occupational status of parents did not affect the achievement.

The causes of under achievement in Mathematics of pupils studying in standard VIII was studied in a stratified cluster sample of 500 pupils, from six school of Gandhi Nagar. Patel (1997) in this study found that level of parent's occupation had a large impact on the achievement.

In a proportionate stratified sample of 871 secondary school pupils of standard IX, Ayishabi and Kuruvilla (1999) found that achievement motivation, a strong determinant of academic performance, is unaffected by maternal employment in Kerala.

Sunitha et. al. (1999) studied the association of mother-child interaction and language development of children of employed and unemployed mothers, in a sample of 60 children, 30 each of employed and unemployed mothers from day-care centers located in Hyderabad. It was found that there is significant difference ($t = 2.94$) in the language development of employed mother's children ($M = 18.9$) and unemployed mother's children ($M = 14.87$).

In a proportionate stratified sample of 900 elementary school pupils, Gafoor (2001) found that significant difference exist between the mean scores of Academic Achievement of elementary school pupils based on different levels of parental involvement, parental income, Father's Education, Mother's Education, Parental Education, Father's employment, Mother's Employment, Father's Absenteeism and Family size. But there is no significant difference in the mean scores of Academic Achievement, based on different levels of Mother's Absenteeism.

Parental Income and Academic Achievement

Muralidharan (1990) in 664 school children of Delhi drawn by

multistage random sampling, found that father's income is positively correlated with reading and arithmetic achievement.

The relationship between parental income and academic achievement of children in a developing area, Transkei was determined by Cherian (1991). The study concluded that among children of low socio-economic status, parental income had a positive relationship with achievement.

A study of student achievement and its relation to family and community poverty, using three long-term studies of American high school students in 1972, 1980 and 1988, conducted by Drazen (1992) found that in 1972 and 1988, the most important factors affecting Mathematics achievement were parental education and family income.

School, family and community factors related to the academic success of economically disadvantaged Appalachian students were studied in a sample of 245 middle school students by Henry et al (1992). It was found that economic characteristics had little power to differentiate high and low achievers.

Certain socio-familial correlates of secondary school science achievement were studied by Usha (1992) using a sample of 850 Std IX pupils selected from four revenue districts of Kerala. It was found that income level of father is significantly associated with physical science achievement.

Mukerji and Sharma (1993) studied mental development as a function

of maternal economic status, literacy, occupation and feeding pattern in a sample of 100 children. A high degree of association between mental development of children and income status of parents was found.

Using a sample of 770 Std IX pupils of Kerala, Girija (1994) studied the interaction effect of creativity, attitude towards problem solving and the social position on the achievement in Mathematics of secondary school pupils. one of the findings was that there is significant relation between income of father and achievement in Mathematics.

In a study of concept attainment in Biology in relation to some social-familial variables of secondary school pupils of the backward areas of Malappuram district Sheeja (1994) used 520 pupils from backward area and 290 pupils from non-backward areas. There was significant relation between concept attainment in biology and parental income for backward as well as non-backward areas.

Venugopal (1994) investigated the relationship of Socio-Economic Status of parents with achievement of middle school pupils. The sample was 300 pupils drawn by multiple random sampling technique, from Vellore town of Tamil Nadu. It was found that parental income was related to achievement.

The study conducted by Sindhu (1995) using a sample of 510 pupils of Std IX, on the relationship of cognitive style and selected sociological variables on achievement in biology, found out that the main effect of

parental income on achievement in biology is not significant even at 0.05 level of significance.

While studying the Socio-Economic Status of Creative high achievers and creative low achievers in Mathematics with a sample of 771 pupils of class IX of the secondary schools of Kerala, Thampuratty (1995) found that the mean score of parental income of creative high achievers were significantly higher than that of creative low achievers.

The relationship between parental income and problem solving ability in Mathematics was studied by Nagalakshmi (1996) in a sample of Hyderabad. The study revealed with higher performance regarding problem solving ability in Mathematics.

Wylie et al. (1996) studied children's competencies in context of family resources and their home activities in a sample of 307 children in the Wellington region of New Zealand. Family income and mother's educational qualifications were most strongly associated with difference in level of children's competencies.

In a longitudinal study, Grudmann (1997) investigated the influence of social class on academic achievement. Social class was defined by the nature of parent's work, education and income. Results indicated that social class had a large impact on educational performance and academic achievement.

Minnalkodi (1997) in a study on randomly selected 900 students of std

IX in Cuddalore educational district found that differing income level of parents did affect the achievement level of students.

Vaghela (2000) in a study of academic achievement in relation to Socio Economic Status, used a randomly selected sample of 100 students of IX std of secondary schools of Anand district of Gujarat. It was found that significant relation existed between school examination scores and Socio Economic Status of students.

An investigation of the intellectual abilities with selected personal social variables in three regions of Andhra Pradesh was conducted by Madhaviatha and Mayuri (2000) in a sample of 878 children covering the age groups 6-18 years. Correlational analysis showed that intellectual ability was significantly related to father's education and mother's education.

CHAPTER III

METHODOLOGY

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- ❖ *Variables*
 - ❖ *Description of Tools*
 - ❖ *Sample*
 - ❖ *Procedure Adopted for Data Collection*
 - ❖ *Scoring and Consolidation*
 - ❖ *Statistical Techniques Used for Analysis*
-
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METHODOLOGY

The method followed for the present study is described under following headings:

- I. VARIABLES
- II. DESCRIPTION OF TOOLS
- III. SAMPLE
- IV. PROCEDURE ADOPTED FOR DATA COLLECTION
- V. SCORING AND CONSOLIDATION
- VI. STATISTICAL TECHNIQUES USED FOR ANALYSIS

I. VARIABLES

The present study includes two types of variables viz;

- (1) Criterion or dependent variable
- (2) Predictor or independent variables

The dependent and independent variables of the study are listed below with rationale for the selection of the variables.

Dependent Variable

As one of the major objectives of the study is to identify the psychological variables which are capable of predicting significant Achievement in Biology, the dependent variable of the study is Achievement in Biology.

In the present study, Scholastic Achievement in Biology is considered as dependent variable. It refers to the tangible accomplishment or proficiency of performance in Biology of secondary school as measured by a standardized test of Achievement in Biology developed by the investigator.

Independent Variables

The independent variables (psychological) used for the prediction purpose are:

(i) Science Aptitude which includes five subtests

- a) Number series
- b) Science information
- c) Scientific formulation
- d) Abstract reasoning
- e) Verbal comprehension

(ii) Attitude towards science

(iii) Science interest

(iv) Intelligence test which includes five subtests

- a) Verbal Analogy
- b) Verbal classification
- c) Numerical reasoning
- d) Verbal reasoning
- e) Verbal comprehension

(v) Socio-Economic Status

Rationale for the Selection of Independent Variables

The independent variables of the study were considered through an indepth survey of literature in the field of academic achievement. The survey revealed that academic achievement is closely associated or linked with a number of variables in various dimensions like cognitive, affective, socio-familial, environmental etc.

In the present study, due importance was given to the cognitive affective and Socio-Economic dimensions, since the investigator intended to identify the predictors of Science Achievement especially Biology.

Affective variables viz., Attitudes, Interest, Anxiety, Achievement Motivation etc have a major role in high Achievement in Biology. Depending on whether these are positively or negatively related to the educative process, these are considered to promote or inhibit student behaviour in the classroom, at home and in the peer groups and ultimately in learning and achievement. Therefore it is proposed to study the affective variables like Science Interest and Attitude towards Science and Socio Economic Status with a view to predict the role of relation of each for higher achievement in Biology.

Thus, some select set of psychological variables are used as the independent variables of Achievement in Biology in the study.

II. DESCRIPTION OF TOOLS

A brief description of each tool used for the measurement of the

dependent and independent variables is given below:

1) Achievement Test in Biology

This test was developed and standardized by the investigator for the present study to measure Achievement in Biology of Std IX pupils. For the purpose, the investigator referred certain books, like Bloom (1979) Stanley (1972) Bhatia (1984) Soman (1997) etc. Moreover, She had made discussions with experts in the field as well as her supervising teacher so as to finalise the techniques to be followed for the preparation and standardization of tools.

Details of development of the Test

Construction and standardization of an achievement test involves various processes like planning, preparation, tryout and finalization.

Planning of the Test

The design was planned with a view to give due weightage to content, educational objectives, type of questions and level of difficulty.

Weightage to content

Due weightage was given to all important topics in the syllabus of standard IX. Details of content area and the respective weightage are as shown in Table 3.1.

TABLE 3.1**Weightage to Content**

Sl. No	Content	Marks	Percentage
1.	Agriculture	11	12.2
2.	Nutrition in plants	19	21.11
3.	Nutrition in animals	21	23.33
4.	Respiration in organisms	13	14.44
5.	Skeletal system and muscular system	7	7.77
6.	Genetics	10	11.11
7.	Continuity of life	6	6.67
8.	Biodiversity and its conservation	3	3.33
	Total	90	100

Weightage to Educational Objectives

As suggested by Bloom (1979) the investigator included the objectives such as knowledge, understanding and Application level only. The other objectives like skill, analysis, synthesis etc. were not included considerably in the peculiarity of the sample as well as the content area. The weightage given to different objectives is presented below in Table 3.2.

TABLE 3.2**Weightage to Educational Objectives**

No	Educational Objectives	Marks	Percentage
1.	Knowledge	17	18.89
2.	Understanding	51	56.67
3.	Application	22	24.44
	Total	90	100

The investigator included objective type questions in the test as it has only one response which enables objective measurement. Among the different forms of objective type questions viz., the true-false type, multiple choice type, matching type and the completion variety, the investigator preferred only multiple choice type items with four distractors. Multiple choice items are more objective, efficient and less subject to item sampling error.

Difficulty Level of the Test Items

Neither too easy nor too difficult items differentiate the bright pupils from dull ones. Hence it was decided to divide questions as difficult and easy questions. Weightage given to difficulty level is given below in Table 3.3.

TABLE 3.3

Weightage to Difficulty Level

Level of Difficulty	Marks	Percentage
Easy	20	22.22
Average	50	55.56
Difficult	20	22.22
Total	90	100

Blue Print of the Test

After the content and objectives were fixed as described earlier, it was proposed to put the design into operational terms by preparing a blue-print. Blue-print is a three dimensional chart specifying the content covered by the test in relation to the weightage assigned for different objectives and type of items.

Here the investigator considered only the objective type items. Therefore, for the present test, the blue-print is a two dimensional chart indicating the content area and the number of questions under each objective. The blue-print of the preliminary test is presented in the Table 3.4.

TABLE 3.4

Blue-Print of the Preliminary Test

No.	Content	K	U	A	Total
1.	Agriculture	1	8	2	11
2.	Nutrition in plants	4	11	4	19
3.	Nutrition in Animals	4	11	6	21
4.	Respiration in organisms	3	8	2	13
5.	Skeletal System and Muscular system	1	4	2	7
6.	Genetics	2	5	3	10
7.	Continuity of life	1	3	2	6
8.	Biodiversity and its conservation	1	1	1	3
	Total	17	51	22	90

Preparation of Test Items

The test items were prepared in accordance with the blue-print. The investigator proposed to include 90 multiple choice items for the preliminary test. The investigator referred a number of books, published question papers, question banks and certain standardized tests of Achievement in Biology. Following the procedures adopted by various researchers, the investigator prepared 110 multiple choice items for the preliminary test. Then she consulted with certain secondary school teachers dealing with Biology.

According to the suggestions and opinions of subject experts and supervising teacher, 20 items were avoided. Thus only 90 items were available for the preliminary test. Necessary directions for the pupils were printed on the test. A scoring key was also prepared. Thus preliminary test along with separate answer sheets were ready for administration. A space was provided at the beginning of each answer sheet to write the biographical data of each pupil viz., name of the school, standard with division, boy/girl and name of the pupil.

The Malayalam and English version of the preliminary test and response sheet are presented as Appendices I, II and III respectively.

Try-Out

For the try out of the Achievement Test in Biology, a stratified random sample of 400 pupils of standard IX from 8 schools of Calicut district of Kerala was selected by giving due representation to sex, locale and type of management of schools.

The try out was conducted during November 2004. The Headmasters of the schools selected were contacted in order to prepare a time schedule for the administration of the test. Then, with the co-operation of the class teachers the investigator administered the test. In the beginning, necessary directions were given to students to answer the questions one by one. The details of the schools selected for try-out of the test are given below in the Table 3.5.

TABLE 3.5

Details of the Schools Selected for Try-Out

Sl. No.	Name of Schools	Type of the School G/B/Co-Edn	Management of the School Govt./Pvt.	Locale of the School R/U
1.	Farook H.S.S. Farook College	Co-Edn	Private	Rural
2.	G.M.H.S.S. C.U. Campus	Co-Edn	Government	Rural
3.	Govt. Ganapath V.H.S., Farook	Co-Edn	Government	Rural
4.	A.M.M. H.S., Pulikkal	Co-Edn	Private	Rural
5.	Sevamandir Post Basic School, Ramanattukara	Co-Edn	Private	Rural
6.	Ramanattukara High School	Co-Edn	Private	Rural
7.	Medical College Campus Govt. High School, Calicut	Co.Edn	Government	Urban
8.	Savio High School, Calicut	Co-Ed	Private	Urban

Scoring

The pupils were provided with separate answer sheets for necessary response according to their choice. There were altogether 400 response sheets available. Out of this, 370 answer sheets were scored for item analysis. Score 'one' was given to each correct response and 'zero' score to a wrong response.

Item Analysis

Items were analysed in order to compute the difficulty level and discriminating power of the sample selected for the try out.

Power of each item, and for the selection of worthy items for the final test, 370 scored answer sheets were arranged in the hierarchical order of the total marks from high to low. The upper 27 percent (i.e., 100) sheets having the highest scores and the bottom 27 percent (i.e., 100) sheets having the lowest scores were taken for analysis and were designed as the upper group (U) and the lower group (L) respectively. The middle 170 papers were discarded from analysis. Then the investigator counted the number of right responses for each of the items in the upper group and lower group.

Discrimination power of each item was found out by using the formula

$\frac{U-L}{N}$ and difficulty level of each item was calculated by using the formula

$\frac{U+L}{2N}$ (Ebel, 1972).

Where,

U = Number of right response for the item in the Upper group

L = Number of right response for the item in the Lower group

N = 100

Details of the item analysis are given in Table 3.6

TABLE 3.6

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Item Analysis of the Try-Out Test

Item No.	Upper group U	Lower group L	Item discrimination $\left(\frac{U-L}{N}\right)$	Item Difficulty $\left(\frac{U+L}{2N}\right)$
1.*	98	43	0.55	0.71
2.	50	30	0.2	0.40
3.	68	29	0.39	0.49
4.	65	30	0.35	0.48
5.*	88	29	0.59	0.59
6.*	90	23	0.67	0.57
7.	65	30	0.35	0.48
8.	77	38	0.39	0.58
9.*	97	35	0.62	0.66
10.*	98	24	0.74	0.61
11.	45	13	0.28	0.35
12.	60	25	0.35	0.43
13.*	90	33	0.57	0.62
14.	50	30	0.20	0.40
15.*	97	29	0.68	0.63
16.	78	46	0.32	0.62
17.	21	16	0.05	0.19
18.	49	21	0.28	0.35
19.	52	35	0.17	0.44
20.	68	29	0.39	0.49
21.	30	25	0.05	0.28
22.*	84	28	0.56	0.56
23.*	79	20	0.59	0.49

24.	26	16	0.10	0.21
25.	66	34	0.32	0.50
26.	49	21	0.28	0.35
27.*	76	25	0.51	0.51
28.*	82	36	0.46	0.59
29.	60	26	0.34	0.43
30.*	85	27	0.58	0.56
31.	52	22	0.30	0.37
32.*	95	24	0.71	0.59
33.	16	14	0.02	0.15
34.*	83	23	0.60	0.53
35.*	85	25	0.60	0.55
36.*	61	15	0.46	0.38
37.*	75	21	0.54	0.48
38.*	99	43	0.56	0.71
39.	60	26	0.34	0.43
40.*	74	28	0.46	0.51
41.	26	19	0.07	0.23
42.*	90	32	0.58	0.61
43.	40	20	0.20	0.30
44.	26	15	0.11	0.21
45.	65	27	0.38	0.46
46.	42	15	0.27	0.28
47.*	89	34	0.55	0.62
48.*	73	31	0.42	0.52
49.*	77	36	0.41	0.57
50.*	63	20	0.43	0.42

51.*	89	31	0.58	0.60
52.	58	27	0.31	0.43
53.	40	21	0.19	0.31
54.*	73	30	0.43	0.52
55.	35	25	0.10	0.30
56.	41	25	0.16	0.33
57.	28	24	0.04	0.26
58.	26	16	0.10	0.21
59.	54	30	0.24	0.42
60.	44	19	0.25	0.32
61.*	90	35	0.55	0.63
62.*	47	34	0.81	0.41
63.	41	33	0.08	0.38
64.*	87	38	0.50	0.63
65.	67	36	0.31	0.52
66.	30	19	0.11	0.25
67.	66	31	0.35	0.49
68.*	82	35	0.47	0.59
69.	40	20	0.21	0.30
70.	41	14	0.27	0.28
71.	24	22	0.02	0.23
72.*	82	27	0.55	0.55
73.	66	31	0.35	0.49
74.*	74	25	0.49	0.49
75.	62	27	0.35	0.45
76.*	88	33	0.55	0.61
77.*	70	18	0.52	0.44

78.*	95	31	0.64	0.63
79.	67	33	0.34	0.50
80.	64	37	0.27	0.51
81.	41	29	0.12	0.35
82.	44	19	0.25	0.32
83.	53	19	0.34	0.36
84.	46	25	0.21	0.36
85.*	67	27	0.40	0.50
86.	36	22	0.14	0.29
87.*	92	29	0.63	0.61
88.*	90	23	0.67	0.57
89.*	69	25	0.44	0.47
90.*	75	31	0.44	0.53

Note: * denotes the items selected for the final test

U- Number of right responses in upper group

L – Number of right responses in lower group

Finalization of the Test

Items having difficulty index around 0.50 are considered to be average difficulty. As also items having discriminating power greater than or equal to 0.40 are considered to be having satisfactory discriminating power.

For the selection of items to be included in final achievement test, the investigator proposed to limit the difficulty index in between 0.4 and 0.6 and the discriminating power to be greater than 0.4.

Thus, the investigator selected 40 items for the final test. The time limit was fixed as 30 minutes. The necessary directions were given at the

beginning of the test. A scoring key for the final test was also prepared. The Malayalam and English version of the final test, response sheet and the scoring key are given as Appendices IV, V, VI and VII respectively.

The blue-print of the final test is given in Table 3.7.

TABLE 3.7

Blue-Print of the Achievement Test in Biology (Final)

No.	Content	K	U	A	Total
1.	Agriculture	1	4	1	6
2.	Nutrition in plants	2	4	-	6
3.	Nutrition in Animals	2	5	2	9
4.	Respiration in organisms	3	2	1	6
5.	Skeletal System and Muscular system	-	3	1	4
6.	Genetics	1	1	2	4
7.	Continuity of life	1	1	1	3
8.	Biodiversity and its conservation	1	1	-	2
	Total	11	21	8	40

Validity

The Achievement test in Biology was constructed with adequate sampling regarding the content in the existing Biology syllabus of standard IX of secondary school pupils. So the investigator claims high content validity for the tool.

To establish criterion validity of the test, the investigator used the marks of the pupils obtained for the first-terminal examination conducted by

the schools. The correlation between test scores and the scores obtained in the first terminal examination was considered as the index of validity. The coefficient obtained for the achievement test in Biology was 0.843 (N = 50).

Reliability

The reliability of Achievement test in Biology was established by the test-retest method. The final Achievement test in Biology was readministered to the IX standard pupils of a secondary school two weeks after the first administration. The scores obtained for each pupil in the first and second administration were correlated and found to be 0.803 (N = 50).

2. Science Aptitude Test (SAT)

In the present study, science aptitude test means a device used to get a composite score on numerical ability, abstract reasoning, verbal comprehension, scientific formulation, and science information. This test was prepared by the investigator in 1998 to measure the science aptitude of secondary school pupils.

The SAT consists of 5 subtests such as

- 1) Numerical Ability Test
- 2) Science Information Test
- 3) Scientific Formulation Test
- 4) Abstract Reasoning and
- 5) Verbal Comprehension

Each subtest carries multiple choice test items.

1) Numerical Ability Test

In each test item a series of numbers are given following a particular principle with one or two numbers missing somewhere in the series. The pupils have to find out the missing number from a set of five alternatives given. The illustrative examples are given below:

		A	B	C	D	E
(i)	1, 3, 9, 27,	21	81	9	12	18
(ii)	4, 6, 12, 14, 28,	32	30	62	64	75

2) Science Information

In this subtest 25 multiple choice test items are given mainly based on science concepts from Physics, Chemistry and Biology. Pupils have to read each item and select the correct answer from the given alternatives:

Example:

- 1) A person jumping out of a moving vehicle falls forward due to
 - a) inertia
 - b) acceleration
 - c) velocity
 - d) mass

3) Scientific Formulation

Here in each test item simple science problems are given. Pupils have

to do it mentally and find out the solution out of the four choices given to each test item and have to mark their response in the answer sheet.

Example:

(i) A man breathes 'a' times in a minute. He takes 0.5lt of oxygen at each breath. Then, how many litre of oxygen does he take within one hour?

- a) 300 lt b) 60 lt c) 30 lt d) 15 lt

(Item No. 1)

4) Abstract Reasoning

A picture and five answers are given for each item. Pupils have to find out the answer figure from the principle followed in the set of problem figure.

Example:



5) Verbal Comprehension

Here a few paragraphs are given and under each of them selected questions or incomplete statements together with their answers are given. Pupils have to read the paragraphs, find out the correct answers and mark them in the response sheet.

Example:

Atom has all the potential to destroy the world twice or thrice over and all the power to make this world a better place to live in. it is our choice of

what we make of it.

Two atomic power reactors at Kalpakkam in Tamil Nadu produce 410 megawatts of power. As against some 40 tones of uranium needed to run these reactors, a coal fired power station of this magnitude would have required several thousand tones of coal. From the used uranium in this reactor we can separate plutonium. A mixture of this plutonium and spent uranium could again be used in what is called a fast breeder reactor as fuel. And that is not the end either. Because this type of breeder reactors would produce more of plutonium than is put in. From there, a third stage could also be seen. In this third stage, India's rich deposits of Thorium could be used in the fast breeder to produce yet another uranium based fuel to use in the third generator reactor. In this way all that we need for taking care of our future electricity needs would be a few thousands tones of uranium and thorium.

- 1) What according to the author, is the source of availability of Plutonium?
 - a) It is found on the sea shores.
 - b) It is extracted from the sea-bed.
 - c) We can separate plutonium from the used uranium in the nuclear reactor.
 - d) It is a very costly metal occurring in rare quantity in the great depths of the earth.
- 2) Read the following statements and select the correct answer from the

given alternatives a, b, c and d.

- I. The atom has all the potential to make the world a better place to live in.
 - II. The atom has all the potential to destroy the world many time over.
 - III. The atom has all the potential to establish world peace.
- a) I only is correct
 - b) II only is correct
 - c) III only is correct
 - d) I and II only are correct

- 3) Which of the following is not true about the Atomic Power Project at Kalpakkam?
- a) It has four or five reactors.
 - b) Its reactors together generate heat enough to produce 410 MW of power.
 - c) It is situated in Tamil Nadu
 - d) From the used Uranium in this reactor we can separate plutonium.
- 4) How much electricity can we produce from one tone Uranium?
- a) 10.25 MW
 - b) 11.35 MW
 - c) 9.75 MW
 - d) 10 MW

- 5) For what purpose could a mixture of Plutonium and the spent Uranium be used?
- a) It could be used to manufacture an atom bomb.
 - b) It could be used again in fast breed reactor as a fuel.
 - c) It could be used for preparing new compounds.
 - d) It has no practical use.
- 6) The title that best expresses the ideas of the passage may be:
- a) India's Achievements in the Nuclear Research.
 - b) Importance of Nuclear Research in India.
 - c) Nuclear Power Station in India.
 - d) Fast breeder reactor.

Scoring

For each correct answer one score was given and no score was given to wrong answer. The Malayalam and English version of the test, the response sheet and scoring key are given as Appendices VIII, IX, X and XI respectively.

Validity

For the science aptitude test, empirical validity was used. This type of validity is obtained by calculating Pearson's Product Moment Correlation Coefficient between the test score on science aptitude and the score obtained by the pupils in two previous terminal examination in Physics, Chemistry and

Biology. The validity coefficient was obtained as 0.601 (N =50).

Reliability

The reliability of the SAT was established by the test-retest method. The retest was conducted two weeks after the first administration. The correlation coefficient obtained from the scores of the test-retest was 0.91 (N =50).

3. Scale of Attitude Towards Science

In order to measure the attitude towards science of IX std students, an attitude scale was developed by the investigator for the study.

The investigator adopted the procedure of a Likert type five point scale for the preparation of attitude scale. The statements were prepared by referring to the relevant literatures in the area, by studying other related scales, and in consultation with few experts in the field. Thus the investigator prepared 80 statements for the pretest. Provisions were also given to mark their responses in a five point continuum viz., SA, A, U, D and SD.

Examples:

1)	Science is an inevitable factor for the development of human beings (positive item)	SA	A	U	D	SD
2)	Environmental pollution is a bye product of science (negative item)	SA	A	U	D	SD

Note:- SA- Strongly Agree

A – Agree

U – Undecided

D - Disagree

SD- Strongly Disagree

Scoring 7

For a positive statement, scores 5, 4, 3, 2 and 1 respectively are to be given to the responses Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD).

For a negative statement, the scoring is in the reverse order. The total score on the scale is obtained by summing up the scores for all the statements.

Standardization of the Attitude Scale

For the standardization of attitude scale, item analysis was done. For this, the investigator calculated Critical Ratio of two tailed t test for each statement with a view to discriminate pupils having high and low level of attitude towards science. The discriminating power of each item was found by testing the significance of difference between mean scores of upper and lower groups of Attitude towards Science. The upper and lower groups were formed on the 27 percent criteria of the sample chosen for item analysis. The Critical Ratio (t- value) of each statement was found by using the formula,

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{(N_1 - 1)S_1^2 + (N_2 - 1)S_2^2}{N_1 + N_2 - 2} \right] \left[\frac{1}{N_1} + \frac{1}{N_2} \right]}} \text{ for } N_1 + N_2 - 2df$$

(Best and Khan, 1992)

where,

\bar{X}_1 is the mean score of the upper group on a given statement

\bar{X}_2 is the mean score of the lower group on same statement

S_1^2 is the variance of the distribution of responses of the upper group to the statement

S_2^2 is the variance of the distribution of responses of the lower group to the statement.

N_1 and N_2 are the number of pupils in upper and lower group respectively.

Discrimination indices of the statements of the preliminary scale are given in Table 3.8.

TABLE 3.8

**Discrimination Indices of the Statements
of the Preliminary Scale of Attitude Towards Science**

Item No.	Discrimination Index	Item No.	Discrimination Index
1.*	4.71	14.	1.29
2.*	4.15	15.*	3.37
3.	-0.14	16.	-1.02
4.	-0.29	17.	1.29
5.	-0.22	18.	-0.93
6.	0.15	19.	1.03
7.	1.52	20.*	3.93
8.*	4.44	21.	2.53
9.*	6.89	22.	1.81
10.	1.03	23.*	4.24
11.	0.17	24.*	6.85
12.*	3.76	25.*	6.69
13.*	3.14	26.*	4.19

Item No.	Discrimination Index	Item No.	Discrimination Index
27.*	9.76	54.	1.91
28.*	4.13	55.	0.31
29.*	6.61	56.	-1.15
30.*	2.79	57.	-0.65
31.*	2.25	58.*	5.78
32.	-0.65	59.	1.71
33.*	3.84	60.	1.86
34.	1.58	61.	-0.53
35.	1.73	62.	1.73
36.	-0.14	63.	1.52
37.	1.26	64.	1.86
38.	-0.93	65.	0.67
39.	-1.65	66.	1.06
40.	1.93	67.	0.09
41.	1.51	68.*	-0.74
42.	1.03	69.*	2.74
43.*	4.31	70.*	3.49
44.	-0.11	71.	-0.91
45.*	2.31	72.	1.56
46.	1.91	73.	-0.15
47.	-0.14	74.	-0.31
48.*	2.75	75.	1.82
49.	0.29	76.	1.31
50.	-0.24	77.*	3.19
51.*	3.59	78.*	6.29
52.	1.31	79.*	4.51
53.	-0.17	80.*	3.57

Note:- * denotes the items selected for the final scale.

Statements with t-values greater than or equal to 2.01, the tabled value of t required for significance at 0.05 level for 52df ($N_1 = N_2 = 27$) were selected for the final scale.

Thus, the final scale of Attitude towards science consists of 30 statements in which 15 are positive and 15 are negative.

The Malayalam and English version of the Preliminary Attitude Scale and Malayalam and English version of the Final Attitude Scale are given as Appendices XII, XIII, XIV and XV respectively.

Validity

Validity of the scale is established empirically by correlating the scores obtained for the scale with the sum of the marks obtained by the students in the first terminal school examinations for all subjects. The coefficient of validity thus obtained is 0.79 ($N = 35$) which indicates that the scale is valid to measure the Attitude towards Science of Secondary school pupils.

Reliability

The reliability of the scale was found by test-retest method with an interval of two weeks between the first and second administrations of Attitude Scales. The correlation coefficient obtained from the scores of the test-retest was found to be 0.83 ($N = 45$) which shows that the scale is highly reliable to measure the Attitude towards Science of secondary school pupils.

4. Science Interest Inventory

This inventory was developed by the investigator to measure the learning interest of secondary school pupils in science as a subject of study.

Each item of the inventory consists of three similar activities (A, B and C) of which one is a science activity. The pupils are expected to identify an activity according to their choice with a view to measure the science interest among the secondary school pupils by which their interest in science is revealed. The preliminary inventory consists of 60 such sets of activities.

- Examples:
- A) Participate in sports
 - B) Participate in elocution contest
 - C) Participate in Science quiz

Scoring

Each item is presented in the form of a set of three activities A, B, C and the subject has to select the activity he/she likes most to do. If the selected activity is related to science gives 'one' score and if not related to science gives a 'zero' score.

Standardization of the Inventory

For standardization of the inventory item analysis was done by calculating discriminating power of each item by using the formula $\frac{U-L}{N}$.

Power of each items, and for the selection of worthy items for the final

test, 370 scored answer sheets were arranged in the hierarchical order of the total marks from high to low. The upper 27 percent (i.e., 100) sheets having the highest scores and the bottom 27 percent (i.e., 100) sheets having the lowest scores were taken for analysis and were designed as the upper group (U) and the lower group (L) respectively. The middle 170 papers were discarded from analysis. Then the investigator counted the number of right responses for each item in the upper group and lower group.

Discriminating power of each item was found out by using the formula, $\frac{U-L}{N}$ where,

U = Number of right responses for the item in the upper group.

L = Number of right response for the item in the lower group.

N = 100

Details of the Item Analysis are given in Table 3.9.

TABLE 3.9

Item Analysis of the Preliminary Inventory

Item No.	Discriminating Power	Item No.	Discriminating Power
1.	0.05	31.*	0.5
2.*	0.5	32.*	0.60
3.	0.29	33.*	0.60
4.	0.18	34.*	0.40
5.	0.25	35.	0.30
6.	0.33	36.*	0.50
7.*	0.40	37.*	0.60
8.	0.04	38.*	0.40
9.*	0.40	39.*	0.60
10.*	0.40	40.	0.26
11.	0.02	41.*	0.40
12.	0.21	42.*	0.60
13.*	0.40	43.*	0.50
14.	0.21	44.*	0.50
15.	0.10	45.*	0.50
16.*	0.40	46.*	0.60
17.*	0.40	47.	0.18
18.	0.20	48.*	0.50
19.	0.04	49.*	0.40
20.*	0.50	50.*	0.70
21.*	0.50	51.*	0.50
22.*	0.50	52.*	0.40
23.	0.12	53.*	0.40
24.*	0.50	54.*	0.50
25.	0.12	55.*	0.73
26.*	0.6	56.*	0.61
27.	0.23	57.	0.31
28.*	0.40	58.*	0.70
29.*	0.60	59.*	0.50
30.	0.30	60.*	0.50

Note:- * denotes the items selected for the final inventory.

Items having discriminating power greater than or equal to 0.40 are considered to be having satisfactory discriminating power.

Thus the investigator selected 40 items for the final inventory which is shown as * mark in the Table 3.9.

The Malayalam and English version of Preliminary Inventory and Malayalam and English version of the Final Inventory are given as Appendices XVI, XVII, XVIII and XIX respectively. Response sheet was given as Appendix XX.

Reliability

Test-retest reliability of the inventory was estimated using a sample of 40 students with an interval of two weeks between the first and second administrations of the inventory. The correlation coefficient obtained is 0.84 which indicates that the inventory is highly reliable.

Validity

The inventory has face validity as each item of the inventory is a set of three similar activities, of which one is science related and the student is to mark the activity he or she likes to do most.

The construct validity of the inventory was examined by setting the following hypotheses.

- (i) The measures of inventory will be positively related to measures of the scale of attitude towards science

- (ii) The measures of the inventory will be positively related to measures of Science Aptitude.
- (iii) Score on the inventory will be high for the members of science club compared to those who are not the members of the club.

On testing, using a sample of 40 students the correlation coefficient (Pearson's r) obtained for the variable science Interest with Attitude towards science and Science Aptitude are 0.68 and 0.53 respectively. These values suggest that the first two hypotheses are substantiated. The critical ratio obtained for the difference between mean scores on Science Interest of the members and non-members of Science club is 4.51, implying that the third hypothesis is also validated.

Hence the inventory has construct validity and can be used to measure the interest in science of secondary school pupil.

5. Verbal Group Test of Intelligence

This is a standardized test of intelligence (verbal) developed by Sudheeshkumar, Hameed and Prasanna (1997), to measure the general intelligence 'g' of secondary school pupils of Kerala. This test consists of five subtests, viz., Verbal Analogy, Verbal classification, Numerical Reasoning, Verbal Reasoning and Comprehension. The details regarding these subtests are given below:

Description of the Subtests:

1. Analogy: This test is intended to measure the ability of pupils to see the relationship between two things or ideas and to use the relationship to other situations. The test has twenty items. In each item of this test three words are given, the fourth one being left blank. The first two words of the three shows a relationship and the subject is required to select the fourth word from the four given alternatives A, B, C, D which will establish the same kind of relationship with the third word of the first set.

Example:

Thirsty: Water: Hungry:-----

A. Meat B. Rest C. Food D. Tired

If we feel thirsty, we drink water. Similarly if we feel hungry, we eat food. So the answer is 'C'.

2. Verbal Classification: In each item of the test four words are given of which three can be grouped together according to some principle. The subject is to find out the word that stands out from others. The test has 20 such items.

Example:

1. A. Sweet B. Chilly C. Chilli taste D. Bitter taste

In this A, C, D are different kinds of tastes, B(Chilli) does not include in any kind of tastes. So the answer is 'B'.

3. Numerical Reasoning

The following six items of the test is a series of numbers arranged according to some principle, out of which one number is missing. The subject is to find out the missing number from the given alternatives A, B, C, D.

Example:

1. 2, 4, 6, ____, 10

A. 5 B. 8 C. 7 D. 11

(Ans: B)

From the item no. 7 to 10 each question consists of four numbers A, B, C and D, of which one number stands out from others. The subject is to find out that number from the given alternatives and mark in the answer sheet.

Example:

1. A. 1 B. 3 C. 6 D. 7

In this A, B, D are odd numbers and C is even number. So the answer is 'C'.

4. Verbal Reasoning: In this test, each question consists of four alternatives A, B, C and D. The subject is to find out the correct answer from the given alternatives.

Example:

1. Bindu is bulky than Sindhu. Manju is leaner than Bindu. Manju and Sandhya are equally fat. Among them who is more fat?

A. Manju B. Bindu C. Sindhu D. Sandhya

(Ans: B)

5. Verbal Comprehension

In this part of the test, each question consists certain statements. After reading each statement carefully, find out the most appropriate answer from the given alternatives A, B, C, D and mark in the response sheet.

Example:-

A and B are sons of Sathish, C and D are daughters. X and Y are the children of Shyama. E and F are children of Manoj and working in the same company. A and D are married. X married C and F married A. Manoj and Shyama are sibblings.

Questions:

1. What is the relation between X and E?

A. Son and Father B. Sibblings C. Cousins D. Daughter and Father

(Ans: C)

Scoring

For each correct answer 'one score' was given and no score was given

to a wrong answer. The Malayalam and English version of the Intelligence Test, the response sheet and scoring key were given as Appendices XXI, XXII, XXIII, and XXIV respectively.

Validity of Verbal Group Test of Intelligence

In the construction of the present test the investigator studied the available verbal group test of intelligence and reviewed the available literature dealing with the measurement of verbal intelligence. For establishing the content validity of Verbal Group Test of Intelligence, the investigator subjected the test items for experts evaluation and found that each item in the Verbal Group Test of Intelligence was a sampling of the significant concepts which the test intended to measure. The components of the Verbal Group Test of Intelligence were adopted from well established tests of intelligence (verbal) which have high factor loadings. Thus content validity of the Verbal Group Test of Intelligence was established.

The validity of the Verbal Group Test of Intelligence was again established using criterion related technique. Achievement in Social Science (school marks) of 50 subjects studying in std VII were randomly selected and Verbal Group Test of Intelligence was administered upon them. The two sets of scores then correlated using Pearson's Product Moment Method (Garret, 1981). High internal validity is ensured through item analysis. The validity coefficients thus obtained (for subtest wise and Total test) are presented in Table 3.10

TABLE 3.10
Validity Coefficient Obtained
for Verbal Group Test of Intelligence (subtest wise and Total)

SI No.	Subtests of VGTI	Obtained 'r'
1	Verbal analogy	0.5498
2	Verbal classification	0.5436
3	Numerical reasoning	0.5249
4	Verbal reasoning	0.4041
5	Comprehen	0.4606
	Int. Total	0.6557

Reliability of the Verbal Group Test of Intelligence

Reliability of the Verbal Group Test of Intelligence was established using the split half method. For this purpose, Verbal Group Test of Intelligence was administered on a representative sample of 50 students.

Items of the Verbal Group Test of Intelligence were splitted into two equal halves in such a way that the scores of the 10 items in each subtests (Total 50) as the first half and the scores of the remaining 10 items in each subtests as the second half (Total 50). The two sets of scores were used to find out the reliability coefficient using Pearson's Product Moment Method (Garret, 1981).

From the correlation of the half tests the reliability coefficient of the whole tests was estimated using Spearman Brown prophecy formula (Garret,

1981). The obtained reliability coefficient, correlated using Spearman Brown prophesy formula for the five sub tests and Total sample are given in Table 3.11.

TABLE 3.11
Reliability Coefficient Obtained
for Verbal Group Test of Intelligence (subtest wise and Total)

SI No.	Subtests of Verbal Group Test of Intelligence	Obtained 'r'
1	Verbal analogy	0.6636
2	Verbal classification	0.5649
3	Numerical reasoning	0.7214
4	Verbal reasoning	0.6328
5	Comprehen	0.4700
	Int. Total	0.8283

P<0.01

The relatively coefficient indicated that the test is a reliable one.

6. Social Economic Status Scale

The Socio Economic Status of the pupils were measured by the scale prepared by Kuppu Swamy and modified by Pillai. The investigator adopted the scale with slight modification made by Subramanyadas in the weightage for income levels of parents according to the living index of the Bureau of Economics and Statistics, Government of India.

The scale consists of Six items, the fist five contributes to the

individual data and the sixth on indicate the Socio Economic Status of the pupil. A copy of the S.E.S Scale is given as Appendix XXV

The details regarding the categories and the respective weightage are presented in Table 3.12.

TABLE 3.12

Weightage Given in the SES Scale

According to Educational Level, Occupation and Income of Parents

No.	Education	Wtg.	Occupation	Wtg.	Income per month	Wtg.
1.	Masters degree professional above	8	Professional	8	Above 7000	8
2.	Bachelor's Degree	7	Semi professional	7	6000-7000	7
3.	Pre-Degree (+2)	5	Skilled worker	7	4501-6000	6
4.	Upto SSLC	4	Semi-skilled worker	4	3001-4500	4
5.	Upto Std VII	2	Unskilled/labourer	2	1001-3000	2
6.	Literate	1	Unemployed	0	1000xbelow	1
7.	Illiterate	0	-	-	-	-

Occupational status is detailed as below

1. Professional

Ministers, judge, bank executives and officials, doctors, engineers, lawyers, university level teachers, heads of research organization, heads of government departments, secretaries of the government, business executives, etc belong to the professional category.

2. Semi-Professional

Chemists, Druggists, qualified nurses, teachers, managers, superintendent of officer, minor business man, contractors, small land lords, sub-inspectors of police, excise inspectors, sub-registrar, assistant educational officers, Block Development Officer, officer of the sub district etc. will come under this category.

3. Skilled workers

Tailors, Mechanics, Filters, Electricians, Driver, Photographers, Laboratory Assistants, Carpenter, Mason, Vakil clerks, Police head constables and the like will come under this category.

4. Semi-Skilled Workers

Farmers, Small Scale Mechanics, Library Attenders, Police constables etc. belong to this category.

5. Unskilled workers/Labourers

Coolies, Ordinary Labourers, Watchman, Peons, Home nurse etc. belong to this category.

6. Unemployed

The scale developed by Kuppu Swami was modified by K.S. Pillai in 1973. The criteria adopted for giving weightage to the level of income was further modified by Dr. Sivaraj and Subrahmaniadas with the consent of the experts in educational research and the Department of Economics and

Statistics, Government of Kerala. The investigator used same scale with slight modifications. Weightage has been given according to the above table.

Conclusion

Details of tools designed is depicted in the following Table 3.13 along with the psychometric characteristic of each.

TABLE 3.13

Details of the Tools Used

Sl No.	Tools Used	Reliability	Validity
1.	Achievement Test in Biology (investigator, 2004)	0.803 (Test-retest)	0.843 (criterion validity)
2.	Science Aptitude Test (investigator, 1998)	0.91 (Test-retest)	0.601 (empirical validity)
3.	Scale of Attitude Towards Science (Investigator, 2004)	0.83 (Test-retest)	0.79 (empirical validity)
4.	Science Interest Inventory (investigator, 2004)	0.84 (Test-retest)	(0.68, 0.53) (construct validity)
5.	Verbal Group Test of Intelligence (Sudheeshkumar, Hameed, Prasanna, 1997)	0.83 (Split-half method)	0.66 (content validity, criterion validity)
6.	Socio-Economic Status Scale (Kuppuswamy modified by Pillai)	--	--

III. SAMPLE

For the present study, the population is secondary school pupils of

Kerala. Large size of this population demands an adequate representative sample. Therefore a representative sample of the population was drawn by considering three major aspects viz., technique of sampling, factors considered in the sampling and size of the sample.

Technique of Sampling

The population consists of large number of pupils belonging to different strata like sex, locale of the schools type of school management etc. Because of this stratification in the population, the investigator decided to adopt stratified sampling method for drawing the sample by which a good representative of the population will be obtained.

Factors Considered in the Sampling

The following factors, which are the characteristic of the population were taken into consideration while drawing the sample.

- (i) Sex
- (ii) Locale of schools
- (iii) Type of management of schools

The rationale for considering each of these strata or factor in the sample is discussed below:

Sex: Sex difference is often observed and reported in many of the psychological variables and in academic achievement (Driver, 1993, Malini, 1995, Mumthas 2001). So the investigator considered sex as a factor for

sample selection. Since the number of boys and girls in secondary schools is almost equal (Fifth All India Survey, 1992) the investigator gave almost equal representation to boys and girls in the proposed sample.

Locale of the Schools

Often student's performance in examinations differ between rural and urban school children and hence locale of the schools was considered as a factor for sample selection. In Kerala, the ratio of rural and urban secondary schools is approximately 5:1 (Fifth All India Educational Survey, 1992). Hence the investigator selected schools for the sample in the ratio 5:1.

Type of Management of School

Many studies revealed that private and government school pupils differ in their academic achievement (Sethumadhavan, 1993, Saleena 1997). The ratio of private and government schools in Kerala is approximately 3:2 (Fifth all India Educational Survey, 1992). Hence the investigator selected private and government schools for the sample in the ratio 3:2.

Size of the Sample

While deciding the size of the sample, the investigator considered the following:

- (i) A sample should be large enough to reduce the magnitude of sampling error within admissible limit (Best and Kahn 1992).

Krutch and Krutchfield (1968) have observed that sample

size of 500 would yield reasonably good results which would keep the error less than five percent.

- (ii) Sample should be small enough to be selected economically (Best and Kahn, 1992)

For the present study there are six tools to be administered to the sample, which requires much time and effort of the test takers.

Considering all these, the investigator proposed to have a sample of size 630 belonging to Palakkad, Ernakulam, Trivandrum, Calicut and Malappuram districts of Kerala drawn by stratified method.

The break up of this proposed sample of size 630 is given as Table 3.14

TABLE 3.14

Break-up of the Initial Sample

Sex (N=630)		Locale of schools (N=630)		Type of School Management (N=630)	
Boys	Girls	Rural	Urban	Private	Government
320	310	378	252	261	369

IV. PROCEDURE ADOPTED FOR DATA COLLECTION

After fixing the sample, adequate copies of the tools and response sheets were got printed. Then a schedule for administering the tools was prepared by visiting the Heads of the proposed schools. The investigator at

this time sought the cooperation of the concerned class teachers for the successful completion of data collection. As there were six tools to be administered for measuring the variables, the investigator had to go to each school twice for fully administering the tools.

A uniform procedure was followed in administering the tools in the selected schools. At the time of administration all the students were informed about the nature of each test and the purpose for which these were given. The question booklets and the response sheets were distributed to the pupils as sets one after one. As the tools are of different nature, the method of responding are different and hence the investigator explained the procedure of making responses of each tool at the time of administration. Time limits were strictly kept wherever necessary and doubts were cleared then and there. All the test materials and responses sheets were collected back after the due time.

V. SCORING AND CONSOLIDATION

After the data collection, response sheets were checked for personal details and for completeness of the data. During this, incomplete response sheets were rejected primarily and response sheets that are complete in all respects were retained for scoring.

Rejection of the incomplete response sheets resulted in a reduction of the size of the sample from 630 to 600. The break up of the final sample of 600 pupils is given as Table 3.15.

TABLE 3.15

Break-up of the Final Sample

Sex		Locale of schools		Type of School Management	
Boys	Girls	Rural	Urban	Private	Government
318	282	368	232	241	359
Total (N) = 600					

School wise distribution of the final sample is given as Appendix XXVI.

Response sheets of 6 tools were then scored using the scoring scheme of each. All the test scores were then consolidated incorporating student's personal data. The data was so entered and consolidated as to facilitate statistical analyses by means of computer.

VI. STATISTICAL TECHNIQUES USED FOR ANALYSIS

Computer facilities were adopted (by using the software programme SPSS) to do the major statistical analysis of the data. The inferential statistics employed in the study are as follows:

One-Way Analysis of Variance (Best and Kahn 1992)

Analysis of variance is an effective way to determine whether the means of more than two samples are too different to attribute the sampling error. The procedure of one-way ANOVA is through the following stepwise calculations.

Step 1 : Total sum of squares, $SS_t = \sum X^2 - (\sum X)^2 / N$

Step 2 : Between groups sum of squares

$$SS_b = (\sum X_1)^2/n_1 + (\sum X_2)^2/n_2 + \dots\dots\dots(\sum X)^2/N$$

Step 3 : Within groups sum of squares, $SS_w = SS_t - SS_b$

Step 4 : Mean square between $MS_b = SS_b/df_b$ and

$$\text{Mean square within, } MS_w = SS_w/df_w$$

Step 5: F- ratio, $F = MS_b/MS_w$

If for a required level of significance and for (k-1, N-k) degrees of freedom, the obtained value of F is higher than the tabled value of F, the difference in the group means is said to be significant for that level of significance.

Pearson's Product Moment Coefficient of Correlation (Garrett, 1966)

Coefficient of correlation between relevant pair of variables is computed by means of the following formula which is in terms of raw scores or measures.

$$r_{xy} = \frac{N\sum XY - \sum X\sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}} \text{ where,}$$

$\sum X$ is sum of the X scores

$\sum Y$ is sum of the Y scores

$\sum X^2$ is sum of the squared X scores

$\sum Y^2$ is sum of the squared Y scores

ΣXY is sum of the products of paired X and Y scores and N is number of paired scores.

Test of significant of the correlations by Fisher's t-test (Best and Kahn, 1992).

This is done by checking whether the t-value obtained by the formula

$$t = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

Exceeds 1.96 or 2.58 for significance at 0.05 level and 0.01 level respectively where 'r' is the obtained correlation coefficient in each case.

The 0.99 confidence interval of r (Garrett, 1966). The limits within which the population 'r' may lie with 99 percent confidence (0.99 confidential interval of r) are calculated using the formula.

$$[r \pm 2.58 SE_r]$$

where SE_r , the standard error of r, is computed by the formula

$$SE_r = \frac{1-r^2}{\sqrt{N-1}}$$

r being the obtained coefficient of correlation.

Verbal Descriptions of 'r' (Garett, 1996)

The magnitude of each r is described for the degree of relationship using the below given explanations.

r from 0.00 to ± 0.20 : indifferent or negligible relationship

r from ± 0.20 to ± 0.40 : low or slight relation

r from ± 0.40 to 0.70 : substantial or marked relationship

r from ± 0.70 to ± 1.00 : high to very high relationship

The Coefficient of Predictive Efficiency (Garrett, 1966)

The coefficient of predictive efficiency is calculated using the formula $E=1-k$ where $K= \sqrt{1-r^2}$, r being the obtained correlation coefficient.

Step-wise Regression Analysis (by ANOVA approach) (Cohen and Manion, 1989)

This is a statistical technique to select the set of variables that best predicts the (criterion) dependent variable and that eliminates superfluous predictor variables.

In regression analysis, the predictor variables are entered one by one on the basis of the size of the partial correlation to see the extent of contribution of each variable in predicting the criterion variable. Hence, as the first step, predictor variable having the highest correlation with the criterion variables is entered. Then, the variable having the next highest partial correlation is entered second and so on. Proceeding like this, a stage may come that further entering of variables won't make significant change either in the percentage variance or in R. it is an indication that the variable entered last and the remaining variables are not significant predictors of the criterion variable.

CHAPTER IV

**ANALYSIS AND
INTERPRETATION OF DATA**

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- ❖ *Preliminary Analysis*
 - ❖ *Analysis of Percentage*
 - ❖ *Multiple Regression Analysis*
-
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ANALYSIS AND INTERPRETATION OF DATA

The present study is aimed to analyse some select correlations of biology achievement among secondary school pupils. The select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status were treated as independent variables and the Biology Achievement as the dependent variable. The details of analysis are presented below.

SECTION ONE

A. PRELIMINARY ANALYSIS

The scores obtained for science Aptitude, Attitude Towards Science, Science Interest, Intelligence, Socio-Economic Status and Achievement in Biology among secondary school pupils were subjected to preliminary statistical analysis with a view to apply further statistical procedure to be done. The major statistical constants such as Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis of the independent and dependent variables were calculated. The distributions were separately examined for the total sample and subsample for normality.

The statistical constants of the dependent and independent variables for the total sample of the secondary school pupils are presented in Table 4.1

TABLE 4.1

Details of Basic Statistics
According to Variables Selected on Total Sample

Sl. No.	Variables	N	Mean	Median	Mode	Standard Deviation	Skewness	Kurtosis
Dependent Variables								
1.	Achievement in Biology	600	22.05	21.00	18.78	9.21	0.01	-0.98
Independent Variables								
2.	Science Aptitude	600	38.62	38.00	37.14	9.91	0.14	-0.38
3.	Attitude Towards Science	600	101.70	103.00	105.22	10.26	-0.42	0.98
4.	Science interest	600	16.77	16.00	15.00	7.08	0.60	-0.31
5.	Intelligence	600	49.60	48.00	45.46	13.40	0.24	-0.30
6.	Socio-Economic Status	600	30.80	29.00	27.02	11.49	1.17	2.04

Table 4.1 reveals that the distribution of data in respect of Achievement in Biology, Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status are almost normal as revealed by Mean, Median, Mode, Skewness and Kurtosis. The Standard Deviation of each of the variables show the scattering of scores in each variable.

The statistical constants such as Mean, Median, Mode, Standard Deviation, Skewness and Kurtosis were found out for the subsamples based

on Sex, Locale and Type of Management in Table 4.2,4.3 and 4.4.

TABLE 4.2

Distribution of Basic Statistics of All the Variables According to Sex

Sex	Variables	Basic Statistics					
		Mean	Median	Mode	Standard Deviation	Skewness	Kurtosis
Boys (N = 318)	Achievement in Biology	18.77	18.00	16.46	7.65	0.52	-0.60
	Science Aptitude	37.00	37.00	37.00	9.34	0.01	-0.61
	Attitude Towards Science	99.70	100.00	100.6	10.87	-0.43	1.14
	Science interest	17.34	16.00	13.32	6.88	0.69	-0.24
	Intelligence	48.42	48.00	47.16	12.86	0.03	-0.73
	Socio-Economic Status	31.01	29.00	24.98	12.13	1.18	2.24
Girls (N = 282)	Achievement in Biology	22.95	23.00	23.10	7.29	0.16	-0.77
	Science Aptitude	40.44	40.00	39.12	10.23	0.17	-0.38
	Attitude Towards Science	103.96	104.00	104.08	9.02	-0.14	-0.08
	Science interest	16.10	15.00	12.74	7.25	0.54	-0.40
	Intelligence	50.92	49.00	45.16	13.88	0.40	-0.12
	Socio-Economic Status	30.71	29.00	25.58	11.18	1.36	2.66

TABLE 4.3

Distribution of Basic Statistics of All the Variables According to Locality

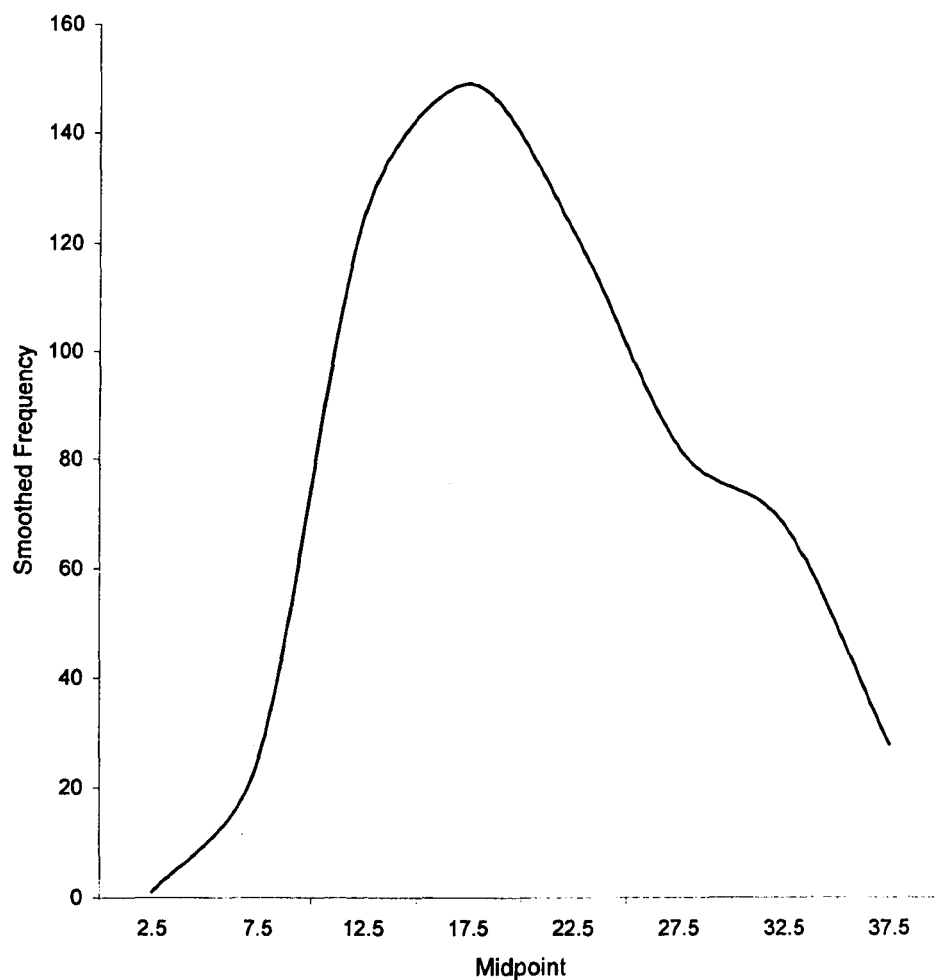
Locality	Variables	Basic Statistics					
		Mean	Median	Mode	Standard Deviation	Skewness	Kurtosis
Rural (N = 368)	Achievement in Biology	19.71	19.00	17.58	7.33	0.42	-0.53
	Science Aptitude	38.35	38.00	37.3	10.43	0.14	-0.39
	Attitude Towards Science	102.36	103.00	104.28	10.00	-0.27	-0.16
	Science interest	16.32	15.00	12.36	6.85	0.65	-0.34
	Intelligence	48.87	48.00	46.26	13.94	0.28	-0.34
	Socio-Economic Status	30.24	28.00	23.52	12.44	1.48	2.92
Urban (N = 232)	Achievement in Biology	22.36	22.00	21.28	8.16	0.04	-0.99
	Science Aptitude	39.05	38.00	35.9	9.04	0.19	-0.48
	Attitude Towards Science	100.65	100.00	98.7	10.60	-0.60	2.31
	Science interest	17.50	16.00	13.00	7.38	0.50	-0.30
	Intelligence	50.75	48.00	42.5	12.43	0.23	-0.25
	Socio-Economic Status	31.87	30.00	26.26	10.31	0.74	0.91

TABLE 4.4
Distribution of Basic Statistics of
All the Variables According to the Type of Management

Type of Management	Variables	Basic Statistics					
		Mean	Median	Mode	Standard Deviation	Skewness	Kurtosis
Private (N = 241)	Achievement in Biology	22.20	22.00	21.6	8.47	0.06	-1.06
	Science Aptitude	38.55	38.00	36.9	9.70	0.19	-0.38
	Attitude Towards Science	101.42	103.00	106.16	10.43	-0.22	-0.49
	Science interest	16.08	15.00	12.84	6.80	0.69	0.12
	Intelligence	51.62	51.00	49.76	13.65	0.18	-0.44
	Socio-Economic Status	31.20	30.00	27.60	10.28	0.69	0.24
Government (N = 359)	Achievement in Biology	19.75	19.00	17.5	7.10	0.39	-0.51
	Science Aptitude	38.67	38.00	36.66	10.07	0.11	-0.37
	Attitude Towards Science	101.89	103.00	105.22	10.16	-0.57	2.12
	Science interest	17.23	16.00	13.54	7.23	0.53	-0.53
	Intelligence	48.24	48.00	47.52	13.06	0.27	-0.18
	Socio-Economic Status	30.53	28.00	22.94	12.25	1.37	2.57

Table 4.2, 4.3 and 4.4 strengthens the argument that the data approximates normality for the subsamples also.

For reaffirming the normality of the dependent variable, Achievement in Biology, the investigator prepared a normal curve of the measures of the variable, Achievement in Biology for the total sample.



The statistical constants and the graphical representation reveal that the distribution of the variable, Achievement in Biology is not badly skewed and follows approximately a normal distribution.

B. ANALYSIS OF PERCENTAGE

Analysis of percentage was carried out to understand the levels of each of select correlates of the total sample viz., Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status of secondary school pupils.

The details of analysis of percentage are described in the order mentioned below,

1. Levels of Science Aptitude of secondary school pupils.
2. Levels of Attitude Towards Science of secondary school pupils.
3. Levels of Science Interest of secondary school pupils.
4. Levels of Intelligence of secondary school pupils.
5. Levels of Socio-Economic Status of secondary school pupils.

1. Levels of Science Aptitude of Secondary School Pupils

The secondary school pupils were classified into three groups as High, Average and Low on the basis of their Science Aptitude Scores by following the conventional procedure of sigma (σ) distance from 'Mean'. By this, 80 subjects who obtained Science Aptitude scores of 48 and above (Mean = 38.62, S.D = 9.91) were treated as High Aptitude groups, 117 subjects who obtained scores of 29 and below were treated as Low Aptitude groups and 403 subjects who obtained Aptitude scores between 29 and 48 were treated as Average group.

The details of percentages of secondary school pupils under different Science Aptitude groups are presented in Table 4.5.

TABLE 4.5
Details of Percentage of
Secondary School Pupils According to the level of Science Aptitude Test

N	Science Aptitude Groups					
	High		Average		Low	
	n	%	n	%	n	%
600	80	13.33	403	67.17	117	19.5

Table 4.5 shows that of the total sample of secondary school pupils, percentage of secondary school pupils having Average Science Aptitude is 67.7 percent, having High Science Aptitude is 13.33 percent and having Low Science Aptitude is 19.5 percent.

2. Levels of Attitude Towards Science of Secondary School Pupils

Pupils with Attitude score above the overall groups value $M+1$ S.D. (i.e., Score 120 and above) were considered as High Attitude group and with Attitude score below $M-1$ S.D. (i.e., score 85 and below) were considered as Low Attitude group and pupil's whose Attitude scores are between $M+1$ S.D. and $M-1$ S.D. (i.e., between 85 and 120) were considered as Average Attitude groups. Details of percentage of secondary school pupils under different attitude groups are given in Table 4.6.

TABLE 4.6

**Details of Percentage of Secondary School
Pupils According to the Level of Attitude Towards Science**

N	Attitude Towards Science					
	High		Average		Low	
	n	%	n	%	n	%
600	101	16.8	392	65.3	107	17.8

From Table 4.6, it is revealed that 16.8 percent of secondary school pupils are having High Attitude Towards Science, where as 65.3 percent of secondary school pupils are having Average Attitude towards Science. But only 17.8 percent of them are having Low Attitude towards Science.

3. Levels of Science Interest of Secondary School Pupils

The secondary school pupils were classified into three groups on the basis of their Science Interest scores. Pupils with Science Interest scores greater than or equal to $M + 1$ S.D. (i.e., score 24 and above) were considered High Science Interest group, and with Science Interest score below $M - 1$ S.D. (i.e., Score 10 and below) were considered as Low Science Interest group. Pupils whose Science Interest scores are between 10 and 24 were considered as Average Science Interest Score.

Details of percentages of Secondary School pupils according to different Science Interest groups are presented in Table 4.7

TABLE 4.7

**Details of Percentage of
Secondary School Pupils According to Various Levels of Science Interest**

N	Science Interest					
	High		Average		Low	
	n	Percentage	N	Percentage	n	Percentage
600	91	15.17	420	70.09	89	14.8

From Table 4.7, it is seen reveals that 15.17 percent of secondary school pupils are having High Science Interest group, 70 percent of secondary school pupils are having Average Science Interest group and 14.8 percent of secondary school pupils are having Low Science Interest group.

4. Levels of Intelligence of Secondary School Pupils

The secondary school pupils with the Intelligence score above the overall groups value $M+1$ S.D. (i.e., score 64 and above) were considered as High Intelligence group and with Intelligence score below $M-1$ S.D. (i.e., score 37 and below) were considered as Low Intelligence groups. Pupil's whose Intelligence scores are between $M+1$ S.D. and $M-1$ S.D. (i.e., between 37 and 64) were considered as Average Intelligence groups.

Details of percentage of secondary school pupils under different Intelligence groups are given in Table 4.8.

TABLE 4.8
Details of Percentage of
Secondary School Pupils According to their Level of Intelligence

N	Intelligence					
	High		Average		Low	
	n	Percentage	n	Percentage	n	Percentage
600	110	18.33	396	66	94	15.66

Table 4.8 reveals that 18.33 percent of secondary school pupils are having High Intelligence group, 66 percent of secondary school pupils are having Average Intelligence and 15.66 percent of secondary school pupils are in Low Intelligence group.

5. Levels of Socio-Economic Status of Secondary School Pupils

The secondary school pupils were classified into two groups viz., High, and Low on the basis of their Socio-Economic Status scores. Pupils having Socio-Economic Status scores greater than or equal to median value (i.e., score 29 and above) were considered as High Socio-Economic Status group and with Socio-Economic Status score below median value (i.e., score below 29) were considered as Low Socio-Economic Status group.

Details of the levels in percentage of secondary school pupils according to different Socio-Economic Status group are presented in Table 4.9.

TABLE 4.9

**Details of Percentage of Secondary School Pupils
According to various Levels of Socio-Economic Status**

N	Socio-Economic Status			
	High		Low	
	n	Percentage	n	Percentage
600	312	52	288	48

Table 4.9 reveals that 52 percent of secondary school pupils are in High Socio-Economic Status group and 48 percent of secondary school pupils are having Low Socio-Economic Status group.

Inorder to find out the significant effect of each of select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status on Achievement in Biology, the investigator proposed to carry out One-Way Analysis of Variance and the details are presented below:

SECTION TWO

A. ANALYSIS OF VARIANCE (ANOVA)

One-Way Analysis of Variance technique with regard to the select correlates; - Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status, was done to examine the significant effect of each of them on Achievement in Biology. The computation was done with the help of computer using the 'STATISTICA' software as

mentioned in the methodology chapter of the present study.

The results obtained by One-Way Analysis of Variance technique with regard to the select correlates for the total sample are presented below in Table 4.10.

TABLE 4.10
Results of Analysis of Variance for the Effect of
Some Select Correlates on Achievement in Biology (Total Sample)

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	1839.926	2	919.963	11.215	0.01
	Within Groups	48970.767	597	82.028		
Attitude Towards Science	Between groups	609.657	2	304.829	3.625	0.05
	Within Groups	50201.036	597	84.089		
Science Interest	Between groups	1590.104	2	795.052	9.643	0.01
	Within Groups	49220.589	597	82.447		
Intelligence	Between groups	2542.220	2	1271.110	15.721	0.01
	Within Groups	48268.473	597	80.852		
Socio-Economic Status	Between groups	95.259	1	95.259	1.123	N.S
	Within Groups	50715.435	598	84.808		

Table 4.10 revealed the following:

- 1) There is highly significant effect of Science Aptitude grouping, viz., High, Average and Low, at 0.01 level of significance on Achievement in Biology. It means that there is significant difference in Achievement in Biology by the Science Aptitude grouping.
- 2) There exists significant effect of Attitude Towards Science grouping (High, Average and Low) on Achievement in Biology, at 0.05 level of significance. That is, there is significant difference on Achievement in Biology due to the Science Attitude grouping as High, Average and Low.
- 3) There is significant effect of groups of Science Interest viz., High, Average and Low at 0.01 level of significance, on Achievement in Biology among secondary school pupils. It implies that there is significant difference in Achievement in Biology with respect to the groups of Science Interest.
- 4) There exists very high significant effect with regard to groups of intelligence- High, Average and Low on Achievement in Biology, at 0.01 level of significant difference in Achievement in Biology by High, Average and Low groups of Intelligence.
- 5) There exists no significant effect of Socio-Economic Status on Achievement in Biology. That means, there is no significant difference

in Achievement in Biology by Socio-Economic Status grouping, High, Average and Low.

Discussion

The above analysis implies that there exists very high significant difference, at 0.01 level of significance among secondary school pupils in their Achievement in Biology of total sample irrespective of the effect of the groups of Science Aptitude, Attitude Towards Science, Science Interest, and Intelligence but no significant difference exists in Achievement in Biology due to Socio-Economic Status groups- High, Average and Low among secondary school pupils.

ANOVA (One-Way Analysis of Variance) was found out for the sub samples, Sex of the pupils, Locality and Type of Management, for finding the effects of some correlates on Achievement in Biology. The results with regard to boys are presented below in Table 4.11.

TABLE 4.11

**Results of Analysis of Variance for the Effect of
Some Select Correlates on Achievement in Biology of Boys**

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	1645.519	2	822.760	15.308	0.01
	Within Groups	16930.179	315	53.747		
Attitude Towards Science	Between groups	297.961	2	148.980	2.568	N.S.
	Within Groups	18277.737	315	58.025		
Science Interest	Between groups	684.912	2	342.456	6.030	0.01
	Within Groups	17890.786	315	56.796		
Intelligence	Between groups	723.222	2	361.611	6.380	0.01
	Within Groups	17852.476	315	56.675		
Socio-Economic Status	Between groups	180.962	1	180.962	3.109	N.S
	Within Groups	18394.736	316	58.211		

Table shows that

- 1) There exists significant effect of groups (High, Average and Low) of Science Aptitude, Science Interest and Intelligence on Achievement in Biology of Boys at 0.01 level. It implies that there is high significant difference in Achievement in Biology of Boys by High, Average and Low groups of Science Aptitude, Attitude Towards Science and Intelligence.

- 2) There is no significant difference on Achievement in Biology of Boys by the effect of groups of Attitude towards Science and Socio-Economic Status.

The results of ANOVA for the effect of some select correlates on Achievement in Biology of Girls are presented below in Table 4.12.

TABLE 4.12

**Results of Analysis of Variance for the Effect of
Some Select Correlates on Achievement in Biology of Girls**

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	476.032	2	238.016	4.596	0.01
	Within Groups	14448.170	279	51.786		
Attitude Towards Science	Between groups	993.034	2	496.517	9.944	0.01
	Within Groups	13931.168	279	49.933		
Science Interest	Between groups	1152.160	2	576.080	11.670	0.01
	Within Groups	13772.042	279	49.362		
Intelligence	Between groups	2428.731	2	1214.365	27.114	0.01
	Within Groups	12495.471	279	44.787		
Socio-Economic Status	Between groups	136.459	1	136.459	2.584	N.S
	Within Groups	14787.743	280	52.813		

- i) From the Table 4.12, it is evident that there is significant effect of the groups of (High, Average and Low) of Science Aptitude, Attitude Towards Science, Science Interest and Intelligence on Achievement in Biology of Girls, at 0.01 level of significance.
- ii) There is no significant difference on Achievement in Biology of Girls by the High and Low groups of Socio-Economic Status.

The results of Analysis of Variance for the effect of some select correlation on Achievement in Biology of Rural Schools are given in Table 4.13

TABLE 4.13

**Results of Analysis of Variance for the Effect of Some
Select Correlates on Achievement in Biology of Pupils in Rural Schools**

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	1188.776	2	594.388	11.706	0.01
	Within Groups	18533.113	365	50.776		
Attitude Towards Science	Between groups	996.790	2	498.395	9.715	0.01
	Within Groups	18725.099	365	51.302		
Science Interest	Between groups	1898.020	2	949.010	19.434	0.01
	Within Groups	17823.869	365	48.833		
Intelligence	Between groups	2919.177	2	1459.589	31.706	0.01
	Within Groups	16802.712	365	46.035		
Socio-Economic Status	Between groups	260.260	1	260.260	4.895	0.05
	Within Groups	19461.628	366	53.174		

- i) From the ANOVA Table 4.13, it is seen that Science Aptitude, Attitude Towards Science, Science Interest and Intelligence are significantly influencing Achievement in Biology of pupils in Rural secondary schools, i.e., some correlates' effects are significant at 0.01 level.
- ii) Socio-Economic Status are significantly influencing Achievement in

Biology of pupils of Rural secondary school pupils at 0.05 level.

It is clear that all the selected correlates are significantly influencing Achievement in Biology of pupils of Rural secondary schools.

The results of Analysis of Variance for the effect of some select correlates on Achievement in Biology of pupils in Urban schools are presented in the Table 4.14.

TABLE 4.14

**Results of Analysis of Variance for the Effect of Some
Select Correlates on Achievement in Biology of Pupils in Urban Schools**

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	964.904	2	482.452	7.665	0.01
	Within Groups	14414.682	229	62.946		
Attitude Towards Science	Between groups	1072.266	2	536.133	8.581	0.01
	Within Groups	14307.321	229	62.477		
Science Interest	Between groups	185.515	2	92.757	1.398	N.S.
	Within Groups	15194.071	229	66.350		
Intelligence	Between groups	106.679	2	53.340	0.800	N.S.
	Within Groups	15272.907	229	66.694		
Socio-Economic Status	Between groups	18.050	1	18.050	0.270	N.S.
	Within Groups	15361.536	230	66.789		

Table 4.14 reveals that

- i) There is significant effect of Science Aptitude and Attitude Towards Science grouping at 0.01 level of significance in Achievement in Biology of pupils in Urban schools.
- ii) There is no significant effect in Achievement in Biology by the groups of Science Interest, Intelligence and Socio-Economic Status of pupils in Urban schools.

The results of ANOVA for the effect of some select correlates on Achievement in Biology of pupils in Private schools are presented in Table 4.15.

TABLE 4.15

**Results of Analysis of Variance for the Effect of Some
Select Correlates on Achievement in Biology of Pupils in Private Schools**

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	435.354	2	217.677	4.405	0.01
	Within Groups	17593.581	356	49.420		
Attitude Towards Science	Between groups	622.497	2	311.249	6.366	0.01
	Within Groups	17406.439	356	48.894		
Science Interest	Between groups	1177.224	2	588.612	12.435	0.01
	Within Groups	16851.712	356	47.336		
Intelligence	Between groups	1443.360	2	721.680	15.490	0.01
	Within Groups	16585.576	356	46.589		
Socio-Economic Status	Between groups	58.162	1	58.162	1.155	N.S
	Within Groups	17970.774	357	50.338		

From Table 4.15

- i) It is clear that groups of Science Aptitude, Attitude towards Science, Science Interest and Intelligence are significantly influencing Achievement in Biology of pupils of secondary schools of Private Management.

- ii) There is no significant effect in Achievement in Biology by the groups of Socio-Economic Status.

The results of Analysis of Variance for the effect of some select correlates on Achievement in Biology of pupils in Government schools are presented in Table 4.16.

TABLE 4.16

Results of Analysis of Variance for the Effect of Some Select Correlates on Achievement in Biology of Pupils in Government Schools

Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	Level of Significance
Science Aptitude	Between groups	435.354	2	217.677	4.405	0.01
	Within Groups	17593.581	356	49.420		
Attitude Towards Science	Between groups	641.845	2	320.922	6.571	0.01
	Within Groups	17387.091	356	48.840		
Science Interest	Between groups	1177.224	2	588.612	12.435	0.01
	Within Groups	16851.712	356	47.336		
Intelligence	Between groups	1443.360	2	721.680	15.490	0.01
	Within Groups	16585.576	356	46.589		
Socio-Economic Status	Between groups	58.162	1	58.162	1.155	N.S
	Within Groups	17970.774	357	50.338		

In the Table 4.16

- i) It is seen that there is significant effect of Science Aptitude, Attitude Towards Science, Science Interest and Intelligence on Achievement in Biology of pupils in Government Schools.
- ii) There is no significant difference in Achievement in Biology of pupils in Government schools by the effect of group of Socio-Economic Status.

Discussion

The above analyses imply that

- 1) Groups of Science Aptitude, Science Interest and Intelligence viz., High, Average and Low are significantly influencing the Achievement in Biology of Boys. But the groups of Attitude towards Science and Socio-Economic Status are not much influencing Achievement in Biology among Boys.
- 2) There exists significant difference in Achievement in Biology of Girls by the effect of grouping (High, Average and Low) of Science Aptitude, Attitude Towards Science, Science Interest, and Intelligence.

It is clear that there is high significant difference in Achievement in Biology, through the effect of some select correlates such as Science Aptitude, Attitude Towards Science, Science Interests and Intelligence of secondary school pupils in Sex-wise. But there is no significant difference

in Achievement in Biology through the effect of Socio-Economic Status.

- 3) There is significant difference in Achievement in Biology of pupils in Rural schools by the effect of some select correlates such as Science Aptitude, Attitude Towards Science, Science Interest and Intelligence. Achievement in Biology is not influenced by effect of Socio-Economic Status.

Achievement in Biology of pupils in Urban schools is significantly influenced by effect of Science Aptitude and Attitude towards Science. There is existing no difference in Achievement in Biology by the groups of Interest, Intelligence and Socio-Economic Status.

It is found that groups of Science Aptitude and Attitude Towards Science are significantly influencing the Achievement in Biology of secondary school pupils in respect of Locale of the schools. There is no difference in Achievement in Biology by the effect of groups Socio-Economic Status. But the groups of Interest and Intelligence are significantly influencing Achievement in Biology of pupils in Urban schools.

- 4) Groups of almost all select correlates are significantly influencing Achievement in Biology of secondary school pupils in relation to the Type of Management of the schools. There is no difference in Achievement in Biology due to groups of Socio-Economic Status.

It can be concluded that groups of almost all select correlates, Science Aptitude, Attitude Towards Science, Science Interest and Intelligence except Socio-Economic Status are significantly influencing Achievement in Biology of secondary school pupils of total as well as relevant subsamples- viz., Sex, Locale and Type of Management.

B. CORRELATION ANALYSIS

The analysis of variance revealed that groups of all select correlates except the Socio-Economic Status of the pupils have significant effect on Achievement in Biology. This implies the possibility of having significant relationship of Achievement in Biology with all the select psychological variables except the Socio-Economic Status. Therefore, in this section, the investigator proposed to find out the extent of relationship between Achievement in Biology and each of the select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status of secondary school pupils by means of Pearson's Product Moment Coefficient of Correlation 'r'.

The value of 'r' obtained in the case of each psychological variable is described below in terms of

- (i) Statistical significance of the coefficient (by Fisher's t test)
- (ii) The size of 'r'
- (iii) Direction of 'r'

- (iv) 99% confidence interval of 'r'
- (v) Shared which a variable has in common with the variable associated and
- (vi) The coefficient of predictive efficiency, E

The details of relationship between select correlates and achievement in Biology of total sample are presented in the Table 4.17.

TABLE 4.17

**Details of Relationship Between
Some Select Correlates and Achievement in Biology of Total Sample**

Sl. No.	Psychological variables	Correlation coefficient 'r'	Fisher's 't'	Standard Error of Estiamte (Ser)	99% confidence Interval	Shared variance	Predictive efficiency of 'r'
1.	Science Aptitude	0.226**	5.673	0.039	(0.68, 0.48)	5.107	0.03
2.	Attitude Towards Science	0.087*	2.136	0.041	(0.33, 0.12)	0.756	0.004
3.	Science Interest	0.196**	4.887	0.039	(0.61, 0.40)	3.841	0.02
4.	Intelligence	0.253**	6.395	0.038	(0.75, 0.55)	6.400	0.03
5.	Socio-Economic Status	0.035	0.856	0.041	(0.19, -0.01)	0.122	0.001

Note: - ** indicates significance at 0.01 level ($P < 0.01$)

* indicates significance at the 0.05 level ($P < 0.05$)

Table 4.17 reveals the following

- (i) There exists significant positive relationship, (at 0.01 level) between Science Aptitude, Science Interest, Intelligence and

Achievement in Biology of secondary school pupils for the total sample.

- (ii) Significant positive relationship, at 0.05 level exists between Attitude Towards Science and Achievement in Biology of secondary school pupils for the total sample.
- (iii) There exists no significant relationship between Socio-Economic Status and Achievement in Biology of Secondary School pupils for the total sample.
- (iv) The magnitude of r 's of 5 select correlates with Achievement in Biology reveals that the relation of two variables (Science Aptitude and Intelligence) are slight relation and relation of three variables (Attitude Towards Science, Science Interest, Socio-Economic Status) are negligible.
- (v) It was found that the relation of Achievement in Biology with select five correlates are positive.
- (vi) Population value of coefficients of correlation falls between 0.01 and 0.75 for the total sample.
- (vii) The shared variance between variables was found to be ranging from 0.122 to 6.400.
- (viii) The predictive efficiency of ' r ' of the total sample was ranging from 0.001 to 0.03.

The details of relationship between some select correlates and Achievement in Biology of Boys and Girls are given in the Table 4.18.

TABLE 4.18

**Details of Relationship Between Some Select
Correlates and Achievement in Biology Among Boys and Girls**

Sex	Psychological variables	Correlation coefficient 'r'	Fisher's 't'	Standard Error of Estiamte (Ser)	99% confidence Interval	Shared variance	Predictive efficiency of 'r'
Boys (N=318)	Science Aptitude	0.295**	5.488	0.051	(0.89, 0.62)	8.703	0.04
	Attitude Towards Science	0.120*	2.148	0.055	(0.45, 0.16)	1.440	0.01
	Science Interest	0.210**	3.818	0.053	(0.68, 0.40)	4.410	0.02
	Intelligence	0.221**	4.028	0.053	(0.70, 0.43)	4.884	0.03
	Socio-Economic Status	0.086	1.534	0.055	(0.36, 0.07)	0.739	0.004
Girls (N=282)	Science Aptitude	0.249**	4.302	0.055	(0.78, 0.49)	6.200	0.03
	Attitude Towards Science	0.249**	4.302	0.055	(0.78, 0.49)	6.200	0.03
	Science Interest	0.301**	5.281	0.054	(0.91, 0.63)	9.060	0.01
	Intelligence	0.419**	7.722	0.049	(1.20, 0.95)	17.556	0.09
	Socio-Economic Status	0.052	0.871	0.059	(0.28, -0.02)	0.270	.001

Note: - ** indicates significance at 0.01 level ($P < 0.01$)

* indicates significance at the 0.05 level ($P < 0.05$)

Table 4.18 reveals the following;

- i) There exists significant positive relationship between Science Aptitude, Science Interest, Intelligence and Achievement in Biology at 0.01 level of significance for boys and there exists significant positive relationship between Science Aptitude, Science

Interest, Intelligence, Attitude Towards Science and Achievement in Biology of secondary school pupils at 0.01 level for girls.

- ii) Significant positive relationship, at 0.05 level exists between Attitude Towards Science and Achievement in Biology of secondary school pupils for Boys.
- iii) There exists no significant relationship between Socio-Economic Status and Achievement in Biology for Boys and Girls.
- iv) The magnitude of r 's of 5 select correlates with Achievement in Biology of Boys reveal that the relation of three variables (Science Aptitude Science Interest and Intelligence) are slight relation and relation of two variables (Attitude Towards Science and Socio-Economic Status) are negligible.
- v) The magnitude of r 's of 5 select correlates with Achievement in Biology of Girls reveals that the relation of two variables (Intelligence and Science Interest) is substantial, relation of two variables (Science Aptitude and Attitude Towards Science) is low and relation of Socio-Economic Status is negligible.
- vi) It was found that the relation of Achievement in Biology with the select five correlates is positive.
- vii) Population value of coefficient of correlation falls between 0.07 and 0.89 for Boys and between -0.02 and 0.95 for Girls.
- viii) The shared variance between variables was found to be ranging from 0.739 to 8.703 for Boys and from 0.270 to 17.556 for girls.

- ix) The predictive efficiency of 'r' for Boys was ranging from 0.004 to 0.040 and for girls, ranging from 0.001 to 0.09.

The details of relationship between some select correlates and Achievement in Biology of Rural and Urban Samples are presented in the Table 4.19.

TABLE 4.19

**Details of Relationship Between Some
Select Correlates and Achievement in Biology of Rural and Urban Pupils**

Locale	Psychological variables	Correlation coefficient 'r'	Fisher's 't'	Standard Error of Estiamte (Ser)	99% confidence Interval	Shared variance	Predictive efficiency of 'r'
Rural (N=368)	Science Aptitude	0.302**	6.061	0.047	(0.90, 0.65)	9.120	0.05
	Attitude Towards Science	0.245**	4.834	0.049	(0.75, 0.50)	6.002	0.03
	Science Interest	0.305**	6.127	0.047	(0.90, 0.66)	9.302	0.05
	Intelligence	0.423**	8.931	0.043	(1.20, 0.98)	17.892	0.09
	Socio-Economic Status	0.094	1.806	0.051	(0.37, 0.10)	0.883	0.004
Urban (N=232)	Science Aptitude	0.312**	4.980	0.059	(0.95, 0.65)	9.734	0.05
	Attitude Towards Science	0.135**	2.066	0.064	(0.51, 0.18)	1.823	0.001
	Science Interest	0.083	14.263	0.065	(0.38, 0.04)	0.688	0.003
	Intelligence	0.162**	2.489	0.064	(0.58, 0.25)	2.624	0.01
	Socio-Economic Status	-0.007	-0.106	0.065	(0.15, -0.18)	0.004	0.0001

** indicates significance at 0.01 level ($P < 0.01$)

Table 4.19 reveals the following:

- (i) Significant positive relationship exists between Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Achievement in Biology at 0.01 level of significance for rural samples.
- (ii) There exists significant positive relationship between Science Aptitude, Attitude Towards Science, Intelligence and Achievement in Biology at 0.01 level for urban samples.
- (iii) There exists no significant relationship between Socio-Economic Status and Achievement in Biology for Rural samples.
- (iv) There exists no significant relationship between Science Interest, Socio-Economic Status and Achievement in Biology for Urban samples.
- (v) The magnitude of r 's of 5 select correlates with Achievement in Biology of Rural sample reveals that the relation of three variables (Science Aptitude, Science Interest and Intelligence) is substantial and relation of Attitude Towards Science is low and relation of Socio-Economic Status is negligible.
- (vi) The magnitude of r 's of 5 select correlates with Achievement in Biology of Urban sample reveals that the relation of three variables (Science Aptitude, Attitude Towards Science, and Intelligence) is

low and the relation of the remaining two variables (Science Interest, Socio-Economic Status) is negligible and Socio-Economic Status shows negative relation.

- (vii) Population value of coefficients of correlation falls between 0.10 and 0.98 for Rural samples and falls between -0.18 and 0.95 for Urban samples.
- (viii) The shared variance between variables was found to be ranging from 0.883 to 17.892 for Rural samples and between 0.004 and 9.734 for Urban samples.
- (ix) The predictive efficiency of 'r' for Rural samples was ranging from 0.004 to 0.09 and ranging from 0.0001 to 0.05 for Urban samples.

The details of relationship between some select correlates and Achievement in Biology of Private and Government school pupils are presented in the Table 4.20.

TABLE 4.20

**Details of Relationship Between Some Select Correlates and
Achievement in Biology of Private and Government School Pupils**

Locale	Psychological variables	Correlation coefficient 'r'	Fisher's 't'	Standard Error of Estiamte (Ser)	99% confidence Interval	Shared variance	Predictive efficiency of 'r'
Private (N=241)	Science Aptitude	0.441**	7.596	0.052	(1.27, 1.00)	19.45	0.10
	Attitude Towards Science	0.262**	4.197	0.060	(0.83, 0.52)	6.864	0.04
	Science Interest	0.187**	2.942	0.062	(0.64, 0.32)	3.496	0.02
	Intelligence	0.295**	4.773	0.058	(0.91, 0.60)	8.702	0.04
	Socio-Economic Status	0.062	0.960	0.064	(0.32, -0.01)	0.384	0.002
Government (N=359)	Science Aptitude	0.212**	4.098	0.050	(0.67, 0.41)	4.494	0.02
	Attitude Towards Science	0.151**	2.886	0.051	(0.52, 0.25)	2.280	0.01
	Science Interest	0.275**	5.404	0.048	(0.83, 0.58)	7.562	0.04
	Intelligence	0.331**	6.627	0.047	(0.97, 0.73)	10.956	0.06
	Socio-Economic Status	0.064	1.212	0.052	(0.30, 0.02)	0.409	0.002

** indicates significance at 0.01 level ($P < 0.01$)

Table 4.20 shows the following:

- (i) There exists significant positive relationship between Science Aptitude, Attitude Towards Science, Science Interest, Intelligence

and Achievement in Biology of secondary school pupils at 0.01 level of significance among private and government schools.

- (ii) There exists no significant relationship between Socio-Economic Status and Achievement in Biology among Private and Government schools.
- (iii) The magnitude of r 's of 5 select correlates with Achievement in Biology of Private sample reveals that the relation of one variable (Science Aptitude) is substantial and relation of three variables (Attitude Towards Science, Science Interest and Intelligence) is low and relation of remaining variable (Socio-Economic Status) is negligible.
- (iv) The magnitude of r 's of five select correlate with Achievement in Biology of Government school reveals that the relation of four variables (Science Aptitude, Attitude Towards Science, Science Interest and Intelligence) is low and relation of one variable (Socio-Economic Status) is negligible.
- (v) It was found that the relation of Achievement in Biology with the select five correlates is positive.
- (vi) Population value of coefficients of correlation falls between -0.01 and 0.91 for private schools and between 0.02 and 0.97 for Government schools.

- (vii) The shared variance between variables falls between 0.384 and 19.450 for Private schools and between 0.409 and 10.956 for Government schools.
- (viii) The predictive efficiency of 'r' for Private schools was ranging from 0.002 to 0.04 for private schools and from 0.002 to 0.06 for Government schools.

Discussion

The correlation analysis revealed that

- 1) Significant positive relationship exists between almost all select correlates (Science Attitude, Attitude Towards Science, Interest and Intelligence) and Achievement in Biology of secondary school pupils.
- 2) There exists no relation between Attitude Towards Science and Achievement in Biology of Secondary school pupils in Urban school.
- 3) There exists no relation between Socio-Economic Status and Achievement in Biology for the Total sample and subsamples, viz., Sex, Locale and Type of Management.

The correlation analysis revealed that significant positive relationship exists between almost all independent variables, (Science Aptitude, Attitude Towards Science, Science Interest and Intelligence) except Socio-Economic Status and the dependent variables (Achievement in Biology of secondary school pupils).

In view of the above the investigator decided to study the influence of the independent variables on the dependent variable and to study the efficiency of the independent variables to predict the dependent variable. For this, Multiple Regression Analysis was carried out and the details are presented below:

C. MULTIPLE REGRESSION ANALYSIS

Multiple Regression Analysis was done to predict the Achievement in Biology of secondary school pupils. The computation was done with the help of computer using the 'STATISTICA' software as mentioned in the methodology chapter of the present study.

Science Aptitude, Attitude Towards Science, Science Interest, Intelligence, and Socio-Economic Status were considered as the independent variables. The Achievement in Biology was considered as the dependent variable.

The results of Multiple Regression Analysis (Forward Step-wise Regression Analysis) are given in Table 4.21.

TABLE 4.21

Details of Forward Step-Wise Regression Analysis

R = 0.34172085 R ² = 0.11677314 Adjusted R ² = 0.10933857						
F (5, 594) = 15.707 P<0.00000 Std. Error of estimate = 8.6920						
	Beta	St. Error of Beta	B-weight	St. Error of Beta	t(594)	P-level
Intercept	--	--	5.8594	2.6204	2.2360	0.0257
Science Aptitude	0.1613	0.1405	0.1499	0.0376	3.9833	7.64E-05**
Attitude Towards Science	-0.0089	0.0396	0.0048	0.0212	0.2267	0.8207
Science Interest	0.1626	0.0391	0.2116	0.0509	4.1560	3.71-05**
Intelligence	0.1887	0.0406	0.1297	0.0279	4.6454	4.18E-06**
Socio-Economic Status	-0.0035	0.0388	0.1297	0.0295	-0.0917	0.9269

Note: ** indicates significance at 0.01 level.

From the above table, it is evident that Attitude Towards Science and Socio-Economic Status do not make any contribution in predicting the Achievement in Biology.

The obtained Multiple Regression Correlation R was 0.3417, showing the strength of the independent variables in predicting the Achievement in Biology of secondary school pupils.

The Multiple r^2 was found to be 0.1167, which shows that 11.7 percent of the variance in Achievement in Biology of the sample is accounted by the variance in the dimensions of Science Aptitude, Science Interest and Intelligence. The remaining percent of variance can be attributed to the

variables no measured in this regression equation.

The standard error as revealed by the analysis above is 8.6920 (8.69 percent), which is negligible.

The value of the constant in the Multiple Regression equation to predict the Achievement in Biology of secondary school pupils taken for the study is

$$Y = a + b_1 (X_1) + b_2(X_2) + b_3 (X_3)$$

Where, Y = predicted score of Achievement in Biology

X_1 = Science Aptitude.

X_2 = Science Interest

X_3 = Intelligence

It means that the predicted score of Achievement in Biology of secondary school pupils is

$$Y = 5.859 + 0.150 (\text{Science Aptitude}) + 0.051(\text{Science Interest}) + 0.028 (\text{Intelligence})$$

This equation will help us to find the individual predictor values of 'Y' knowing the individual value of X_1 , X_2 and X_3 .

By the equation predicting 'Achievement in Biology', it may be noted that for every unit increase in X_3 , X_2 and X_1 (Intelligence, Science Interest and Science Aptitude) 'Y' (Achievement in Biology) is increasing by 0.028,

0.051 and 0.150. It may also be inferred that Science Aptitude has the highest weight for predicting Achievement in Biology of secondary school pupils. Hence better Aptitude Towards Science, Science Interest and Intelligence can improve the Achievement in Biology of secondary school pupils.

Discussion

The Multiple Regression Analysis (Forward Stepwise Regression Analysis) proved that the independent variables viz., Science Aptitude, Science Interest and Intelligence are the best predictors for predicting the Achievement in Biology of secondary school pupils.

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CHAPTER V

**SUMMARY, CONCLUSIONS,
RECOMMENDATIONS AND SUGGESTIONS**

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- ❖ *Objectives of the Study*
 - ❖ *Hypotheses*
 - ❖ *Methodology*
 - ❖ *Procedure*
 - ❖ *Statistical Techniques Used*
 - ❖ *Major Findings of the Study*
 - ❖ *Summary of Results*
 - ❖ *Conclusion*
 - ❖ *Tenability of Hypotheses*
 - ❖ *Educational Implications of the Study*
 - ❖ *Suggestions for Further Research*
-
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SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS

INTRODUCTION

The 21st century is considered as the age of learning. Therefore, it is high time to focus on some progressive steps which would be able to awaken curiosity, Interest and Attitude towards Learning amongst the learners. But the present teaching learning process, to certain extent is seen towards rote memory without providing proper practical knowledge. As such the students are not motivated to learn systematically. Hence, steps have to be taken to improve systematic learning of various subjects, especially science because the heart and soul of educational process is science.

Science is considered as an intellectual endeavour which consists of two parts viz., process and product. The 'product approach' implies the way of transferring knowledge established by the scientists to the students whereas 'process approach' stressed by Robert. M. Gagne (1985) includes the way scientists think and do when they solve any scientific problems. The process approach includes hypothesizing, observing, designing experiments, recording, analysing data, informing etc. In addition to all this, it consists of an awareness of the values underlying science.

Thus learning of science may be amenable for development of the

skills related to process of science along with products i.e., scientific knowledge. This is possible only by involving the students in manipulation, observation, exploration, experimentation, interpretation, prediction etc. in science classes. Unless the students are involved in using processes of science during gathering of knowledge, their learning of science remains incomplete. Therefore, science instruction in our classrooms should be more activity oriented, instead of a theoretical one which might hamper student's Attitude towards Science and Interest in Science.

Eventhough the process method of learning science has been implemented in our schools, the scholastic achievement of the learners has not been seen considerably improved due to various reasons. This may be due to certain gaps existing between theories and practice or lack of interest, aptitude and attitude on the part of the students or may be due to the socio-familial variations of the pupils. Various empirical studies have been seen attempted so far on different psychological factors, but nobody has studied the dominant factors responsible for the scholastic achievement in science, especially Biology. Hence it is proposed to investigate with a view to identify the factors responsible for the scholastic Achievement in Biology. Such a study will be helpful to predict the future performance of students in the learning of science, especially, Biology.

Moreover, being a Biology teacher and teacher educator for the last four years, the investigator has opportunities to observe that majority of the

pupils who are talented in science is not seen scored high marks in science, especially Biology. This may be due to various reasons. Hence the investigator proposed to conduct a study to identify the contributing factors which helps in the scoring of higher marks in Biology. The investigator earnestly believe that the findings thus emerged will be highly useful and beneficial to educationists, planners and administrators, while framing curriculum in science subjects especially Biology in future.

OBJECTIVES OF THE STUDY

- 1) To examine the significant effect of each select correlates on Achievement in Biology among secondary school pupils, for the Total and Subsamples viz., Sex, Locale and Type of Management.
- 2) To find out the relationship of each select correlates with Achievement in Biology among secondary school pupils separately for the Total and Subsamples.
- 3) To identify the most significant correlates for predicting Achievement in Biology among secondary school pupils.

HYPOTHESES

Based on the objectives the hypotheses formulated for the study were as follows:

- 1) There will be significant effect of each select correlates on Achievement in Biology among secondary school pupils.

- 2) There will be significant difference in the relationship of each select correlates with Achievement in Biology among secondary school pupils.
- 3) There will be most significant correlates for predicting Achievement in Biology among secondary school pupils.

METHODOLOGY

The present study is a descriptive survey which includes two types of variables viz.,

- 1) Dependent variable
- 2) Independent variables.

As one of the major objectives of the study is to identify the psychological variables which are capable of predicting significant Achievement in Biology, the dependent variable of the study is Achievement in Biology.

In the present study, Scholastic Achievement in Biology is considered as dependent variable.

The independent variables used are:

- 1) Science Aptitude
- 2) Attitude Towards Science
- 3) Science Interest
- 4) Intelligence
- 5) Socio-Economic Status

After fixing the sample, adequate copies of the tools and response sheets were got printed. Then a schedule for administering the tool was prepared by visiting the Heads of the proposed schools. As there were six tools to be administered for measuring the variables, the investigator had to get to each school twice for administering the tools.

The question booklets and the response sheets were distributed to the pupils as sets one after one. Time limits were strictly kept wherever necessary. All the test materials and response sheets were collected back after the due time.

Response Sheets of six tools were then scored using the scoring scheme of each item. All the test scores were then consolidated incorporating student's personal data. The data was so entered and consolidated as to facilitate statistical analyses by means of computer.

PROCEDURE

SAMPLE

The study was conducted on a sample of 600 secondary school pupils drawn from five different districts of Kerala by stratified random sampling method.

TOOLS

The tools used were

- i) Science Aptitude Test

- ii) Scale of Attitude Towards Science
- iii) Science Interest Inventory
- iv) Verbal Group Test of Intelligence
- v) Socio-Economic Status Scale
- vi) Achievement Test in Biology for IX Standard Pupils.

Four tools, Science Aptitude Test, Scale of Attitude Towards Science, Science Interest Inventory and Achievement Test in Biology were prepared and standardized by the investigator with the help of her supervising teacher. Verbal Group Test of Intelligence was developed by Sudheeshkumar, Hameed and Prasanna (1997) to measure the general intelligence 'g' of secondary school pupils and the Socio-Economic Status Scale prepared by Kuppuswamy and modified by Pillai was selected to measure the Socio Economic Status of the secondary school pupils with slight modification.

STATISTICAL TECHNIQUES USED

Mean, Median, Mode, Standard Deviation, Skewness and Kurtosis of the distribution of the variables were determined. Normal curve of the Achievement in Biology for the total sample was drawn.

Percentage analysis was carried out to determine the levels of each select correlates of the total sample viz., Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status of Secondary School Pupils.

The significant effects of the groups of some select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest, Intelligence and Socio-Economic Status on the Achievement in Biology for the Total sample and for the Subsamples were examined by One-Way Analysis of Variance.

The relationship between Achievement in Biology and each of the select correlates for the total sample and as well as subsamples were examined by using Karl Pearson's Coefficient of Correlation.

Multiple Linear Regression Analysis was carried out to predict the dependent variable from the set of independent variables.

Multiple Regression Analysis and Analysis of Variance were carried out with the help of computer using 'STATISTICA' software. All other computations were done by the investigator herself.

MAJOR FINDINGS OF THE STUDY

Major findings of the study are listed below:

SECTION ONE

ANALYSIS OF VARIANCE

- i) There exists very high significant difference in Achievement in Biology of Total sample, irrespective of the effect of groups of the independent variables., Science Aptitude, Attitude towards Science, Science Interest and Intelligence.

- ii) There is no significant difference exists in Achievement in Biology by the groups of Socio-Economic Status.
- iii) There is high significant difference in Achievement in Biology by the effects of the groups of some select correlates such as Science Aptitude, Attitude towards Science, Science Interest and Intelligence of secondary school pupils in relation to Sex. But there is no significant effect in Achievement in Biology by the groups of Socio-Economic Status.
- iv) Groups of Science Aptitude and Attitude Towards Science are significantly influencing the Achievement in Biology of secondary school pupils in respect of Locale of the school (Rural and Urban). There is no difference in Achievement in Biology by the effect of groups of Socio-Economic Status, but the groups of Interest and Intelligence are significantly influencing on Achievement in Biology of secondary school pupils in Urban schools.
- v) It is found that groups of almost all select correlates, Science Aptitude, Attitude towards Science, Science Interest and Intelligence are significantly influencing in Achievement in Biology of secondary school pupils based on the Type of Management of the Schools (Private and Government). There is no difference in Achievement in Biology by the effect of groups of Socio-Economic Status.

SECTION TWO

FINDINGS RELATED TO CORRELATIONAL ANALYSIS

a) Results Related to Total Sample

- (i) Significant positive relationship exists between almost all select correlates (Science Aptitude, Attitude towards Science, Science Interest and Intelligence) and Achievement in Biology of secondary school pupils.

There is no significant relationship between Socio-Economic Status and Achievement in Biology.

- (ii) The population value of coefficients of correlation falls between 0.01 and 0.75 for the Total sample.
- (iii) The shared variance between variables was found to be ranging from 0.122 to 6.400
- (iv) The predictive efficiency of 'r' of the Total sample was ranging from 0.001 to 0.030.

b) Results Related to Subsamples

For Boys

- i) There exists significant positive relationship between Science Aptitude, Science Interest, Intelligence and Achievement in Biology (at 0.01 level).

- ii) Significant positive relationship, at 0.05 level exists between Attitude towards Science and Achievement in Biology of secondary school pupils.
- iii) There is no significant relationship between Socio-Economic Status and Achievement in Biology.
- iv) The shared variance between variables was found to be ranging from 0.739 to 8.703.
- v) The predictive efficiency of 'r' of Boys was ranging from 0.004 to 0.04.

For Girls

- i) There exists significant positive relationship between Science Aptitude, Attitude towards Science, Science Interest, Intelligence and Achievement in Biology (at 0.01 level).
- ii) There is no significant relationship between Socio-Economic Status and Achievement in Biology.
- iii) The shared variance between variables was found to be ranging from 0.270 to 17.556.
- iv) The predictive efficiency of 'r' of girls was ranging from 0.001 to 0.09.

For Rural School Pupils

- i) There is significant positive relationship exists between Science Aptitude, Attitude towards Science, Science Interest, Intelligence and Achievement in Biology at 0.01 level.

There is no significant relationship between Socio-Economic Status and Achievement in Biology.

- ii) Population value of coefficient of correlation falls between 0.10 and 0.98.
- iii) The shared variance between variables were found to be ranging from 0.883 to 17.892.
- iv) The predictive efficiency of 'r' were ranging from 0.004 to 0.09.

For Urban School Pupils

- i) There exists significant positive relationship between Science Aptitude, Attitude towards Science, Intelligence and Achievement in Biology at 0.01 level. There exists no significant relationship between Science Interest, Socio-Economic Status and Achievement in Biology.
- ii) Population value of coefficient of correlation falls between -0.18 and 0.95.
- iii) The shared variance between variables were ranging from 0.004 and 9.734.
- iv) The predictive efficiency of 'r' were ranging from 0.0001 to 0.05.

For Private School Pupils

- i) There exists significant positive relationship between Science Aptitude, Attitude towards Science, Science Interest, Intelligence and Achievement in Biology at 0.01 level. There exists no

significant relationship between Socio-Economic Status and Achievement in Biology.

- ii) The population value of coefficient of correlation falls between 0.01 and 0.91.
- iii) The shared variance between variables were falls between 0.38 and 19.4.
- iv) The predictive efficiency of 'r' were ranging from 0.002 to 0.04.

For Government School Pupils

- i) There exists significant positive relationship between Science Aptitude, Attitude towards Science, Science Interest, Intelligence and Achievement in Biology at 0.01 level. There exists no significant relationship between Socio-Economic Status and Achievement in Biology at 0.01 level.

There is no significant relationship between Socio-Economic Status and Achievement in Biology

- ii) The population value of coefficient of correlation falls between 0.02 and 0.97.
- iii) The shared variance between variables were falls between 0.40 and 10.95.
- iv) The predictive efficiency of 'r' were ranging from 0.002 to 0.06.

SECTION THREE

FINDINGS RELATED TO MULTIPLE REGRESSION ANALYSIS

The result of the Multiple Regression Analysis showed that the Science Aptitude, Science Interest and Intelligence are the best subset for predicting the Achievement in Biology of secondary school pupils.

The relationship obtained (R) between some select correlates (Science Aptitude, Science Interest and Intelligence) and Achievement in Biology of secondary school pupils was 0.3417.

SUMMARY OF RESULTS

The present study revealed the following:

- (i) High-, Average-, and Low-, groups of almost all select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest and Intelligence except Socio-Economic Status have been significantly influencing the Achievement in Biology of secondary school pupils of Total and relevant subsamples namely Sex, Locale and Type of Management.
- (ii) The correlation analysis revealed that significant positive relationship exists between almost all select correlates (Science Aptitude, Attitude Towards Science, Science Interest and Intelligence) except Socio-Economic Status and the Achievement

in Biology of secondary school pupils.

- (iii) The Multiple Regression Analysis proved that the independent variables viz., Science Aptitude, Science Interest and Intelligence are the best predictors for predicting the Achievement in Biology of secondary school pupils.

CONCLUSION

In the present study, the investigator attempted to find out the significant effect of some select correlates on the Academic Achievement in Biology among secondary school pupils. Another important objective was to identify the most significant correlates for predicting Achievement in Biology among secondary school pupils. These objectives were tested through different statistical techniques like One-Way Analysis of Variance, Coefficient of Correlation and Step-Wise Regression Analysis.

From the analyses, it was found that almost all select correlates except Socio-Economic Status have significant effect and significant correlation with the Achievement in Biology, indicating that almost all of the variables are seen as predictors of Academic Achievement in Biology. But Step-Wise Regression Analysis shows only three out of five variables as significant predictors of Achievement in Biology. These three significant predictors are Science Aptitude, Science Interest and Intelligence respectively.

TENABILITY OF THE HYPOTHESES

1. The first hypothesis stated that “ each select correlates has significant effect on Achievement in Biology”.

One-Way Analysis of Variance revealed that all four select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest and Intelligence have significant effect on Achievement in Biology. But no significant effect exists in Achievement in Biology by the effect of Socio-Economic Status of the pupils. Hence, the first hypothesis is not fully substantiated.

2. The second hypothesis states that “there will be significant difference in the relationship of each select correlates with Achievement in Biology”.

The Coefficient of Correlations (Pearson's r) obtained between Achievement in Biology and each of the select correlates revealed that almost all the select correlates viz., Science Aptitude, Attitude Towards Science, Science Interest and Intelligence have significant positive relation with Achievement in Biology. But there exists no significant relationship between SES and Achievement in Biology. Hence, the second hypothesis for the present study is not fully substantiated.

3. The third hypothesis states that “there will be most significant correlates for predicting Achievement in Biology among secondary school pupils”.

The regression analysis showed that three out of five independent

variables are significant predictors of Achievement in Biology. Thus, the third hypothesis is fully substantiated.

EDUCATIONAL IMPLICATIONS OF THE STUDY

The present study has helped to locate those variables from among the select variables which have significant effect on Achievement in Biology. The variables which have most significant effect on Achievement in Biology are:

(i) Science Aptitude, (ii) Science Interest and (iii) Intelligence.

On the basis of the above findings, the investigator put forward the following suggestions with regard to each significant predictor of Achievement in Biology for the improvement of the present educational practices in relation to Achievement in Biology. The following are some of the guidelines suggested:

1) Among the three identified predictors of Achievement in Biology, Science Aptitude was the most significant predictor. Therefore, development of Science Aptitude becomes the most essential for high Achievement in Biology. Science Aptitude designates certain mental abilities which denote the potentialities for future accomplishment in learning Science with regard to past training and achievement.

Some suggestions for fostering Science Aptitude are as follows:

(i) Since Science Aptitude is an inborn ability, some special programmes may be arranged in schools to boost this talent

among students. The programmes like organizing Science clubs, Science exhibition, work experience classes etc in schools will no doubt ensure the nourishment of Science Aptitude among school children.

- (ii) Classroom environment may be made more comfortable and gratifying for the pupils to express their ideas and also provide ample opportunities and facilities to conduct experiments in the Science laboratory of the school.
- (iii) The teachers may adopt innovative teaching methods such as the new model of teaching in the Science classes like 'Inquiry Training Model' to create enthusiasm towards Science among pupils.
- (iv) The teachers may appreciate the pupils for their small inventions at the right time and may promote conducting science and explorative activities.
- (v) Abundant opportunities for group work, group discussions and group study may be provided without any Sex bias.
- (vi) Moreover, organizing science oriented vacation classes will create enthusiasm among pupils to know more and more about Science- Cochin University has conducted such programmes called "Science in Society" which may not only foster Science Aptitude among school children but also made science public.

Science Interest is the second significant predictor variable of Achievement in Biology. We know that for any achievement, interest is an essential factor. Without interest there is no successful completion of any task. Therefore, in order to develop interest in learning especially in science subjects, certain suggestions are given below:

- (i) As a Biology teacher, the investigator feels that majority of pupils likes the subject may be because of its relation to daily life. So teaching of Biology related to daily life situations will create more interest in learning the subject and make it more life-oriented.
- (ii) Creating Interest in Learning Science should be made from the primary classes itself. For this, parents and teachers have equal role by developing reading habits among children especially books like science fictions, science stories, autobiographies of great scientists etc.
- (iii) Application of problematic situations in Science classes will stimulate students' interest in problem solving. Therefore teachers may provide freedom to the students to think and express their ideas freely. Make flexible every problem solving opportunity. And also, discussions should be made open and untimely judgments and evaluation may be avoided.
- (iv) The teachers may find time for giving problem solving experiences and find a reward system for motivating students.

- (v) The teachers may employ modern technologies like computer, LCDs, Televisions etc for teaching Science which will create interest in learning Science among school pupils.

The third significant predictor variable of Achievement in Biology is Intelligence. Teachers can provide proper environment in the classroom to improve the intelligence of the pupils. Some suggestions are as follows:

- (i) The teacher can use Intelligence Test in the classroom to identify High Intelligent, Average Intelligent and Low Intelligent pupils. This will help him/her to plan the lessons according to the needs and ability of the pupils.
- (ii) The skill of problem solving method is to be acquired by children through earnest participation in learning activities. Therefore students may be provided with task requiring different mental processes and operations involving inductive and deductive reasoning abilities supplemented by illustrative examples.
- (iii) Depending on the scope and nature of the content, teacher may adopt information processing models of teaching on major instructional strategies for developing cognitive abilities.
- (iv) Suitable refresher courses should be given to teachers which will enable them to teach science according to the intelligence of their pupil.

In short, the relation of cognitive and affective variables with Achievement in Biology shows that the usual educational practices should be based on cognitive and affective outcomes. That is, teachers should be aware of the relationship of these variables with achievement while designing instructional experiences and evaluation techniques.

SUGGESTIONS FOR FURTHER RESEARCH

1. At present there is no comprehensive test for measuring the significant predictors and predicting Achievement in Biology of secondary school pupils. So it will be better to conduct a study for the development of a comprehensive test and thereby studying its effectiveness in predicting Achievement in Biology.
2. Replication of the study with additional Independent Variables including cognitive, and Affective Variables which predict Achievement of Physics and Chemistry among secondary school pupils.
3. The same study can be extended to central schools and secondary schools affiliated to C.B.S.E.
4. Another study may be conducted to analyse Biology textbooks at secondary school level for determining the scope of the development of the significant predictors found in the study.

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APPENDICES

APPENDIX - I

University of Calicut

Achievement Test in Biology For IX Std Pupils - PRELIMINARY

Priya K.P.

നിർദ്ദേശങ്ങൾ :

1. ഇത് ഒരു ബയോളജി ടെസ്റ്റാണ്. ഉത്തരങ്ങൾ അടയാളപ്പെടുത്തുന്നതിന് വേറെ കടലാസ് തന്നിട്ടുണ്ട്. ചോദ്യക്കടലാസിൽ ഒന്നും എഴുതുകയോ വരയ്ക്കുകയോ ചെയ്യരുത്.
2. എല്ലാ ചോദ്യങ്ങൾക്കും A, B, C, D എന്നീ അക്ഷരങ്ങൾ ഇട്ട് നാല് ഉത്തരങ്ങൾ വീതം കൊടുത്തിരിക്കുന്നു. അവയിൽ ഒന്നു മാത്രമാണ് ശരി. ഉത്തരക്കടലാസിൽ ഓരോ ചോദ്യ നമ്പരിനുമെതിരെ A, B, C, D എന്ന് രേഖപ്പെടുത്തിയിരിക്കുന്നു. ഓരോ ചോദ്യത്തിനും ശരിയായ ഉത്തരം കണ്ടുപിടിക്കുക. അതിനുശേഷം ഉത്തരക്കടലാസിൽ ചോദ്യനമ്പരിനുനേരെ ശരിയുത്തരത്തെക്കുറിക്കുന്ന അക്ഷരത്തിൽ 'X' അടയാളം ഇടുക.
3. നിങ്ങൾ ആദ്യം അടയാളപ്പെടുത്തിയ 'X' ചിഹ്നം തെറ്റായ സ്ഥാനത്താണെങ്കിൽ സ്ഥാനം മാറ്റുന്നതിന് അതിനുചുറ്റും ചെറിയ സമചതുരം (□) വരയ്ക്കുകയും ശരിയായ സ്ഥാനത്ത് ചിഹ്നം ഇടുകയും ചെയ്യുക.
4. എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം അടയാളപ്പെടുത്താൻ ശ്രദ്ധിക്കുക.
5. പരിശോധകൻ "Start" എന്നു പറയുമ്പോൾ ഉത്തരം അടയാളപ്പെടുത്താൻ ആരംഭിക്കുക.

മാതൃക:

ഒരാവാസവ്യവസ്ഥയിലെ ഊർജ്ജത്തിന്റെ പ്രാഥമിക ഉറവിടമേത്. ?

- A. വായു, B. സൂര്യപ്രകാശം, C. ജലം, D മണ്ണ്.

Q. No. 1 A X C D

1. സുസ്ഥിര റ്റികസനത്തിന് ഏറ്റവും അനുയോജ്യമായ അവസ്ഥ ഏത്?
 A) ജനസംഖ്യാ വർദ്ധനവും കൃഷിയിലൂടെയുള്ള ഉപജീവനവും
 B) ജനസംഖ്യാ വർദ്ധനവും വ്യവസായവൽക്കരണവും
 C) ജനസംഖ്യാ നിയന്ത്രണവും കൃഷിയിലൂടെയുള്ള ഉപജീവനവും
 D) ജനസംഖ്യാ നിയന്ത്രണവും ഉപജീവനത്തിനുവേണ്ടി പ്രകൃതിയുടെ ചൂഷണവും
2. ദൃശ്യപ്രകാശഘടകങ്ങളിൽ പ്രകാശസംശ്ലേഷണം ഏറ്റവും കുറഞ്ഞ തോതിൽ നടത്തുന്ന വർണ്ണമേൽ?
 A) മഞ്ഞ
 B) പച്ച
 C) നീല
 D) ചുവപ്പ്
3. സെല്ലുലോസിനെ സംബന്ധിച്ച് തെറ്റായ പ്രസ്താവനയേത്?
 A) സെല്ലുലോസ് ദഹനത്തിന് വിധേയമാകുന്നില്ല
 B) സെല്ലുലോസ് ദഹനത്തെ സഹായിക്കുന്നു
 C) അയവെട്ടുന്ന മൃഗങ്ങളിൽ സെല്ലുലോസ് ദഹിക്കുന്നു
 D) സെല്ലുലോസ് ദഹനക്കേടുണ്ടാക്കുന്നു.
4. ശ്വസനത്തിന്റെ അടിസ്ഥാന ധർമ്മമെന്ത്?
 A) ഭക്ഷണപദാർത്ഥത്തിലെ ഊർജ്ജം സ്വതന്ത്രമാക്കുന്നു
 B) CO₂ നെ പുറത്തുവിടുന്നു
 C) O₂ നെ സ്വീകരിക്കുന്നു
 D) രക്തം ശുദ്ധീകരിക്കുന്നു
5. പ്രകാശലഭ്യതയുടെ ഏറ്റക്കുറച്ചിൽ കാര്യക്ഷമമായി പ്രയോജനപ്പെടുത്തുന്ന കൃഷിരീതി ഏത്?
 A) കുട്ടുകൃഷി
 B) മിശ്രകൃഷി
 C) വിളപര്യയം
 D) മേൽപറഞ്ഞവയെല്ലാം
6. അന്നപഥത്തിന്റെ തരംഗരൂപത്തിലുള്ള ചലനം ഏത്?
 A) പരാലിസിസ്
 B) ഹെപ്പാറ്റിറ്റിസ്
 C) ഡയാലിസിസ്
 D) പെരിസ്റ്റാൾസിസ്
7. ശ്വസനം ഏതു തരത്തിലുള്ള പ്രവർത്തനമാണ്. ?
 A) അപചയം
 B) ഉപചയം
 C) സംശ്ലേഷണം
 D) ആഗിരണം
8. പ്രകാശസംശ്ലേഷണം വഴി നിർമ്മിക്കപ്പെടുന്ന ഗ്ലൂക്കോസിനെ എന്താക്കി മാറ്റിയാണ് സസ്യങ്ങൾ സംഭരിക്കുന്നത്?
 A) മാൾട്ടോസ്
 B) സുക്രോസ്
 C) അന്നജം
 D) ഫ്രക്ടോസ്

- 9. പൂക്കളുടെ കൃഷിയുമായി ബന്ധപ്പെട്ട ശാസ്ത്രശാഖയെ എന്തു വിളിക്കുന്നു?
 A) എപ്പി കൾച്ചർ
 B) ഹോർട്ടി കൾച്ചർ
 C) സെറി കൾച്ചർ
 D) ഫ്ളോറി കൾച്ചർ
- 10. വൈറ്റൽ ക്ലാസിറ്റി എന്നാൽ എന്ത്?
 A) ശക്തമായ ഉച്ഛ്വാസത്തിനുശേഷം ശക്തമായി നിശ്വസിക്കുമ്പോഴുള്ള വായുവിന്റെ അളവ്
 B) സാധാരണ ഉച്ഛ്വാസത്തിനുശേഷം സാധാരണ നിശ്വസിക്കുമ്പോഴുള്ള വായുവിന്റെ അളവ്
 C) നിശ്വാസത്തിനുശേഷം ശ്വാസകോശത്തിൽ അവശേഷിക്കുന്ന വായുവിന്റെ അളവ്
 D) ഉച്ഛ്വാസത്തിലൂടെ ഉൾക്കൊള്ളുന്ന വായുവിന്റെ അളവ്
- 11. ഗ്ലൂക്കോസിന്റെ ഫോർമുല ഏത്?
 A) $C_6H_6O_6$
 B) $C_{12}H_6O_6$
 C) $C_6H_{12}O_6$
 D) CH_2O
- 12. ജലത്തിനോട് പ്രതിപത്തി കാണിക്കുന്ന വസ്തുക്കളുടെ സഹായത്താൽ ജലം വലിച്ചെടുക്കുന്ന പ്രക്രിയയെ എന്തു പറയുന്നു?
 A) സ്വേദനം
 B) വ്യാപനം
 C) ആവാഹനം
 D) ആപാനം
- 13. ഒരു പ്രദേശത്തെ മുഖ്യവിളയുടെ ഉൽപ്പാദനക്ഷമത വൈറസ് രോഗം മൂലം കുറയുന്നുണ്ടെന്ന് പറഞ്ഞതിലൂടെ കണ്ടെത്തി. അവിടെ സ്വീകരിക്കാവുന്ന ഫലപ്രദമായ രോഗ നിയന്ത്രണ മാർഗ്ഗം?
 A) വീര്യം കുടിയ രാസകീടനാശിനികൾ കുറഞ്ഞ അളവിൽ പ്രയോഗിക്കുക.
 B) വീര്യം കുറഞ്ഞ രാസകീടനാശിനികൾ കുടിയ അളവിൽ പ്രയോഗിക്കുക.
 C) ജൈവ കീടനാശിനികൾ പ്രയോഗിക്കുക.
 D) രോഗബാധിതമായ സസ്യങ്ങൾ നശിപ്പിച്ച് രോഗ വ്യാപനം തടയുക
- 14. താഴെ പറയുന്നവയിൽ പ്രകാശസംശ്ലേഷണത്തെ സംബന്ധിച്ച് ശരിയായതേത്?
 A) CO_2 വായി ജലത്തെ ചേർത്ത് കാർബോഹൈഡ്രേറ്റ് ആക്കി മാറ്റുന്നു
 B) CO_2 വിഘടിച്ച് O_2 നെ പുറത്തു വിടുന്നു
 C) ജലം വിഘടിച്ച് O_2 നെ പുറത്തു വിടുന്നു
 D) ജലത്തെ കാർബണുമായി ചേർത്ത് കാർബോഹൈഡ്രേറ്റ് ഉണ്ടാക്കുന്നു
- 15. താഴെ പറയുന്നവയിൽ ഏറ്റവും ശരിയായ പ്രസ്താവനയേത്?
 A) സസ്യങ്ങളില്ലെങ്കിൽ പരപോഷികളില്ല
 B) ജന്തുക്കളില്ലെങ്കിൽ സസ്യങ്ങളില്ല
 C) മനുഷ്യനില്ലെങ്കിൽ മറ്റു ജീവജാലങ്ങളില്ല
 D) മനുഷ്യന് സസ്യങ്ങളില്ലാതെയും ജീവിക്കാം
- 16. പ്രകാശസംശ്ലേഷണ പരീക്ഷണത്തിന് മുമ്പായി ചെടിയെ രണ്ടുദിവസം ഇരുട്ടത്ത് വെയ്ക്കുന്നത് എന്തിന്?
 A) ഇലയെ ഉഷ്മരഹിതമാക്കാൻ
 B) ഇലയ്ക്ക് അന്നജരഹിതമാക്കാൻ
 C) ഇലയെ ഹരിതരഹിതമാക്കാൻ
 D) ഇലയെ മൃദുലമാക്കാൻ

- 17. ആമാശയത്തിൽ വെച്ച് കൊഴുപ്പിന്റെ ദഹനം നടക്കാത്തതിനുകാരണം, ആമാശയത്തിൽ
 - A) അമിലേസ് ഇല്ലാത്തതാണ്
 - B) പെപ്സിൻ ഇല്ലാത്തതാണ്
 - C) ട്രിപ്സിൻ ഇല്ലാത്തതാണ്
 - D) ലിപേസ് ഇല്ലാത്തതാണ്
- 18. അമീബയ്ക്ക് പ്രത്യേകമായി ഒരു ദഹനേന്ദ്രിയവ്യൂഹം ഇല്ലാത്തതിനുകാരണം, അമീബ ഒരു
 - A) പരപോഷി ആയതുകൊണ്ട്.
 - B) ജലജീവി ആയതുകൊണ്ട്.
 - C) ഏകകോശജീവി ആയതുകൊണ്ട്.
 - D) സ്വപോഷി ആയതുകൊണ്ട്.
- 19. ക്ഷേണം കഴിക്കുമ്പോൾ സംസാരിച്ചാൽ ശ്വാസതടസ്സമുണ്ടാവാൻ സാധ്യതയുണ്ട്, കാരണം.?
 - A) സംസാരിക്കുമ്പോൾ ക്ലോമപിധാനം തുറക്കുന്നു.
 - B) സംസാരിക്കുമ്പോൾ ഉണ്ണാക്ക് അടയുന്നു
 - C) ക്ഷേണം കഴിക്കുമ്പോൾ ശ്വാസനാളം അടയുന്നു
 - D) ക്ഷേണം കഴിക്കുമ്പോൾ ഉണ്ണാക്ക് തുറക്കുന്നു
- 20. കന്നുകാലികളിലെ കുളമ്പുരോഗം നിയന്ത്രിക്കുന്നതിനുള്ള ഏറ്റവും പ്രായോഗിക രീതി ഏത്.?
 - A) രോഗം പകരുന്നത് തടയാനുള്ള മാർഗ്ഗങ്ങൾ സ്വീകരിക്കുക
 - B) രോഗം പരത്തുന്ന കീടങ്ങളെ നിയന്ത്രിക്കുക
 - C) ആന്റിബയോട്ടിക്സുകൾ ഉപയോഗിക്കുക
 - D) രോഗകാരികളെ നശിപ്പിക്കുക
- 21. തവളകളുടെ ശ്വസന വ്യവസ്ഥ സംബന്ധിച്ച് തെറ്റായതേത്.?
 - A) ചർമ്മത്തിലൂടെ ശ്വസിക്കുന്നു.
 - B) ശ്വാസനാളിലൂടെ ശ്വസിക്കുന്നു.
 - C) ശ്വാസകോശത്തിലൂടെ ശ്വസിക്കുന്നു.
 - D) വായിലൂടെ ശ്വസിക്കുന്നു.
- 22. താഴെ പറയുന്നതിൽ ശരിയായതേത്.?
 - A) ഉമിനീർ അന്നജത്തിന്റെ ദഹനത്തെ സഹായിക്കുന്നു
 - B) ഉമിനീർ പ്രോട്ടീന്റെ ദഹനത്തെ സഹായിക്കുന്നു
 - C) ഉമിനീർ കൊഴുപ്പിന്റെ ദഹനത്തെ സഹായിക്കുന്നു
 - D) ഉമിനീർ ഗ്ലൂക്കോസിന്റെ ദഹനത്തെ സഹായിക്കുന്നു
- 23. മാംസ്യത്തിന്റെ അടിസ്ഥാന ഘടകം ഏത്.?
 - A) ഗ്ലൂക്കോസ്
 - B) കൊഴുപ്പ്
 - C) അമിനോ ആസിഡ്
 - D) പേശി
- 24. വായു അറ ശ്വാസകോശത്തിന്റെ അടിസ്ഥാന ഘടകം എന്നു പറയാൻ കാരണമെന്ത്.?
 - A) രക്തലോമികകൾ ആവരണം ചെയ്തതുകൊണ്ട്
 - B) സൂക്ഷ്മദർശിനി കൊണ്ട് മാത്രം കാണാൻ കഴിയുന്നതുകൊണ്ട്
 - C) ശ്വാസകോശത്തിലെ വായു ശേഖരിക്കുന്ന സ്ഥാനമായതുകൊണ്ട്
 - D) വാതക വിനിമയം നടക്കുന്ന സ്ഥലമായതുകൊണ്ട്
- 25. വില്ലസ് കാണുന്നതെവിടെ.?
 - A) വൻകുടലിൽ
 - B) ചെറുകുടലിൽ
 - C) അന്നനാളത്തിൽ
 - D) ആമാശയത്തിൽ

- 26. ശരീരത്തിൽ ഊർജ്ജാൽപ്പാദനത്തിനായിട്ട് ഉപയോഗിക്കുന്ന പോഷകഘടകം ഏത്?
 - A) ധാന്യകം
 - B) മാംസ്യം
 - C) അമിനോ ആസിഡ്
 - D) വിറ്റാമിൻ
- 27. ക്ഷയം എന്ന രോഗം ഏതവയവത്തെ ബാധിക്കുന്നു?
 - A) പേശി
 - B) അസ്ഥി
 - C) കരൾ
 - D) ശ്വാസകോശം
- 28. അമീബ എന്നുപയോഗിച്ചാണ് ആഹാരം സ്വീകരിക്കുന്നത് ?
 - A) മർമ്മം
 - B) കപടപാദം
 - C) സങ്കോചഫേനം
 - D) വായ
- 29. മൂലലോമത്തിലെ കോശസ്തരം ഏതുതരത്തിൽപ്പെട്ടതാണ് ?
 - A) അതാര്യം
 - B) സുതാര്യം
 - C) അർദ്ധതാര്യം
 - D) സർവ്വതാര്യം
- 30. ശുന്യാകാശയാത്രികർ ശ്വാസനോപകരണങ്ങളിൽ ഉപയോഗിക്കുന്ന ഹരിതസസ്യമേത് ?
 - A) ക്ലോറെല്ല
 - B) ക്ലോറോപ്ലാസ്റ്റ്
 - C) ക്ലോറോഫിൻ
 - D) ക്ലോറോഫോം
- 31. തേനിലിട്ടാൽ മൂന്തിരിങ്ങ ചുളുങ്ങിപ്പോകുന്നതിന് ഏറ്റവും അനുയോജ്യമായ വിശദീകരണമെന്ത് ?
 - A) എക്സോസ്മോസിസ്
 - B) എന്റോസ്മോസിസ്
 - C) പ്ലാസ്മോലൈസിസ്
 - D) ഗ്ലൈക്കോലൈസിസ്
- 32. എട്ടുകാലിയിൽ കാണപ്പെടുന്ന ശ്വാസനാവയവം ഏത് ?
 - A) ശകുലങ്ങൾ
 - B) ശ്വാസനാളികൾ
 - C) ബുക്ക്ലംഗ്സ്
 - D) ശ്വാസനാളികൾ
- 33. മുക്ക് കുത്തുമ്പോൾ കൂടുതലായി രക്തം പൊടിയുന്നില്ല. കാരണം ?
 - A) ശരീരത്തിന്റെ അഗ്രഭാഗങ്ങളിൽ രക്തക്കുഴലുകൾ കുറവായതുകൊണ്ട്
 - B) തരുണാസ്ഥിയുള്ള ഭാഗങ്ങളിൽ രക്തം പെട്ടെന്ന് കട്ട പിടിക്കുന്നു
 - C) തരുണാസ്ഥികളിൽ രക്തക്കുഴലുകൾ താരതമ്യേന കുറവാണ്.
 - D) തരുണാസ്ഥികളിൽ രക്തക്കുഴലുകളില്ല
- 34. അവായുശ്വാസനം നടത്തുന്ന ജീവികൾ
 - A) ഉഭയജീവികൾ
 - B) യീസ്റ്റുകൾ
 - C) സസ്യങ്ങൾ
 - D) വൈറസുകൾ

- 35 ജനിതകശാസ്ത്രത്തിന്റെ പിതാവാണ് ?
 - A) ചാൾസ് ഡാർവിൻ
 - B) ജോൺ വാട്സൺ
 - C) ലിനീയെസ്
 - D) ഗ്രിഗർ മെന്റൽ
- 36 ശ്വാസനം സംബന്ധിച്ച് ശരിയായ പ്രസ്താവനയേത് ?
 - A) ഓക്സിജന്റെ സാന്നിധ്യത്തിൽ മാത്രം നടക്കുന്നു.
 - B) കാർബൺ ഡൈ ഓക്സൈഡിന്റെ അഭാവത്തിൽ മാത്രം നടക്കുന്നു
 - C) സസ്യങ്ങളിൽ നടക്കുന്നില്ല
 - D) ഓക്സിജന്റെ അഭാവത്തിലും നടക്കുന്നു
- 37 ലൂക്കീമിയ മാറ്റാൻ ഏറ്റവും അനുയോജ്യമായ ചികിത്സയേത് ?
 - A) രക്തനിവേശനം
 - B) മജ്ജ മാറ്റിവെയ്ക്കൽ
 - C) ഹൃദയം മാറ്റിവെയ്ക്കൽ
 - D) ഡയാലിസിസ്
- 38 മനുഷ്യനിലെ ചുരുണ്ട മുടി പ്രകടഗുണവും നീണ്ട മുടി ഗുപ്തഗുണവുമാണ് എന്നിരിക്കട്ടെ എന്നാൽ നീളൻമുടിയോടുകൂടിയ പിതാവിനും ചുരുണ്ട മുടിയോടുകൂടിയ മാതാവിനും ജനിച്ച നാലു മക്കളിൽ മുടിയുടെ സ്വഭാവം എന്തായിരിക്കും ?
 - A) നാലു മക്കൾക്കും നീണ്ട മുടി
 - B) നാലു മക്കൾക്കും ചുരുണ്ട മുടി
 - C) രണ്ടു മക്കൾക്ക് ചുരുണ്ട മുടി, രണ്ടു മക്കൾക്ക് നീണ്ട മുടി
 - D) മൂന്നു മക്കൾക്ക് ചുരുണ്ട മുടി, ഒരാൾക്ക് നീണ്ട മുടി
- 39 അസ്ഥികളെക്കുറിച്ചുള്ള പറഞ്ഞവ എന്തുപേരിലറിയപ്പെടുന്നു ?
 - A) ഓഫിയോളജി
 - B) ഓങ്കോളജി
 - C) ഓഫ്താൽമോളജി
 - D) ഓസ്റ്റിയോളജി
- 40 ഒരു ജീവി വർഗ്ഗത്തെ എക്കാലവും നിലനിർത്തുന്നതിനുവേണ്ടി സ്വീകരിക്കാവുന്ന ഏറ്റവും ഉചിതമായ മാർഗ്ഗം
 - A) വന നശീകരണം തടയുക
 - B) വേട്ടയാടൽ നിരോധിക്കുക
 - C) ജീൻപുൾ സംരക്ഷിക്കുക
 - D) ദേശീയ പാർക്കുകൾ സ്ഥാപിക്കുക.
- 41 താഴെ പറയുന്നവയിൽ തെറ്റായ പ്രസ്താവന ഏത് ?
 - A) DNA ഇരട്ട തന്തുക്കളാൽ നിർമ്മിതമാണ്
 - B) DNA സ്റ്റ് ചുറ്റുഗോവണിയുടെ ആകൃതിയാണ്
 - C) DNA യിൽ പ്യൂരിൻ, പിരമിഡയൻ ബേസുകൾ ഉണ്ട്.
 - D) DNA യിൽ റൈബോസ് പഞ്ചസാര അടങ്ങിയിട്ടുണ്ട്.
- 42 ഉറങ്ങിക്കിടക്കുമ്പോഴും അന്നപഥത്തിൽ ഭക്ഷണം നീങ്ങുന്നു, കാരണം അന്നപഥം നിർമ്മിച്ചിരിക്കുന്നത്
 - A) ഐശ്വരിക പേശികളാലാണ്.
 - B) അനൈശ്വരിക പേശികളാലാണ്.
 - C) രേഖാങ്കിത പേശികളാലാണ്.
 - D) അസ്ഥി പേശികളാലാണ്.

- 43 പട്ടിയുടെ ശാസ്ത്രനാമം കാനിസ് ഫെമിലിയാരിസ് എന്നും ചെന്നായയുടേത് കാനിസ് ലുപസ് എന്നുമാണ്. ഇതിൽ നിന്ന് വെളിവാകുന്ന വസ്തുത
- A) ഇവ രണ്ടും ഒരു സ്പീഷീസിൽ പെടുന്നു
 - B) ഇവരണ്ടും ഒരു ഫാമിലിയിൽ പെടുന്നു
 - C) ഇവ രണ്ടും ഒരു ജീനസിൽ പെടുന്നു
 - D) ഇവ രണ്ടും ഒരു ഓർഡറിൽ പെടുന്നു
- 44 താഴെ പറയുന്ന പ്രസ്താവനകളിൽ ശരിയായതേത് ?
- A) മാതാവിന്റെ രക്തത്തിൽ നിന്ന് കുഞ്ഞിന്റെ രക്തം രൂപപ്പെടുന്നു.
 - B) കുഞ്ഞിന് ജനനം വരെ സ്വന്തമായി രക്തമില്ല
 - C) മാതാവിന്റേയും കുഞ്ഞിന്റേയും രക്തം കൂടിക്കലരുന്നു
 - D) മാതാവിന്റേയും കുഞ്ഞിന്റേയും രക്തം കൂടിക്കലരുന്നില്ല
- 45 പേശീവ്യവസ്ഥയുടെ ധർമ്മമല്ലാത്തതേത് ?
- A) ശരീരത്തിന് സൗന്ദര്യം നൽകുക
 - B) ചലനങ്ങൾക്ക് സഹായിക്കുക
 - C) താപോൽപ്പാദനം നടത്തുക
 - D) ആന്തരികായവങ്ങളെ സംരക്ഷിക്കുക
- 46 തലമുറകൾ തോറും ക്രോമസോമുകൾ ഇരട്ടിക്കാത്തതിന് കാരണം
- A) ലിംഗകോശങ്ങളിൽ ഊനഭംഗം നടക്കുന്നതുകൊണ്ട്
 - B) ലിംഗകോശങ്ങളിൽ ക്രമഭംഗം നടക്കുന്നതുകൊണ്ട്
 - C) ശരീരകോശങ്ങളിൽ ഊനഭംഗം നടക്കുന്നതുകൊണ്ട്
 - D) ശരീരകോശങ്ങളിൽ ക്രമഭംഗം നടക്കുന്നതുകൊണ്ട്
- 47 അനിഷേകജനനം പ്രകടിപ്പിക്കുന്ന ജീവിയിൽ ഉദാഹരണമാണ്
- A) പ്ലനേറിയ
 - B) അമീബ
 - C) ഹൈഡ്ര
 - D) തേനീച്ച
- 48 പുച്ചയുടെ ശാസ്ത്ര നാമം എന്ത് ?
- A) ഫെലിസ് ലിയോ
 - B) ഫെലിസ് ഡൊമസ്റ്റിക്ക
 - C) പന്തേറ ഗ്രൈസ്
 - D) പാവോ ക്രിസ്റ്റാറ്റസ്
- 49 താഴെ പറയുന്നവയിൽ തെറ്റായ പ്രസ്താവന ഏത് ?
- A) കുതിരയുടെ കുളമ്പ് ബാഹ്യാസ്ഥിയിൽ ഉദാഹരണമാണ്
 - B) ബാഹ്യാസ്ഥികൾ ശരീര സംരക്ഷണം നൽകുന്നു.
 - C) മനുഷ്യന് ബാഹ്യാസ്ഥികളില്ല
 - D) പക്ഷിതുവലുകൾ ബാഹ്യാസ്ഥികളാണ്
- 50 മനുഷ്യനിലെ ലിംഗഭേദം ഒരു ജോഡി ക്രോമസോമുകളാൽ നിർണ്ണയിക്കപ്പെടുന്നു. XX ക്രോമസോം ജോഡി വന്നാൽ സ്ത്രീകളും XY ക്രോമസോം ജോഡി വന്നാൽ പുരുഷന്മാരും, എങ്കിൽ കുഞ്ഞിന്റെ ലിംഗ നിർണ്ണയത്തിന് ആധാരം.
- A) പുരുഷ ബീജമാണ്
 - B) സ്ത്രീബീജമാണ്
 - C) പുരുഷന്റേയും സ്ത്രീയുടേയും ബീജമാണ്
 - D) രണ്ടുമല്ല.

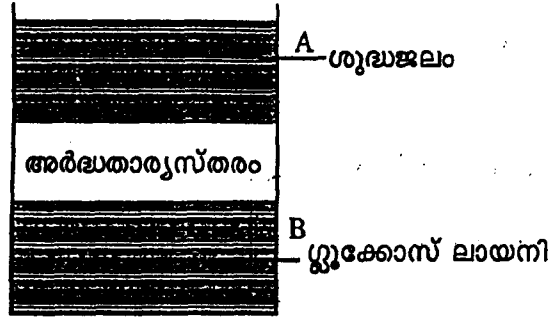
- 51. കാൽമുട്ട് ഏത് തരം അസ്ഥിസന്ധിയാണ്.?
 - A) ഗോളരസന്ധി
 - B) വിജാഗിരി സന്ധി
 - C) തെന്നി നീങ്ങുന്ന സന്ധി
 - D) കീല സന്ധി
- 52. ദഹനരസമായ പിത്തരസം ഉൽപ്പാദിപ്പിക്കുന്ന ദഹനഗ്രന്ഥിയേത്.?
 - A) പാൻക്രിയാസ്
 - B) ആമാശയ ഗ്രന്ഥി
 - C) കരൾ
 - D) ഉമിനീർ ഗ്രന്ഥി
- 53. മൊണിറ്ററിൽ ബാക്ടീരിയയെ ഉൾപ്പെടുത്തിയിരിക്കുന്നതിനു കാരണം.?
 - A) അവ ഏകകോശജീവികളാണ്
 - B) അവയ്ക്ക് നിശ്ചിത ആകൃതിയില്ല
 - C) അവയ്ക്ക് പൂർണ്ണമായ കോശമർമ്മം ഇല്ല
 - D) മേൽ പറഞ്ഞ സവിശേഷതകളെല്ലാം ഉണ്ട്.
- 54. ഉദയലിംഗജീവികൾ എന്നാൽ എന്ത്.?
 - A) ആൺ പെൺ ജീവികൾ വെവ്വേറെയുള്ളത്
 - B) ആൺ പെൺ ബീജങ്ങൾ ഉൽപ്പാദിപ്പിക്കാത്ത ജീവികൾ
 - C) ചുറ്റുപാടിനനുസരിച്ച് ലിംഗഭേദം വരുത്താൻ കഴിവുള്ള ജീവികൾ
 - D) ആൺ പെൺ ബീജങ്ങൾ ഒരേ ജീവികളിൽ തന്നെ കാണപ്പെടുന്നവ
- 55. RNA യുടെ പ്രധാന ധർമ്മമെന്ത്.?
 - A) വംശപാരമ്പര്യം നിലനിർത്തുക
 - B) മാംസ്യ സംശ്ലേഷണം
 - C) കോശവിഭജനം
 - D) DNA നിർമ്മാണം
- 56. മനുഷ്യനിലെ ക്രോമസോം നമ്പർ എത്ര.?
 - A) 23 ജോഡി
 - B) 46 ജോഡി
 - C) 21 ജോഡി
 - D) 43 ജോഡി
- 57. സമജാത ഇരട്ടകൾ പരസ്പരം തിരിച്ചറിയാൻ കഴിയാത്തവിധം ഉള്ളവരാകാൻ കാരണം അവർ
 - A) ഒരു അണ്ഡത്തിൽ നിന്നു രൂപം കൊണ്ടവരാണ്.
 - B) ഒരു പുംബീജത്തിൽ നിന്നു രൂപം കൊണ്ടവരാണ്.
 - C) ഒരു സിക്താണ്ഡത്തിന്റെ വിഭജനത്തിലൂടെ രൂപം കൊണ്ടവരാണ്.
 - D) മേൽപറഞ്ഞ കാരണങ്ങളെല്ലാം ഒരു പോലെ ബാധകമാണ്.
- 58. കൃഷി മുഖ്യതൊഴിലാക്കിയ നാല് കർഷകർ ചെയ്യുന്ന വിവിധ കൃഷികൾ ചുവടെ ചേർക്കുന്നു ഇവയെ പരസ്പരം ബന്ധിപ്പിച്ചാൽ ഏറെ ആദായകരമാകാൻ സാധ്യതയുള്ള കൃഷി ഏത് .?
 - A) നെൽകൃഷി, സെറികൾച്ചർ, ഏപ്പികൾച്ചർ
 - B) കന്നുകാലി വളർത്തൽ, നെൽകൃഷി, ഏപ്പികൾച്ചർ
 - C) കോഴി വളർത്തൽ, ഏപ്പികൾച്ചർ, കന്നുകാലി വളർത്തൽ
 - D) കുരുമുളക് കൃഷി, കന്നുകാലി വളർത്തൽ, ഏപ്പികൾച്ചർ,
- 59. ഗുവനീനം, സൈറസിനം, കൂടാതെ DNA യിൽ കാണുന്ന നൈട്രജൻ ബേസുകൾ എവ.?
 - A) ആഡനീൻ, യുറാസിൽ
 - B) ആഡനീൻ, തൈമീൻ
 - C) യുറാസിൽ, തൈമീൻ
 - D) ഇവയൊന്നുമല്ല

60. സഹജാതശിശുക്കൾ രൂപപ്പെടുന്നത്?
 A) സിക്താണു വിഭജിച്ച് വേർപ്പെടുമ്പോഴാണ്
 B) അനിഷേക ജനനം നടക്കുമ്പോഴാണ്
 C) അണ്ഡവുമായി ഒന്നിലധികം പുംബീജങ്ങൾ സംയോജിക്കുമ്പോഴാണ്
 D) ഒരേ സമയം ഒന്നിലധികം അണ്ഡങ്ങളിൽ ബീജസംയോജനം നടക്കുമ്പോഴാണ്
61. മനുഷ്യന്റെ നിലനിൽപ്പിനു തന്നെ ഭീഷണിയാകുന്ന കാലിരോഗം?
 A) അകിടുവീക്കം
 B) കൂളമ്പുരോഗം
 C) ആന്താക്സ്
 D) മേൽപറഞ്ഞ മൂന്നു രോഗങ്ങളും
62. താഴെ പറയുന്നവയിൽ തെറ്റായ പ്രസ്താവന ഏത്?
 A) ഒരു ജീവി വർഗ്ഗത്തിന്റെ ജീനുകളുടെ ആകെത്തുകയാണ് ജീൻപുൾ
 B) തലമുറകൾ കഴിയുന്നതോടും ജീൻപുളിൽ മാറ്റമുണ്ടാകും
 C) ഒരു ജീവി വർഗ്ഗത്തിന്റെ ജീൻപുൾ മറ്റൊന്നിന്റേതുമായി കലരുന്നില്ല
 D) ഒരു ജീവി വർഗ്ഗത്തിന്റെ ജീൻപുൾ മറ്റൊന്നിന്റേതുമായി കലരും
63. വൻതോതിൽ പച്ചക്കറികൃഷിചെയ്യുന്ന ഒരുകർഷകന് കായ്തിന്നു നശിപ്പിക്കുന്ന ഈച്ചയെ നശിപ്പിക്കുവാൻ സ്വീകരിക്കാവുന്ന പ്രായോഗികവും അപകടരഹിതവുമായ മാർഗ്ഗം?
 A) രാസകീടനാശിനി തളിക്കുന്നു
 B) കീടനാശിനിയും ശർക്കരയും ചേർന്ന മിശ്രിതം കെണിയായി ഉപയോഗിക്കുന്നു
 C) കടലാസ് കവറുകൾ കൊണ്ട് കായ് മൂടുന്നു
 D) രാസകീടനാശിനിയും ജൈവകീടനാശിനിയും ചേർന്ന മിശ്രിതം തളിക്കുന്നു
64. ഇന്ത്യയിൽ മത്സ്യകൃഷി വികസിക്കാൻ സഹായിച്ച വിപ്ലവം?
 A) ധവള വിപ്ലവം
 B) നീല വിപ്ലവം
 C) ഹരിത വിപ്ലവം
 D) ഇവയൊന്നുമല്ല
65. പ്രകാശസംശ്ലേഷണ പ്രക്രിയയിലെ ഇരുണ്ട ഘട്ടത്തിൽ കാർബൺഡൈഓക്സൈഡിന് എന്ത് സംഭവിക്കുന്നു?
 A) ഓക്സീകരണം
 B) നിരോക്സീകരണം
 C) ബാഷ്പീകരണം
 D) സ്വാംശീകരണം
66. താഴെ പറയുന്ന രോഗങ്ങളിൽ വായുവിലൂടെ പകരുന്ന രോഗമേത്?
 A) ബ്ലൈറ്റ് രോഗം
 B) ഇലപ്പുള്ളി രോഗം
 C) വാട്ടം
 D) ദ്രുതവാട്ടം
67. ആഹാരം കടിച്ചു മുറിക്കാൻ സഹായിക്കുന്ന പല്ല് ഏത്?
 A) കോമ്പല്ല്
 B) ഉളിപ്പല്ല്
 C) ചർവണകം
 D) അഗ്രചർവണകം
68. ഇലകളിൽ ജലം എത്തിക്കാൻ സഹായിക്കുന്ന കോശം ഏത്?
 A) സൈലം കൂഴലുകൾ
 B) പാലീസേഡ് കലകൾ
 C) ആസ്യരന്ധ്രം
 D) ഇവയൊന്നുമല്ല

- 69. പല്ലി പഠിക്കുമ്പോൾ വേദന ഉണ്ടാകുന്നു കാരണം ?
 - A) ഇനാമലിന് കടുപ്പമുള്ളതുകൊണ്ട്
 - B) പല്ലിൽ നിമ്നോന്നതങ്ങൾ ഉള്ളതുകൊണ്ട്
 - C) പല്ലിനകത്തെ പൾപ്പിൽ രക്തക്കുഴലുകളും നാഡികളും ഉള്ളതുകൊണ്ട്
 - D) പല്ലിനെ സിമന്റ് കൊണ്ട് ഉറപ്പിച്ചതുകൊണ്ട്
- 70. പ്രകാശസംശ്ലേഷണ പ്രക്രിയയിൽ ഹരിതകണത്തിലെ ഗ്രാനയിൽ വെച്ച് നടക്കുന്ന രാസപ്രവർത്തനത്തെ എന്ത് പറയുന്നു.?
 - A) ഇരുണ്ടഘട്ടം
 - B) പ്രകാശഘട്ടം
 - C) ടർഗർ പ്രഷർ
 - D) ആപാനം
- 71. താഴെ പറയുന്ന രോഗങ്ങളിൽ വൈറസ് രോഗകാരിയായിട്ടുള്ള രോഗമേത്.?
 - A) അകിടുവീക്കം
 - B) ആന്താക്സ്
 - C) പുളളുറം കോഴിരോഗം
 - D) കുളമ്പുരോഗം
- 72. മാംസ്യത്തിന്റെ അഭാവം മൂലം ഉണ്ടാകുന്ന രോഗം ഏത്.?
 - A) മരാണ്മസ്
 - B) മാലക്കണ്ണി
 - C) ക്വാഷിയോർക്കർ
 - D) അനീമിയ
- 73. യു. വി. രശ്മികളുടെ സഹായത്താൽ നിർമ്മിക്കുന്ന വിറ്റാമിൻ ഏത്.?
 - A) വിറ്റാമിൻ A
 - B) വിറ്റാമിൻ D
 - C) വിറ്റാമിൻ K
 - D) വിറ്റാമിൻ E
- 74. വായിൽ ഉമിനീരിന്റെ സഹായത്തോടെ അന്നജത്തെ ഏന്താക്കി മാറ്റുന്നു.?
 - A) മാൾട്ടോസ്
 - B) ലാക്ടോസ്
 - C) ഗ്ലൂക്കോസ്
 - D) ഫ്രക്ടോസ്
- 75. താഴെ പറയുന്നവയിൽ വിറ്റാമിൻ K യുടെ അപര്യാപ്തതമൂലം ഉണ്ടാകുന്ന രോഗം ഏത്.?
 - A) വന്ധ്യത
 - B) നിശാസ്യത
 - C) രക്തം കട്ടപിടിക്കുന്നതിനു തടസ്സം
 - D) പേശിവേദന
- 76. വാൽമാക്രിയുടെ ശ്വസനാവയവമാണ്.?
 - A) ശകുലങ്ങൾ
 - B) ബാഹ്യശകുലങ്ങൾ
 - C) ത്വക്ക്
 - D) ശ്വാസകോശങ്ങൾ
- 77. പ്രകാശസംശ്ലേഷണത്തിലെ ഇരുണ്ടഘട്ടത്തെ സംബന്ധിച്ച് ശരിയായ പ്രസ്താവന ഏത്.?
 - A) ഇരുണ്ടഘട്ടം സൂര്യപ്രകാശത്തിൽ നടക്കുന്നില്ല
 - B) ഇരുണ്ടഘട്ടത്തിനു സൂര്യപ്രകാശത്തിന്റെ ആവശ്യമില്ല
 - C) ഇരുണ്ടഘട്ടം ആരംഭിക്കുമ്പോൾ സൂര്യപ്രകാശം ആവശ്യമാണ്
 - D) ഇരുണ്ടഘട്ടത്തിൽ ജലത്തിന്റെ വിഘടനത്തിന് സൂര്യപ്രകാശം ആവശ്യമാണ്

- 78 കൊഴുപ്പിൽ നിന്ന് കൂടുതൽ കലോറി ഊർജ്ജം ലഭിക്കുമെങ്കിലും ക്ഷീണിതനായ രോഗിക്ക് ക്ഷീണമകറ്റാൻ ഗ്ലൂക്കോസ് നൽകുന്നതിനു കാരണം?
- A) കൊഴുപ്പിന് അരുചിയുള്ളതിനാൽ
 - B) ഗ്ലൂക്കോസിൽ നിന്ന് വേഗത്തിൽ ഊർജ്ജം സ്വതന്ത്രമാകുന്നു.
 - C) കൊഴുപ്പ് ചില രോഗങ്ങൾക്കു കാരണമാകുന്നു.
 - D) ഗ്ലൂക്കോസ് വെള്ളത്തിൽ ലയിക്കുന്നതിനാൽ
- 79 ചെറുകുടലിന് നീളം കൂടുതലാണല്ലോ, ഇത്
- A) ദഹനം പൂർത്തിയാക്കുന്നതിന് സഹായിക്കുന്നു.
 - B) ദഹിച്ച ആഹാരഘടകങ്ങളുടെ ആഗിരണത്തിനു സഹായിക്കുന്നു.
 - C) ജലത്തിന്റെ ആഗിരണത്തെ സഹായിക്കുന്നു.
 - D) അവശിഷ്ടങ്ങളെ വേർതിരിക്കുന്നതിനു സഹായിക്കുന്നു.
- 80 ഒരു ആവാസവ്യവസ്ഥയിൽ പകലിനെ അപേക്ഷിച്ചു രാത്രി അന്തരീക്ഷത്തിൽ കാർബൺഡൈഓക്സൈഡിന്റെ അളവു കൂടുന്നതായി കാണപ്പെട്ടു. കാരണം?
- A) രാത്രിയിൽ സസ്യങ്ങളുടെ ശ്വസനനിരക്കു കൂടുതലാണ്.
 - B) രാത്രിയിൽ ജന്തുക്കളുടെ ശ്വസനനിരക്കു കൂടുതലാണ്.
 - C) രാത്രിയിൽ പ്രകാശസംശ്ലേഷണ നിരക്കു കുറവാണ്.
 - D) മേൽപറഞ്ഞ മൂന്നു കാരണങ്ങളും ഒരുപോലെ ബാധകമാണ്.
- 81 യീസ്റ്റ് ചേർക്കുമ്പോൾ അമിതാവു പുളിക്കാൻ കാരണം. യീസ്റ്റിൽ നടക്കുന്ന
- A) വിഭജനം
 - B) ശ്വസനം
 - C) മുകുളനം
 - D) ഇവമൂന്നും
- 82 ഒരുകുട്ടി പ്രകാശസംശ്ലേഷണത്തിന് സൂര്യപ്രകാശം ആവശ്യമാണെന്നു തെളിയിക്കുന്ന പരീക്ഷണം ചെയ്തു. പരീക്ഷണവിധേയമാക്കിയ ഇല പഠിച്ചെടുത്ത് അന്നജ പരിശോധന നടത്തിയപ്പോൾ കടുംനീലനിറം കാണപ്പെട്ടില്ല. കുട്ടിക്കുപറ്റിയ തെറ്റായതായിരിക്കും?
- A) പരീക്ഷണത്തിനു മുൻപായി ചെടി ഇരുട്ടത്തു വയ്ക്കാത്തതുകൊണ്ടാകാം
 - B) ഇലയിൽ നിക്ഷിപ്ത സ്ഥാനത്തു കാർബൺ പേപ്പർ ഒട്ടിക്കാൻ മറന്നുപോയിരിക്കാം
 - C) മേൽപറഞ്ഞ രണ്ടുതെറ്റുകളും സംഭവിച്ചിട്ടുണ്ടാകാം.
 - D) അയഡിന്റെ അളവ് കുറഞ്ഞതുകൊണ്ടാവാം
- 83 വൈറ്റൽ ക്ലാസിറ്റി കൂടുമ്പോൾ?
- A) കോശശ്വസന നിരക്കു കൂടുന്നു
 - B) കോശശ്വസന നിരക്കു കുറയുന്നു
 - C) കോശശ്വസന നിരക്കും വൈറ്റൽ ക്ലാസിറ്റിയും തമ്മിൽ ബന്ധമില്ല.
 - D) കോശത്തിൽ ലാക്ടിക് അമ്ലത്തിന്റെ അളവു കൂടുന്നു.
- 84 അൽപം പാലെടുത്ത് അതിൽ രണ്ടുതുളളി അയഡിൻ ലായനി ഒഴിച്ചപ്പോൾ കടും നീല നിറം കാണപ്പെട്ടു. കാരണം?
- A) പാലിൽ ധാന്യകമായ ലാക്ടോസിന്റെ അളവ് കൂടുതലാണ്.
 - B) പാല് മായം ചേർന്നതാണ്
 - C) പാലിലെ മാംസ്യത്തിന്റെ അളവ് കൂടുതലാണ്.
 - D) കൊഴുപ്പ് നീക്കം ചെയ്ത പാലാണ്.

85 താഴെ കാണിച്ചിരിക്കുന്ന പരീക്ഷണ സംവിധാനത്തിൽ ഒരു മണിക്കൂർ കഴിയുമ്പോൾ എന്തുമാറ്റം ഉണ്ടാകുന്നു ?



- A) A യിലേക്ക് ഗ്ലൂക്കോസ് വ്യാപിക്കുന്നു.
 - B) B യിൽ ഗ്ലൂക്കോസിന്റെ ഗാഢത കുറയുന്നു.
 - C) B യിൽ ഗ്ലൂക്കോസിന്റെ ഗാഢത കൂടുന്നു.
 - D) ഇതു മൂന്നും സംഭവിക്കുന്നില്ല.
- 86 താഴെ പറയുന്നവയിൽ സസ്യസ്പന്ദനത്തിന് പങ്കില്ലാത്ത പ്രവർത്തനം?
- A) വേരു വലിച്ചെടുക്കുന്ന ജലം ഇലകളിൽ എത്തിക്കുക.
 - B) ഇലകളിൽ നിർമ്മിക്കുന്ന ആഹാരം കാണഡങ്ങളിലും വേരുകളിലും എത്തിക്കുക.
 - C) സസ്യങ്ങളിൽ ജലത്തിന്റെ അളവ് നിയന്ത്രിക്കുക.
 - D) ഇതു മൂന്നും സസ്യസ്പന്ദനത്തിനു കൂടി പങ്കുള്ള പ്രവർത്തനമാണ്.
- 87 വെള്ളത്തിൽ മുങ്ങിത്താഴുമ്പോഴും തൊണ്ടയിൽ അനുവസ്തുക്കൾ കൂടുങ്ങുമ്പോഴും ഓക്സിജന്റെ ലഭ്യത കുറയുകയും ശ്വാസതടസ്സം അനുഭവപ്പെടുകയും ചെയ്യുന്നു. ഈ അവസ്ഥയെ എന്തുപറയുന്നു?
- A) ആസ്മ
 - B) ആസ്മിക്സിയ
 - C) ക്ഷയം
 - D) സിലിക്കോസിസ്
- 88 ഹൃദയപേശികൾ ഏതുതരം?
- A) അനൈച്ഛരികം
 - B) ഐച്ഛരികം
 - C) വരകളില്ലാത്തവ
 - D) ഇവയൊന്നുമല്ല
- 89 ബയോടെക്നോളജിയുടെ സംഭാവനയേത്?
- A) ജനിതക എൻജിനീയറിങ്ങ്
 - B) ടിഷ്യൂകൾച്ചർ
 - C) ക്ലോണിങ്ങ്
 - D) ഇവയെല്ലാം
- 90 കോശത്തിലെ എല്ലാ പ്രവർത്തനങ്ങളുടേയും നിയന്ത്രണകേന്ദ്രമേത്?
- A) കോശസ്തരം
 - B) മൈറ്റോകോൺഡ്രിയ
 - C) മർമ്മം
 - D) കോശദ്രവ്യം

APPENDIX -II
UNIVERSITY OF CALICUT
ACHIEVEMENT TEST IN BIOLOGY FOR IX STANDARD PUPILS
(PRELIMINARY)

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DIRECTIONS:

1. This is a biology test. A separate answer sheet given to mark your responses. Do not mark or write anything in the question paper.
2. Each question carries four alternatives A, B, C and D. Among them, only one is correct. Each question in the answer sheet also carries four alternatives A, B, C and D. Find out the correct answer and put an 'X' mark against the appropriate alternative.
3. Try to answer all the questions.

Example:

1. Which is the primary source of energy in an ecosystem.

A. Air B. Sunlight C. Water D. Soil

1	A	X	C	D
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1. Which is the most suitable condition for the sustainable development of our country?
A) Population growth and livelihood through agriculture
B) Population growth and industrialization
C) Population control and living through agriculture
D) Population control and nature exploitation
 2. Which is the component colour that decreases the rate of photosynthesis in a visible spectrum?
A) Yellow
B) Green
C) Blue
D) Red
 3. Which of the following statement is wrong related to cellulose?
A) Cellulose will never digest
B) Cellulose helps in digestion
C) Cellulose will digest in ruminants
D) Cellulose causes indigestion

4. What is the basic function of respiration?
 - A) It releases energy in the food
 - B) It give out CO_2
 - C) It intake O_2
 - D) It purifies blood
5. Which is the most suitable cultivation method that exploit high and low availability of sunlight?
 - A) Group farming
 - B) Mixed cropping
 - C) Rotation of crops
 - D) All the above
6. Which is wave-like movement of alimentary canal?
 - A) Paralysis
 - B) Hepatitis
 - C) Dialysis
 - D) Peristalsis
7. Which type of activity is respiration?
 - A) Metabolic activity
 - B) Catabolic activity
 - C) Synthesis
 - D) Absorption
8. In what form plants store glucose which is prepared through photosynthesis?
 - A) Maltose
 - B) Sucrose
 - C) Carbohydrate
 - D) Fructose
9. Name the scientific branch which is related to growing of flowering plants?
 - A) Apiculture
 - B) Horticulture
 - C) Sericulture
 - D) Floriculture
10. What do you mean by vital capacity?
 - A) The volume of forcibly exhaled air after the deepest inhalation
 - B) The volume of normal exhaled air after the normal inhalation
 - C) The volume of air that remains in the lungs after the exhalation
 - D) The volume of air that we take in by inhalation

11. What is the formula of glucose?
- A) $C_6H_6O_6$
 - B) $C_{12}H_6O_6$
 - C) $C_6H_{12}O_6$
 - D) CH_2O
12. What is the process which absorb water with the help of hydrophilic substances?
- A) Transpiration
 - B) Diffusion
 - C) Absorption
 - D) Imbibition
13. Through research it was found that there is a decrease in the productivity of main crop in an area by virus disease. Which is the most suitable disease control strategy in that area?
- A) Use of high concentrated chemical pesticides in small quantity.
 - B) Use of lower concentrated chemical pesticides in high quantity.
 - C) Use of natural pesticides.
 - D) Control of spreading the disease by destroying the virus affected plants.
14. Which of the following statement is correct related to photosynthesis?
- A) CO_2 react with water to form carbohydrate
 - B) CO_2 splits up to release O_2
 - C) Water splits up to release O_2
 - D) Water is mixed with carbon to form carbohydrate
15. Which is the most correct statement in the following?
- A) There is no heterotrophs without plants
 - B) There is no plants without animals
 - C) There is no other living organisms without man.
 - D) Man can live without plants.
16. Before photosynthesis experiment, the plant is kept in darkness for two days. Why?
- A) To remove temperature from the leaf
 - B) To remove starch from the leaf
 - C) To remove chlorophyll from the leaf
 - D) To soften the leaf.
17. Fat digestion does not take place in stomach. Why?
- A) Because of the absence of Amylase
 - B) Because of the absence of Pepsin
 - C) Because of the absence of Trypsin
 - D) Because of the absence of Lipase

18. The digestive system is absent in amoeba. Why?
- A) Because it is a heterotroph
 - B) Because it is an aquatic organism
 - C) Because it is a unicellular organism
 - D) Because it is an autotroph
19. There is a chance for blocking of air due to laughing while taking food. Why?
- A) Because of the opening of glottis while laughing.
 - B) Because of the closing of ulva while laughing.
 - C) Because of the trachea is closed while eating.
 - D) Because ulva is opened while eating.
20. Which is the most practical method for controlling foot disease in cattles?
- A) Use control measures for the spreading of disease.
 - B) Control the disease causing vectors.
 - C) Use antibiotics.
 - D) Destroy disease causing organisms.
21. Which of the following statement is wrong related to respiratory system of frogs?
- A) Respire through the skin.
 - B) Respire through gills.
 - C) Respire through lungs.
 - D) Respire through mouth.
22. Which of the following statement is correct?
- A) Saliva helps in the digestion of carbohydrate
 - B) Saliva helps in the digestion of protein
 - C) Saliva helps in the digestion of fat.
 - D) Saliva helps in the digestion of glucose.
23. Which is the basic unit of protein?
- A) Glucose
 - B) Fat
 - C) Amino acid
 - D) Muscle
24. Why is it said that alveols are the basic unit of lungs?
- A) Because the alveols are covered by blood capillaries.
 - B) Because alveols can be observed only through a microscope.
 - C) Because alveols are the storage site of air.
 - D) Because alveols are the site of gas exchange.

25. Where is Villus located?
- A) In large intestine
 - B) In small intestine
 - C) In the alimentary canal
 - D) In the stomach
26. Which nutrient factor is used for the production of energy in the body?
- A) Carbohydrates
 - B) Proteins
 - C) Amino Acid
 - D) Vitamin
27. Which organ is affected by tuberculosis disease
- A) Muscle.
 - B) Bone.
 - C) Liver.
 - D) Lungs.
28. Which part of the body of amoeba helps in the ingestion of food?
- A) Nucleus
 - B) Pseudopodia
 - C) Contractile vacuole
 - D) Mouth
29. What type of cell membrane are seen in root hairs?
- A) Opaque
 - B) Transparent
 - C) Semi permeable
 - D) Permeable
30. Which is the algae used by space men in their special chambers?
- A) Chlorella
 - B) Chloroplast
 - C) Chlorophin
 - D) Chloroform
31. Which is the most suitable explanation for the shrinking of grapes when dipped in honey?
- A) Exosmosis
 - B) Endosmosis
 - C) Plasmolysis
 - D) Glycolysis

32. Which is the respiratory organ of spider?
- A) Gills
 - B) Trachea
 - C) Book lungs
 - D) Tracheoles
33. When making hole on the nose, only a little blood will ooze out. Why?
- A) Because of the reduced amount of blood vessels on the peripheral regions of the body.
 - B) Because the blood clots quickly in the cartilaginous part of the body.
 - C) Because the number of blood vessels are comparatively low in cartilages.
 - D) Because there is no blood vessels in cartilages.
34. Which of the following organism use anaerobic respiration?
- A) Amphibians
 - B) Yeast
 - C) Plants
 - D) Virus
35. Who is the father of 'Genetics'?
- A) Charles Darwin
 - B) John Watson
 - C) Linneaus
 - D) Gregor Mendel
36. Which is the correct statement related to respiration?
- A) Takes place only in the presence of O_2 .
 - B) Takes place only in the absence of CO_2 .
 - C) Do not take place in plants.
 - D) Take place even in the absence of O_2 .
37. Which is the most suitable treatment for Lukemia?
- A) Blood transfusion.
 - B) Bone Marrow transplantation
 - C) Heart transplantation
 - D) Dialysis
38. In man curly hair is dominant characteristic and long hair is recessive character. Then what is the characteristic of hair in four offsprings of a father with long hair and a mother with curl hair?
- A) Four children have long hair
 - B) Four children have curl hair
 - C) Two children have curl hair and two children have long hair
 - D) Three children have curl hair and one has long hair

39. Name the branch of study which deals with bones.
- A) Ophiology
 - B) Oncology
 - C) Ophthalmology
 - D) Osteology
40. Which is the most suitable method for maintaining a species for ever?
- A) Prevention of deforestation
 - B) Prevention of hunting
 - C) Conservation of gene pool
 - D) Establishing national parks
41. Which of the following statement is wrong?
- A) DNA is double stranded.
 - B) DNA has the shape of spiral staircase.
 - C) DNA has purine and Pyrimidine bases.
 - D) DNA has ribose sugar.
42. What is the reason for the movement of food in the alimentary canal, even if we are sleeping?
- A) Because it is made up of voluntary muscles.
 - B) Because it is made up of involuntary muscles.
 - C) Because it is made up of striated muscles.
 - D) Because it is made up of bone muscles.
43. The scientific name of dog is *Canis familiaris* and that of wolf is *Canis lupus*. What fact is revealed from this statement?
- A) Both of them are in one species.
 - B) Both of them are in one family.
 - C) Both of them are in one genus.
 - D) Both of them are in one order.
44. Which of the following statement is correct?
- A) The blood of baby is formed from the blood of mother.
 - B) The baby has no blood of its own till birth.
 - C) The blood of baby and mother will mixed.
 - D) The blood of baby and mother will never mixed.
45. Which of the following is not the function of muscular system?
- A) It gives structure to the body
 - B) It helps in movements
 - C) It produces heat
 - D) It protects internal organs

46. The chromosome number remains constant without change even after several generations. Why?
- A) Because meiosis takes place in reproductive cells.
 - B) Because mitosis takes place in reproductive cells.
 - C) Because meiosis takes place in body cells.
 - D) Because mitosis takes place in body cells.
47. Name the organism which shows parthenogenesis.
- A) Planeria
 - B) Amoeba
 - C) Hydra
 - D) Honey bee
48. What is the scientific name of cat?
- A) Felis leo
 - B) Felis domestica
 - C) Panthera tigris
 - D) Pavo cristatus
49. Which of the following is a wrong statement?
- A) Horse hoof is an example of exoskeleton
 - B) Exoskeleton protects the body
 - C) Man has no exoskeleton
 - D) Feathers are exoskeleton
50. In man sex difference is determined by a pair of chromosomes. XX chromosome determines female and XY chromosome determines male. Then what is the basic factor which determines the sex of a child?
- A) Male gamete
 - B) Female gamete
 - C) Male and Female gamete
 - D) None of the above
51. Which type of joint is kneejoint?
- A) Ball and Socket joint
 - B) Hinge joint
 - C) Gliding joint
 - D) Pivot joint
52. Name the digestive gland which produce bile.
- A) Pancreas
 - B) Gastric gland
 - C) Liver
 - D) Salivary gland

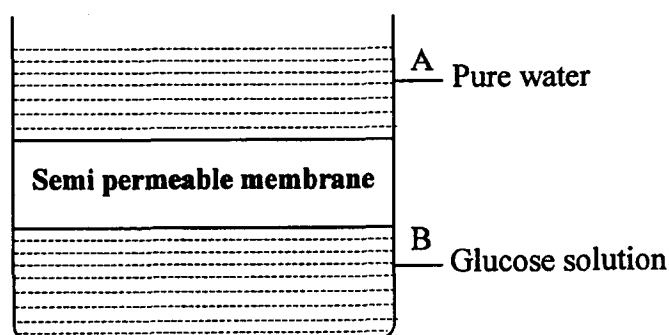
53. What is the reason for including bacteria in monera?
- A) Because they are unicellular organism.
 - B) Because they have no definite shape.
 - C) Because they have no definite nucleus.
 - D) Because they have all the above characters.
54. What is meant by hermaphrodites?
- A) Organism having separate male and female gametes
 - B) Organism which does not produce male and female gametes
 - C) Organism having the capacity to change sex according to the surroundings.
 - D) Male and female gametes are present in the same organism.
55. What is the main function of RNA?
- A) Maintain generations
 - B) Protein synthesis
 - C) Cells division
 - D) Production of DNA
56. How many chromosomes are there in man?
- A) 23 pairs
 - B) 46 pairs
 - C) 21 pairs
 - D) 43 pairs.
57. It is difficult to identify identical twins from each other. Why?
- A) Because they are formed from same egg.
 - B) Because they are formed from same sperm.
 - C) Because they are formed by the division of same zygote.
 - D) All the above characters are responsible for this.
58. Below given is a list of varied crops growing by four persons whose main occupation is agriculture. If these crops are related together, which one will be more profitable?
- A) Paddy cultivation, Sericulture, Apiculture.
 - B) Cattle rearing, Paddy cultivation, Apiculture.
 - C) Poultry farming, Apiculture, Cattle rearing.
 - D) Pepper cultivation, Cattle rearing, Apiculture.
59. Which of the following nitrogen bases are seen in DNA except guanine and cytosine?
- A) Adenine, Uracil
 - B) Adenine, Thymine
 - C) Uracil, Thymine
 - D) None of the above

60. How is fraternal twins formed?
- A) When the zygote is divided and separated.
 - B) When parthenogenesis takes places.
 - C) When ovum is fertilized by more than one sperm.
 - D) When more than one ovum is fertilized at a time.
61. Which of the following cattle disease is a threat even for the existence of man?
- A) Swelling of udder
 - B) Foot and Mouth disease
 - C) Anthrax
 - D) All the above
62. Which is the wrong statement?
- A) The sum total of all genes of a species is called its gene pool.
 - B) Gene pool may undergo changes through generations.
 - C) One species of organism can never breed with another species.
 - D) One species of organism can breed with another species.
63. Which of the following is the most practical and safe method for killing flies which destroy vegetables produced in huge amount?
- A) Spraying of chemical pesticides.
 - B) Mixture of jagger and pesticides is used as a trap.
 - C) Foil the fruits by paper cover.
 - D) Spraying of the mixture of chemical and natural pesticides.
64. Which revolution helps India for the development of Pisciculture?
- A) White revolution
 - B) Blue revolution
 - C) Green Revolution
 - D) None of the above
65. What happens to the carbon dioxide during dark reaction of photosynthesis?
- A) Oxidation
 - B) Reduction
 - C) Evaporation
 - D) Assimilation
66. Which of the following disease is spread through the air?
- A) Blight disease
 - B) Blast disease
 - C) Wilt disease
 - D) Mosaic disease

67. Which tooth helps in the cutting of food?
- A) Canines
 - B) Incisors
 - C) Molars
 - D) Premolars.
68. Which cell helps the plant to conduct water towards the leaves?
- A) Xylum vessels
 - B) Palisade cells
 - C) Stomata
 - D) None of the above
69. Why do we feel pain while plucking the tooth?
- A) Because the enamel is too hard
 - B) Because tooth has sharp cutting edges
 - C) Because there are nerves and blood vessels in the pulp cavity of tooth
 - D) Because the tooth is fixed with cement.
70. What is the name of chemical reaction that takes place in the grana of chloroplast during the process of photosynthesis?
- A) Dark reaction
 - B) Light reaction
 - C) Turgor pressure
 - D) Imbibition
71. Which of the following disease is caused by virus?
- A) Swelling of udder
 - B) Anthrax
 - C) Chicken disease
 - D) Foot disease
72. Which is the disease caused by protein deficiency?
- A) Marasmus
 - B) Nightblindness
 - C) Kwashiorker
 - D) Anemia
73. Which is the vitamin that produced by the help of U.V. rays?
- A) Vitamin A
 - B) Vitamin D
 - C) Vitamin K
 - D) Vitamin E

74. With the help of Saliva, starch is converted into what form?
- A) Maltose
 - B) Lactose
 - C) Glucose
 - D) Fructose
75. Which of the following disease is caused by the deficiency of vitamin K?
- A) Infertility
 - B) Night blindness
 - C) Prevents blood clotting
 - D) Muscle pain
76. Which is the respiratory organ of tadpole?
- A) Gill filament
 - B) External gills
 - C) Skin
 - D) Lungs
77. Which is the correct statement related to dark reaction of photosynthesis.
- A) Dark reaction does not take place in the presence of sunlight.
 - B) Sunlight is not essential for dark reaction.
 - C) Sunlight is necessary in the beginning of dark reactions
 - D) Sunlight is necessary for the splitting of water in the dark reaction
78. What is the reason for giving glucose to a tired person, eventhough fat has large calorie content?
- A) Because fat has no taste
 - B) Because energy is released from glucose faster
 - C) Because fat causes some diseases
 - D) Because glucose is dissolved in water
79. What is the advantage of the lengthy small intestine?
- A) It helps in the completion of digestion.
 - B) It helps in the absorption of digested food.
 - C) It helps in the absorption of water.
 - D) It helps in the separation of waste materials.
80. In an ecosystem the amount of carbon dioxide is found to be increased in night than daytime. What is the reason?
- A) Because the rate of respiration in plants are high during night.
 - B) Because the rate of respiration in animals' are high during night.
 - C) Because, the rate of photosynthesis is low during night.
 - D) All the above.

81. What is the reason for the fermentation of dough while adding yeast?
- Due to division of the yeast
 - Due to the respiration of the yeast
 - Due to budding of the yeast
 - All the above
82. A body conduct an experiment to prove the necessity of sunlight in photosynthesis. When he conduct a starch test with the experimented leaf there is no dark blue colour. What is wrong with the experiment?
- May be because the plant was not kept in darkness before the experiment.
 - May be because he forget to paste the carbon paper on appropriate position of leaf.
 - The above two mistakes may happened.
 - The amount of iodine may be decreased.
83. What happen when vital capacity increased?
- The rate of cellular respiration increases.
 - The rate of cellular respiration decreases
 - There is no relation between cellular respiration and vital capacity.
 - The amount of lactic acid in the cell increases.
84. When two drops of iodine solution is put into some milk, a deep blue colour was appeared. Why?
- Because the amount of lactose is high in the milk.
 - Because it is an adulterated milk
 - Because the amount of protein in the milk is high
 - Because it is fat free milk.
85. What happens in the following experimental set up after one hour?



- Glucose spread into A
- The concentration of glucose decreased in B
- The concentration of glucose increased in B
- None of the above.

86. Which of the following activity has no role in transpiration?
- A) Conduct water absorbed by roots to leaves.
 - B) Conduct food from leaves to stem and roots.
 - C) Control the amount of water in plants.
 - D) All these activities are carried out with the help of transpiration.
87. When a person sink in water or when any foreign objects obstruct the trachea, he may not be able to inhale air. What is the name of this condition?
- A) Asthma.
 - B) Asphyxia.
 - C) Tuberculosis.
 - D) Silicosis.
88. What is the characteristic of cardiac muscle?
- A) Involuntary
 - B) Voluntary
 - C) Non striated
 - D) None of the above
89. Which of the following is the contribution of Biotechnology?
- A) Genetic engineering
 - B) Tissue culture
 - C) Cloning
 - D) All the above
90. Which is the co-ordinating unit of all activities in a cell?
- A) Cell membrane
 - B) Mitochondria
 - C) Nucleus
 - D) Cytoplasm

APPENDIX -III

RESPONSE SHEET OF ACHIEVEMENT TEST IN BIOLOGY-PRELIMINARY

സ്കൂളിന്റെ പേര് ക്ലാസ്സ് ഡിവിഷൻ.....

വിദ്യാർത്ഥിയുടെ പേര്..... ആൺകുട്ടി/പെൺകുട്ടി

1	A	B	C	D	46	A	B	C	D
2	A	B	C	D	47	A	B	C	D
3	A	B	C	D	48	A	B	C	D
4	A	B	C	D	49	A	B	C	D
5	A	B	C	D	50	A	B	C	D
6	A	B	C	D	51	A	B	C	D
7	A	B	C	D	52	A	B	C	D
8	A	B	C	D	53	A	B	C	D
9	A	B	C	D	54	A	B	C	D
10	A	B	C	D	55	A	B	C	D
11	A	B	C	D	56	A	B	C	D
12	A	B	C	D	57	A	B	C	D
13	A	B	C	D	58	A	B	C	D
14	A	B	C	D	59	A	B	C	D
15	A	B	C	D	60	A	B	C	D
16	A	B	C	D	61	A	B	C	D
17	A	B	C	D	62	A	B	C	D
18	A	B	C	D	63	A	B	C	D
19	A	B	C	D	64	A	B	C	D
20	A	B	C	D	65	A	B	C	D
21	A	B	C	D	66	A	B	C	D
22	A	B	C	D	67	A	B	C	D
23	A	B	C	D	68	A	B	C	D
24	A	B	C	D	69	A	B	C	D
25	A	B	C	D	70	A	B	C	D
26	A	B	C	D	71	A	B	C	D
27	A	B	C	D	72	A	B	C	D
28	A	B	C	D	73	A	B	C	D
29	A	B	C	D	74	A	B	C	D
30	A	B	C	D	75	A	B	C	D
31	A	B	C	D	76	A	B	C	D
32	A	B	C	D	77	A	B	C	D
33	A	B	C	D	78	A	B	C	D
34	A	B	C	D	79	A	B	C	D
35	A	B	C	D	80	A	B	C	D
36	A	B	C	D	81	A	B	C	D
37	A	B	C	D	82	A	B	C	D
38	A	B	C	D	83	A	B	C	D
39	A	B	C	D	84	A	B	C	D
40	A	B	C	D	85	A	B	C	D
41	A	B	C	D	86	A	B	C	D
42	A	B	C	D	87	A	B	C	D
43	A	B	C	D	88	A	B	C	D
44	A	B	C	D	89	A	B	C	D
45	A	B	C	D	90	A	B	C	D

Appendix IV

UNIVERSITY OF CALICUT
Achievement Test in Biology for IX Std Pupils (Final)

Priya K.P

നിർദ്ദേശങ്ങൾ

1. ഇത് ഒരു ബയോളജി ടെസ്റ്റാണ്. ഉത്തരങ്ങൾ അടയാളപ്പെടുത്തുന്നതിന് വേറെ കടലാസ് തന്നിട്ടുണ്ട്. ചോദ്യക്കടലാസ്സിൽ ഒന്നും എഴുതുകയോ വരയ്ക്കുകയോ ചെയ്യരുത്.
2. എല്ലാ ചോദ്യങ്ങൾക്കും A,B,C,D എന്നീ അക്ഷരങ്ങൾ ഇട്ട് നാല് ഉത്തരങ്ങൾ വീതം കൊടുത്തിരിക്കുന്നു. അവയിൽ ഒന്നു മാത്രമാണ് ശരി. ഉത്തരക്കടലാസിൽ ഓരോ ചോദ്യ നമ്പരിനുമെതിരെ A,B,C,D എന്ന് രേഖപ്പെടുത്തിയിരിക്കുന്നു. ഓരോ ചോദ്യത്തിനും ശരിയായ ഉത്തരം കണ്ടുപിടിക്കുക. അതിനുശേഷം ഉത്തരക്കടലാസ്സിൽ ചോദ്യനമ്പരിനുമേറെ ശരിയുത്തരത്തെക്കുറിക്കുന്ന അക്ഷരത്തിൽ 'X' അയാളം ഇടുക.
3. നിങ്ങൾ ആദ്യം അടയാളപ്പെടുത്തി 'X' ചിഹ്നം തെറ്റായ സ്ഥാനത്താണെങ്കിൽ സ്ഥാനം മാറ്റുന്നതിന് അതിനു ചുറ്റും ചെറിയ സമചതുരം (□) വരയ്ക്കുകയും ശരിയായ സ്ഥാനത്ത് ചിഹ്നം ഇടുകയും ചെയ്യുക.
4. എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം അടയാളപ്പെടുത്താൻ ശ്രദ്ധിക്കുക.
5. പരിശോധകൻ 'Start' എന്നു പറയുമ്പോൾ ഉത്തരം അടയാളപ്പെടുത്താൻ ആരംഭിക്കുക.

മാതൃക:

ഒരാവാസവ്യവസ്ഥയിലെ ഊർജ്ജത്തിന്റെ പ്രാഥമിക ഉറവിടമേത്?

A. വായു, B. സൂര്യപ്രകാശം, C. ജലം, D. മണ്ണ്

Q No. 1

A

~~B~~

C

D

1. സുസ്ഥിര വികസനത്തിന് ഏറ്റവും അനുയോജ്യമായ അവസ്ഥ ഏത്?
 - A) ജനസംഖ്യാ വർദ്ധനവും കൃഷിയിലൂടെയുള്ള ഉപജീവനവും
 - B) ജനസംഖ്യാ വർദ്ധനവും വ്യവസായ വൽക്കരണവും
 - C) ജനസംഖ്യാ നിയന്ത്രണവും കൃഷിയിലൂടെയുള്ള ഉപജീവനവും
 - D) ജനസംഖ്യാ നിയന്ത്രണവും ഉപജീവനത്തിനുവേണ്ടി പ്രകൃതിയുടെ ചുഷണവും

2. പ്രകാശലഭ്യതയുടെ ഏറ്റക്കുറച്ചിൽ കാര്യക്ഷമമായി പ്രയോജനപ്പെടുത്തുന്ന കൃഷിരീതി ഏത്?
 - A) കൂട്ടുകൃഷി
 - B) മിശ്രകൃഷി
 - C) വിളപര്യയം
 - D) മേൽപറഞ്ഞവയെല്ലാം

3. അന്നപഥത്തിന്റെ തരംഗരൂപത്തിലുള്ള ചലനം ഏത്?
 - A) പരാലിസിസ്
 - B) ഹെപ്പാറ്റിസ്
 - C) ഡയാലിസിസ്
 - D) പെരിസ്റ്റാൾസിസ്

4. പൂക്കളുടെ കൃഷിയുമായി ബന്ധപ്പെട്ട ശാസ്ത്രശാഖയെ എന്തു വിളിക്കുന്നു?
 - A) എപ്പി കൾച്ചർ
 - B) ഹോർട്ടി കൾച്ചർ
 - C) സെറി കൾച്ചർ
 - D) ഫ്ലോറി കൾച്ചർ

5. വൈറ്റൽ ക്ലാസിറ്റി എന്നാൽ എന്ത്?
 - A) ശക്തമായ ഉച്ഛ്വാസത്തിനുശേഷം ശക്തമായി നിശ്വസിക്കുമ്പോഴുള്ള വായുവിന്റെ അളവ്
 - B) സാധാരണ ഉച്ഛ്വാസത്തിനുശേഷം സാധാരണ നിശ്വസിക്കുമ്പോഴുള്ള വായുവിന്റെ അളവ്
 - C) നിശ്വാസത്തിനുശേഷം ശ്വാസകോശത്തിൽ അവശേഷിക്കുന്ന വായുവിന്റെ അളവ്
 - D) ഉച്ഛ്വാസത്തിലൂടെ ഉൾക്കൊള്ളുന്ന വായുവിന്റെ അളവ്

6. ഒരു പ്രദേശത്തെ മുഖ്യവിളയുടെ ഉൽപാദനക്ഷമത വൈറസ് രോഗം മൂലം കുറയുന്നുണ്ടെന്ന് പറഞ്ഞതിലൂടെ കണ്ടെത്തി. അവിടെ സ്വീകരിക്കാവുന്ന ഫലപ്രദമായ രോഗ നിയന്ത്രണ മാർഗ്ഗം?
- A) വീര്യം കൂടിയ രാസകീടനാശിനികൾ കുറഞ്ഞ അളവിൽ പ്രയോഗിക്കുക.
- B) വീര്യം കുറഞ്ഞ രാസകീടനാശിനികൾ കൂടിയ അളവിൽ പ്രയോഗിക്കുക
- C) ജൈവ കീടനാശിനികൾ പ്രയോഗിക്കുക
- D) രോഗബാധിതമായ സസ്യങ്ങൾ നശിപ്പിച്ച് രോഗ വ്യാപനം തടയുക
7. താഴെ പറയുന്നവയിൽ ഏറ്റവും ശരിയായ പ്രസ്താവനയേത്?
- A) സസ്യങ്ങളില്ലെങ്കിൽ പരപോഷികളില്ല
- B) ജന്തുക്കളില്ലെങ്കിൽ സസ്യങ്ങളില്ല
- C) മനുഷ്യനില്ലെങ്കിൽ മറ്റുജീവജാലങ്ങളില്ല
- D) മനുഷ്യന് സസ്യങ്ങളില്ലാതെയും ജീവിക്കാം
8. താഴെ പറയുന്നതിൽ ശരിയായതേത്?
- A) ഉമിനീർ അന്നജത്തിന്റെ ദഹനത്തെ സഹായിക്കുന്നു
- B) ഉമിനീർ പ്രോട്ടീന്റെ ദഹനത്തെ സഹായിക്കുന്നു
- C) ഉമിനീർ കൊഴുപ്പിന്റെ ദഹനത്തെ സഹായിക്കുന്നു
- D) ഉമിനീർ ഗ്ലൂക്കോസിന്റെ ദഹനത്തെ സഹായിക്കുന്നു
9. മാംസ്യത്തിന്റെ അടിസ്ഥാന ഘടകം ഏത്?
- A) ഗ്ലൂക്കോസ്
- B) കൊഴുപ്പ്
- C) അമിനോ ആസിഡ്
- D) പേശി
10. ക്ഷയം എന്ന രോഗം ഏതവയവത്തെ ബാധിക്കുന്നു?
- A) പേശി
- B) അസ്ഥി
- C) കരൾ
- D) ശ്വാസകോശം

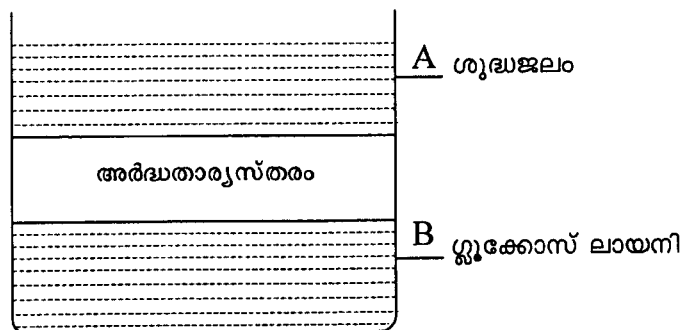
11. അമീബ എന്തുപയോഗിച്ചാണ് ആഹാരം സ്വീകരിക്കുന്നത്?
- A) മർമ്മം
B) കപടപാദം
C) സങ്കോചഫേനം
D) വായ
12. ശുക്യാകാശയാത്രികർ ശ്വാസനോപകരണങ്ങളിൽ ഉപയോഗിക്കുന്ന ഹരിതസസ്യമേത്?
- A) ക്ലോറെല്ല
B) ക്ലോറോപ്ലാസ്റ്റ്
C) ക്ലോറോഫിൻ
D) ക്ലോറോഫോം
13. ഏട്ടുകാലിയിൽ കാണപ്പെടുന്ന ശ്വാസനാവയവം ഏത്?
- A) ശകുലങ്ങൾ
B) ശ്വാസനനാളികൾ
C) ബുക്ക്ലംഗ്സ്
D) ശ്വാസനനാളികകൾ
14. അവായുശ്വാസനം നടത്തുന്ന ജീവികൾ
- A) ഉഭയജീവികൾ
B) യീസ്റ്റുകൾ
C) സസ്യങ്ങൾ
D) വൈറസുകൾ
15. ജനിതകശാസ്ത്രത്തിന്റെ പിതാവാണ്?
- A) ചാൾസ് ഡാർവിൻ
B) ജോൺ വാട്സൺ
C) ലീനിയസ്
D) ഗ്രിഗർ മെന്റൽ

16. ശ്വസനം സംബന്ധിച്ച് ശരിയായ പ്രസ്താവനയേത്?
- ഓക്സിജന്റെ സാന്നിധ്യത്തിൽ മാത്രം നടക്കുന്നു
 - കാർബൺ ഡൈ ഓക്സൈഡിന്റെ അഭാവത്തിൽ മാത്രം നടക്കുന്നു
 - സസ്യങ്ങളിൽ നടക്കുന്നില്ല
 - ഓക്സിജന്റെ അഭാവത്തിലും നടക്കുന്നു
17. ലൂക്കീമിയ മാറ്റാൻ ഏറ്റവും അനുയോജ്യമായ ചികിത്സയേത്?
- രക്തനിവേശനം
 - മജ്ജ മാറ്റിവെയ്ക്കൽ
 - ഹൃദയം മാറ്റിവെയ്ക്കൽ
 - ഡയാലിസിസ്
18. മനുഷ്യനിലെ ചുരുണ്ട മുടി പ്രകടഗുണവും നീണ്ട മുടി ഗുപ്തഗുണവുമാണ് എന്നിരിക്കട്ടെ എന്നാൽ നീളൻമുടിയോടുകൂടിയ പിതാവിനും ചുരുണ്ട മുടി യോടുകൂടിയ മാതാവിനും ജനിച്ച നാലു മക്കളിൽ മുടിയുടെ സ്വഭാവം എന്തായിരിക്കും?
- നാലു മക്കൾക്കും നീണ്ട മുടി
 - നാലു മക്കൾക്കു ചുരുണ്ട മുടി
 - രണ്ടു മക്കൾക്ക് ചുരുണ്ട മുടി, രണ്ടു മക്കൾക്ക് നീണ്ട മുടി
 - മൂന്നു മക്കൾക്ക് ചുരുണ്ട മുടി, ഒരാൾക്ക് നീണ്ട മുടി
19. ഒരു ജീവി വർഗ്ഗത്തെ എക്കാലവും നിലനിർത്തുന്നതിനുവേണ്ടി സ്വീകരിക്കാവുന്ന ഏറ്റവും ഉചിതമായ മാർഗ്ഗം?
- വന നശീകരണം തടയുക
 - വേട്ടയാടൽ നിരോധിക്കുക
 - ജീൻപുൾ സംരക്ഷിക്കുക
 - ദേശീയ പാർക്കുകൾ സ്ഥാപിക്കുക
20. ഉറങ്ങിക്കിടക്കുമ്പോഴും അന്നപഥത്തിൽ ഭക്ഷണം നീങ്ങുന്നു, കാരണം അന്നപഥം നിർമ്മിച്ചിരിക്കുന്നത്
- ഐശ്ചിക പേശികളാലാണ്
 - അനൈശ്ചിക പേശികളാലാണ്
 - രേഖാങ്കിത പേശികളാലാണ്
 - അസ്ഥി പേശികളാലാണ്

21. അനിഷേകജനനം പ്രകടിപ്പിക്കുന്ന ജീവിയ്ക്ക് ഉദാഹരണമാണ്
- പ്ലാനേറിയ
 - അമീബ
 - ഹൈഡ്ര
 - തേനീച്ച
22. പുച്ചയുടെ ശാസ്ത്രനാമം എന്ത്?
- ഫെലിസ് ലിയോ
 - ഫെലിസ് ഡൊമസ്റ്റിക്ക
 - പന്തേറ ട്രൈഗ്രിസ്
 - പാവോ ക്രിസ്റ്റാറ്റസ്
23. താഴെ പറയുന്നവയിൽ തെറ്റായ പ്രസ്താവന ഏത്?
- കുതിരയുടെ കുള്ളൻ ബാഹ്യാസ്ഥിയ്ക്ക് ഉദാഹരണമാണ്
 - ബാഹ്യാസ്ഥികൾ ശരീര സംരക്ഷണം നൽകുന്നു
 - മനുഷ്യൻ ബാഹ്യാസ്ഥികളില്ല
 - പക്ഷിതുവലുകൾ ബാഹ്യാസ്ഥികളാണ്
24. മനുഷ്യനിലെ ലിംഗഭേദം ഒരു ജോഡി ക്രോമസോമുകളാൽ നിർണ്ണയിക്കപ്പെടുന്നു. XX ക്രോമസോം ജോഡി വന്നാൽ സ്ത്രീകളും XY ക്രോമസോം ജോഡി വന്നാൽ പുരുഷന്മാരും, എങ്കിൽ കുഞ്ഞിന്റെ ലിംഗ നിർണ്ണയത്തിന് ആധാരം.
- പുരുഷ ബീജമാണ്
 - സ്ത്രീബീജമാണ്
 - പുരുഷന്റേയും സ്ത്രീയുടേയും ബീജമാണ്
 - രണ്ടുമല്ല.
25. കാൽമുട്ട് ഏത് തരം അസ്ഥിസന്ധിയാണ്?
- ഗോളരസന്ധി
 - വിജാഗിരി സന്ധി
 - തെന്നി നീങ്ങുന്ന സന്ധി
 - കീല സന്ധി

26. ഉഭയലിംഗജീവികൾ എന്നാൽ എന്ത്?
- A) ആൺ പെൺ ജീവികൾ വെവ്വേറെയുള്ളത്
 - B) ആൺ പെൺ ബീജങ്ങൾ ഉൽപാദിപ്പിക്കാത്ത ജീവികൾ
 - C) ചുറ്റുപാടിനനുസരിച്ച് ലിംഗഭേദം വരുത്താൻ കഴിവുള്ള ജീവികൾ
 - D) ആൺ പെൺ ബീജങ്ങൾ ഒരേ ജീവികളിൽ തന്നെ കാണപ്പെടുന്നവ
27. മനുഷ്യന്റെ നിലനിൽപ്പിനു തന്നെ ഭീഷണിയാകുന്ന കാലിരോഗം?
- A) അകിടൂവീക്കം
 - B) കുളമ്പുരോഗം
 - C) ആന്താക്സ്
 - D) മേൽപറഞ്ഞ മൂന്നു രോഗങ്ങളും
28. താഴെ പറയുന്നവയിൽ തെറ്റായ പ്രസ്താവന ഏത്?
- A) ഒരു ജീവി വർദ്ധിപ്പിക്കാൻ ജീനുകളുടെ ആകെത്തുകയാണ് ജീൻപുൾ
 - B) തലമുറകൾ കഴിയുന്നതോടും ജീൻപുളിൽ മാറ്റമുണ്ടാകും
 - C) ഒരു ജീവി വർദ്ധിപ്പിക്കാൻ ജീൻപുൾ മറ്റൊന്നിന്റേതുമായി കലരുന്നില്ല
 - D) ഒരു ജീവി വർദ്ധിപ്പിക്കാൻ ജീൻപുൾ മറ്റൊന്നിന്റേതുമായി കലരും
29. ഇന്ത്യയിൽ മത്സ്യകൃഷി വികസിക്കാൻ സഹായിച്ച വിപ്ലവം?
- A) ധവള വിപ്ലവം
 - B) നീല വിപ്ലവം
 - C) ഹരിത വിപ്ലവം
 - D) ഇവയൊന്നുമല്ല
30. ഇലകളിൽ ജലം എത്തിക്കാൻ സഹായിക്കുന്ന കോശം ഏത്?
- A) സൈലം കൂഴലുകൾ
 - B) പാലിസേഡ് കലകൾ
 - C) ആസ്യരന്ധ്രം
 - D) ഇവയൊന്നുമല്ല
31. മാംസ്യത്തിന്റെ അഭാവം മൂലം ഉണ്ടാകുന്ന രോഗം ഏത്?
- A) മരാസ്മസ്
 - B) മാലക്കണ്ണി
 - C) ക്വാഷിയോർക്കർ
 - D) അനീമിയ

32. വായിൽ ഉമിനീരിന്റെ സഹായത്തോടെ അന്നജത്തെ എന്താക്കി മാറ്റുന്നു?
- A) മാൾട്ടോസ്
 - B) ലാക്ടോസ്
 - C) ഗ്ലൂക്കോസ്
 - D) ഫ്രക്ടോസ്
33. വാൽമാക്രിയുടെ ശ്വസനാവയവമാണ്.?
- A) ശകുലങ്ങൾ
 - B) ബാഹ്യശകുലങ്ങൾ
 - C) തിക്ക്
 - D) ശ്വാസകോശങ്ങൾ
34. പ്രകാശസംശ്ലേഷണത്തിലെ ഇരുണ്ടഘട്ടത്തെ സംബന്ധിച്ച് ശരിയായ പ്രസ്താവന ഏത്?
- A) ഇരുണ്ടഘട്ടം സൂര്യപ്രകാശത്തിൽ നടക്കുന്നില്ല
 - B) ഇരുണ്ടഘട്ടത്തിന് സൂര്യപ്രകാശത്തിന്റെ ആവശ്യമില്ല
 - C) ഇരുണ്ടഘട്ടം ആരംഭിക്കുമ്പോൾ സൂര്യപ്രകാശം ആവശ്യമാണ്
 - D) ഇരുണ്ടഘട്ടത്തിൽ ജലത്തിന്റെ വിഘടനത്തിന് സൂര്യപ്രകാശം ആവശ്യമാണ്
35. കൊഴുപ്പിൽ നിന്ന് കൂടുതൽ കലോറി ഊർജ്ജം ലഭിക്കുമെങ്കിലും ക്ഷീണിതനായ ഒരാൾക്ക് ക്ഷീണമകറ്റാൻ ഗ്ലൂക്കോസ് നൽകുന്നതിനു കാരണം.?
- A) കൊഴുപ്പിന് അരുചിയുള്ളതിനാൽ
 - B) ഗ്ലൂക്കോസിൽ നിന്ന് വേഗത്തിൽ ഊർജ്ജം സ്വതന്ത്രമാകുന്നു
 - C) കൊഴുപ്പ് ചില രോഗങ്ങൾക്കു കാരണമാകുന്നു.
 - D) ഗ്ലൂക്കോസ് വെള്ളത്തിൽ ലയിക്കുന്നതിനാൽ
36. താഴെ കാണിച്ചിരിക്കുന്ന പരീക്ഷണ സംവിധാനത്തിൽ ഒരു മണിക്കൂർ കഴിയുമ്പോൾ എന്തു മാറ്റം ഉണ്ടാകുന്നു?



- A) A യിലേക്ക് ഗ്ലൂക്കോസ് വ്യാപിക്കുന്നു
 B) B യിൽ ഗ്ലൂക്കോസിന്റെ ഗാഢത കുറയുന്നു
 C) B യിൽ ഗ്ലൂക്കോസിന്റെ ഗാഢത കൂടുന്നു
 D) ഇതുമൂന്നും സംഭവിക്കുന്നില്ല
37. വെള്ളത്തിൽ മുങ്ങിത്താഴുമ്പോഴും തൊണ്ടയിൽ അന്യ വസ്തുക്കൾ കൂടുങ്ങുമ്പോഴും ഓക്സിജന്റെ ലഭ്യത കുറയുകയും ശ്വാസതടസ്സം അനുഭവപ്പെടുകയും ചെയ്യുന്നു. ഈ അവസ്ഥയെ എന്തുപറയുന്നു?
 A) ആസ്മ
 B) ആസ്മിക്സിയ
 C) ക്ഷയം
 D) സിലിക്കോസിസ്
38. ഹൃദയപേശികൾ ഏതുതരം?
 A) അനൈശ്ചികം
 B) ഐശ്ചികം
 C) വരകളില്ലാത്തവ
 D) ഇവയൊന്നുമല്ല
39. ബയോടെക്നോളജിയുടെ സംഭാവനയെന്ത്?
 A) ജനിതക എൻജിനീയറിങ്ങ്
 B) ടിഷ്യൂകൾച്ചർ
 C) ക്ലോണിങ്ങ്
 D) ഇവയെല്ലാം
40. കോശത്തിലെ എല്ലാ പ്രവർത്തനങ്ങളുടേയും നിയന്ത്രണകേന്ദ്രമേത്?
 A) കോശസ്തരം
 B) മൈറ്റോകോൺഡ്രിയ
 C) മർമ്മം
 D) കോശദ്രവ്യം

APPENDIX -V
UNIVERSITY OF CALICUT

ACHIEVEMENT TEST IN BIOLOGY FOR IX STANDARD PUPILS
(FINAL)

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DIRECTIONS:

1. This is a biology test. A separate answer sheet given to mark your responses. Do not mark or write anything in the question paper.
2. Each question carries four alternatives A, B, C and D. Among them, only one is correct. Each question in the answer sheet also carries four alternatives A, B, C and D. Find out the correct answer and put an 'X' mark against the appropriate alternative.
3. Try to answer all the questions.

Example:

1. Which is the primary source of energy in an ecosystem.

A. Air B. Sunlight C. Water D. Soil

1	A	X	C	D
---	---	--------------	---	---

-
1. Which is the most suitable condition for the sustainable development of our country?
 - A) Population growth and livelihood through agriculture
 - B) Population growth and industrialization
 - C) Population control and living through agriculture
 - D) Population control and nature exploitation
 2. Which is the most suitable cultivation method that exploit high and low availability of sunlight?
 - A) Group farming
 - B) Mixed cropping
 - C) Rotation of crops
 - D) All the above

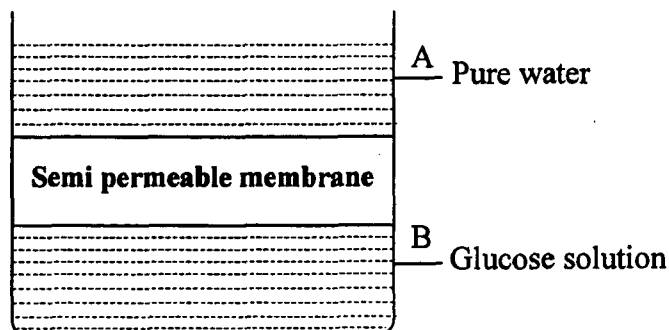
3. Which is wave-like movement of alimentary canal?
 - A) Paralysis
 - B) Hepatitis
 - C) Dialysis
 - D) Peristalsis
4. Name the scientific branch which is related to growing of flowering plants?
 - A) Apiculture
 - B) Horticulture
 - C) Sericulture
 - D) Floriculture
5. What do you mean by vital capacity?
 - A) The volume of forcibly exhaled air after the deepest inhalation
 - B) The volume of normal exhaled air after the normal inhalation
 - C) The volume of air that remains in the lungs after the exhalation
 - D) The volume of air that we take in by inhalation
6. Through research it was found that there is a decrease in the productivity of main crop in an area by virus disease. Which is the most suitable disease control strategy in that area?
 - A) Use of high concentrated chemical pesticides in small quantity.
 - B) Use of lower concentrated chemical pesticides in high quantity.
 - C) Use of natural pesticides.
 - D) Control of spreading the disease by destroying the virus affected plants.
7. Which is the most correct statement in the following?
 - A) There is no heterotrophs without plants
 - B) There is no plants without animals
 - C) There is no other living organisms without man.
 - D) Man can live without plants.
8. Which of the following statement is correct?
 - A) Saliva helps in the digestion of carbohydrate
 - B) Saliva helps in the digestion of protein
 - C) Saliva helps in the digestion of fat.
 - D) Saliva helps in the digestion of glucose.
9. Which is the basic unit of protein?
 - A) Glucose
 - B) Fat
 - C) Amino acid
 - D) Muscle

10. Which organ is affected by tuberculosis disease
- A) Muscle.
 - B) Bone.
 - C) Liver.
 - D) Lungs.
11. Which part of the body of amoeba helps in the ingestion of food?
- A) Nucleus
 - B) Pseudopodia
 - C) Contractile vacuole
 - D) Mouth
12. Which is the algae used by space men in their special chambers?
- A) Chlorella
 - B) Chloroplast
 - C) Chlorophin
 - D) Chloroform
13. Which is the respiratory organ of spider?
- A) Gills
 - B) Trachea
 - C) Book lungs
 - D) Tracheoles
14. Which of the following organism use anaerobic respiration?
- A) Amphibians
 - B) Yeast
 - C) Plants
 - D) Virus
15. Who is the father of 'Genetics'?
- A) Charles Darwin
 - B) John Watson
 - C) Linneaus
 - D) Gregor Mendel
16. Which is the correct statement related to respiration?
- A) Takes place only in the presence of O_2 .
 - B) Takes place only in the absence of CO_2 .
 - C) Do not take place in plants.
 - D) Take place even in the absence of O_2 .

17. Which is the most suitable treatment for Lukemia?
- A) Blood transfusion.
 - B) Bone Marrow transplantation
 - C) Heart transplantation
 - D) Dialysis
18. In man curly hair is dominant characteristic and long hair is recessive character. Then what is the characteristic of hair in four offsprings of a father with long hair and a mother with curl hair?
- A) Four children have long hair
 - B) Four children have curl hair
 - C) Two children have curl hair and two children have long hair
 - D) Three children have curl hair and one has long hair
19. Which is the most suitable method for maintaining a species for ever?
- A) Prevention of deforestation
 - B) Prevention of hunting
 - C) Conservation of gene pool
 - D) Establishing national parks
20. What is the reason for the movement of food in the alimentary canal, even if we are sleeping?
- A) Because it is made up of voluntary muscles.
 - B) Because it is made up of involuntary muscles.
 - C) Because it is made up of striated muscles.
 - D) Because it is made up of bone muscles.
21. Name the organism which shows parthenogenesis.
- A) Planeria
 - B) Amoeba
 - C) Hydra
 - D) Honey bee
22. What is the scientific name of cat?
- A) Felis leo
 - B) Felis domestica
 - C) Panthera tigris
 - D) Pavo cristatus
23. Which of the following is a wrong statement?
- A) Horse hoof is an example of exoskeleton
 - B) Exoskeleton protects the body
 - C) Man has no exoskeleton
 - D) Feathers are exoskeleton

24. In man sex difference is determined by a pair of chromosomes. XX chromosome determines female and XY chromosome determines male. Then what is the basic factor which determines the sex of a child?
- A) Male gamete
 - B) Female gamete
 - C) Male and Female gamete
 - D) None of the above
25. Which type of joint is kneejoint?
- A) Ball and Socket joint
 - B) Hinge joint
 - C) Gliding joint
 - D) Pivot joint
26. What is meant by hermaphrodites?
- A) Organism having separate male and female gametes
 - B) Organism which does not produce male and female gametes
 - C) Organism having the capacity to change sex according to the surroundings.
 - D) Male and female gametes are present in the same organism.
27. Which of the following cattle disease is a threat even for the existence of man?
- A) Swelling of udder
 - B) Foot and Mouth disease
 - C) Anthrax
 - D) All the above
28. Which is the wrong statement?
- A) The sum total of all genes of a species is called its gene pool.
 - B) Gene pool may undergo changes through generations.
 - C) One species of organism can never breed with another species.
 - D) One species of organism can breed with another species.
29. Which revolution helps India for the development of Pisciculture?
- A) White revolution
 - B) Blue revolution
 - C) Green Revolution
 - D) None of the above
30. Which cell helps the plant to conduct water towards the leaves?
- A) Xylum vessels
 - B) Palisade cells
 - C) Stomata
 - D) None of the above

31. Which is the disease caused by protein deficiency?
- Marasmus
 - Nightblindness
 - Kwashiorker
 - Anemia
32. With the help of Saliva, starch is converted into what form?
- Maltose
 - Lactose
 - Glucose
 - Fructose
33. Which is the respiratory organ of tadpole?
- Gill filament
 - External gills
 - Skin
 - Lungs
34. Which is the correct statement related to dark reaction of photosynthesis.
- Dark reaction does not take place in the presence of sunlight.
 - Sunlight is not essential for dark reaction.
 - Sunlight is necessary in the beginning of dark reactions
 - Sunlight is necessary for the splitting of water in the dark reaction
35. What is the reason for giving glucose to a tired person, eventhough fat has large calorie content?
- Because fat has no taste
 - Because energy is released from glucose faster
 - Because fat causes some diseases
 - Because glucose is dissolved in water
36. What happens in the following experimental set up after one hour?



- Glucose spread into A
- The concentration of glucose decreased in B
- The concentration of glucose increased in B
- None of the above.

37. When a person sink in water or when any foreign objects obstruct the trachea, he may not be able to inhale air. What is the name of this condition?
- A) Asthma.
 - B) Asphyxia.
 - C) Tuberculosis.
 - D) Silicosis.
38. What is the characteristic of cardiac muscle?
- A) Involuntary
 - B) Voluntary
 - C) Non striated
 - D) None of the above
39. Which of the following is the contribution of Biotechnology?
- A) Genetic engineering
 - B) Tissue culture
 - C) Cloning
 - D) All the above
40. Which is the co-ordinating unit of all activities in a cell?
- A) Cell membrane
 - B) Mitochondria
 - C) Nucleus
 - D) Cytoplasm

APPENDIX -VI

RESPONSE SHEET OF ACHIEVEMENT TEST IN BIOLOGY-FINAL

Name of the Student..... Class & Division.....

Name of the School:.....Boy/Girl.....

1	A	B	C	D	21	A	B	C	D
2	A	B	C	D	22	A	B	C	D
3	A	B	C	D	23	A	B	C	D
4	A	B	C	D	24	A	B	C	D
5	A	B	C	D	25	A	B	C	D
6	A	B	C	D	26	A	B	C	D
7	A	B	C	D	27	A	B	C	D
8	A	B	C	D	28	A	B	C	D
9	A	B	C	D	29	A	B	C	D
10	A	B	C	D	30	A	B	C	D
11	A	B	C	D	31	A	B	C	D
12	A	B	C	D	32	A	B	C	D
13	A	B	C	D	33	A	B	C	D
14	A	B	C	D	34	A	B	C	D
15	A	B	C	D	35	A	B	C	D
16	A	B	C	D	36	A	B	C	D
17	A	B	C	D	37	A	B	C	D
18	A	B	C	D	38	A	B	C	D
19	A	B	C	D	39	A	B	C	D
20	A	B	C	D	40	A	B	C	D

APPENDIX -VII

SCORING KEY OF ACHIEVEMENT TEST IN BIOLOGY (FINAL)

1	C
2	B
3	D
4	D
5	A
6	D
7	A
8	A
9	C
10	D
11	B
12	A
13	C
14	B
15	D
16	D
17	B
18	B
19	C
20	B

21	D
22	B
23	C
24	A
25	B
26	D
27	C
28	D
29	B
30	A
31	C
32	A
33	B
34	B
35	B
36	B
37	B
38	B
39	D
40	C

APPENDIX - VIII

FAROOK TRAINING COLLEGE, CALICUT

SCIENCE APTITUDE TEST

(1998)

ABDUL GAFOOR. K.

Lecturer

Farook Training College

PRIYA.K.P.

M.Ed Student

പൊതു നിർദ്ദേശങ്ങൾ

നിങ്ങളുടെ ശാസ്ത്ര സംബന്ധമായ അഭിരുചി അളക്കുന്നതിനുള്ള ശോധകമാണിത്. ഈ ടെസ്റ്റിന് അഞ്ചു ഭാഗങ്ങളുണ്ട്. ഓരോ ഭാഗവും ഒരു നിശ്ചിത സമയത്തിനുള്ളിൽ ചെയ്തു തീർക്കാനുള്ളതാണ്. ഓരോ ഭാഗത്തിനും അനുവദിച്ചിട്ടുള്ള സമയ പരിധി അതാതിന്റെ ആരംഭ ഭാഗത്ത് നൽകിയിട്ടുണ്ട്. ഓരോ ഭാഗത്തിനും നിർദ്ദേശം ലഭിക്കുമ്പോൾ മാത്രം ഉത്തരം എഴുതാൻ ആരംഭിക്കുക. ഉത്തരങ്ങൾ അടയാളപ്പെടുത്തുന്നതിന് ഇതിനോടു കൂടെ പ്രത്യേകം ഉത്തരക്കടലാസ് നൽകിയിട്ടുണ്ട്. ഉത്തരങ്ങൾ ഉത്തരക്കടലാസിൽ, ഓരോ ഭാഗത്തോടും അനുബന്ധിച്ച് നൽകിയിട്ടുള്ള നിർദ്ദേശപ്രകാരം അടയാളപ്പെടുത്തുക.

(ആവശ്യപ്പെടുമ്പോൾ മാത്രം പുറം മറിക്കുക)

SUB TEST - 1

നിർദ്ദേശങ്ങൾ :-

താഴെ ഓരോ വരിയിലും രണ്ട് സെറ്റ് സംഖ്യകൾ നൽകിയിരിക്കുന്നു. ആദ്യസെറ്റ് സംഖ്യകൾ ഒരു പ്രത്യേക ക്രമം പാലിച്ചിരിക്കുന്നു. ഈ ക്രമം മനസ്സിലാക്കിയ ശേഷം “_____” ഇട്ട ഭാഗത്ത് വരുന്ന സംഖ്യ ഏതെന്ന് രണ്ടാമത്തെ സെറ്റിൽ നിന്ന് തെരഞ്ഞെടുത്ത് അതിനെ സൂചിപ്പിക്കുന്ന A,B,C,D,E എന്നീ അക്ഷരങ്ങളിൽ അനുയോജ്യമായി തന്നിരിക്കുന്ന ഉത്തരക്കടലാസിൽ ‘X’ അടയാളമിട്ട് രേഖപ്പെടുത്തുക.

ഉദാഹരണം:
(i) 0,1,2,3,4-

ഉത്തരക്കടലാസ്				
A	B	C	D	E
0	4	5	8	9

വിശദീകരണം: ഇവിടെ “_____” ന്റെ സ്ഥാനത്ത് വരാവുന്ന സംഖ്യ 5 ആണല്ലോ. അതിനാൽ 5 നെ സൂചിപ്പിക്കുന്ന C എന്ന അക്ഷരം ഉത്തരക്കടലാസിൽ X എന്ന് അടയാളപ്പെടുത്തിയിരിക്കുന്നു.

		A	B	C	D	E
1	1,3,9,27, _____	21	81	9	12	18
2	34,45,56,67, _____	73	82	78	75	84
3	4,6,12,14,28, _____	32	30	62	64	75
4	4,9,16,25, _____	49	36	81	64	144
5	2,4,7,11,16,22, _____	24	23	28	29	35
6	5,10,13,16,18,58, _____	64	125	122	61	128
7	1,2,4,8,16,32, _____	154	64	128	148	130
8	2,4,12,48,240, _____	960	1080	1920	1440	1560
9	2,2,6,12,20,30,42, _____	72	70	56	64	60
10	3,15,75, _____ 1875,9375	625	150	125	375	275
11	3,13,23,33, _____, 53,	63	73	43	53	23
12	4,8,4,12,4;16,4, _____	20	24	18	28	30
13	1,3,6,8,16,18, _____	20	36	32	28	34
14	5,7,11,13,17, _____	21	52	43	19	28
15	8,14,26,50, _____	48	55	63	98	78

SUB TEST - 11

നിർദ്ദേശങ്ങൾ :-

താഴെ കൊടുത്തിരിക്കുന്ന ചോദ്യങ്ങൾ വായിച്ച് ABCD എന്നീ ഉത്തരങ്ങളിൽ ഏറ്റവും അനുയോജ്യമായത് തിരഞ്ഞെടുത്ത് തന്നിരിക്കുന്ന ഉത്തരക്കടലാസിൽ 'X' ചിഹ്നം കൊണ്ട് അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

(i) താഴെ കാണുന്നവയിൽ ഏറ്റവും കൂടുതൽ ആയുർദൈർഘ്യം ഉള്ള ജീവി ഏത്?

a) ആന	b) മനുഷ്യൻ
c) നീല തിമിംഗലം	d) ആമ

ഉത്തരക്കടലാസ്

(i) A B C **D**

1. സഞ്ചരിക്കുന്ന വാഹനത്തിൽ നിന്ന് ഒരാൾ ചാടിയാൽ അയാൾ മുന്നോട്ട് ആയുുന്നത് എന്തുകൊണ്ട്?
a) താരണം b) പ്രവേഗം c) ജഡത്വം d) പിണ്ഡം
2. ഏത് ഭാഗമാണ് കമ്പ്യൂട്ടറിന്റെ പ്രവർത്തനത്തെ നിയന്ത്രിക്കുന്നത്?
a) മോണിറ്റർ b) സി.പി.യു. c) ഹാർഡ് ഡിസ്ക് d) എ.എൽ.യു
3. ഭൂമിയുടെ ഉപരിതലത്തിൽ നിന്ന് മുകളിലോട്ട് പോകും തോറും അന്തരീക്ഷ വായുവിന് എന്തു സംഭവിക്കുന്നു?
a) കൂടുതൽ നീലനിറമാകുന്നു. b) സാന്ദ്രത കൂടുന്നു c) സാന്ദ്രത കുറയുന്നു d) ഇവയൊന്നുമല്ല.
4. താഴെ കൊടുത്തിരിക്കുന്നവയിൽ ഏതിന്റെ ഉപയോഗമാണ് ചുട്ടുകാലത്ത് കുറയ്ക്കേണ്ടത്?
a) മാംസ്യം b) വിറ്റാമിൻ c) കൊഴുപ്പ് d) സ്പോർച്ച്
5. ഒരു കുതിര ശക്തി എതിന് സമമാണ്?
a) 750 വാട്ട് b) 700 വാട്ട് c) 720 വാട്ട് d) 746 വാട്ട്
6. ചുവന്ന പ്രകാശം അപകട സൂചകമായി ഉപയോഗിക്കാൻ കാരണമെന്ത്?
a) ഒരു പ്രതീകമായി സ്വീകരിച്ചതുകൊണ്ട് b) കണ്ണിന് സുഖകരമായതുകൊണ്ട്
c) കണ്ണിനെ ഉദ്ദീപിപ്പിക്കുന്നതുകൊണ്ട് d) കൂടിയ തരംഗദൈർഘ്യം ഉള്ളതുകൊണ്ട്.
7. ഓർബിറ്റലുകളുടെ ഊർജ്ജം കൂടുന്നതനുസരിച്ചുള്ള ശരിയായ ക്രമം ഏത്?
a) 3S<3P<4S<3d b) 3S<3P<3d<4S c) 3S<4S<3P<3d d) 3S<4S<3d<3P
8. AIDS രോഗം പകരുന്നത് ഏതിലൂടെയാണ്
a) ത്വക്ക് b) വായ് c) രക്തം d) കഹരം
9. ജലത്തിന്റെ കഠിനതയ്ക്ക് കാരണമെന്ത്?
a) ജലത്തിലെ മാലിന്യം
b) ജലത്തിൽ ലയിച്ച സോഡിയത്തിന്റെ സാന്നിദ്ധ്യം
c) കാൽസ്യത്തിന്റെയും മഗ്നീഷ്യത്തിന്റെയും ജലത്തിൽ ലയിക്കുന്ന സംയുക്തങ്ങളുടെ സാന്നിദ്ധ്യം
d) ജലത്തിൽ ലയിക്കുന്ന ഫോസ്ഫറസ് സംയുക്തങ്ങളുടെ സാന്നിദ്ധ്യം
10. കോബാൾട്ടിന്റെ പ്രതീകം ഏത്?
a) CO b) Cb c) Co d) C
11. ഇലക്ട്രോൺ മൈക്രോസ്കോപ്പിൽ ഉപയോഗിക്കുന്ന ലൈറ്റിന്റെ ദ്രസ്രാതസ്സ് ഏത്?
a) സൂര്യപ്രകാശം b) ഇലക്ട്രോണുകളുടെ കിരണാവലി
c) അൾട്രാവയലറ്റ് രശ്മികൾ d) എക്സ്റേ
12. ആറ്റോമിക് സംഖ്യ 10 ആയ മൂലകത്തിന്റെ P ഇലക്ട്രോണുകളുടെ ആകെ എണ്ണം എത്ര?
a) 8 b) 10 c) 7 d) 6
13. സസ്യങ്ങളിൽ നടക്കുന്ന പ്രകാശസംശ്ലേഷണത്തിന്റെ യഥാർത്ഥ ഊർജ്ജ ദ്രസ്രാതസ്സ് ഏത്?
a) CO₂ b) സൂര്യൻ c) മണ്ണ് d) ധാതുക്കൾ

14. ശൂന്യതയിൽ പ്രകാശത്തിന്റെ പ്രവേഗം എത്ര?
 a) 3×10^8 m/s b) 3×10^8 cm/s c) 3×10^6 m/s d) 3×10^6 cm/s
15. ഊർജ്ജത്തെ എങ്ങിനെ നിർവചിക്കാം?
 a) പ്രവൃത്തി ചെയ്യുന്ന നിരക്ക് b) പ്രവൃത്തി ചെയ്യാനുള്ള കഴിവ്
 c) പ്രവേഗവും സമയവും തമ്മിലുള്ള അനുപാതം d) ഇവയൊന്നുമല്ല.
16. ഗ്ലൂക്കോസ്സിന്റെ രാസസമവാക്യം ഏത്?
 a) $C_{12}H_{12}O_6$ b) $C_6H_6O_{12}$ c) $C_6H_{12}O_6$ d) $C_{12}H_6O_6$
17. സൂര്യപ്രകാശത്തിന്റെ സഹായത്തോടെ ത്വക്കിൽ ഉൽപ്പാദിപ്പിക്കുന്ന വിറ്റാമിൻ ഏത്?
 a) വിറ്റാമിൻ A b) വിറ്റാമിൻ B c) വിറ്റാമിൻ C d) വിറ്റാമിൻ D
18. ആറ്റത്തിനോട് ഇലക്ട്രോൺ ബന്ധപ്പെട്ടിരിക്കുന്നതുപോലെ ആറ്റം എന്തിനോട് ബന്ധപ്പെട്ടിരിക്കുന്നു?
 a) ഊർജ്ജം b) സംയുക്തം c) പവർ d) തന്മാത്ര
19. ആഹാരത്തിന്റെ ഏറ്റവും പ്രധാനപ്പെട്ട ധർമ്മം എന്ത്?
 a) വിശപ്പിനെ ശമിപ്പിക്കുന്നു b) രുചി ആസ്വാദകമൊക്കുന്നു
 c) ഊർജ്ജം ഉൽപ്പാദിപ്പിക്കപ്പെടുന്നു. d) ശരീര വളർച്ചയെ സഹായിക്കുന്നു.
20. ഒരു ചെടിയിലെ പുഷ്പം ഏത് പ്രക്രിയ നിർവഹിക്കാൻ സഹായിക്കുന്നു?
 a) വിത്ത് വിതരണത്തിന് b) ഭക്ഷണം പാകം ചെയ്യുന്നതിന്
 c) ഭക്ഷണം സംഭരിക്കുന്നതിന് d) പ്രത്യുൽപ്പാദനത്തിന്
21. നെഫ്രിഡിയ മണ്ണിരയോട് ബന്ധപ്പെട്ടിരിക്കുന്നതു പോലെ മാൽപീജിയൻ നാളികൾ എന്തിനോട് ബന്ധപ്പെട്ടിരിക്കുന്നു.
 a) ഏകകോശജീവി b) ഷഡ്‌പദങ്ങൾ c) പക്ഷികൾ d) മനുഷ്യൻ
22. എപ്പോഴാണ് സൂര്യപ്രകാശത്തിന്റെ വിവിധ വർണ്ണങ്ങൾ നമുക്ക് കാണാൻ കഴിയുന്നത്?
 a) സൂര്യപ്രകാശം ഒരു കണ്ണാടിയിൽ പതിക്കുമ്പോൾ
 b) സൂര്യപ്രകാശം ഒരു കട്ടി കുറഞ്ഞ ഗ്ലാസ്സിലൂടെ കടന്നുപോകുമ്പോൾ
 c) സൂര്യപ്രകാശം ഒരു കട്ടിയുള്ള ഗ്ലാസ്സിലൂടെ കടന്നുപോകുമ്പോൾ
 d) സൂര്യപ്രകാശം ഒരു പ്രിസത്തിലൂടെ കടന്നുപോകുമ്പോൾ
23. ക്രോമസോമുകൾ എന്തുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു?
 a) ശരീരവളർച്ച b) ശ്വാസം
 c) പാരമ്പര്യ സ്വഭാവങ്ങളുടെ സംപ്രേഷണം d) സ്വാംശീകരണം
24. താഴെ കൊടുത്തിരിക്കുന്നവയിൽ ഒരു രാസപ്രവർത്തനത്തെ സംബന്ധിച്ച് ശരിയായതേത്?
 a) ചെറിയതോതിൽ താപം പുറത്തേക്ക് വിടുന്നു.
 b) ചെറിയതോതിൽ താപം ആഗിരണം ചെയ്യുന്നു.
 c) രാസപ്രവർത്തനത്തോടനുബന്ധിച്ച് ഊർജ്ജമറ്റം സംഭവിക്കുന്നു.
 d) രാസപ്രവർത്തനത്തോടനുബന്ധിച്ച് ഊർജ്ജം സംഭവിക്കുന്നു.
25. ഓം പ്രതിരോധവുമായി ബന്ധപ്പെട്ടിരിക്കുന്നതു പോലെ വാട്ട് എന്തുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു?
 a) വൈദ്യുതി b) പ്രവൃത്തി c) പവർ d) ഊർജ്ജം

SUB TEST - 11I

നിർദ്ദേശങ്ങൾ : -

ശാസ്ത്രീയമായ ചില പ്രശ്നങ്ങൾ താഴെ കൊടുത്തിരിക്കുന്നു. ഈ പ്രശ്നങ്ങൾക്ക് ഏറ്റവും അനുയോജ്യമായ ഉത്തരം A,B,C,D, എന്നിവയിൽ നിന്നും തിരഞ്ഞെടുത്ത് അത് തിരഞ്ഞെടുക്കുന്ന ഉത്തരകടലാസിൽ 'X' അടയാളമിട്ട് രേഖപ്പെടുത്തുക.

ഉദാഹരണം:

(i) പ്രൈമറിയിൽ 5000 ഉം സെക്കന്ററിയിൽ 250 ഉം ചുറ്റുകൾ ഉള്ള ഒരു ട്രാൻസ്ഫോർമറിന്റെ പ്രൈമറിയിൽ ഉപയോഗിക്കുന്ന വോൾട്ടേജ 240 V ആയാൽ സെക്കന്ററിയിൽ ലഭ്യമാകുന്ന വോൾട്ടേജ എത്രയായിരിക്കും?

a) 15 V b) 10 V c) 8 V d) 12 V

ഉത്തരകടലാസ്			
A	B	C	X

വിശദീകരണം:

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

$V_s = ? \quad N_s = 250$
 $V_p = 240 \quad N_p = 5000$

$$V_s = \frac{V_p \times N_s}{N_p} = \frac{240 \times 250}{5000} = 12V$$

അതിനാൽ ഉത്തരം D

1. ഒരു മിനുട്ടിൽ ഒരു പ്രാവശ്യം ശ്വാസോച്ഛ്വാസം ചെയ്യുന്നു. ഓരോ ശ്വാസത്തിനും അയാൾ 0.5 ലിറ്റർ ഓക്സിജൻ സ്വീകരിക്കുന്നു. അങ്ങനെ എങ്കിൽ 1 മണിക്കൂറിൽ അയാൾ ഉപയോഗിക്കുന്ന ഓക്സിജന്റെ അളവ് എത്ര?

a) 300 ലിറ്റർ b) 80 ലിറ്റർ c) 30 ലിറ്റർ d) 15 ലിറ്റർ
2. ഒരു മീറ്റർ നീളമുള്ള ഒരു ചരടിന്റെ അറ്റത്ത് 200 ഗ്രാം പിണ്ഡമുള്ള ഒരു കല്ലുകെട്ടി മറ്റേ അറ്റത്ത് പിടിച്ചുകൊണ്ട് തിരശ്ചീനതലത്തിൽ വട്ടം കറക്കുന്നു. കല്ലിന്റെ ചലനവേഗത 10^3 /s ആയാൽ അഭികേന്ദ്രബലം കണക്കാക്കുക

a) 18 N b) 20 N c) 24 N d) 30 N
3. 250 മീറ്റർ നീളമുള്ള ഒരു ട്രെയിൻ 12 സെക്കന്റ് കൊണ്ട് ഒരു കേന്ദ്രബിന്ദുവിലൂടെ കടന്നു പോവുകയാണെങ്കിൽ അതിന്റെ വേഗത എത്ര?

a) 25.കി.മീ/മണിക്കൂർ b) 75.കി.മീ/മണിക്കൂർ c) 72.കി.മീ/മണിക്കൂർ d) 54.കി.മീ/മണിക്കൂർ
4. ഒരു ഇലക്ട്രോണിന്റെ മാസ് 9.11×10^{-31} ഗ്രാം ആണെങ്കിൽ 1 ഗ്രാമിൽ അടങ്ങിയിരിക്കുന്ന ഇലക്ട്രോണുകളുടെ എണ്ണം എത്ര?

a) 1.09×10^{27} b) 2.56×10^{24} c) 6×10 d) 2.59×10^{20}
5. 'm' kg. പിണ്ഡവും Vm/s പ്രവേഗവുമുള്ള ഒരു വസ്തുവിന്റെ ഗതികോർജ്ജം എന്ത്?

a) mv b) mv² c) mv²/2 d) 2mv
6. പ്രതിരോധമുള്ള 5 പ്രതിരോധങ്ങൾ ഒരാളുടെ കയ്യിലുണ്ട് ഇവയെ സംയോജിപ്പിച്ച് കിട്ടുന്ന ഏറ്റവും കൂടിയ പ്രതിരോധം എത്ര?

a) $2/5 \Omega$ b) $1/5 \Omega$ c) 5Ω d) 1Ω

7. ഒരു മുഖകത്തിന്റെ ആറ്റോമികഭാരവും ആറ്റോമികനമ്പരും യഥാക്രമം W, N എന്നിവയാണ്, എങ്കിൽ ആ മുഖകത്തിലെ ആറ്റത്തിൽ എത്ര ന്യൂട്രോണുകൾ ഉണ്ടായിരിക്കും.
 a) W b) N c) $W-N$ d) $N+W$

8. ഒരു വസ്തുവിന്റെ പ്രവേഗം 'u' വിൽ നിന്നും V ആയി മാറാൻ t സെക്കന്റ് എടുക്കുന്നുവെങ്കിൽ അതിന്റെ ത്വരണം എത്ര?
 a) $a = \frac{u-v}{t}$ b) $a = (u-v)t$ c) $a = (v+u)t$ d) $a = \frac{v-u}{t}$

9. താഴെ കൊടുത്തിരിക്കുന്നവയിൽ ഉത്തരാമകങ്ങളെ സംബന്ധിച്ച തത്വമേത്?
 a) യത്നം \times രോധം = യത്നജ്ജം \times രോധജ്ജം
 b) യത്നം \times യത്നജ്ജം = രോധം \times രോധജ്ജം
 c) യത്നം \times രോധജ്ജം = രോധം \times യത്നജ്ജം
 d) യത്നം \times യത്നജ്ജം = രോധം \times രോധജ്ജം

10. 5 ഡസൻ നേഗ്രതപ്പഴത്തിന്റെ വില 90 രൂപ ആണെങ്കിൽ 20 പഴത്തിന്റെ വില എത്ര?
 a) 150 b) 90 c) 50 d) 30

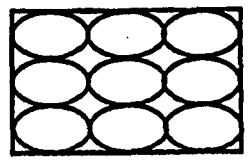
11. 3 മോളാർ വിദ്യമുള്ള 3 ലിറ്റർ സോഡിയം ക്ലോറൈഡ് ലായനിയിലടങ്ങിയിരിക്കുന്ന മോളുകളുടെ എണ്ണം എത്ര?
 a) 1 b) 3 c) 9 d) 27

12. 'f' ഫോക്കസ് ദൂരമുള്ള ഒരു ചെറുസീന്റെ പ്രകാശകേന്ദ്രത്തിൽ നിന്ന് വസ്തുവിലേക്കുള്ള ദൂരം 'u' വും പ്രതിബിംബത്തിലേക്കുള്ള ദൂരം 'v' യും ആണെങ്കിൽ താഴെ കൊടുത്തിരിക്കുന്നവയിൽ എത്ര ബന്ധമാണ് ചെറുസീനെ സംബന്ധിച്ച് ശരിയായത്
 a) $u + v = f$ b) $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ c) $u + v = \frac{1}{f}$ d) $\frac{1}{u} - \frac{1}{v} = \frac{1}{f}$

13. ഒരു നിറമില്ലാത്ത A എന്ന വാതകം ചുണ്ണാമ്പുവെള്ളത്തെ പാൽനിറമാക്കുന്നു. അതിനെ ചുടാക്കിയ പാർക്കോളിലൂടെ കടത്തിവിടുമ്പോൾ ഇളം നീല നിറത്തിൽ കത്തുന്ന B എന്ന വാതകമായി മാറുന്നു. 1 ലിറ്റർ A പാർക്കോളിലൂടെ കടത്തിവിടുമ്പോൾ എത്ര വ്യാപ്തം B കിട്ടും?
 a) 1 ലിറ്റർ b) 500 മില്ലി c) 2 ലിറ്റർ d) 1.5 ലിറ്റർ

14. ഒരു ബിന്ദുവിൽ സ്ഥിതി ചെയ്യുന്ന 3 കിഗ്രാം ഭാരമുള്ള ഒരു വസ്തുവിൽ അനുഭവപ്പെടുന്ന ഗുരുത്വാകർഷണബലം 45 ന്യൂട്ടൺ ആണ്. എന്നാൽ ആ ബിന്ദുവിൽ അനുഭവപ്പെടുന്ന ഗുരുത്വാകർഷണ മണ്ഡലത്തിന്റെ തീവ്രത എത്ര?
 a) 9.8ms^{-2} b) ന്യൂട്ടൺ c) $1/15$ ന്യൂട്ടൺ/കി.ഗ്രാം d) 135 ന്യൂട്ടൺ

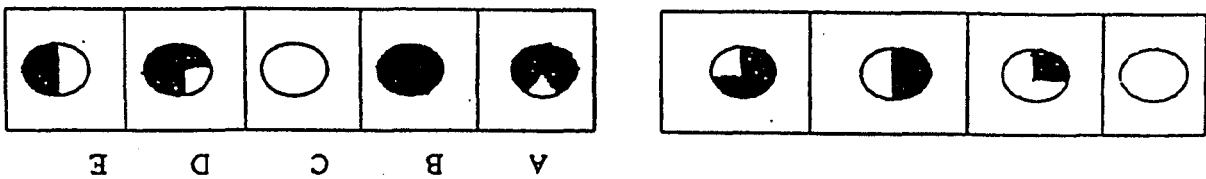
15. താഴെ കൊടുത്തിരിക്കുന്ന ചിത്രത്തിലെ ഓരോ വൃത്തത്തിന്റെയും വ്യാസം 'd' ആണെങ്കിൽ, അതിലെ ചതുരത്തിന്റെ വിസ്തീർണ്ണം എത്ര?
 a) $3d^2$ b) $9d^2$ c) $9d$ d) $4d^2$



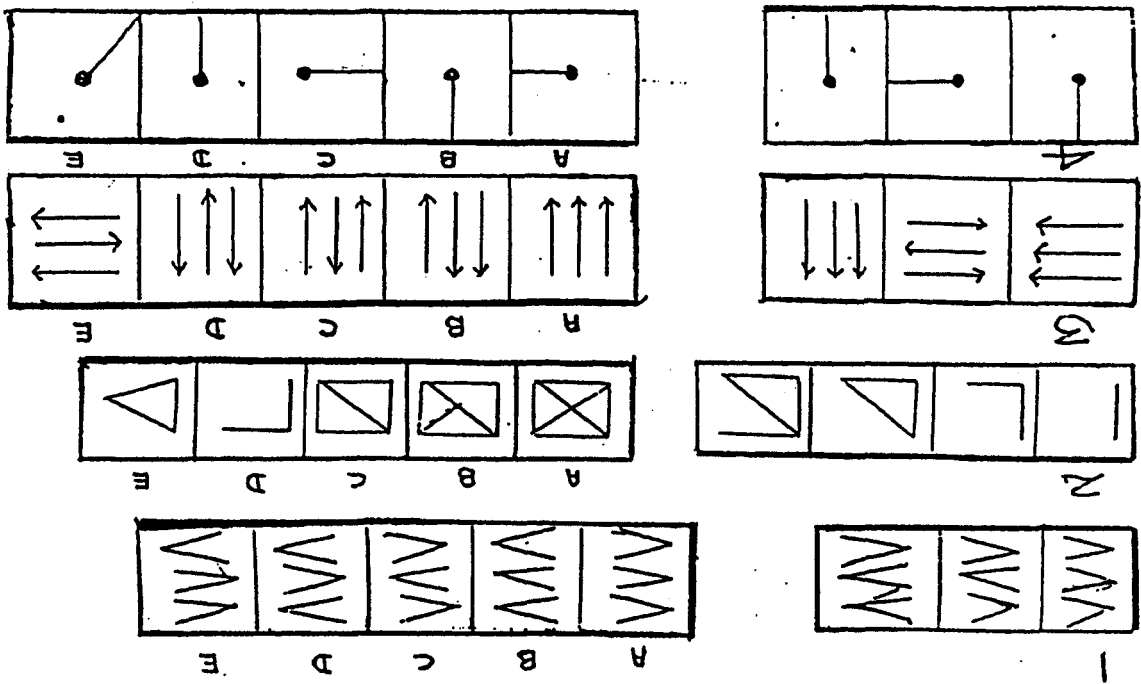
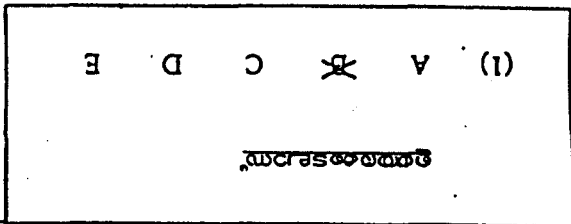
SUBTEST - IV

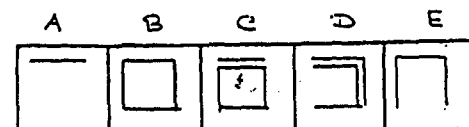
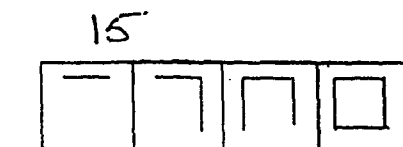
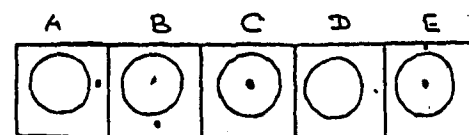
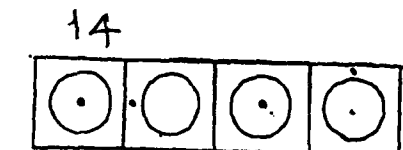
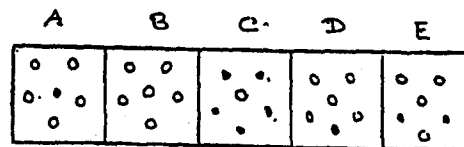
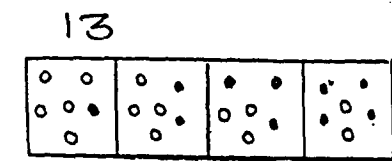
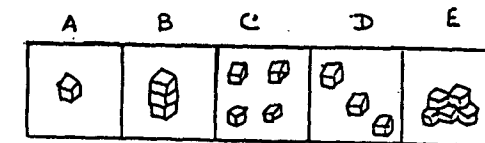
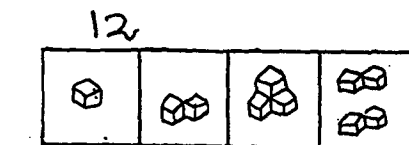
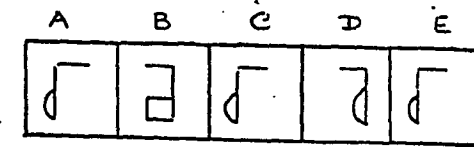
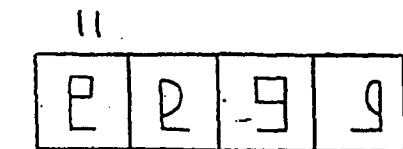
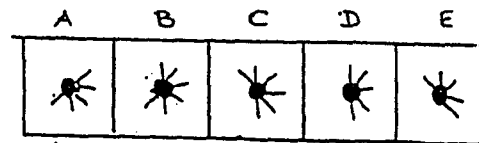
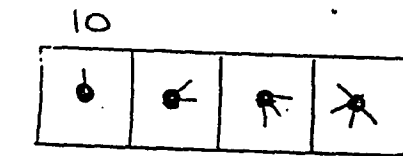
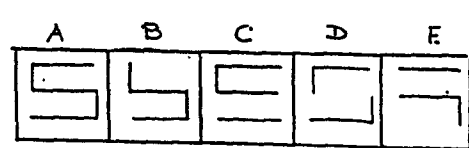
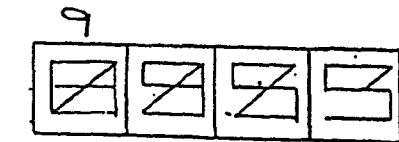
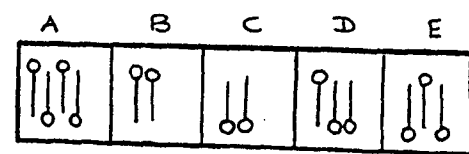
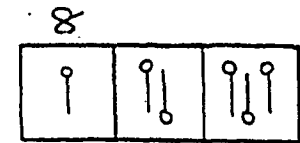
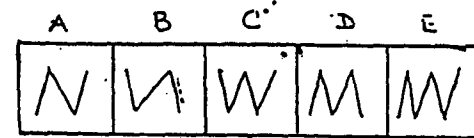
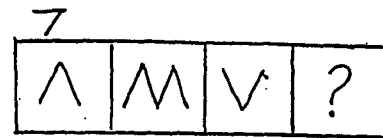
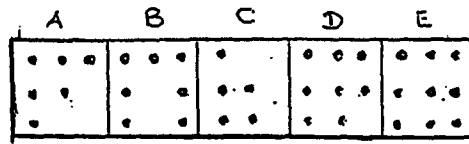
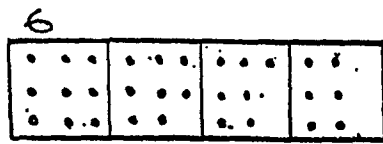
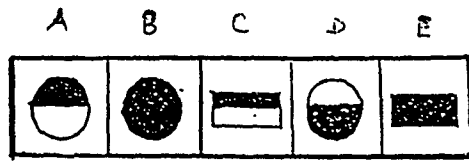
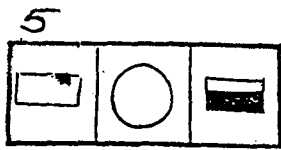
നാലുപറ്റു പരിശീലനം രണ്ട് കൂട്ടം ചിത്രങ്ങൾ നൽകിയിരിക്കുന്നു. ആദ്യത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്. രണ്ടാമത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്. രണ്ടാമത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്. രണ്ടാമത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്.

രേഖാശബ്ദം



ഇവയുടെ ഏതെങ്കിലും ഒരു പറ്റു പരിശീലനം വെട്ടിയെടുത്തതാണ്. രണ്ടാമത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്. രണ്ടാമത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്. രണ്ടാമത്തെ പറ്റു പരിശീലനം ഒരു പലകയുടെ മേൽ വെട്ടിയെടുത്തതാണ്.





SUB TEST-V

Time: 2

നിർദ്ദേശങ്ങൾ:-

താഴെ കൊടുത്തിരിക്കുന്ന ഖണ്ഡികകളും പ്രസ്താവനകളും വായിച്ചശേഷം നൽകിയിരിക്കുന്ന നിർദ്ദേശപ്രകാരം ഉത്തരങ്ങൾ അടയാളപ്പെടുത്തുക

ഖണ്ഡിക I

ആണവ ശക്തിക്ക് ഈ ലോകത്തെ മണ്ടോ അതിലധികമോ തവണ നശിപ്പിക്കാനുള്ള കഴിവുണ്ട്. അതേ പോലെതന്നെ നമുക്ക് കൂടുതൽ മെച്ചമായ ജീവിതസാഹചര്യങ്ങൾ പ്രദാനം ചെയ്യാനുള്ള കഴിവുമുണ്ട്. ഇതിൽ ഏത് വേണമെന്ന് തെരഞ്ഞെടുക്കേണ്ടവർ നാം തന്നെയാണ്.

തമിഴ് നാട്ടിലെ കൽപ്പാക്കത്തുള്ള രണ്ട് ആണവ റിയാക്ടറുകളിലായി 410 മെഗാവാട്ട് വൈദ്യുതി ഉല്പാദിപ്പിക്കപ്പെടുന്നുണ്ട്. ഇതിനായി ഏകദേശം 40 ടൺ യുറേനിയം മാത്രമാണ് ഉപയോഗിക്കപ്പെടുന്നത്. ഇതേ അളവിൽ വൈദ്യുതി ഉല്പാദിപ്പിക്കുന്ന ഒരു താപവൈദ്യുതി നിലയത്തിലാണെങ്കിൽ ആയിരക്കണക്കിന് ടൺ കൽക്കരി ഉപയോഗിക്കേണ്ടി വരുമായിരുന്നു. റിയാക്ടറുകളിൽ ഉപയോഗിച്ച യുറേനിയത്തിൽ നിന്ന് നമുക്ക് പ്ലൂട്ടോണിയം ഉപയോഗിച്ച യുറേനിയവുംകൂടിയ മിശ്രിതം ഫാസ്റ്റ് ബ്രീഡർ എന്ന റിയാക്ടറിൽ നിന്നാകട്ടെ ഉപയോഗിക്കുന്നതിനേക്കാൾ കൂടുതൽ പ്ലൂട്ടോണിയം നമുക്ക് തിരിച്ചു കിട്ടുന്നു. ഇനി മൂന്നാം ഘട്ടം ആരംഭിക്കുകയാണ്. ഇന്ത്യയിൽ സുലഭമായി ലഭിക്കുന്ന തോറിയം ഫാസ്റ്റ് ബ്രീഡറിൽ ഉപയോഗിക്കുക വഴി നമുക്ക് യുറേനിയായിഷ്ഠിതമായ ഒരു ഇന്ധനം ലഭിക്കുന്നു. ഈ ഇന്ധനം മൂന്നാം തലമുറ റിയാക്ടറിൽ നമുക്ക് ഉപയോഗിക്കാം. അങ്ങനെ ഭാവിയിലെ നമ്മുടെ വൈദ്യുതി ആവശ്യങ്ങൾക്കായി നാം ഉപയോഗിക്കേണ്ടി വരുന്നത് ഏതാനും ആയിരം ടൺ തോറിയവും യുറേനിയവും മാത്രം.

1. ലേഖകന്റെ അഭിപ്രായത്തിൽ പ്ലൂട്ടോണിയം ലഭ്യമാകുന്ന സ്രോതസ്സ്?
 - a) കൽക്കരയിൽ നിന്ന്
 - b) കടലിനടിയിൽ നിന്ന് വേർതിരിച്ചെടുക്കുന്നു.
 - c) ആണവ റിയാക്ടറുകളിൽ ഉപയോഗിച്ച യുറേനിയത്തിൽ നിന്ന് വേർതിരിച്ചെടുക്കാം
 - d) ഭൂഗർഭത്തിൽ നിന്ന് ദ്രുതമായി ലഭിക്കുന്ന അമൂല്യമായ ഒരു ലോഹം.
2. താഴെ കൊടുത്തിരിക്കുന്ന മൂന്ന് പ്രസ്താവനകൾ വായിച്ചശേഷം തന്നിരിക്കുന്ന a,b,c,d എന്നീ പ്രതികരണങ്ങളിൽ ഏറ്റവും ശരിയായത് തെരഞ്ഞെടുത്ത് അടയാളപ്പെടുത്തുക.

I ലോകത്തിന് കൂടുതൽ മെച്ചമായ ജീവിത സാഹചര്യങ്ങൾ പ്രദാനം ചെയ്യുവാനുള്ള കഴിവ് അണുശക്തിക്കുണ്ട്.

II ലോകത്തെ പലതവണ നശിപ്പിക്കാനുള്ള അപാരമായ കഴിവ് അണുശക്തിക്കുണ്ട്

III ലോകസമാധാനം സ്ഥാപിക്കാനുള്ള അപാരമായ കഴിവ് അണുശക്തിക്കുണ്ട്.

- a) ഒന്നാമത്തെ മാത്രം ശരി
- b) രണ്ടാമത്തെ മാത്രം ശരി
- c) മൂന്നാമത്തെ മാത്രം ശരി
- d) ഒന്നും രണ്ടും മാത്രം ശരി

3 കൽപ്പാക്കം ആണവ നിലയത്തെക്കുറിച്ചുള്ള പരാമർശങ്ങളിൽ സത്യവിരുദ്ധമായത് ഏതാണ്?

- a) അതിന്, നാലോ അഞ്ചോ റിയാക്ടറുകളുണ്ട്.
- b) ഈ ആണവനിലയത്തിലെ റിയാക്ടറുകൾ 410 മെഗാവാട്ട് വൈദ്യുതിക്ക് തുല്യമായ ഊർജ്ജം ഉൽപ്പാദിപ്പിക്കുന്നു.
- c) തമിഴ്നാട്ടിൽ സ്ഥിതി ചെയ്യുന്നു.
- f) ഈ ആണവ നിലയത്തിൽ ഉപയോഗിച്ച യുറേനിയത്തിൽ നിന്നും നമുക്ക് പ്ലൂട്ടോണിയം വേർതിരിച്ചെടുക്കാം

4 ഒരു ടൺ യുറേനിയത്തിൽ നിന്നും ഏകദേശം എത്ര മെഗാവാട്ട് വൈദ്യുതി ഉൽപ്പാദിപ്പിക്കാം?

- a) 10.25 മെഗാവാട്ട്
- b) 1.35 മെഗാവാട്ട്
- c) 2.75 മെഗാവാട്ട്
- d) 10 മെഗാവാട്ട്

5 പ്ലൂട്ടോണിയത്തിന്റെയും ഉപയോഗിച്ച യുറേനിയത്തിന്റെയും മിശ്രിതം എന്താവിശ്യത്തിനാണ് ഉപയോഗിക്കുന്നത്?

- a) ആറ്റം ബോംബ് നിർമ്മിക്കാൻ
- b) ഫാസ്റ്റ് ബ്രീഡർ റിയാക്ടറിൽ ഇന്ധനമായി ഉപയോഗിക്കുന്നു.
- c) പുതിയ ഒരു സംയുക്തം തയ്യാറാക്കാൻ
- d) യാതൊരു പ്രായോഗിക ഉപയോഗവും ഇല്ല.

- 6 നമ്മുടെ ഭാവിയ്ക്കുള്ള വൈദ്യുതി ആവശ്യങ്ങൾക്ക് എങ്ങനെ ഉത്തരം കണ്ടെത്താം
 - a) കഴിയാവുന്നത്ര ജലവൈദ്യുത പദ്ധതികൾ ഏർപ്പെടുത്തുക
 - b) കഴിയാവുന്നത്ര താപവൈദ്യുത നിലയങ്ങൾ സ്ഥാപിക്കുക.
 - c) സ്വകാര്യ സംരംഭകരെ സ്വന്തമായി വൈദ്യുത നിലയങ്ങൾ സ്ഥാപിക്കാൻ അനുവദിക്കുക.
 - d) ഏതാനും ആയിരം ടൺ യൂറേനിയവും തോറിയവും വൈദ്യുതി ഉല്പാദനത്തിനു വേണ്ടി വിനിയോഗിക്കുക.
- 7 ഈ ലേഖനത്തിന് നൽകാവുന്ന ഏറ്റവും ഉചിതമായ തലവാചകം
 - a) ആണവോർജ്ജത്തിന്റെ നേട്ടങ്ങൾ
 - b) ഇന്ത്യയിൽ ആണവോർജ്ജത്തിന്റെ പ്രാധാന്യം
 - c) ഇന്ത്യയിലെ താപവൈദ്യുതി നിലയങ്ങൾ
 - d) ഫാസ്റ്റ് ബ്രീഡർ റിയാക്ടർ.

ഖണ്ഡിക II-

ആശയവിനിമയത്തിനായി മനുഷ്യൻ ആധുനിക സങ്കേതങ്ങളായ ടെലഫോൺ, ടെലിവിഷൻ, ഇന്റർനെറ്റ് മുതലായവ ഉപയോഗിക്കുന്നു. നാം സ്വായത്തമാക്കിയ ഈ ആശയവിനിമയോപാധികളെല്ലാം പ്രാണിവർഗ്ഗങ്ങൾക്ക് ജന്മനാതന്നെ ലഭിച്ചിട്ടുണ്ട്. ശബ്ദം, വെളിച്ചം, ചലനം, രാസവസ്തുക്കൾ എന്നിവയിലൂടെയാണ് ഇവ ആശയ വിനിമയം സാധ്യമാക്കുന്നത്. ആശയവിനിമയത്തിന് ഉപയോഗിക്കുന്ന രാസ വസ്തുക്കളെ 'ഫിറമോൺസ്' എന്നു വിളിക്കുന്നു. പ്രാണികളുടെ വിവിധ ആവശ്യങ്ങൾക്കുള്ള വ്യത്യസ്ത ഫിറമോണുകൾ ഉത്പാദിപ്പിക്കുന്നത് ബാഹ്യസ്രാവഗ്രന്ഥികളാണ്. ജന്തുസ്രാവ ഗ്രന്ഥികളിലെ ഫോർമോണുകളിൽ നിന്നും വ്യത്യസ്തമായി ബാഹ്യസ്രാവ ഗ്രന്ഥികളിലെ സ്രവങ്ങൾ പ്രാണികളുടെ ശരീരത്തിനു പുറത്തേക്കാണ് വിടുന്നത്. ഫിറമോൺ സ്വീകരണികളാണ് പ്രാണികളുടെ അന്തഃപ്രതിരോധങ്ങൾ. രണ്ടു മൈൽ അകലെ വെച്ചുതന്നെ ഫിറമോൺ സാന്നിദ്ധ്യം പ്രാണികൾക്ക് മനസ്സിലാക്കാൻ കഴിയും. തേനീച്ചകൾ കിലോമീറ്ററുകളോളം യാത്ര ചെയ്താലും കൃത്യമായി കൂട്ടിൽ തിരിച്ചെത്തുന്നത് ഫിറമോണുകളുടെ സഹായത്തിലാണ്. ഉറുമ്പുകൾ അഭ്യൂഹമായ ഒരു ഫിറമോൺ രേഖ നിർമ്മിച്ചുകൊണ്ടാണ് സഞ്ചരിക്കുന്നത്. ഈ അഭ്യൂഹരേഖയെക്കുറിച്ചുള്ള ഉറുമ്പുകൾ ആശയക്കുഴപ്പത്തിലാകും. ഒരു വർഗ്ഗത്തിലുള്ള ഉറുമ്പുകളുടെ ഫിറമോണുകൾ മറ്റുള്ള വർഗ്ഗത്തിലെ ഫിറമോണുകളുമായി കലരുന്നില്ല. ചില തരം ഫിറമോണുകൾ കൂട്ടുകാർക്ക് അപായ സൂചന നൽകുന്നവയാണ്. ഉറുമ്പിൻ കൂട്ടത്തെയോ തേനീച്ച കൂട്ടത്തെയോ ആക്രമിച്ചാൽ അവ ഉടനെ തന്നെ തിരിച്ചുകൊണ്ടുവരുന്നത് ഫിറമോണിന്റെ സഹായത്തോടെയാണ്. കൃഷിക്ക് ദോഷകരമായ പ്രാണികളെ നശിപ്പിക്കാൻ മനുഷ്യൻ കീടനാശിനികൾ നിർമ്മിക്കുന്നുണ്ടെങ്കിലും അവയെ തരണം ചെയ്യാൻ ഇവയ്ക്ക് കഴിയുന്നത് ഫിറമോൺ എന്ന ആശയവിനിമയോപാധി ഉള്ളതുകൊണ്ടാണ്. ഈ

ആശയവിനിമയ ശൃംഖലയെ തകർത്താൽ മാത്രമേ ഉപദ്രവകാരികളായ കീടങ്ങളെ ഫലപ്രദമായി തടയാൻ കഴിയുകയുള്ളൂ.

- 8) ഫിറമോൺ എന്ന രാസവസ്തു പ്രാണികൾ എന്താവശ്യത്തിനാണ് ഉപയോഗിക്കുന്നത് ?
 - a) കൂട് നിർമ്മിക്കാൻ
 - b) കീടനശീകരണത്തിന്
 - c) ആശയവിനിമയത്തിന്
 - d) ജലത്തിൽ സഞ്ചരിക്കുന്നതിന്
- 9) പ്രാണികളിൽ ഏത് ഗ്രന്ഥിയാണ് ഫിറമോൺ ഉൽപാദിപ്പിക്കുന്നത്?
 - a) അന്തഃസ്രാവഗ്രന്ഥി
 - b) ആഗേയ ഗ്രന്ഥി
 - c) അഡ്രിനൽ ഗ്രന്ഥി
 - d) ബാഹ്യസ്രാവഗ്രന്ഥി
- 10) ദോഷഫലങ്ങൾ കൂടാതെ ഉപദ്രവകാരികളായ കീടങ്ങളെ തടയാനുള്ള ഒരു മാർഗ്ഗം ഏത്?
 - a) ജൈവവളങ്ങൾ ഉപയോഗിക്കുക
 - b) ഫിറമോൺ ശൃംഖല തകർക്കുക
 - c) അത്യൽപ്പാദന ശേഷിയുള്ള വിത്തുകൾ ഉപയോഗിക്കുക
 - d) രാസവസ്തുക്കൾ ഉപയോഗിക്കുക
- 11) ഉറുമ്പുകൾ പരസ്പരം കൂട്ടം തെറ്റിപ്പോകാതിരിക്കാൻ കാരണം എന്ത്
 - a) അവ പ്രത്യേക ശബ്ദം പുറപ്പെടുവിക്കുന്നതുകൊണ്ട്
 - b) അവ നേതാവിനെ അനുസരിക്കുന്നതുകൊണ്ട്
 - c) ഫിറമോണുകൾ തമ്മിൽ കലരാത്തതുകൊണ്ട്
 - d) വളരെ ദൂരം പോകാത്തതുകൊണ്ട്
- 12) ചുറ്റുപാടുകളെക്കുറിച്ച് അറിയാൻ പ്രാണികളെ സഹായിക്കുന്ന ഇന്ദ്രിയം ഏത്?
 - a) അന്തഃസ്രാവ ഗ്രന്ഥി
 - b) ഫിറമോൺ സ്വീകരണി
 - c) ഹോർമോണുകൾ
 - d) ഇവയൊന്നുമല്ല

നിർദ്ദേശങ്ങൾ:

ഓരോ ചില പ്രസ്താവനകൾ കൊടുത്തിരിക്കുന്നു. പ്രസ്താവനയെക്കുറിച്ചുള്ള വിവരണങ്ങളാണ് A, B, C, എന്നിവ.

- A പ്രസ്താവനയുടെ ആദ്യഭാഗം രണ്ടാം ഭാഗത്തിന്റെ കാരണമാണ്
- B പ്രസ്താവനയുടെ ആദ്യഭാഗം രണ്ടാം ഭാഗത്തിന്റെ ഫലമാണ്
- C രണ്ടു ഭാഗങ്ങൾക്കും യാതൊരു കാര്യകാരണ ബന്ധവുമില്ല.

ഓരോ പ്രസ്താവനയും വായിച്ചശേഷം A, B, C എന്നിവയിൽ ആ പ്രസ്താവനയ്ക്ക് ഏറ്റവും അനുയോജ്യമായ വിശദീകരണം ഏതെന്ന് മാർക്കിലാക്കി അതിനെ തന്നിരിക്കുന്ന ഉത്തരക്കടലാസിൽ 'X' ചിഹ്നമിട്ട് അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

പ്രസ്താവന

(i) ഒരു കഷ്ണം ഇരുമ്പ് ചൂടാക്കുമ്പോൾ വികസിക്കുന്നു
ഉത്തരം: (ഇവിടെ ഇരുമ്പ് ചൂടാക്കുക എന്ന ആദ്യഭാഗം രണ്ടാം ഭാഗത്തിന്റെ കാരണമാണല്ലോ അതിനാൽ A ആണ് ശരിയായ ഉത്തരം. ആയതിനാൽ A എന്ന അക്ഷരം 'X' എന്ന് അടയാളപ്പെടുത്തിയിരിക്കുന്നു.

ഉത്തരക്കടലാസ്

(i) A B C

- 13 സസ്യങ്ങൾ ഭക്ഷണം ഉണ്ടാക്കുന്നത് സൂര്യൻ പ്രകാശിക്കുമ്പോഴാണ്
- 14 വായുവിൽ ഓക്സിജനുണ്ട്, കൂടാതെ നൈട്രജനും
- 15 റേർഷണം ക്യാൻസർ എണ്ണു പുട്ടുവുന്നു
- 16 ഓപ്പോലിൽ വാതകദൂരണം ഉണ്ടായത് 1984-ൽ ആണ്
- 17 ഭൂമി വരണ്ടുണങ്ങി, മഴ പെയ്തു
- 18 വൈദ്യുതി കടന്നു പോയാൽ കമ്പിച്ചുരുൾ ചൂടാകുന്നു
- 19 ലോഹങ്ങളിലുള്ള സ്വതന്ത്ര ഇലക്ട്രോണുകൾ അവയെ ചാലകങ്ങളാക്കുന്നു.
- 20 ജനസംഖ്യാവർദ്ധനവിന് അനുസരിച്ച് സമീകൃതാഹാരത്തിന്റെ ലഭ്യത കുറയുന്നു.

APPENDIX - IX

FAROOK TRAINING COLLEGE, CALICUT

SCIENCE APTITUDE TEST

(1998)

ABDUL GAFOOR. K.
Lecturer
Farook Training College

PRIYA. K.P.
M.Ed student

Directions:

This test is intended to measure your science aptitude. It carries five subtests. Each subtest is to be completed within the prescribed time. The time limit is given along with the subtests. Please start with each subtest only after getting instruction to do so.

A separate response sheet is provided to mark your answer. Answers are to be marked according to the special direction given along with each subtest.

(Do not turn over till you get permission)

SUBTEST 1

Time: 12 mts.

Instructions:

You are given with two sets of numbers against each item number. The first set of numbers in each item follows a specific order. Discovering the order, from the first set choose the number which fits in the ' ____ ' part of the second set. Then, put a 'X' mark over the appropriate letter that denotes your answer from A, B, C, D, E provided in the response sheet against the item number.

Example

(i) 0, 1, 2, 3, 4, ____

Explanations:-

Response Sheet

A	B	X	D	E
0	4	5	8	9

Here the possible answer is 5. Hence we put an 'X' mark over the letter C, which denotes the answer (5)

	A	B	C	D	E
1) 1, 3, 9, 27, ____	21	81	9	12	18
2) 34, 45, 56, 67, ____	73	82	78	75	84
3) 4, 6, 12, 14, 28, ____	32	30	62	64	75
4) 4, 9, 16, 25, ____	49	36	81	64	144
5) 2, 4, 7, 11, 16, 22	24	23	28	29	35
6) 5, 10, 13, 26, 29, 58, ____	64	125	122	61	128
7) 1, 2, 4, 8, 16, 32, ____	154	64	128	148	130
8) 2, 4, 12, 48, 240, ____	960	1080	1920	1440	1560
9) 2, 6, 12, 20, 30, 42, ____	72	70	56	64	60

10)	3, 15, 75, ___, 1875, 9375	625	150	125	375	275
11)	3, 13, 23, 33, ___, 53	63	73	43	53	23
12)	4, 8, 4, 12, 4, 16, 4, ___	20	24	18	28	30
13)	1, 3, 6, 8, 16, 18, ___	20	36	32	28	34
14)	5, 7, 11, 13, 17, ___	21	52	43	19	28
15)	8, 14, 26, 50, ___	48	55	63	98	78

SUBTEST II

Time: 19 mts.

Instructions:

Read the following items and findout the most suitable answer from the alternatives A, B, C and D. Mark your answer in the given response sheet by putting an 'X' mark over A, B, C or D according to your choice.

Example :-

(i) Which of the following is the longest living creature on earth ?

- a) Elephant b) Man
c) Blue whale d) Tortoise

Response sheet

(i) A B C

1) A person jumping out of a moving vehicle falls forward due to

- a) acceleration b) velocity
c) inertia d) mass

2) Processing of a computer is controlled by

- a) monitor b) CPU
c) Hard disk d) ALU

3) As one moves away from the surface of the earth, the atmospheric air becomes .

- a) more blue in colour b) denser
c) less dense d) none of the above

- 19) The most important function of food is
- a) to satisfy hunger
 - b) to relish the taste
 - c) to get energy
 - d) to help growth of the body
- 20) The flower is the part of a plant specially adopted to carry on the process of
- a) seed dispersal
 - b) preparation of food
 - c) storing the food
 - d) reproduction
- 21) Nephridia in relation to earthworm is similar to malphigian tubule in relation to
- a) unicellular organism
 - b) insects
 - b) birds
 - d) man
- 22) The different colours of sunlight can be seen when it
- a) falls on a mirror
 - b) passes through a thick glass
 - c) passes through a thin glass
 - d) passes through a prism
- 23) Chromosomes are concerned with
- a) growth of the body
 - b) respiration
 - c) transmission of hereditary characters
 - d) assimilation
- 24) Which one of the following is necessarily true in case of a chemical reaction?
- a) certain amount of heat will be liberated
 - b) certain amount of heat will be absorbed
 - c) It is accompanied by energy changes
 - d) It is accompanied by loss of weight
- 25) Ohm in relation to resistance is similar to watt in relation to
- a) electricity
 - b) work
 - c) power
 - d) energy

SUBTEST III

Time: 12 mts.

Instructions:

Each item under this subtest is a problem from science. Find out the most suitable answer from the given choices A, B, C and D. Mark your answer by putting an 'X' mark in the response sheet over the letter.

Example:-

- (i) A transformer has 5000 turns in the primary and 250 turns in the secondary coils. If the voltage applied in the primary is 240 V, what is the voltage available from the secondary coil ?

- a) 15 v b) 10 v
c) 8 v d) 12 v

Response sheet				
(i)	A	B	C	D
				X

Explanations:

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} \quad V_s = ? \quad V_p = 240$$

$$N_s = 250 \quad N_p = 5000$$

$$V_s = V_p \times \frac{N_s}{N_p}$$

$$= 240 \times \frac{250}{5000} = 12v$$

Therefore the answer is D

- 1) A man breath 'a' times in a minute. He takes 0.5 l of oxygen at each breath. Then, how many litre of oxygen he takes in one hour.

- a) 300 l b) 60 l
c) 30 l d) 15 l

8) If the time taken to change the velocity of an object from 'u' to 'v' is t, then what is its acceleration ?

a)
$$a = \frac{u-v}{t}$$

b) $a = (u-v) t$

c) $a = (v+u) t$

d)
$$a = \frac{v-u}{t}$$

9) The principle of levers is given by the relation

a) effort x load = effort arm x load arm

b) effort x effortarm = load x load arm

c) effort x load arm = load x effortarm

d) effort + effortarm = load + loadarm

10) If 5 dozen bananas cost Rs.90/- What is the cost of 20 bananas ?

a) 150

b) 90

c) 50

d) 30

11) The number of moles of NaCl in 3 litres of its 3 M solution is

a) 1

b) 3

c) 9

d) 27

12) The focus length of a lens is f. If the distance from its optic centre to an object is u and to its image is v, which of the following relation is true for this lens ?

a) $u + v = f$

b)
$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

c)
$$u + v = \frac{1}{f}$$

d)
$$\frac{1}{u} - \frac{1}{v} = \frac{1}{f}$$

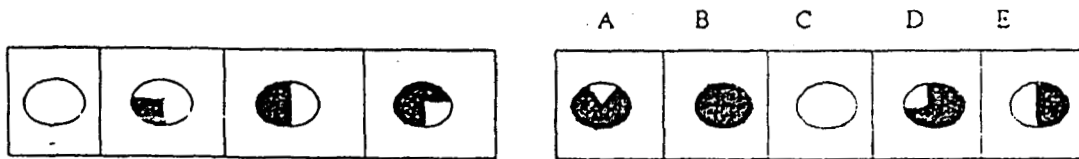
SUBTEST IV

Time: 7 mts

Instructions

You are given with 2 sets of figures. The first set in each item follows an order. Discovering this order, you select the next possible figure for the first set, from the second set. Mark your answer in the response sheet by putting an 'X' mark over the letter A, B, C, D or E which denotes your answer.

Example:



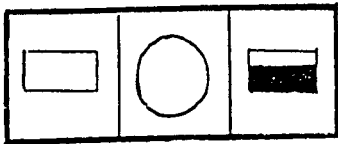
Here in the first set a quarter of each circle is shaded more, than the previous one. Therefore the next possible figure will be one where the whole circle is shaded.

Response sheet

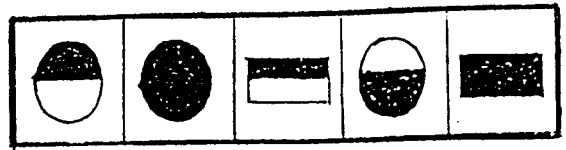
i) A B C D E

	<table border="1" style="width: 100%; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	A	B	C	D	E					
A	B	C	D	E							
	<table border="1" style="width: 100%; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	A	B	C	D	E					
A	B	C	D	E							
	<table border="1" style="width: 100%; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	A	B	C	D	E					
A	B	C	D	E							
	<table border="1" style="width: 100%; text-align: center;"> <tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	A	B	C	D	E					
A	B	C	D	E							

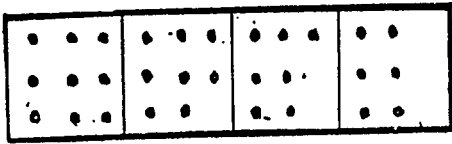
5



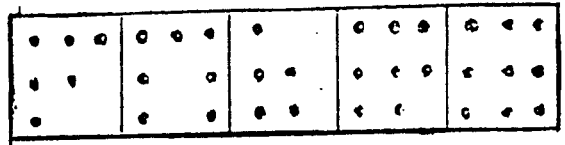
A B C D E



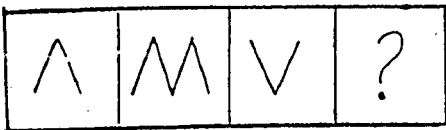
6



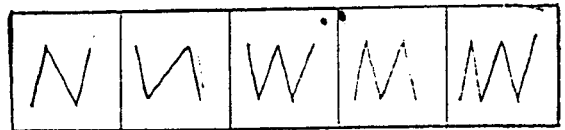
A B C D E



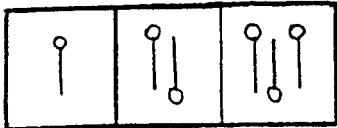
7



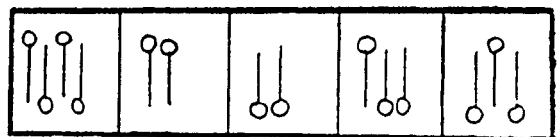
A B C D E



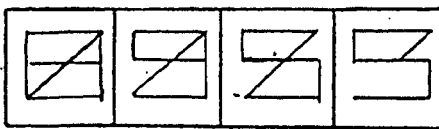
8



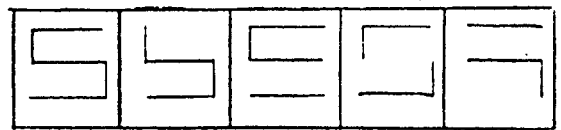
A B C D E



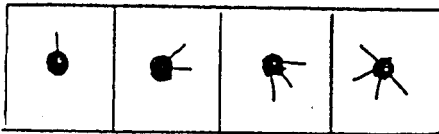
9



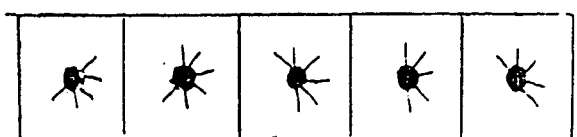
A B C D E



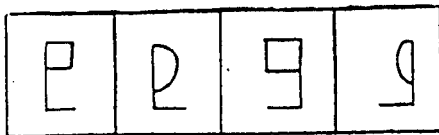
10



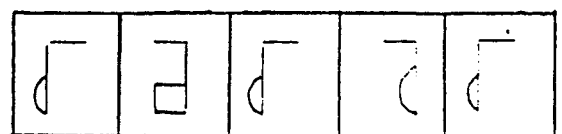
A B C D E



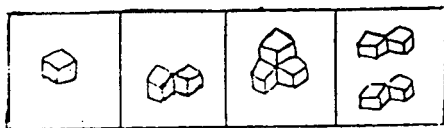
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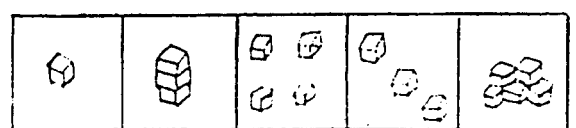
A B C D E



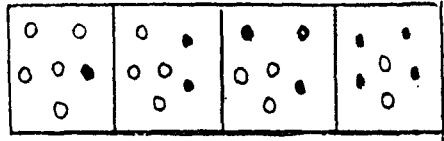
12



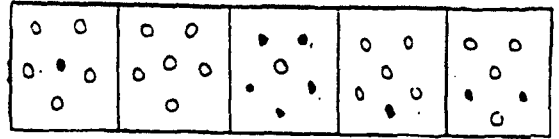
A B C D E



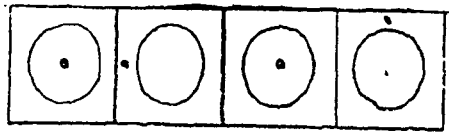
13



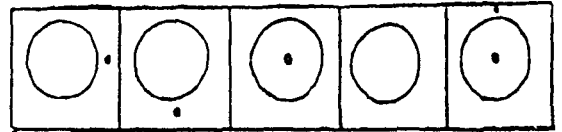
A B C D E



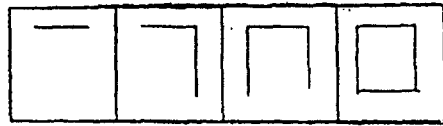
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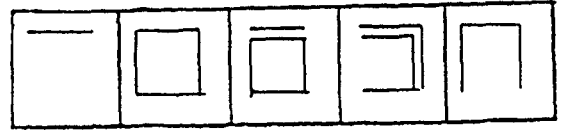
A B C D E



15



A B C D E



SUBTEST V

Time: 15 mts.

Instructions:

Read the following passages and statements and answer the questions as directed.

Passage I

Atom has all the potential to destroy the world twice or thrice over and all the power to make this world a better place to live in. It is our choice of what we make of it.

Two atomic power reactors at Kalpakkam in Tamilnadu produce 410 megawatts of power. As against some 40 tones of uranium needed to run these reactors, a coal fired power station of this magnitude would have required several thousand tones of coal. From the used uranium in this reactor we can separate plutonium. A mixture of this plutonium and spent uranium could again be used in what is called a fast breeder reactor as a fuel. And that is not the end either. Because this type of breeder reactors would produce more of plutonium than is put in. From there, a third stage could also be seen. In this third stage, India's rich deposits of Thorium could be used in the fast breeder to produce yet another uranium based fuel to use in the third generator reactor. In this way all that we need for taking care of our future electricity needs would be a few thousand tones of uranium and thorium.

1. What, according to the author, is the source of availability of Plutonium ?
 - a) It is found on the sea shores.
 - b) It is extracted from the sea-bed.
 - c) We can separate Plutonium from the used uranium in the nuclear reactor.
 - d) It is a very costly metal occurring in rare quantity in the great depths of the earth.
- 2) Read the following statements and select the correct answer from the given alternatives. a, b, c and d.
 - I. The atom has all the potential to make the world a better place to live in.
 - II. The atom has all the potential to destroy the world many times over.
 - III. The atom has all the potential to establish world peace.

- a) I only is correct
 - b) II only is correct
 - c) III only is correct
 - d) I and II only are correct
- 3) Which of the following is not true about the Atomic Power Project at Kalpakkam ?
- a) It has four or five reactors
 - b) Its reactors together generate heat enough to produce 410 MW of power.
 - c) It is situated in Tamilnadu.
 - d) From the used Uranium in this reactor we can separate Plutonium.
- 4) How much electricity can we produce from one tone Uranium ?
- a) 10.25 Mw
 - b) 11.35 Mw
 - c) 9.75 Mw
 - d) 10 Mw
- 5) For what purpose could a mixture of Plutonium and the spent Uranium be used ?
- a) It could be used to manufacture an atom bomb.
 - b) It could be used again in fast breeder reactor as a fuel.
 - c) It could be used for preparing new compounds.
 - d) It has no practical use.
- 6) The title that best expresses the ideas of the passage may be:
- a) India's Achievements in the Nuclear Research.
 - b) Importance of Nuclear Research in India.
 - c) Nuclear Power Station in India.
 - d) Fast Breeder Reactor.

Passage II

Man uses modern technology like telephone, television, internet etc. for communication. But the insects do have these communication skills by birth. They communicate ideas by means of sound, light, movements, chemical substances etc.

The chemical substance which is used for communication is called pheromones. It is the exocrine gland which produces different pheromones for

different purposes for insects. Unlike, hormones of the endocrine gland, the secretions of exocrine gland, is released to the external environment from the body of insects. Pheromone receptors are the sense organs of insects. They are able to catch the presence of pheromones about 2 miles away ! It is with the help of pheromones that the honeybees return to their nest correctly even after travelling kilometers away. Ants move forward by making an invisible pheromone line. If these invisible lines are rubbed, they became confused. The pheromones produced by one species of ants does not mix with those of other species. Some kinds of pheromones provide danger signal to their friends. It is with the help of pheromones that ants or bees immediately defend when we attack them. Moreover, they are able to overcome the effect of pesticides only with the help of this medium of communication, called pheromones. Only by destroying this communication cycle, we can prevent the harmful insects effectively.

- 8) For what purpose do insects use pheromones ?
- | | |
|-------------------|-----------------------|
| a) to build nest | b) to destroy insects |
| c) to communicate | d) to move in water |
- 9) Which of the following gland produce pheromones in insects ?
- | | |
|--------------------|-------------------|
| a) endocrine gland | b) pancreas |
| c) adrenal gland | d) exocrine gland |
- 10) Which is the way to control harmful insects without any side effect ?
- | | |
|-------------------------------|-------------------------------|
| a) use of biological manure | b) destroy pheromone cycle |
| c) use of high yielding seeds | d) use of chemical substances |
- 11) What helps the ants not to miss their group?
- | |
|---------------------------------|
| a) they make a particular sound |
| b) they obey their leader |
| c) pheromones do not get mixed |
| d) they do not go far away |
- 12) Which is the organ that helps the insects to know about their surroundings?
- | | |
|--------------------|-----------------------|
| a) endocrine gland | b) pheromone receptor |
| c) hormones | d) none of the above |

Instructions:

Following are some statements. The letters A, B and C are the explanation of the statement.

- A. The first part of the statement is the cause of the second part.
- B. The first part of the statement is the result of the second part.
- C. Two parts of the statement have no cause-effect relationship.

After reading each statement find out the most appropriate explanation for the statement from the choices A, B and C. Mark your answer by putting an 'X' mark over A, B or C which denotes your answer.

Example:

(i) When a piece of iron is heated, it expands.

Here the first part of the statement i.e., heating the iron is the cause of second part i.e., the expansion of iron. So A is the correct answer.

Response sheet

(i) A B C

Statements

- 13) Plants make food when the sun shines.
- 14) Air contains oxygen and also nitrogen.
- 15) To reduce friction, oil is applied.
- 16) Bhopal gas tragedy occurred in 1984.
- 17) The earth dried up, it rained.
- 18) When current passes, the coil get heated.
- 19) Free electrons in metals, make them conductors.
- 20) As population increases, availability of nutrient food decreases.

APPENDIX -X

RESPONSE SHEET OF SCIENCE APTITUDE TEST

SUBTEST I

1.	A	B	C	D	E
2.	A	B	C	D	E
3.	A	B	C	D	E
4.	A	B	C	D	E
5.	A	B	C	D	E

6.	A	B	C	D	E
7.	A	B	C	D	E
8.	A	B	C	D	E
9.	A	B	C	D	E
10.	A	B	C	D	E

11.	A	B	C	D	E
12.	A	B	C	D	E
13.	A	B	C	D	E
14.	A	B	C	D	E
15.	A	B	C	D	E

SUBTEST II

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D

10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D

19.	A	B	C	D
20.	A	B	C	D
21.	A	B	C	D
22.	A	B	C	D
23.	A	B	C	D
24.	A	B	C	D
25.	A	B	C	D

SUBTEST III

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D

6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D

SUBTEST IV

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D

6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D

SUBTEST V

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D

6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D

16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

APPENDIX- XI

SCORING KEY OF THE SCIENCE APTITUDE TEST

SUBTEST I

1.	B
2.	C
3.	B
4.	B

5.	D
6.	D
7.	B
8.	D

9.	C
10.	D
11.	C
12.	A

13.	B
14.	D
15.	D

SUBTEST II

1.	C
2.	B
3.	C
4.	C
5.	D
6.	D
7.	A

8.	C
9.	C
10.	C
11.	B
12.	D
13.	B
14.	A

15.	B
16.	C
17.	B
18.	D
19.	C
20.	D
21.	B

22.	D
23.	C
24.	C
25.	C

SUBTEST III

1.	C
2.	B
3.	B
4.	A

5.	C
6.	D
7.	C
8.	D

9.	B
10.	D
11.	C
12.	B

13.	C
14.	B
15.	B

SUBTEST IV

1.	B
2.	C
3.	C
4.	C

5.	C
6.	D
7.	C
8.	A

9.	A
10.	B
11.	C
12.	C

13.	C
14.	B
15.	E

SUBTEST V

1.	C
2.	D
3.	A
4.	A
5.	B
6.	D

7.	B
8.	C
9.	D
10.	B
11.	C
12.	B

13.	B
14.	C
15.	B
16.	C
17.	C
18.	A

19.	A
20.	A

APPENDIX - XII

University Of Calicut
 Department of Adult & Continuing Education & Extension Services
 SCALE OF ATTITUDE TOWARDS SCIENCE - PRELIMINARY

പേര് _____ ആൺ
 സ്കൂളിന്റെ പേര് _____ പെൺ
 ക്ലാസ്സ് _____ സഹോദരനുമണെങ്കിൽ എത്രപേര്
 _____ സഹോദരിയുമണെങ്കിൽ എത്രപേര്

മാതാപിതാക്കളെ സംബന്ധിച്ച വിവരം

	വിദ്യാഭ്യാസ യോഗ്യത	തൊഴിൽ	മാസം തോറുമുള്ള വരവ്
അച്ഛൻ			
അമ്മ			

നിർദ്ദേശങ്ങൾ:

ഈ സ്കെയിലിൽ 80 പ്രസ്താവനകൾ ഉണ്ട്. ശാസ്ത്രത്തോട് നിങ്ങൾക്കുള്ള മനോഭാവവും പ്രതികരണവും കണ്ടുപിടിക്കുകയാണ് ഇതിന്റെ ലക്ഷ്യം. ഓരോ പ്രസ്താവനക്കുമെതിരെ പൂർണ്ണമായി യോജിക്കുന്നു (SA), യോജിക്കുന്നു, (A), തീർച്ചയില്ല (U), വിരോധിക്കുന്നു (D), ശക്തിയായി വിരോധിക്കുന്നു (SD) എന്നീ പ്രതികരണങ്ങളാണ് കൊടുത്തിട്ടുള്ളത്. ഓരോ പ്രസ്താവനയും ശ്രദ്ധാപൂർവ്വം വായിച്ചുനോക്കി നിങ്ങളുടെ പ്രതികരണം " ടിക് " "√" അടയാളം കൊണ്ട് രേഖപ്പെടുത്തുക. ഒരു പ്രസ്താവനയോട് നിങ്ങൾ പൂർണ്ണമായി യോജിക്കുന്നുവെങ്കിൽ "SA" എന്നതിനുമുകളിൽ "√" അടയാളമിടുക. യോജിക്കുന്നില്ലെങ്കിൽ "D" എന്നതിന്റെ മുകളിൽ "√" അടയാളമിടുക. ഇതേ രീതിയിൽ തന്നെയാണ് ബാക്കിയുള്ള പ്രതികരണങ്ങളും അടയാളപ്പെടുത്തേണ്ടത്. "√" അടയാളം നിങ്ങളുടെ പ്രതികരണത്തെക്കുറിക്കുന്ന അക്ഷരത്തിന്റെ മുകളിൽ തന്നെ ഇടാൻ പ്രത്യേകം ശ്രദ്ധിക്കണം.

ഉദാഹരണം:

ശാസ്ത്രം പഴയതിന്റെ പുനർ വ്യാഖ്യാനമാണ്. SA A U **√** SD

ഈ ഉദാഹരണത്തിൽ "D" എന്നതിന്റെ മുകളിലാണ് "√" അടയാളം ഇട്ടിരിക്കുന്നത്. ഉത്തരമെഴുതുന്ന ആൾ ഈ പ്രസ്താവനയോട് വിരോധിക്കുന്നു എന്നാണ് ഇത് സൂചിപ്പിക്കുന്നത്.

ഇത് ഓരോ പ്രസ്താവനയും ശ്രദ്ധിച്ച് വായിച്ച് മുകളിൽ നിർദ്ദേശിച്ചിരിക്കുന്നതുപോലെ നിങ്ങളുടെ പ്രതികരണങ്ങൾ ഓരോന്നും അടയാളപ്പെടുത്തുക.

- SA പൂർണ്ണമായി യോജിക്കുന്നു
- A യോജിക്കുന്നു
- U തീർച്ചയില്ല
- D വിരോധിക്കുന്നു
- SD ശക്തിയായി വിരോധിക്കുന്നു

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| 1 ശാസ്ത്രം മനുഷ്യന്റെ പുരോഗതിക്ക് ഒഴിച്ചുകൂടാൻ പറ്റാത്ത ഒരു ഘടകമാണ് | SA A U D SD |
| 2 ശാസ്ത്രത്തിന് മനുഷ്യരാൽപ്പത്തിയോളം പഴക്കമുണ്ട് | SA A U D SD |
| 3 ശാസ്ത്രം മനുഷ്യരാൽപ്പതിനേക്കാൾ നൂറു വർഷം പ്രായം ചെയ്തിട്ടുണ്ട് | SA A U D SD |
| 4 ലൗകിക ശാസ്ത്രജ്ഞന്മാരുടെ എണ്ണം പരിമിതമാണ് | SA A U D SD |
| 5 ശാസ്ത്രസത്യങ്ങൾ പരിവർത്തന വിധേയമാണ് | SA A U D SD |
| 6 ശാസ്ത്രം വൈകാരികതയ്ക്ക് അടിമയാണ് | SA A U D SD |

7	ശാസ്ത്രം മാനുഷിക മൂല്യങ്ങൾക്ക് എതിരാണ് എന്ന ഒരു വിഭാഗം ആളുകളുടെ വാദം ശരിയല്ല	SA	A	U	D	SD
8	മതപരമായ പല ആചാരങ്ങളും ശാസ്ത്രീയമായി തെളിയിക്കപ്പെട്ടിട്ടുണ്ട്	SA	A	U	D	SD
9	ആത്മസമർപ്പണമാണ് ഒരു ശാസ്ത്ര വിദ്യാർത്ഥിയുടെ മേന്മയുടെ ലക്ഷണം.	SA	A	U	D	SD
10	ശാസ്ത്രീയമായ ഗവേഷണങ്ങളിൽ കൂടി മാത്രമേ ഒരു രാഷ്ട്രത്തിന് പുരോഗതിക്കാൻ കഴിയൂ	SA	A	U	D	SD
11	ശാസ്ത്ര ഗവേഷണ ഘടങ്ങൾ രാഷ്ട്രങ്ങൾ തമ്മിൽ പങ്കിടേണ്ടതാണ്.	SA	A	U	D	SD
12	ശാസ്ത്രപഠനം മാതൃഭാഷയിൽ ആയിരിക്കേണ്ടതാണ്	SA	A	U	D	SD
13	ശാസ്ത്രന്മേടങ്ങൾ ഇന്ന് നമ്മുടെ ജീവിതത്തെ വളരെയേറെ സന്തുഷ്ടവും അനായാസവുമാക്കിയിട്ടുണ്ട്.	SA	A	U	D	SD
14	ശാസ്ത്രീയമായി തെളിയിക്കപ്പെടാത്ത കാര്യങ്ങളെ നാം അന്വയിശ്യാസമെന്ന് വിളിക്കുന്നു.	SA	A	U	D	SD
15	ശാസ്ത്രവിദ്യാഭ്യാസം പൂർണ്ണമായും സൗജന്യമാക്കേണ്ടതാണ്	SA	A	U	D	SD
16	ശാസ്ത്രന്മേടങ്ങൾ സമൂഹത്തിലെ ഉപരിവർഗ്ഗം മാത്രം കൈയ്യടക്കി വെച്ചിരിക്കുകയാണ്.	SA	A	U	D	SD
17	ശാസ്ത്രജ്ഞർ അതതു രാഷ്ട്രത്തിന്റെ സ്വകാര്യ സമ്പത്താണ്	SA	A	U	D	SD
18	ചക്രങ്ങളുടെ കണ്ടുപിടുത്തത്തോടെയാണ് ശാസ്ത്രത്തിന്റെ വളർച്ച ത്വരിതത്തിയിലായത്.	SA	A	U	D	SD
19	ഒരു ശാസ്ത്രജ്ഞൻ രാഷ്ട്രത്തലവൻ ആകുന്നത് രാഷ്ട്രത്തിന്റെ പുരോഗതിക്ക് അഭിലഷണീയമാണ്	SA	A	U	D	SD
20	ശാസ്ത്രം ഭൂമിയെ ഒരു കൊച്ചു ഗ്രാമമാക്കി മാറ്റിയിരിക്കുന്നു.	SA	A	U	D	SD
21	പരിസ്ഥിതി മലിനീകരണം ശാസ്ത്രത്തിന്റെ ഒരു ഉപോൽപ്പന്നമാണ്	SA	A	U	D	SD
22	ശാസ്ത്രജ്ഞന്റെ ഗവേഷണഘടങ്ങൾ ഭരണാധികാരികൾ ദുരുപയോഗം ചെയ്യുന്നതിനുള്ള സാധ്യതകൾ തള്ളിക്കളയാതാവുമല്ല	SA	A	U	D	SD
23	സങ്കല്പങ്ങളെ അതിജീവിക്കാൻ ഉതകുന്ന വിതത്തിൽ ശാസ്ത്രം പുരോഗമിച്ചിരിക്കുന്നു.	SA	A	U	D	SD
24	ഒരിക്കലും അവസാനിക്കാത്ത ഒരു തുടർപ്രതിഭാസമാണ് ശാസ്ത്രം	SA	A	U	D	SD
25	ശാസ്ത്രജ്ഞൻ സർവ്വതന്ത്ര സ്വതന്ത്രനായിരിക്കണം.	SA	A	U	D	SD
26	മാനുഷികമൂല്യങ്ങളിൽ അനിഷ്ടമായിരിക്കണം ഒരു ശാസ്ത്രജ്ഞന്റെ ഗവേഷണ പഠനങ്ങൾ.	SA	A	U	D	SD
27	ഒരു തീർച്ചിത കാലയളവിനുള്ളിൽ ഓരോ രാഷ്ട്രത്തിനുമുണ്ടായ ഗവേഷണ ഘടങ്ങൾ വിശകലനം ചെയ്യപ്പെടേണ്ടതാണ്.	SA	A	U	D	SD
28	ശാസ്ത്രം പുരോഗമിക്കുമ്പോഴും ശാസ്ത്രത്തെക്കുറിച്ചുള്ള പഠനം അനായാസമായിത്തീരും.	SA	A	U	D	SD
29	മനുഷ്യന്റെ പ്രവർത്തനക്ഷമതയെ ശാസ്ത്രം പ്രതികൂലമായി ബാധിച്ചിട്ടുണ്ട്.	SA	A	U	D	SD
30	ശാസ്ത്രത്തിന്റെ ദുഷ്ടഫലങ്ങളെ അകറ്റാൻ ശാസ്ത്ര ഗവേഷണങ്ങൾ അനിവാര്യമായിരിക്കുന്നു.	SA	A	U	D	SD
31	ആധുനികശാസ്ത്രത്തിന്റെ അതിപ്രസരത്താൽ പാരമ്പര്യസിദ്ധികൾ പലതും നഷ്ടപ്പെട്ടുകൊണ്ടിരിക്കുന്നു.	SA	A	U	D	SD

32	ശാസ്ത്രവിദ്യാർത്ഥി എഴോഴും സംരയത്തിനുമടയായിരിക്കും	SA	A	U	D	SD
33	പ്രപഞ്ചനിത്യന്മകളെ അനാവരണം ചെയ്ത് മനുഷ്യ നന്മയ്ക്കു ഉചയുക്തമാകുകയാണ് ഒരു ശാസ്ത്രജ്ഞൻ ചെയ്യുന്നത്	SA	A	U	D	SD
34	ശാസ്ത്രവും ആത്മീയതയും പരസ്പര പൂരകങ്ങളാണ്	SA	A	U	D	SD
35	ശാസ്ത്രജ്ഞർക്കിടയിൽ സ്ത്രീകളുടെ അന്യപാതം തുലോം കുറവാണ്.	SA	A	U	D	SD
36	ദാരിദ്ര്യം നിർമ്മാർജ്ജനം ചെയ്യുന്ന കാര്യത്തിൽ ശാസ്ത്രത്തിന് ഒട്ടേറെ സംഭാവനകൾ നൽകാൻ കഴിയും.	SA	A	U	D	SD
37	ഒരു ശാസ്ത്രവിദ്യാർത്ഥി എല്ലായ്പ്പോഴും നൂതനമായ ആശയങ്ങളും, ഭേദങ്ങളും കണ്ടെത്താൻ കഴിവുള്ള വേഗതാ സമ്പന്നനായിരിക്കണം	SA	A	U	D	SD
38	ലക്ഷ്യം കണ്ടെത്താനായില്ലെങ്കിലും പുതിയ ഒരു ലക്ഷ്യത്തിനു വേണ്ടിയുള്ള തവേഷണത്തിനു തുടക്കമിട്ടു ആളെയും ഒരു ശാസ്ത്രജ്ഞനായി പരിഗണിക്കാവുന്നതാണ്.	SA	A	U	D	SD
39	ശാസ്ത്രാന്വേഷികളെ പ്രോത്സാഹിപ്പിക്കുകയും അംഗീകരിക്കുകയും ചെയ്യുന്ന ഒരു സമൂഹത്തിലേ ശാസ്ത്രം വളർച്ച പ്രാപിയ്ക്കും.	SA	A	U	D	SD
40	മാതൃഷീകമുല്പന്നങ്ങളെ അവഗണിച്ചുകൊണ്ടുള്ള തവേഷണങ്ങൾ ലോകത്തെ സർപ്പനാശത്തിലേക്കായിരിക്കും നയിക്കുക.	SA	A	U	D	SD
41	ശാസ്ത്രം യഥാർത്ഥത്തിൽ ഒരു കലയാണ്	SA	A	U	D	SD
42	ശാസ്ത്രം പഠിയ്ക്കേണ്ടതോ പഠിപ്പിയ്ക്കേണ്ടതോ ആയ ഒരു വിദ്യയല്ല. ആവര്യം വരുമ്പോൾ സ്വയം പ്രത്യക്ഷപ്പെടുന്ന ഒരു യാദൃച്ഛികതയാണ്	SA	A	U	D	SD
43	പഴയ കണ്ടെത്തലുകളുടെ വിശദീകരണങ്ങളോ വിശദീകരണങ്ങളോ അല്ലാതെ രണ്ടാംലോകമഹായുദ്ധത്തിനു ശേഷം പുതിയ ശാസ്ത്രയന്ത്രങ്ങളൊന്നും ഉടലെടുത്തിട്ടില്ല.	SA	A	U	D	SD
44	സന്താനഭോഗ്യമില്ലാത്തവർക്ക് ക്ലോബിംഗ് ഒരു അന്യഗ്രഹമാണ്	SA	A	U	D	SD
45	ഇന്നു ലോകത്ത് ശാസ്ത്രജ്ഞന്മാർ കുറവാണ്. വിവിത രാജ്യങ്ങളുടെ കീഴിൽ പണിയെടുക്കുന്ന ശാസ്ത്ര തൊഴിലാളികളാണ് ഏറിയപങ്കും.	SA	A	U	D	SD
46	വളർച്ച മുരടിച്ച ഒരു ശാസ്ത്രശാഖയാണ് മനുഷാസ്ത്രം എന്നതിന്റെ ഉദാഹരണമാണ് ഇന്നു കേരളത്തിൽ പെരുകി വരുന്ന ആത്മഹത്യാ നിരക്ക്.	SA	A	U	D	SD
47	കാരണം അന്വേഷിച്ചുള്ള നിരന്തരമായ യാത്രയാണ് ശാസ്ത്ര തവേഷണം.	SA	A	U	D	SD
48	മിക്ക രാഷ്ട്രങ്ങൾക്കും താൽപര്യം അധികാരം ഉറപ്പിയുറപ്പിക്കുന്ന തരത്തിലുള്ള ശാസ്ത്ര തവേഷണങ്ങളോടു മാത്രമാണ്	SA	A	U	D	SD
49	ശാസ്ത്രപുരോഗതി വൈവ വൈവിധ്യത്തിനു ഭീഷണിയാണ്	SA	A	U	D	SD
50	തുടങ്ങിയേടത്തുതന്നെ തിരിച്ചെത്തുന്ന യാത്രയ്ക്കിടയിൽ കണ്ടുമുട്ടുന്ന വിനോദം പോലെയാണ് ശാസ്ത്രനേട്ടങ്ങൾ.	SA	A	U	D	SD
51	അന്യരുടെ ശാസ്ത്രനേട്ടങ്ങളെ തടസ്സമാക്കാൻ ശ്രമിക്കുന്ന ശാസ്ത്രചോരന്മാരുടെ എണ്ണം പെരുകിവരികയാണ്	SA	A	U	D	SD
52	പരിശ്രമിച്ചാൽ ആർക്കും ഒരു ശാസ്ത്രജ്ഞനാകാൻ കഴിയും.	SA	A	U	D	SD
53	ഒരു ശാസ്ത്രജ്ഞനെക്കുറിച്ചും ജന്മം നൽകാൻ കഴിയാത്ത നാട് ഈ ഭൂമുഖത്തില്ല	SA	A	U	D	SD
54	ശാസ്ത്രാഭിമുഖ്യം ജന്മസിദ്ധമാണ്	SA	A	U	D	SD
55	ശാസ്ത്രപുരോഗതി മരണനിരക്കു കുറയാൻ കാരണമായിട്ടുണ്ട്	SA	A	U	D	SD

56	കായിക വിദ്യാർത്ഥികളെ എന്നപോലെ ശാസ്ത്രകുതുകികളായ വിദ്യാർത്ഥികളെ കണ്ടെത്തി സർക്കാർ തലത്തിൽ പ്രത്യേകം പരിശീലിപ്പിക്കേണ്ടതാണ്.	SA	A	U	D	SD
57	സ്വന്തം നിലയ്ക്ക് ശാസ്ത്രഗവേഷണങ്ങൾ നടത്തുന്ന നാദാളം ചൊടുക്കാർ തമിഴ്നാട്. അവർക്ക് അർഹമായ പ്രോത്സാഹനം നൽകുന്നത് നാടിന്റെ വികസനത്തെ സഹായിക്കും.	SA	A	U	D	SD
58	ചില തിക്ഷിപ്ത താൽപര്യങ്ങൾ ശാസ്ത്രപുരോഗതിയ്ക്ക് വിലങ്ങുതടികളാവുന്നുണ്ട്	SA	A	U	D	SD
59	പരിസ്ഥിതിയ്ക്ക് പോരാലേൽപ്പിക്കാത്ത വിധത്തിലുള്ള ശാസ്ത്രീയ നേട്ടങ്ങളാണ് കാലഘട്ടത്തിന്റെ ആവശ്യം.	SA	A	U	D	SD
60	ശാസ്ത്രം അതിന്റെ വളർച്ചയുടെ പരാമ്യത്തിലെത്തിയിരിക്കുകയാണ്.	SA	A	U	D	SD
61	ഇന്നു നാം നേടിയെടുത്ത ഒട്ടേറെ ശാസ്ത്രനേട്ടങ്ങൾക്കു പിന്നിൽ ശാസ്ത്ര സാഹിത്യകാരന്മാർക്ക് വലിയ പങ്കുണ്ട്.	SA	A	U	D	SD
62	ഏറ്റവും വലിയ ശാസ്ത്രകാരൻ വൈദഗ്ദ്ധ്യം	SA	A	U	D	SD
63	ഈശ്വരാന്വേഷണത്തിലെ വ്യത്യസ്ത പന്ഥാവാണ് ശാസ്ത്രം	SA	A	U	D	SD
64	മനുഷ്യമനസ്സിന്റെ ഉന്മാദാവസ്ഥയുടെ ഒരു ഘട്ടത്തിൽ നിന്ന് ശാസ്ത്രകാരൻ ജന്മം കൊള്ളുന്നു.	SA	A	U	D	SD
65	ശാസ്ത്രസത്യം ഒരു പൂട്ടാണ്. ശാസ്ത്രജ്ഞൻ അതിന്റെ താക്കോലും.	SA	A	U	D	SD
66	ആഗോളതലത്തിൽ ശാസ്ത്രജ്ഞരുടെ ഒരു കൂട്ടായ്മ ഉണ്ടാവുകയാണെങ്കിൽ ലോകത്ത് യുദ്ധങ്ങൾ ഒഴിവാക്കുകയും അതുവഴി സമ്പദ്സമൃദ്ധി ഉണ്ടാവുകയും ചെയ്യും.	SA	A	U	D	SD
67	നാദാളം നന്മ ചെലവ് ചെയ്യേണ്ടി വരുന്ന ഒരു മേഖലയായതുകൊണ്ട് ദരിദ്രവിദ്യാർത്ഥികൾക്ക് ശാസ്ത്രഗവേഷണം അയാലായി മാറിക്കൊണ്ടിരിക്കുന്നു.	SA	A	U	D	SD
68	ശാസ്ത്രം പുരോഗമിച്ചാൽ ഉച്ചനിലയിലുള്ള ജീവിതം	SA	A	U	D	SD
69	അതികരംതത്ത് ഗവേഷണങ്ങൾ നടത്താനിരിക്കുകയാണ് നല്ലത്	SA	A	U	D	SD
70	വർഗ്ഗസങ്കലനം നടത്തിക്കൊണ്ടുള്ള ശാസ്ത്രഗവേഷണം ശാസ്ത്രവൈകൃതമാണ്	SA	A	U	D	SD
71	മൂന്നു കാലങ്ങളും ഒരേ സമയത്ത് അനുഭവപ്പെടുന്ന ഒരു കാലത്തേയ്ക്കും ശാസ്ത്രം വളരും.	SA	A	U	D	SD
72	ഉച്ചനിലയിലുള്ള ശാസ്ത്രത്തിന്റെ സംഭാവനയാണ്.	SA	A	U	D	SD
73	രേഖപ്പെടുത്തപ്പെട്ട ആദ്യത്തെ ശാസ്ത്രനേട്ടം വരമൊഴിയാണ്	SA	A	U	D	SD
74	കാലം ശാസ്ത്രത്തിന് കടന്നുചെല്ലാൻ കഴിയാത്ത ഒരു നിഗൂഢതയാണ്	SA	A	U	D	SD
75	ഭക്ഷണം, വെള്ളം, വെളിച്ചം എന്നിവയെല്ലാം ജീവജാലങ്ങൾക്ക് ആവശ്യമായതെന്നും നൽകാൻ കഴിയാത്ത സൂര്യനെക്കുറിച്ച് ഇനിയും ഗവേഷണങ്ങൾ നടക്കാനിരിക്കുന്നതെന്നുമുള്ള	SA	A	U	D	SD
76	കാലത്തിന്റെ ക്രമബിന്ദു കണ്ടെത്തുന്നതോടെ ഗവേഷകന്റെ അന്വേഷണം അവസാനിക്കും.	SA	A	U	D	SD
77	സാമൂഹ്യപുരോഗതിയ്ക്ക് ശാസ്ത്രത്തിന്റെ സഹായം ആവശ്യമില്ല	SA	A	U	D	SD
78	ശാസ്ത്രവിശ്വാസങ്ങൾ വിമർശിക്കപ്പെടുന്നത് ശാസ്ത്ര പുരോഗതിയെ തടസ്സപ്പെടുത്തും	SA	A	U	D	SD
79	മതവിശ്വാസങ്ങളെ എതിർക്കാൻ ഉപയോഗിക്കുന്ന ഒരു ആയുധമാണ് ശാസ്ത്രം	SA	A	U	D	SD
80	ക്ലോണിംഗ് മനുഷ്യരോടിയ്ക്ക് ഭീഷണിയാണ്	SA	A	U	D	SD

APPENDIX - XIII

UNIVERSITY OF CALICUT Department of Adult & Continuing Education & Extension Services SCALE OF ATTITUDE TOWARDS SCIENCE –PRELIMINARY

Name : Boy:
 Name of school : Girl:
 Class : If brothers, how many:
 If sisters, how many:

DETAILS OF PARENTS

	Educational Qualification	Occupation	Monthly Income
Father			
Mother			

INSTRUCTIONS:

There are 80 statements in this scale. This is to find out your attitude and response towards science. For each statement five responses are given like Strongly Agree (SA), Agree (A), Undecided (U) Disagree (D), and Strongly Disagree (SD). Read each statement carefully and put a '✓' mark against your response.

Example:

1. Science is the reinterpretation of old one SA A U **✓D** SD

From this, we can understand that the person disagrees with the statement.

- | | | | | | |
|--|----|---|---|---|----|
| 1. Science is an inevitable factor for the development of human beings | SA | A | U | D | SD |
| 2. Science is so old as the origin of mankind | SA | A | U | D | SD |
| 3. Science has bestowed both good and evil to mankind. | SA | A | U | D | SD |
| 4. Original scientists are limited in number | SA | A | U | D | SD |
| 5. Scientific truths are dynamic | SA | A | U | D | SD |
| 6. Science is above emotions | SA | A | U | D | SD |
| 7. The argument that science is antagonist of human values is not true | SA | A | U | D | SD |

- | | | | | | |
|--|----|---|---|---|----|
| 8. Many religious, customs and traditions have been proved to be scientific | SA | A | U | D | SD |
| 9. Dedication is the foremost quality of a science student | SA | A | U | D | SD |
| 10. Only through scientific experimentations, one country can attain developments | SA | A | U | D | SD |
| 11. The results of science researches should be shared between countries | SA | A | U | D | SD |
| 12. Science learning should be in mother tongue | SA | A | U | D | SD |
| 13. Today science has made our life easy and comfortable | SA | A | U | D | SD |
| 14. Scientifically unproved things are called superstition | SA | A | U | D | SD |
| 15. Science learning should become completely free of cost | SA | A | U | D | SD |
| 16. The contributions of science are accessible only for upper classes | SA | A | U | D | SD |
| 17. The scientists are the private possessions of their own country | SA | A | U | D | SD |
| 18. The speed of science progress begins with the invention of wheels. | SA | A | U | D | SD |
| 19. A scientists becoming the head of the nation is more preferable for the progress of the country | SA | A | U | D | SD |
| 20. Science has changed the globe into a tiny village | SA | A | U | D | SD |
| 21. Environmental pollution is a bye-product of science | SA | A | U | D | SD |
| 22. The possibilities to misuse the results of scientific researches by the rulers may not be negligible | SA | A | U | D | SD |
| 23. Science has been developed to overcome the level of imagination | SA | A | U | D | SD |
| 24. Science is a never ending phenomenon | SA | A | U | D | SD |
| 25. A scientist must be absolutely independent | SA | A | U | D | SD |
| 26. The aim of scientist's research must be based on human values. | SA | A | U | D | SD |
| 27. The achievements of science research of a country in a given time should be analysed. | SA | A | U | D | SD |
| 28. The learning of science will become easy according to the progress of science. | SA | A | U | D | SD |

- | | | | | | |
|--|----|---|---|---|----|
| 29. The working capacity of mankind has been adversely affected by the growth of science. | SA | A | U | D | SD |
| 30. The scientific researches are badly needed for avoiding the bad effects of science. | SA | A | U | D | SD |
| 31. We are losing many of our inherited talents by the excessive influence of modern science. | SA | A | U | D | SD |
| 32. A science student will always be suspicious | SA | A | U | D | SD |
| 33. Scientists unveil the universal secrets and make them beneficial for the mankind. | SA | A | U | D | SD |
| 34. Science and spirituality are complementary to each other | SA | A | U | D | SD |
| 35. The ratio of lady scientist is comparatively low | SA | A | U | D | SD |
| 36. Science can contribute several things to evade poverty | SA | A | U | D | SD |
| 37. A science student should always be able to find out innovative ideas and develop new sectors | SA | A | U | D | SD |
| 38. Eventhough could not achieve the goal, one who laid the path for an invention should be considered as a scientist. | SA | A | U | D | SD |
| 39. Science will develop only in a society which appreciate and encourage scientists. | SA | A | U | D | SD |
| 40. Scientific researches which neglect human values will lead only to entire disaster. | SA | A | U | D | SD |
| 41. Science is actually an art. | SA | A | U | D | SD |
| 42. Science is not something to learn or to be learned but something that emerges itself when required. | SA | A | U | D | SD |
| 43. There has been no new scientific achievements after second world war unless the expansion or analysis of older inventions. | SA | A | U | D | SD |
| 44. Cloning is a boon for those who are impotent | SA | A | U | D | SD |
| 45. Nowadays scientists are rare. There are only scientific labourers who work under different countries. | SA | A | U | D | SD |
| 46. The increasing rate of suicidal death in Kerala proves that psychology is a stunted branch of science. | SA | A | U | D | SD |
| 47. Scientific research is an eternal voyage of searching for the cause | SA | A | U | D | SD |

- 48. Majority of countries are interested only on scientific researches that helps to retain their powers. SA A U D SD
- 49. Scientific development is a threat to biodiversity SA A U D SD
- 50. Science is something like an entertainment arranged on the way of voyage that ends on the starting point itself. SA A U D SD
- 51. Number of scientists who steal the achievements of other scientists is growing SA A U D SD
- 52. Any one can become a scientist by means of hard work SA A U D SD
- 53. There is no country in the world that haven't given birth to at least one scientist. SA A U D SD
- 54. Science Aptitude is an inborn talent SA A U D SD
- 55. Scientific development has reduced the mortality rate SA A U D SD
- 56. Government should take initiative to train science students also like sports and athletic students SA A U D SD
- 57. There are so many talented youngsters who are doing scientific researches on their own. Encouragement of such scientists will be helpful to the progress of the nation. SA A U D SD
- 58. Some vested interest make hurdles in the progress of science. SA A U D SD
- 59. Eco-friendly scientific achievements are the need of the day. SA A U D SD
- 60. Science has grown to its peak level. SA A U D SD
- 61. Science fictions has a great role behind our several scientific achievements. SA A U D SD
- 62. God is the greatest scientist SA A U D SD
- 63. Science is another way to god SA A U D SD
- 64. A scientist is originated at a point of eccentric state of mind. SA A U D SD
- 65. When science is a lock, scientist is its key SA A U D SD
- 66. If there comes a global alliance of scientist that will prevent wars and lead to global prosperity. SA A U D SD

- 67. As it is a highly expensive field, poor pupils are evaded from scientific researches. SA A U D SD
- 68. If science has developed, there will be no discrimination between haves and have nots. SA A U D SD
- 69. It is wise to keep away from genetic researches. SA A U D SD
- 70. Researches on cross-breeding is a scientific vulgarity. SA A U D SD
- 71. Science may develop even to a point where past, present and future will be experienced at a time. SA A U D SD
- 72. Haves and have nots are the contributions of science SA A U D SD
- 73. The first known science achievement is the invention of word. SA A U D SD
- 74. Time is a secret area where science cannot enter SA A U D SD
- 75. Research is yet to come about the sun, which provide anything to living things like food, water and light SA A U D SD
- 76. The researcher can wind up his job while he find out the center point of the "time" SA A U D SD
- 77. Science is not essential for social development. SA A U D SD
- 78. The criticism of scientific theories will check the progress of science SA A U D SD
- 79. Science is a weapon used against religious concepts SA A U D SD
- 80. Cloning is threat to mankind. SA A U D SD

APPENDIX - XIV

UNIVERSITY OF CALICUT

Department of Adult & Continuing Education & Extension Services

SCALE OF ATTITUDE TOWARDS SCIENCE -FINAL

പേര് : ആൺ:
 സ്കൂളിന്റെ പേര് : പെൺ:
 ക്ലാസ്സ് : സഹോദരനുണ്ടെങ്കിൽ എത്രപേർ:
 സഹോദരിയുണ്ടെങ്കിൽ എത്രപേർ:

മാതാപിതാക്കളെ സംബന്ധിച്ച വിവരം

	വിദ്യാഭ്യാസ യോഗ്യത	തൊഴിൽ	മാസം തോറുമുള്ള വരവ്
അച്ഛൻ			
അമ്മ			

നിർദ്ദേശങ്ങൾ:

ഈ സ്കെയിലിൽ 80 പ്രസ്താവനകൾ ഉണ്ട്. ശാസ്ത്രത്തോട് നിങ്ങൾക്കുള്ള മനോഭാവവും പ്രതികരണവും കണ്ടുപിടിക്കുകയാണ് ഇതിന്റെ ലക്ഷ്യം. ഓരോ പ്രസ്താവനക്കുമെതിരെ പൂർണ്ണമായി യോജിക്കുന്നു (SA), യോജിക്കുന്നു (A), തീർച്ചയില്ല (U), വിരോധിക്കുന്നു (D), ശക്തമായി വിരോധിക്കുന്നു (SD) എന്നീ പ്രതികരണങ്ങളാണ് കൊടുത്തിട്ടുള്ളത്. ഓരോ പ്രസ്താവനയും ശ്രദ്ധാപൂർവ്വം വായിച്ചുനോക്കി നിങ്ങളുടെ പ്രതികരണം “ടിക്” ‘✓’ അടയാളം കൊണ്ട് രേഖപ്പെടുത്തുക. ഒരു പ്രസ്താവനയോട് നിങ്ങൾ പൂർണ്ണമായി യോജിക്കുന്നുവെങ്കിൽ “SA” എന്നതിനുമുകളിൽ ‘✓’ അടയാളമിടുക. യോജിക്കുന്നില്ലെങ്കിൽ “D” എന്നതിന്റെ മുകളിൽ ‘✓’ അടയാളമിടുക. ഇതേ രീതിയിൽ തന്നെയാണ് ബാക്കിയുള്ള പ്രതികരണങ്ങളും അടയാളപ്പെടുത്തേണ്ടത്. ‘✓’ അടയാളം നിങ്ങളുടെ പ്രതികരണത്തെക്കുറിക്കുന്ന അക്ഷരത്തിന്റെ മുകളിൽ തന്നെ ഇടാൻ പ്രത്യേകം ശ്രദ്ധിക്കണം.

ഉദാഹരണം:

ശാസ്ത്രം പഴയതിന്റെ പുനർ വ്യാഖ്യാനമാണ്. SA A U [✓]D SD

ഈ ഉദാഹരണത്തിൽ ‘D’ എന്നതിന്റെ മുകളിലാണ് ‘✓’ അടയാളം ഇട്ടിരിക്കുന്നത്. ഉത്തരമെഴുതുന്ന ആൾ ഈ പ്രസ്താവനയോട് വിരോധിക്കുന്നു എന്നാണ് ഇത് സൂചിപ്പിക്കുന്നത്

1. ശാസ്ത്രം മനുഷ്യന്റെ പുരോഗതിക്ക് ഒഴിച്ചുകൂടാൻ പറ്റാത്ത ഒരു ഘടകമാണ് SA A U D SD
2. ശാസ്ത്രത്തിന് മനുഷ്യോൽപ്പത്തിയോളം പഴക്കമുണ്ട് SA A U D SD
3. മതപരമായ പല ആചാരങ്ങളും ശാസ്ത്രീയമായി തെളിയിക്കപ്പെട്ടിട്ടുണ്ട് SA A U D SD
4. ആത്മസമർപ്പണമാണ് ഒരു ശാസ്ത്ര വിദ്യാർത്ഥിയുടെ മേന്മയുടെ ലക്ഷണം. SA A U D SD
5. ശാസ്ത്രപഠനം മാതൃഭാഷയിൽ ആയിരിക്കേണ്ടതാണ് SA A U D SD
6. ശാസ്ത്രനേട്ടങ്ങൾ ഇന്ന് നമ്മുടെ ജീവിതത്തെ വളരെയേറെ സന്തുഷ്ടവും അനായാസമുമാക്കിയിട്ടുണ്ട് SA A U D SD
7. ശാസ്ത്രവിദ്യാഭ്യാസം പൂർണ്ണമായും സൗജന്യമാക്കേണ്ടതാണ് SA A U D SD
8. ശാസ്ത്രം ഭൂമിയെ ഒരു കൊച്ചു ഗ്രാമമാക്കി മാറ്റിയിരിക്കുന്നു SA A U D SD
9. പരിസ്ഥിതി മലിനീകരണം ശാസ്ത്രത്തിന്റെ ഒരു ഉപോൽപ്പന്നമാണ് SA A U D SD
10. സങ്കല്പങ്ങളെ അതിജീവിക്കാൻ ഉതകുന്ന വിധത്തിൽ ശാസ്ത്രം പുരോഗമിച്ചിരിക്കുന്നു. SA A U D SD
11. ഒരിക്കലും അവസാനിക്കാത്ത ഒരു തുടർപ്രതിഭാസമാണ് ശാസ്ത്രം SA A U D SD
12. ശാസ്ത്രജ്ഞൻ സർവ്വതന്ത്ര സ്വതന്ത്രനായിരിക്കണം SA A U D SD
13. മാനുഷികമൂല്യങ്ങളിൽ അദിഷ്ഠിതമായിരിക്കണം ഒരു ശാസ്ത്രജ്ഞന്റെ ഗവേഷണ പഠനങ്ങൾ SA A U D SD
14. ഒരു നിശ്ചിത കാലയളവിനുള്ളിൽ ഓരോ രാഷ്ട്രത്തിനുമുണ്ടായ ഗവേഷണ ഫലങ്ങൾ വിശകലനം ചെയ്യപ്പെടേണ്ടതാണ്. SA A U D SD
15. ശാസ്ത്രം പുരോഗമിക്കുന്നതോടും ശാസ്ത്രത്തെക്കുറിച്ചുള്ള പഠനം അനായമായിത്തീരും SA A U D SD
16. മനുഷ്യന്റെ പ്രവർത്തനക്ഷമതയെ ശാസ്ത്രം പ്രതികൂലമായി ബാധിച്ചിട്ടുണ്ട് SA A U D SD
17. ശാസ്ത്രത്തിന്റെ ദുഷ്യഫലങ്ങളെ അകറ്റാൻ ശാസ്ത്ര ഗവേഷണങ്ങൾ അനിവാര്യമായിരിക്കുന്നു. SA A U D SD

18. ആധുനികശാസ്ത്രത്തിന്റെ അതിപ്രസരത്താൽ പാരമ്പര്യ പലതും നഷ്ടപ്പെട്ടുകൊണ്ടിരിക്കുന്നു. SA A U D SD
19. പ്രപഞ്ചനിഗൂഢതകളെ അനാവരണം ചെയ്ത് മനുഷ്യ നന്മയ്ക്കു ഉപയുക്തമാക്കുകയാണ് ഒരു ശാസ്ത്രജ്ഞൻ ചെയ്യുന്നത് SA A U D SD
20. പഴയ കണ്ടെത്തലുകളുടെ വിശദീകരണങ്ങളോ വിശകലനങ്ങളോ അല്ലാതെ രണ്ടാം ലോകമഹായുദ്ധത്തിനും ശേഷം പുതിയ ശാസ്ത്രനേട്ടങ്ങളൊന്നും ഉടലെടുത്തിട്ടില്ല. SA A U D SD
21. ഇന്നു ലോകത്ത് ശാസ്ത്രജ്ഞന്മാർ കുറവാണ്. വിവിധ രാജ്യങ്ങളുടെ കീഴിൽ പണിയെടുക്കുന്ന ശാസ്ത്രതൊഴിലാളികളാണ് ഏറിയപങ്കും. SA A U D SD
22. മിക്ക രാഷ്ട്രങ്ങൾക്കും താൽപര്യം അധികാരം ഉറപ്പി യുറപ്പിക്കുന്ന തരത്തിലുള്ള ശാസ്ത്ര ഗവേഷണങ്ങളോടു മാത്രമാണ്. SA A U D SD
23. അന്യരുടെ ശാസ്ത്രനേട്ടങ്ങളെ തന്റേതാക്കാൻ ശ്രമിക്കുന്ന ശാസ്ത്രചോരന്മാരുടെ എണ്ണം പെരുകുവരികയാണ്. SA A U D SD
24. ചില നിക്ഷിപ്ത താൽപര്യങ്ങൾ ശാസ്ത്രപുരോഗതിയ്ക്ക് വിലങ്ങുതടികളാവുന്നുണ്ട് SA A U D SD
25. ജനിതകരംഗത്ത് ഗവേഷണങ്ങൾ നടത്താതിരിക്കുകയാണ് നല്ലത്. SA A U D SD
26. വർഗ്ഗസങ്കലനം നടത്തിക്കൊണ്ടുള്ള ശാസ്ത്രഗവേഷണം ശാസ്ത്രവൈകൃതമാണ് SA A U D SD
27. സാമൂഹ്യപുരോഗതിയാക്ക് ശാസ്ത്രത്തിന്റെ സഹായം ആവശ്യമില്ല SA A U D SD
28. ശാസ്ത്രസിദ്ധാന്തങ്ങൾ വിമർശിക്കപ്പെടുന്നത് ശാസ്ത്രപുരോഗതിയെ തടസ്സപ്പെടുത്തും. SA A U D SD
29. മതസിദ്ധാന്തങ്ങളെ എതിർക്കാൻ ഉപയോഗിക്കുന്ന ഒരു ആയുധമാണ് ശാസ്ത്രം SA A U D SD
30. ക്ലോണിംഗ് മനുഷ്യരാശിയ്ക്ക് ഭീഷണിയാണ് SA A U D SD

APPENDIX - XV
UNIVERSITY OF CALICUT
Department of Adult & Continuing Education & Extension Services
SCALE OF ATTITUDE TOWARDS SCIENCE –FINAL

Name : Boy:
 Name of school : Girl:
 Class : If brothers, how many:
 If sisters, how many:

DETAILS OF PARENTS

	Educational Qualification	Occupation	Monthly Income
Father			
Mother			

INSTRUCTIONS:

There are 80 statements in this scale. This is to find out your attitude and response towards science. For each statement five responses are given like Strongly Agree (SA), Agree (A), Undecided (U) Disagree (D), and Strongly Disagree (SD). Read each statement carefully and put a '✓' mark against your response.

Example:

1. Science is the reinterpretation of old one SA A U **D** SD

From this, we can understand that the person disagrees with the statement.

- | | | | | | |
|---|----|---|---|----------|----|
| 1. Science is an inevitable factor for the development of human beings | SA | A | U | D | SD |
| 2. Science is so old as the origin of mankind | SA | A | U | D | SD |
| 3. Many religious, customs and traditions have been proved to be scientific | SA | A | U | D | SD |
| 4. Dedication is the foremost quality of a science student | SA | A | U | D | SD |
| 5. Science learning should be in mother tongue | SA | A | U | D | SD |
| 6. Today science has made our life easy and comfortable | SA | A | U | D | SD |
| 7. Science learning should become completely free of cost | SA | A | U | D | SD |

- | | | | | | |
|--|----|---|---|---|----|
| 8. Science has changed the globe into a tiny village | SA | A | U | D | SD |
| 9. Environmental pollution is a bye-product of science | SA | A | U | D | SD |
| 10. Science has been developed to overcome the level of imagination | SA | A | U | D | SD |
| 11. Science is a never ending phenomenon | SA | A | U | D | SD |
| 12. A scientist must be absolutely independent | SA | A | U | D | SD |
| 13. The aim of scientist's research must be based on human values. | SA | A | U | D | SD |
| 14. The achievements of science research of a country in a given time should be analysed. | SA | A | U | D | SD |
| 15. The learning of science will become easy according to the progress of science. | SA | A | U | D | SD |
| 16. The working capacity of mankind has been adversely affected by the growth of science. | SA | A | U | D | SD |
| 17. The scientific researches are badly needed for avoiding the bad effects of science. | SA | A | U | D | SD |
| 18. We are losing many of our inherited talents by the excessive influence of modern science. | SA | A | U | D | SD |
| 19. Scientists unveil the universal secrets and make them beneficial for the mankind. | SA | A | U | D | SD |
| 20. There has been no new scientific achievements after second world war unless the expansion or analysis of older inventions. | SA | A | U | D | SD |
| 21. Nowadays scientists are rare. There are only scientific labourers who work under different countries. | SA | A | U | D | SD |
| 22. Majority of countries are interested only on scientific researches that helps to retain their powers. | SA | A | U | D | SD |
| 23. Number of scientists who steal the achievements of other scientists is growing | SA | A | U | D | SD |
| 24. Some vested interest make hurdles in the progress of science. | SA | A | U | D | SD |
| 25. It is wise to keep away from genetic researches. | SA | A | U | D | SD |
| 26. Researches on cross-breeding is a scientific vulgarity. | SA | A | U | D | SD |

- 27. Science is not essential for social development. SA A U D SD
- 28. The criticism of scientific theories will check the progress of science SA A U D SD
- 29. Science is a weapon used against religious concepts SA A U D SD
- 30. Cloning is threat to mankind. SA A U D SD

APPENDIX – XVI

University of Calicut
Department of Adult & continuing Education & Extension Services
Science Interest Inventory – PRELIMINARY

നിർദ്ദേശം

വിദ്യാർത്ഥികൾക്ക് ചില പ്രത്യേക ഇനം പ്രവൃത്തികളിൽ എത്രമാത്രം താല്പര്യം ഉണ്ടെന്ന് കണ്ടുപിടിക്കുന്നതിനുള്ള കുറെ പ്രസ്താവനകൾ, അടുത്ത പേജുകളിൽ കൊടുത്തിരിക്കുന്നു. ഓരോ ചോദ്യത്തിലും സാധാരണ നിങ്ങൾ ചെയ്യാൻ ഉഷ്ടപ്പെടുന്ന മൂന്നു പ്രവൃത്തികൾ ABC എന്നീ അക്ഷരങ്ങളിൽ കൊടുത്തിട്ടുണ്ട്. ആ മൂന്നു പ്രവൃത്തികളും ചെയ്യുന്നതിൽ നിങ്ങൾക്ക് ഒരു പോലെ സ്വാതന്ത്ര്യവും സാഹചര്യങ്ങളും ഉണ്ടെന്ന് സങ്കല്പിക്കുക. അവയിൽ നിങ്ങൾ ഏറ്റവും ഉഷ്ടപ്പെടുന്ന പ്രവൃത്തി ഏതാണെന്നു തീരുമാനിക്കണം. അപ്രകാരം തെരഞ്ഞെടുക്കുന്ന പ്രവൃത്തിയെ സൂചിപ്പിക്കുന്നതിനുള്ള അക്ഷരം മാത്രം ഉത്തരകടലാസിൽ അടയാളപ്പെടുത്തുക.

മാതൃകാ
ഉത്തരകടലാസ്
1. A (B) C

ഉദാ : താഴെ മൂന്ന് പ്രവൃത്തികൾ കൊടുത്തിരിക്കുന്നത് നോക്കുക.

- A) സിനിമാതാരങ്ങളുടെ പടങ്ങൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
- B) വിവിധ രാജ്യങ്ങളിലെ സ്തംബുകൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
- C) പലയിനം പക്ഷികളുടെ ചിത്രങ്ങൾ ശേഖരിച്ച് തരം തിരിച്ച് സൂക്ഷിക്കുക.

ഇവയിൽ വിവിധ രാജ്യങ്ങളിലെ സ്തംബുകൾ ശേഖരിച്ച് സൂക്ഷിക്കുന്നതാണ് നിങ്ങൾക്ക് ഏറ്റവും ഉഷ്ടപ്പെടുന്ന പ്രവൃത്തിയെങ്കിൽ ഉത്തരകടലാസിൽ ആ പ്രവൃത്തിക്കെതിരായി കൊടുത്തിട്ടുള്ള “B” എന്ന അക്ഷരത്തിനുചുറ്റും വലതുവശത്തു കാണിച്ചിരിക്കുന്നതുപോലെ ഒരു വൃത്തം ഇടുക. ഈ രീതിയിലുള്ള 61 തരം പ്രസ്താവനകൾ അടുത്ത പേജുകളിൽ കൊടുത്തിരിക്കുന്നു. അവ വായിച്ച് അദ്ധ്യാപകൻ നിർദ്ദേശിക്കുമ്പോൾ മാത്രം ഭേദപഠനത്ത വീധം അടയാളപ്പെടുത്തി തുടങ്ങുക.

- 1
 - A) വിവിധയിനം പക്ഷികളുടെ തൂവലുകൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
 - B) വിവിധ രാജ്യങ്ങളുടെ ഭൗമീയ പതാകകളുടെ ചിത്രങ്ങൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
 - C) രാഷ്ട്രനേതാക്കളുടെ ചിത്രങ്ങൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
- 2
 - A) സിനിമ കാണുക
 - B) ടെലസ്കോപ്പിലൂടെ വാനനിരീക്ഷണം നടത്തുക.
 - C) നാടകം കാണുക
- 3
 - A) തയ്യാൽ പരിശീലനം നേടുക.
 - B) പേപ്പർ കട്ടിംഗിൽ പരിശീലനം നേടുക.
 - C) സോപ്പ് നിർമ്മാണത്തിൽ പരിശീലനം നേടുക.
- 4
 - A) കമ്പോസ്റ്റ് നിർമ്മാണത്തിലേർപ്പെടുക.
 - B) ചിത്രരചനയിൽ ഏർപ്പെടുക
 - C) ശില്പനിർമ്മാണത്തിലേർപ്പെടുക.
- 5
 - A) കവിതകൾ ഹൃദിസ്ഥമാക്കുക.
 - B) സൂത്ര വാക്യങ്ങൾ പഠിക്കുക.
 - C) സിനിമാ ഗാനങ്ങൾ ഹൃദിസ്ഥമാക്കുക.
- 6
 - A) കമ്പ്യൂട്ടർ പഠിക്കുക.
 - B) സൗരീതമദ്യസിക്കുക.
 - C) ന്യൂനതമദ്യസിക്കുക.

- 7 A) ഷെയ്ക്സ്പിയർ കഥകൾ വായിക്കുക.
 B) റെജിനാസ്കോപ്പ് ഉപയോഗിച്ച് കോശത്തിന്റെ ഘടന പരിശോധിക്കുക.
 C) ഗുന്തൽ ഭരണഘടനയിൽ വ്യവസ്ഥ ചെയ്തിട്ടുള്ള ഭൗതികാവകാശങ്ങൾ പരിശോധിക്കുക
- 8 A) പടക്കമ്പിർമ്മാണത്തെക്കുറിച്ച് മനസ്സിലാക്കുക.
 B) പായ് നെയ്ത്ത് പരിശീലിക്കുക.
 C) കയർ നിർമ്മാണം പരിശീലിക്കുക.
- 9 A) കായികമത്സരങ്ങളിൽ പങ്കെടുക്കുക.
 B) പ്രസാസ മത്സരങ്ങളിൽ പങ്കെടുക്കുക.
 C) സ്ഥൻസ് ക്വിസിൽ പങ്കെടുക്കുക.
- 10 A) ന്യൂസ് ചാനൽ കാണുക
 B) ഡിസ്കവറി ചാനൽ കാണുക
 C) ജ്യൂസീക് ചാനൽ കാണുക
- 11 A) വീട് വൈദ്യുതീകരിക്കുന്നതിൽ സഹായിക്കുക.
 B) വീട് ചായം പുശുനത്തിൽ സഹായിക്കുക.
 C) വീട് വൃത്തിയാക്കുന്നതിൽ സഹായിക്കുക.
- 12 A) തോട്ടം നന്നയ്ക്കുക
 B) ചെടികൾ bud ചെയ്യുക.
 C) കൊപ്ര ഉണക്കുക.
- 13 A) സ്ഥൻസ് എക്സിബിഷൻ സംഘടിപ്പിക്കുന്നതിൽ സഹായിക്കുക.
 B) കരകൗശല വസ്തുക്കളുടെ പ്രദർശനത്തിന് സഹായിക്കുക.
 C) ചിത്ര പ്രദർശനം സംഘടിപ്പിക്കുന്നതിൽ സഹായിക്കുക.
- 14 A) ഏബ്രാഹാമി പരിശീലനകേന്ദ്രം സന്ദർശിക്കുക.
 B) ബീഡി നിർമ്മാണ ശാല സന്ദർശിക്കുക
 C) തേനീച്ച വളർത്തൽ കേന്ദ്രം സന്ദർശിക്കുക
- 15 A) ഗൃഹോപകരണങ്ങൾ വൃത്തിയാക്കുക
 B) പമ്പുവെസ്റ്റ് റിപ്പയർ ചെയ്യുക.
 C) വീട്ടുപുനരണനം കുഴിപ്പിക്കുക.
- 16 A) കളർ ലാബിന്റെ പ്രവർത്തനം വിശദീകരിക്കുന്ന പുസ്തകം വായിക്കുക.
 B) തുളുൽ കൃതികൾ വായിക്കുക.
 C) വാദികകൾ വായിക്കുക
- 17 A) ഷർണിച്ചർ നിർമ്മാണശാല സന്ദർശിക്കുക
 B) ഷെകത്വറി നെയ്ത്തുശാല സന്ദർശിക്കുക
 C) ആയുർവേദ മരുന്നുകളുടെ ഉൽപ്പാദനശാല സന്ദർശിക്കുക

- 18 A) വിവിധയിനം കുഷികൾ ശേഖരിക്കുക.
 B) കൃഷ്ണകൃഷി ചെയ്യുക.
 C) കരകൗശല വസ്തുക്കൾ നിർമ്മിക്കുക.
- 19 A) നിറക്കൂട്ടുകൾ നിർമ്മിക്കുക.
 B) സിറപ്പുകൾ ഉണ്ടാക്കുക
 C) അച്ചാറുണ്ടാക്കുക.
- 20 A) ഭേദിതയായിട്ട് കൂടി കുറ്റാന്വേഷണ നാടകങ്ങൾ ശ്രവിക്കുക.
 B) സാമൂഹിക നാടകങ്ങൾ ശ്രവിക്കുക.
 C) ശാസ്ത്ര സംബന്ധിയായ പരിപാടികൾ ശ്രവിക്കുക.
- 21 A) പശുവിനെ കറക്കുക
 B) തുണി അലക്കുക.
 C) വിത്തുതേങ്ങുകൾ പാവുക
- 22 A) കലാകാരന്മാരുമായി അഭിമുഖ സംഭാഷണത്തിൽ ഏർപ്പെടുക.
 B) ശാസ്ത്രജ്ഞന്മാരുമായി അഭിമുഖ സംഭാഷണം നടത്തുക.
 C) മതപണ്ഡിതന്മാരുമായി ഇടപഴകുക
- 23 A) നമ്പൂർഷീറ്റ് അടിക്കുക
 B) നെല്ല് ഉണക്കുക
 C) തൊഴുത്ത് റിപ്പയർ ചെയ്യുക.
- 24 A) രാഷ്ട്രതലവന്മാരുടെ ജീവചരിത്രങ്ങൾ വായിക്കുക.
 B) കലാകാരന്മാരുടെ ജീവചരിത്രങ്ങൾ വായിക്കുക.
 C) ശാസ്ത്രജ്ഞന്മാരുടെ ജീവചരിത്രങ്ങൾ വായിക്കുക.
- 25 A) ശാസ്ത്രകൃതികൾ വായിക്കുക.
 B) നിഘണ്ടുനോക്കി പുതിയ പദങ്ങൾ ഹൃദിസമ്മാക്കുക.
 C) വ്യാകരണം പഠിക്കുക.
- 26 A) കവണ ഉണ്ടാക്കുക
 B) ബൈനോക്കുലർ നിർമ്മിക്കുക
 C) ക്രിക്കറ്റ് ബാറ്റ് ഉണ്ടാക്കുക
- 27 A) പുതിയ ഇംഗ്ലീഷ് വാക്കുകളുടെ സ്പെല്ലിംഗ് പഠിക്കുക.
 B) വിവിധ രാജ്യങ്ങളുടെ പടം വരച്ച് പഠിക്കുക.
 C) പാവപുസ്തകങ്ങളിൽ നിർദ്ദേശിച്ചിട്ടുള്ള പരീക്ഷണങ്ങൾ ചെയ്യുക.
- 28 A) പഞ്ചായത്ത് ഓഫീസ് സന്ദർശിക്കുക
 B) പോസ്റ്റ് ഓഫീസ് സന്ദർശിക്കുക
 C) നെല്ല് ഗവേഷണകേന്ദ്രം സന്ദർശിക്കുക

- 29 A) കോലിക്കുകൾ വായിക്കുക
B) സിനിമാ ലാസികൾ വായിക്കുക
C) ക്ലോണിംഗിനെക്കുറിച്ച് വിശദീകരിക്കുന്ന പുസ്തകങ്ങൾ വായിക്കുക
- 30 A) മൃഗശാല സന്ദർശിക്കുക
B) കായിക പരിശീലനകേന്ദ്രം സന്ദർശിക്കുക
C) സർക്കസ് കാണുക
- 31 A) സോഷ്യൽ സർവ്വീസ് ലീഗ് അംഗമാകുക
B) സയൻസ് ക്ലബ്ബിലെ അംഗമാകുക
C) എൻ. സി.സി. യിൽ അംഗമാകുക
- 32 A) പരീക്ഷണങ്ങൾ സൂക്ഷ്മതയോടെ വേഗത്തിൽ ചെയ്യാൻ പരിശീലിക്കുക.
B) വൃത്തിയായി എഴുതാൻ പരിശീലിക്കുക.
C) വേഗത്തിൽ വായിക്കാൻ പരിശീലിക്കുക.
- 33 A) വിശ്രമ വേളകളിൽ ടെലിവിഷൻ കാണുക
B) വിശ്രമ വേളകളിൽ ശാസ്ത്ര പരീക്ഷണങ്ങൾ നടത്തുക.
C) വിശ്രമ വേളകളിൽ കഥാ പുസ്തകങ്ങൾ വായിക്കുക.
- 34 A) ആർട്ട് ഗ്യാലറി സന്ദർശിക്കുക
B) കുട്ടികളുടെ പാർക്കിൽ പോവുക
C) പ്ലാനറ്റോറിയം സന്ദർശിക്കുക
- 35 A) വിവിധ രാജ്യങ്ങളിലെ വിദ്യാഭ്യാസസമ്പ്രദായങ്ങളെക്കുറിച്ച് ഉപന്യാസം എഴുതുക.
B) ശാസ്ത്ര പുരോഗതിയുടെ ഭവിയുത്തുകയെക്കുറിച്ച് ഉപന്യാസം എഴുതുക.
C) സാഹിത്യത്തിലെ നൂതന പ്രവണതകളെക്കുറിച്ച് ഉപന്യാസം എഴുതുക.
- 36 A) പാവകൾ ഉണ്ടാക്കുക
B) തീപ്പെട്ടി പടങ്ങൾ ശേഖരിക്കുക.
C) അക്വേറിയം നിർമ്മിക്കുക
- 37 A) സോളാർ അടുപ്പുകൾ ഉണ്ടാക്കാൻ പഠിക്കുക.
B) നീന്താൻ പഠിക്കുക.
C) സൈക്കിൾ ഓടിക്കാൻ പഠിക്കുക.
- 38 A) പട്ടം പറത്തുക
B) പട്ടുനൂൽ ഉണ്ടാക്കുന്നതെങ്ങനെ എന്ന് മനസ്സിലാക്കുക
C) ചെസ്സ് കളിക്കുക
- 39 A) ജീവികളെ സ്ലാഷ് ചെയ്യാൻ പഠിക്കുക.
B) കൂട നിർമ്മാണം പരിശീലിക്കുക
C) പൂക്കൾ ശേഖരിച്ച് മാലയുണ്ടാക്കുക

- 40 A) വിദേശഭാഷകൾ പഠിക്കുക.
B) ഷ്ളാസ്കിന്റെ പ്രവർത്തന തത്വം മനസ്സിലാക്കുക
C) ഒരു വായനശാല ഉണ്ടാക്കുക.
- 41 A) സ്കൂളിൽ ജോലി കിട്ടുക.
B) റോക്കറ്റ് വിക്ഷേപണ കേന്ദ്രത്തിൽ ജോലി ലഭിക്കുക.
C) സാഹിത്യ അക്കാദമിയിൽ ജോലി കിട്ടുക.
- 42 A) മലയാളഭാഷ ഉണ്ടാക്കായ വ്യക്തിയെക്കുറിച്ച് മനസ്സിലാക്കുക
B) മലയാളനിഘണ്ടു ആദ്യമായി നിർമ്മിച്ച വിദേശിയെക്കുറിച്ച് മനസ്സിലാക്കുക
C) ബഹിരാകാശയാത്ര നടത്തിയ ആദ്യവനിതയെക്കുറിച്ച് മനസ്സിലാക്കുക
- 43 A) ഷുട്ബോൾ കളിയുടെ നിയമങ്ങൾ മനസ്സിലാക്കുക
B) ടെലസ്കോപ്പ് കണ്ടുപിടിച്ച മഹാനെപ്പറ്റി അറിയുക.
C) ഭൂപടം നോക്കി വിവിധ രാജ്യങ്ങളെപ്പറ്റി മനസ്സിലാക്കുക
- 44 A) ക്രിക്കറ്റ് മത്സരങ്ങളെക്കുറിച്ച് പ്രതിപാദിക്കുന്ന പുസ്തകങ്ങൾ വായിക്കുക.
B) മഹാത്മാഗാന്ധിയുടെ ജീവചരിത്രം വായിക്കുക.
C) പുതിയ കൃഷിരീതികളെക്കുറിച്ച് പ്രതിപാദിക്കുന്ന പുസ്തകം വായിക്കുക.
- 45 A) കാർട്ടൂൺ പടങ്ങൾ കാണുക.
B) വനനശീകരണത്തെ വീമർശിക്കുന്ന ചിത്രങ്ങൾ കാണുക.
C) രവിവർമ്മ വരച്ച ചിത്രങ്ങൾ കാണുക.
- 46 A) ഷോസിറ്റികളെക്കുറിച്ചുള്ള വിവരങ്ങൾ ശേഖരിക്കുക.
B) പുരാതന നാണയങ്ങൾ ശേഖരിക്കുക.
C) നാട്യശാസ്ത്രത്തെക്കുറിച്ചുള്ള വിവരങ്ങൾ ശേഖരിക്കുക.
- 47 A) വിവിധയിനം പാത്രങ്ങൾ ശേഖരിക്കുക.
B) വിവിധതരം മണ്ണ് ശേഖരിക്കുക.
C) വിവിധയിനം കടൽ ജീവികളെ ശേഖരിക്കുക.
- 48 A) സിനിമാനടന്മാർ അഭിനയിക്കുന്നത് കാണുക.
B) സിനിമ എടുക്കുന്ന ക്യാമറയുടെ പ്രവർത്തനം മനസ്സിലാക്കുക
C) സിനിമയിലെ പിന്നണിഗാനങ്ങൾ കേൾക്കുക.
- 49 A) പാചക ക്ലാസ്സുകളിൽ പങ്കെടുക്കുക
B) ബുക്ക് ബൈന്റിംഗ് പഠിക്കുക
C) വാച്ച് നന്നാക്കുന്നത് കണ്ടുപിടിക്കുക
- 50 A) രാസവളങ്ങളുടെ ദുഷ്പ്രഭവങ്ങളെക്കുറിച്ചുള്ള ഡോക്യുമെന്ററി കാണുക.
B) ടി. വി സീരിയലുകൾ കാണുക.
C) ഇംഗ്ലീഷ് സിനിമകൾ കാണുക.

- 51 A) ദാസ്ത്രീയ സംഗീതം അഭ്യസിക്കുക
 B) നാടകത്തിൽ അഭിനയിക്കുക.
 C) ദാസ്ത്രീവിഷയങ്ങളുടെ സംവാദത്തിൽ പങ്കെടുക്കുക.
- 52 A) ലലയാളഭാഷയിൽ ആദ്യത്തെ നോവലെഴുതിയവ്യക്തിയെക്കുറിച്ച് മനസ്സിലാക്കുക
 B) ലോകത്തിലെ ആദ്യത്തെ ടെസ്റ്റ് ട്യൂബ് ശിശുവിനെക്കുറിച്ചുള്ള വിവരങ്ങൾ മനസ്സിലാക്കുക
 C) സാഹിത്യത്തിൽ നോബൽ സമ്മാനം വാങ്ങിയ ആദ്യത്തെ ഭാരതീയനെക്കുറിച്ച് മനസ്സിലാക്കുക
- 53 A) പ്രാമശുശ്രൂഷ ചെയ്യുന്ന രീതികൾ കണ്ടുപഠിക്കുക
 B) വ്യായാമം ചെയ്യുന്ന രീതികൾ കണ്ടുപഠിക്കുക
 C) യോഗ ചെയ്യുന്ന രീതികൾ കണ്ടുപഠിക്കുക
- 54 A) കളിമണ്ണുകൊണ്ട് പാത്രങ്ങൾ നിർമ്മിക്കുക
 B) വൈദ്യുത കാന്തത്തിന്റെ മാതൃക നിർമ്മിക്കുക
 C) പ്ലാസ്റ്റർ ഓഫ് പാരീസ് കൊണ്ട് ശില്പങ്ങൾ നിർമ്മിക്കുക
- 55 A) പൂന്തോട്ടം നിർമ്മിക്കുക
 B) പച്ചക്കറികൾ അരിഞ്ഞ് രൂപങ്ങൾ ഉണ്ടാക്കുക
 C) പാത്രങ്ങൾ കഴുകി തുടച്ച് വെക്കുക
- 56 A) വിവിധ ഭോധലുകളിലുള്ള കാനുകളെക്കുറിച്ച് വിവരങ്ങൾ ശേഖരിക്കുക.
 B) വിവിധയിനം കാനുകളുടെ വിലവിവരങ്ങൾ ശേഖരിക്കുക
 C) കാനിന്റെ എഞ്ചിൻ പ്രവർത്തനം മനസ്സിലാക്കുക
- 57 A) സ്കൂളിൽ ഒരു സയൻസ് ലൈബ്രറി ഉണ്ടാക്കാൻ സ്വഹായിക്കുക.
 B) സ്കൂളിൽ ക്രാഷ്റ്റ് ക്ലാസ്സുകളിൽ ഉണ്ടാക്കുന്ന വസ്തുക്കളുടെ പ്രദർശനത്തിന് സ്വഹായിക്കുക.
 C) സ്കൂളിൽ സ്പോർട്ട്സ് സാമഗ്രികൾ അടുക്കിവെക്കാൻ സ്വഹായിക്കുക.
- 58 A) ഓലകൊണ്ട് കളിപ്പാട്ടങ്ങൾ ഉണ്ടാക്കുക
 B) കോലം വരയ്ക്കുക
 C) കിഡ്നിയുടെ മാതൃക ഉണ്ടാക്കുക
- 59 A) ബീച്ചിൽ പോവുക
 B) റോക്കറ്റ് വിക്ഷേപണ കേന്ദ്രം സന്ദർശിക്കുക
 C) ചോപ്പിംഗ് സെന്റർ സന്ദർശിക്കുക
- 60 A) കവിയ രചിക്കുക
 B) കഥയെഴുതുക
 C) സയൻസ് ഡയറി ഉണ്ടാക്കുക

APPENDIX - XVII

UNIVERSITY OF CALICUT
DEPARTMENT OF ADULT AND
CONTINUING EDUCATION AND EXTENSION SERVICES
SCIENCE INTEREST INVENTORY –PRELIMINARY

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Directions:-

Some statements are given in the next pages, in order to measure the interest among students to do certain activities. Each item of the inventory consists of three similar activities A, B and C which you usually like to do. Imagine that you have full freedom and proper conditions to do all these activities. You have to select the activity you like most and mark the corresponding alternative in the answer sheet.

Example:

Look at the following three activities given.

- A. Collecting pictures of filmstars
- B. Collecting stamps of different countries.
- C. Collecting and sorting pictures of different birds.

Suppose, your choice is collecting stamps of different countries, you can mark the corresponding alternative to that which is B.

A	<input checked="" type="checkbox"/> B	C
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1. A] Collecting feathers of different kinds of birds.
B] Collecting pictures of various national flags.
C] Collecting pictures of national leaders.
2. A] Watching film.
B] Observing sky through a telescope.
C] Watching drama.
3. A] Attending tailoring classes
B] Attending paper cutting classes
C] Training in soap making

4. A] Compost making.
B] Drawing pictures.
C] Clay modelling.
5. A] Byhearting poems.
B] Learning formulas.
C] Byhearting film songs.
6. A] Learning computer.
B] Learning music.
C] Learning dance.
7. A] Reading Shakesperian stories
B] Studying the structure of cell with the help of microscope.
C] Examining the fundamental rights of Indian Constitution.
8. A] Learning the techniques of making crackers.
B] Training of mat making.
C] Training of coir making.
9. A] Participate in sports.
B] Participate in elocution contest.
C] Participate in Science Quiz.
10. A] Watching News Channel.
B] Watching Discovery Channel.
C] Watching Music Channel.
11. A] Helping in the electrification of house.
B] Helping in painting the house.
C] Helping in cleaning the house.
12. A] Watering plants.
B] Budding plants.
C] Drying copras.
13. A] Help to organize a science exhibition.
B] Help to organize a handicraft exhibition.
C] Help to organize a painting exhibition.
14. A] Visiting an embroidery training centre.
B] Visiting a beedi factory .
C] Visiting a bee farm.

15. A] Cleaning household utensils.
B] Repairing Pumpsets.
C] Washing domestic animals.
16. A] Reading a book about colour lab technology.
B] Reading Thullal story books.
C] Reading weeklies.
17. A] Visiting furniture factory.
B] Visiting handloom industry.
C] Visiting an Ayurvedic medicine factory.
18. A] Collecting different kinds of bottles.
B] Cultivating mushrooms.
C] Making handicrafts.
19. A] Mixing colours.
B] Making Syrups.
C] Making pickles.
20. A] Listening detective dramas in radio.
B] Listening social dramas.
C] Listening programmes related to science.
21. A] Milking of cow.
B] Washing clothes.
C] Prepare coconuts for seedlings.
22. A] Interview with artists.
B] Interview with scientists.
C] Making Conversation with religious leaders.
23. A] Making rubber sheets.
B] Drying of Paddy.
C] Repairing of cattle shed.
24. A] Reading biographies of national leaders.
B] Reading biographies of artists.
C] Reading biographies of scientists.

25. A] Reading science books.
B] Byhearting of new words from the dictionary.
C] Learning of grammar.
26. A] Making sling.
B] Making binocular.
C] Making cricket bat.
27. A] Learning the spelling of new English words.
B] Practice to draw maps of different countries.
C] Doing experiments suggested in the text books.
28. A] Visiting Panchayat office .
B] Visiting Post office.
C] Visiting Rice Research Centre.
29. A] Reading Comics.
B] Reading film magazines.
C] Reading book about cloning.
30. A] Visiting zoo.
B] Visiting physical training centre.
C] Watching circus.
31. A] Taking membership in social service league.
B] Taking membership in science club.
C] Taking membership in N.C.C.
32. A] Practice to do experiments with speed and safely.
B] Practice to improve handwriting.
C] Practice speedy reading.
33. A] Watching Television at leisure time.
B] Conducting science experiments at leisure time.
C] Reading stories at leisure time.
34. A] Visiting art gallery.
B] Visiting children park.
C] Visiting Planetarium.
35. A] Write essays about educational systems of different countries.
B] Write essays about the consequences of scientific developments.
C] Write essays about modernism in literature.

36. A] Doll making.
B] Collecting matchbox pictures.
C] Making aquarium.
37. A] Learning to make solar ovens.
B] Learn how to swim.
C] Learning cycling.
38. A] Flying Kite.
B] Learning how to make silk yarn.
C] Playing chess.
39. A] Learn to stuff animals.
B] Training in umbrella making.
C] Making of flower garlands.
40. A] Learn foreign languages.
B] Learn the function of flask.
C] Arrange a library.
41. A] Getting job as a teacher in school.
B] Getting job as a scientist in rocket launching centre.
C] Getting job in academy of literature.
42. A] Understand about the first person who introduce Malayalam language.
B] Understand about the first person who introduce Malayalam dictionary.
C] Understand about the first lady space traveller.
43. A] Get an idea about the rules and regulations of football.
B] Understand about the person who invent telescope.
C] Understand about different countries from a map.
44. A] Reading books about the competition of cricket.
B] Reading autobiography of Mahatma Gandhi.
C] Reading books about modern methods of agriculture.
45. A] Watching cartoon films.
B] Watching pictures which criticize deforestation.
C] Watching pictures of Ravivarma.
46. A] Collecting informations about fossils.
B] Collecting old coins.
C] Collecting information about Natya Sasthra.

47. A] Collecting different types of vessels.
B] Collecting different types of soils.
C] Collecting different types of sea animals.
48. A] Watching film stars.
B] Get an idea about the function of movie camera.
C] Listening film songs.
49. A] Participate in cookery class.
B] Learn book binding.
C] Learn watch repairing.
50. A] Watching documentary about the ill effects of pesticides.
B] Watching T.V. serials.
C] Watching English films.
51. A] Learn classical music.
B] Participate in drama.
C] Participate in science debates.
52. A] Understand about the first novelist in Malayalam.
B] Get an idea about the world's first test tube baby.
C] Understand about the first Indian who win the Nobel Prize in literature.
53. A] Learn the techniques of different first aids.
B] Learn to do exercise.
C] Learn to do Yogas.
54. A] Making clay pots.
B] Making model of electric magnet.
C] Making sculpture with plaster of paris.
55. A] Making garden.
B] Making vegetable carvings.
C] Cleaning plates.
56. A] Collecting informations about different models of cars.
B] Collecting informations about the prices of different types of cars.
C] Learn the function of the engine of a car.
57. A] Helps in the arrangement of science library in schools.
B] Helps in the exhibition of handicrafts made in schools.
C] Helps in the arrangement of sports equipments in schools.

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58. A] Making toys with coconut leaves.
B] Drawing "Kolam" in front of the house.
C] Making a model of kidney.
59. A] Visiting beach.
B] Visiting Rocket launching centre.
C] Visiting shopping centre.
60. A] Poetry writing
B] Writing story.
C] Prepare science diary.

Appendix XVIII

UNIVERSITY OF CALICUT
Department of Adult & Continuing Education and Extension Services
Science Interest Inventory (Final)

നിർദ്ദേശം

വിദ്യാർത്ഥികൾക്ക് ചില പ്രത്യേക ഇനം പ്രവൃത്തികളിൽ എത്രമാത്രം താല്പര്യം ഉണ്ടെന്ന് കണ്ടുപിടിക്കുന്നതിനുള്ള കുറെ പ്രസ്താവനകൾ, അടുത്ത പേജുകളിൽ കൊടുത്തിരിക്കുന്നു. ഓരോ ചോദ്യത്തിലും സാധാരണ നിങ്ങൾ ചെയ്യാൻ ഇഷ്ടപ്പെടുന്ന മൂന്നു പ്രവൃത്തികൾ ABC എന്നീ അക്ഷരങ്ങളിൽ കൊടുത്തിട്ടുണ്ട്. ആ മൂന്നു പ്രവൃത്തികളും ചെയ്യുന്നതിന് നിങ്ങൾക്ക് ഒരു പോലെ സ്വാതന്ത്ര്യവും സാഹചര്യങ്ങളും ഉണ്ടെന്ന് സങ്കല്പിക്കുക. അവയിൽ നിങ്ങൾ ഏറ്റവും ഇഷ്ടപ്പെടുന്ന പ്രവൃത്തി ഏതാണെന്നു തീരുമാനിക്കണം. അപ്രകാരം തെരഞ്ഞെടുക്കുന്ന പ്രവൃത്തിയെ സൂചിപ്പിക്കുന്നതിനുള്ള അക്ഷരം മാത്രം ഉത്തരക്കടലാസ്സിൽ അടയാളപ്പെടുത്തുക.

ഉദാ: താഴെ മൂന്ന് പ്രവൃത്തികൾ കൊടുത്തിരിക്കുന്നത് നോക്കുക.

മാതൃകാ ഉത്തരക്കടലാസ്
1 A (B) C

- A. സിനിമാതാരങ്ങളുടെ പടങ്ങൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
- B വിവിധ രാജ്യങ്ങളിലെ സ്റ്റാമ്പുകൾ ശേഖരിച്ച് സൂക്ഷിക്കുക.
- C പലയിനം പക്ഷികളുടെ ചിത്രങ്ങൾ ശേഖരിച്ച് തരം തിരിച്ച് സൂക്ഷിക്കുക.

ഇവയിൽ വിവിധ രാജ്യങ്ങളിലെ സ്റ്റാമ്പുകൾ ശേഖരിച്ച് സൂക്ഷിക്കുന്നതാണ് നിങ്ങൾക്ക് ഏറ്റവും ഇഷ്ടപ്പെടുന്ന പ്രവൃത്തിയെങ്കിൽ ഉത്തരക്കടലാസിൽ ആ പ്രവൃത്തിക്കെതിരായി കൊടുത്തിട്ടുള്ള B എന്ന അക്ഷരത്തിനുചുറ്റും വലതുവശത്തു കാണിച്ചിരിക്കുന്നതുപോലെ ഒരു വൃത്തം ഇടുക. ഈ രീതിയിലുള്ള 61 തരം പ്രസ്താവനകൾ അടുത്ത പേജുകളിൽ കൊടുത്തിരിക്കുന്നു. അവ വായിച്ച് അദ്ധ്യാപകൻ നിർദ്ദേശിക്കുമ്പോൾ മാത്രം മേൽ പറഞ്ഞവിധം അടയാളപ്പെടുത്തി തുടങ്ങുക.

1. A) സിനിമ കാണുക
B) ടെലസ്കോപ്പിലൂടെ വാനനിരീക്ഷണം നടത്തുക
C) നാടകം കാണുക
2. A) ഷെയ്ക്സ്പിയർ കഥകൾ വായിക്കുക
B) മൈക്രോസ്കോപ്പ് ഉപയോഗിച്ച് കോശത്തിന്റെ ഘടന പരിശോധിക്കുക
C) ഇന്ത്യൻ ഭരണഘടനയിൽ വ്യവസ്ഥ ചെയ്തിട്ടുള്ള മൗലികാവകാശങ്ങൾ പരിശോധിക്കുക
3. A) കായികമൽസരങ്ങളിൽ പങ്കെടുക്കുക
B) പ്രസംഗമൽസരങ്ങളിൽ പങ്കെടുക്കുക
C) സയൻസ് കിസിൽ പങ്കെടുക്കുക.
4. A) ന്യൂസ് ചാനൽ കാണുക
B) ഡിസ്കവറി ചാനൽ കാണുക
C) മ്യൂസിക് ചാനൽ കാണുക
5. A) സയൻസ് എക്സിബിഷൻ സംഘടിപ്പിക്കുന്നതിൽ സഹായിക്കുക
B) കരകൗശല വസ്തുക്കളുടെ പ്രദർശനത്തിന് സഹായിക്കുക
C) ചിത്ര പ്രദർശനം സംഘടിപ്പിക്കുന്നതിൽ സഹായിക്കുക.
6. A) കളർ ലാബിന്റെ പ്രവർത്തനം വിശദീകരിക്കുന്ന പുസ്തകം വായിക്കുക
B) തുള്ളൽ കൃതികൾ വായിക്കുക
C) വാരികകൾ വായിക്കുക
7. A) ഫർണിച്ചർ നിർമ്മാണശാല സന്ദർശിക്കുക
B) കൈത്തറി നെയ്ത്തുശാല സന്ദർശിക്കുക
C) ആയുർവേദ മരുന്നുകളുടെ ഉൽപ്പാദനശാല സന്ദർശിക്കുക
8. A) റേഡിയോയിൽ കൂടി കുറ്റാന്വേഷണനാടകങ്ങൾ ശ്രവിക്കുക
B) സാമൂഹിക നാടകങ്ങൾ ശ്രവിക്കുക
C) ശാസ്ത്ര സംബന്ധിതമായ പരിപാടികൾ ശ്രവിക്കുക

- 9. A) പശുവിനെ കറക്കുക
B) തുണി അലക്കുക
C) വിത്തു തേങ്ങുകൾ പാവുക
- 10. A) കലാകാരന്മാരുമായി അഭിമുഖ സംഭാഷണത്തിൽ ഏർപ്പെടുക
B) ശാസ്ത്രജ്ഞരുമായി അഭിമുഖ സംഭാഷണം നടത്തുക
C) മതപണ്ഡിതന്മാരുമായി ഇടപഴകുക
- 11. A) രാഷ്ട്രതലവന്മാരുടെ ജീവചരിത്രങ്ങൾ വായിക്കുക
B) കലാകാരന്മാരുടെ ജീവചരിത്രങ്ങൾ വായിക്കുക
C) ശാസ്ത്രജ്ഞന്മാരുടെ ജീവചരിത്രങ്ങൾ വായിക്കുക.
- 12. A) കവണ ഉണ്ടാക്കുക
B) ബൈനോക്കുലർ നിർമ്മിക്കുക
C) ക്രിക്കറ്റ് ബാറ്റ് ഉണ്ടാക്കുക
- 13. A) പഞ്ചായത്ത് ഓഫീസ് സന്ദർശിക്കുക
B) പോസ്റ്റ് ഓഫീസ് സന്ദർശിക്കുക
C) നെല്ല് ഗവേഷണകേന്ദ്രം സന്ദർശിക്കുക
- 14. A) കോമിക്കുകൾ വായിക്കുക
B) സിനിമാ മാസികകൾ വായിക്കുക
C) ക്ലോണിംഗിനെക്കുറിച്ച് വിശദീകരിക്കുന്ന പുസ്തകങ്ങൾ വായിക്കുക
- 15. A) സോഷ്യൽ സർവ്വീസ് ലീഗ് അംഗമാകുക
B) സയൻസ് ക്ലബ്ബിലെ അംഗമാവുക
C) എൻ.സി.സി.യിൽ അംഗമാകുക
- 16. A) പരീക്ഷണങ്ങൾ സൂക്ഷ്മതയോടെ വേഗത്തിൽ ചെയ്യാൻ പരിശീലിക്കുക
B) വൃത്തിയായി എഴുതാൻ പരിശീലിക്കുക
C) വേഗത്തിൽ വായിക്കാൻ പരിശീലിക്കുക

17. A) വിശ്രമവേളകളിൽ ടെലിവിഷൻ കാണുക
B) വിശ്രമവേളകളിൽ ശാസ്ത്ര പരീക്ഷണങ്ങൾ നടത്തുക
C) വിശ്രമവേളകളിൽ കഥാ പുസ്തകങ്ങൾ വായിക്കുക
18. A) ആർട്ട് ഗ്യാലറി സന്ദർശിക്കുക
B) കുട്ടികളുടെ പാർക്കിൽ പോവുക
C) പ്ലാനറ്റോറിയം സന്ദർശിക്കുക
19. A) പാവകൾ ഉണ്ടാക്കുക
B) തീപ്പെട്ടി പടങ്ങൾ ശേഖരിക്കുക
C) അക്ഷേപിതം നിർമ്മിക്കുക
20. A) സോളാർ അടുപ്പുകൾ ഉണ്ടാക്കാൻ പഠിക്കുക
B) നീന്താൻ പഠിക്കുക
C) സൈക്കിൾ ഓടിക്കാൻ പഠിക്കുക
21. A) പട്ടം പറത്തുക
B) പട്ടുനൂൽ ഉണ്ടാക്കുന്നതെങ്ങനെ എന്ന് മനസ്സിലാക്കുക
C) ചെസ്സ് കളിക്കുക
22. A) ജീവികളെ സ്റ്റഫ് ചെയ്യാൻ പഠിക്കുക
B) കൂട നിർമ്മാണം പരിശീലിക്കുക
C) പൂക്കൾ ശേഖരിച്ച് മാലയുണ്ടാക്കുക
23. A) സ്കൂളിൽ ജോലി കിട്ടുക
B) റോക്കറ്റ് വിക്ഷേപണ കേന്ദ്രത്തിൽ ജോലി ലഭിക്കുക
C) സാഹിത്യ അക്കാദമിയിൽ ജോലി കിട്ടുക
24. A) മലയാളഭാഷ ഉണ്ടാക്കിയ വ്യക്തിയെക്കുറിച്ച് മനസ്സിലാക്കുക
B) മലയാളനിഘണ്ടു ആദ്യമായി നിർമ്മിച്ച വിദേശിയെക്കുറിച്ച് മനസ്സിലാക്കുക
C) ബഹിരാകാശയാത്ര നടത്തിയ ആദ്യവനിതയെക്കുറിച്ച് മനസ്സിലാക്കുക

25. A) ഫുട്ബോൾ കളിയുടെ നിയമങ്ങൾ മനസ്സിലാക്കുക
 B) ടെലസ്കോപ്പ് കണ്ടുപിടിച്ച മഹാനെപ്പറ്റി അറിയുക
 C) ഭൂപടം നോക്കി വിവിധ രാജ്യങ്ങളെപ്പറ്റി മനസ്സിലാക്കുക
26. A) ക്രിക്കറ്റ് മത്സരങ്ങളെക്കുറിച്ച് പ്രതിപാദിക്കുന്ന പുസ്തകങ്ങൾ വായിക്കുക
 B) മഹാത്മാഗാന്ധിയുടെ ജീവചരിത്രം വായിക്കുക
 C) പുതിയ കൃഷിരീതികളെക്കുറിച്ച് പ്രതിപാദിക്കുന്ന പുസ്തകം വായിക്കുക
27. A) കാർട്ടൂൺ പടങ്ങൾ കാണുക
 B) വനനശീകരണത്തെ വിമർശിക്കുന്ന ചിത്രങ്ങൾ കാണുക
 C) രവിവർമ്മ വരച്ച ചിത്രങ്ങൾ കാണുക
28. A) ഫോസിലുകളെക്കുറിച്ചുള്ള വിവരങ്ങൾ ശേഖരിക്കുക
 B) പുരാതന നാണയങ്ങൾ ശേഖരിക്കുക
 C) നാട്യശാസ്ത്രത്തെക്കുറിച്ചുള്ള വിവരങ്ങൾ ശേഖരിക്കുക
29. A) സിനിമാനടന്മാർ അഭിനയിക്കുന്നത് കാണുക
 B) സിനിമ എടുക്കുന്ന ക്യാമറയുടെ പ്രവർത്തനം മനസ്സിലാക്കുക
 C) സിനിമയിലെ പിന്നണിഗാനങ്ങൾ കേൾക്കുക
30. A) പാചക ക്ലാസ്സുകളിൽ പങ്കെടുക്കുക
 B) ബുക്ക് ബൈന്റിംഗ് പഠിക്കുക
 C) വാച്ച് നന്നാക്കുന്നത് കണ്ടുപഠിക്കുക
31. A) രാസവളങ്ങളുടെ ദുഷ്യഫലങ്ങളെക്കുറിച്ചുള്ള ഡോക്യുമെന്റി കാണുക
 B) ടി.വി. സീരിയലുകൾ കാണുക
 C) ഇംഗ്ലീഷ് സിനിമകൾ കാണുക

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- 32. A) ശാസ്ത്രീയ സംഗീതം അഭ്യസിക്കുക
 B) നാടകത്തിൽ അഭിനയിക്കുക
 C) ശാസ്ത്രവിഷയങ്ങളുടെ സംവാദത്തിൽ പങ്കെടുക്കുക

- 33. A) മലയാളഭാഷയിൽ ആദ്യത്തെ നോവലെഴുതിയ വ്യക്തിയെക്കുറിച്ച് മനസ്സിലാക്കുക
 B) ലോകത്തിലെ ആദ്യത്തെ ടെസ്റ്റ് ട്യൂബ് ശിശുവിനെക്കുറിച്ചുള്ള വിവരങ്ങൾ മനസ്സിലാക്കുക
 C) സാഹിത്യത്തിൽ നോബൽ സമ്മാനം വാങ്ങിയ ആദ്യത്തെ ഭാരതീയനെക്കുറിച്ച് മനസ്സിലാക്കുക

- 34. A) പ്രഥമശുശ്രൂഷ ചെയ്യുന്ന രീതികൾ കണ്ടുപിടിക്കുക
 B) വ്യായമം ചെയ്യുന്ന രീതികൾ കണ്ടുപിടിക്കുക
 C) യോഗ ചെയ്യുന്ന രീതികൾ കണ്ടുപിടിക്കുക

- 35. A) കളിമണ്ണുകൊണ്ട് പാത്രങ്ങൾ നിർമ്മിക്കുക
 B) വൈദ്യുത കാന്തത്തിന്റെ മാതൃക നിർമ്മിക്കുക
 C) പ്ലാസ്റ്റർ ഓഫ് പാരീസ് കൊണ്ട് ശില്പങ്ങൾ നിർമ്മിക്കുക

- 36. A) വിവിധ മോഡലുകളിലുള്ള കാറുകളെക്കുറിച്ച് വിവരങ്ങൾ ശേഖരിക്കുക
 B) വിവിധയിനം കാറുകളുടെ വിലവിവരങ്ങൾ ശേഖരിക്കുക
 C) കാറിന്റെ എഞ്ചിൻ പ്രവർത്തനം മനസ്സിലാക്കുക

- 37. A) സ്കൂളിൽ ഒരു സയൻസ് ലൈബ്രറി ഉണ്ടാക്കാൻ സഹായിക്കുക
 B) സ്കൂളിൽ ക്രാഫ്റ്റ് ക്ലാസ്സുകളിൽ ഉണ്ടാക്കുന്ന വസ്തുക്കളുടെ പ്രദർശനത്തിന് സഹായിക്കുക
 C) സ്കൂളിൽ സ്പോർട്ട്സ് സാമഗ്രികൾ അടുക്കിവെക്കാൻ സഹായിക്കുക.

- 38. A) ഓലകൊണ്ട് കളിപ്പാട്ടങ്ങൾ ഉണ്ടാക്കുക
 B) കോലം വരയ്ക്കുക
 C) കിട്നിയുടെ മാതൃക ഉണ്ടാക്കുക

39. A) ബീച്ചിൽ പോവുക
B) റോക്കറ്റ് വിക്ഷേപണ കേന്ദ്രം സന്ദർശിക്കുക
C) ഷോപ്പിംഗ് സെന്റർ സന്ദർശിക്കുക
40. A) കവിത രചിക്കുക
B) കഥയെഴുതുക
C) സയൻസ് ഡയറി ഉണ്ടാക്കുക.

APPENDIX - XIX

UNIVERSITY OF CALICUT
DEPARTMENT OF ADULT AND
CONTINUING EDUCATION AND EXTENSION SERVICES
SCIENCE INTEREST INVENTORY –FINAL

Dr. K. Karunakaran
Supervising teacher

Priya K.P.
Research Scholar

Directions:-

Some statements are given in the next pages, in order to measure the interest among students to do certain activities. Each item of the inventory consists of three similar activities A, B and C which you usually like to do. Imagine that you have full freedom and proper conditions to do all these activities. You have to select the activity you like most and mark the corresponding alternative in the answer sheet.

Example:

Look at the following three activities given.

- A. Collecting pictures of filmstars
- B. Collecting stamps of different countries.
- C. Collecting and sorting pictures of different birds.

Suppose, your choice is collecting stamps of different countries, you can mark the corresponding alternative to that which is B.

A	B	C
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1. A] Watching film.
B] Observing sky through a telescope.
C] Watching drama.
2. A] Reading Shakesperian stories
B] Studying the structure of cell with the help of microscope.
C] Examining the fundamental rights of Indian Constitution.
3. A] Participate in sports.
B] Participate in elocution contest.
C] Participate in Science Quiz.

4. A) Watching News Channel.
B) Watching Discovery Channel.
C) Watching Music Channel.
5. A) Help to organize a science exhibition.
B) Help to organize a handicraft exhibition.
C) Help to organize a painting exhibition.
6. A) Reading a book about colour lab technology.
B) Reading Thullal story books.
C) Reading weeklies.
7. A) Visiting furniture factory.
B) Visiting handloom industry.
C) Visiting an Ayurvedic medicine factory.
8. A) Listening detective dramas in radio.
B) Listening social dramas.
C) Listening programmes related to science.
9. A) Milking of cow.
B) Washing clothes.
C) Prepare coconuts for seedlings.
10. A) Interview with artists.
B) Interview with scientists.
C) Making Conversation with religious leaders.
11. A) Reading biographies of national leaders.
B) Reading biographies of artists.
C) Reading biographies of scientists.
12. A) Making sling.
B) Making binocular.
C) Making cricket bat.
13. A) Visiting Panchayat office .
B) Visiting Post office.
C) Visiting Rice Research Centre.
14. A) Reading Comics.
B) Reading film magazines.
C) Reading book about cloning.

15. A] Taking membership in social service league.
B] Taking membership in science club.
C] Taking membership in N.C.C.
16. A] Practice to do experiments with speed and safely.
B] Practice to improve handwriting.
C] Practice speedy reading.
17. A] Watching Television at leisure time.
B] Conducting science experiments at leisure time.
C] Reading stories at leisure time.
18. A] Visiting art gallery.
B] Visiting children park.
C] Visiting Planetarium.
19. A] Doll making.
B] Collecting matchbox pictures.
C] Making aquarium.
20. A] Learning to make solar ovens.
B] Learn how to swim.
C] Learning cycling.
21. A] Flying Kite.
B] Learning how to make silk yarn.
C] Playing chess.
22. A] Learn to stuff animals.
B] Training in umbrella making.
C] Making of flower garlands.
23. A] Getting job as a teacher in school.
B] Getting job as a scientist in rocket launching centre.
C] Getting job in academy of literature.
24. A] Understand about the first person who introduce Malayalam language.
B] Understand about the first person who introduce Malayalam dictionary.
C] Understand about the first lady space traveller.
25. A] Get an idea about the rules and regulations of football.
B] Understand about the person who invent telescope.
C] Understand about different countries from a map.

26. A] Reading books about the competition of cricket.
B] Reading autobiography of Mahatma Gandhi.
C] Reading books about modern methods of agriculture.
27. A] Watching cartoon films.
B] Watching pictures which criticize deforestation.
C] Watching pictures of Ravivarma.
28. A] Collecting informations about fossils.
B] Collecting old coins.
C] Collecting information about Natya Sasthra.
29. A] Watching film stars.
B] Get an idea about the function of movie camera.
C] Listening film songs.
30. A] Participate in cookery class.
B] Learn book binding.
C] Learn watch repairing.
31. A] Watching documentary about the ill effects of pesticides.
B] Watching T.V. serials.
C] Watching English films.
32. A] Learn classical music.
B] Participate in drama.
C] Participate in science debates.
33. A] Understand about the first novelist in Malayalam.
B] Get an idea about the world's first test tube baby.
C] Understand about the first Indian who win the Nobel Prize in literature.
34. A] Learn the techniques of different first aids.
B] Learn to do exercise.
C] Learn to do Yogas.
35. A] Making clay pots.
B] Making model of electric magnet.
C] Making sculpture with plaster of paris.
36. A] Making garden.
B] Making vegetable carvings.
C] Cleaning plates.

37. A] Collecting informations about different models of cars.
B] Collecting informations about the prices of different types of cars.
C] Learn the function of the engine of a car.
38. A] Making toys with coconut leaves.
B] Drawing "Kolam" in front of the house.
C] Making a model of kidney.
39. A] Visiting beach.
B] Visiting Rocket launching centre.
C] Visiting shopping centre.
40. A] Poetry writing
B] Writing story.
C] Prepare science diary.

APPENDIX -XX

RESPONSE SHEET OF SCIENCE INTEREST INVENTORY

സ്കൂളിന്റെ പേര് ക്ലാസ്സ് ഡിവിഷൻ.....

വിദ്യാർത്ഥിയുടെ പേര്.....ആൺകുട്ടി/പെൺകുട്ടി

1	A	B	C
2	A	B	C
3	A	B	C
4	A	B	C
5	A	B	C
6	A	B	C
7	A	B	C
8	A	B	C
9	A	B	C
10	A	B	C
11	A	B	C
12	A	B	C
13	A	B	C
14	A	B	C
15	A	B	C
16	A	B	C
17	A	B	C
18	A	B	C
19	A	B	C
20	A	B	C

21	A	B	C
22	A	B	C
23	A	B	C
24	A	B	C
25	A	B	C
26	A	B	C
27	A	B	C
28	A	B	C
29	A	B	C
30	A	B	C
31	A	B	C
32	A	B	C
33	A	B	C
34	A	B	C
35	A	B	C
36	A	B	C
37	A	B	C
38	A	B	C
39	A	B	C
40	A	B	C

APPENDIX - XXI

UNIVERSITY OF CALICUT

DEPARTMENT OF EDUCATION

VERBAL GROUP TEST OF INTELLIGENCE

Dr. P.K. Sudheesh Kumar

Hameed. A. & Prasanna. A.

വിദ്യാർത്ഥികളുടെ മാനസികമായ കഴിവുകൾ പരിശോധിക്കുന്നതിനുവേണ്ടി തയ്യാറാക്കിയിട്ടുള്ളതാണ് ഈ ടെസ്റ്റ്. വിവിധ തരത്തിലുള്ള 5 ടെസ്റ്റുകൾ ഇതിൽ ഉൾക്കൊള്ളിച്ചിരിക്കുന്നു. ഓരോ ടെസ്റ്റിന്റെയും ആരംഭത്തിൽ കൊടുത്തിട്ടുള്ള നിർദ്ദേശങ്ങൾ എഴുതിത്തുടങ്ങുന്നതിനുമുമ്പ് ശ്രദ്ധിച്ചു വായിക്കുക. ഉത്തരം എഴുതേണ്ട രീതി ഉദാഹരണസഹിതം വ്യക്തമാക്കിയിട്ടുണ്ട്. നിർദ്ദിഷ്ട സമയത്തിനുള്ളിൽ ഉത്തരം എഴുതിത്തീർക്കാൻ ശ്രമിക്കുകയും, പറഞ്ഞതിനുശേഷം മാത്രം എഴുതിത്തുടങ്ങുകയും, ഏറ്റവും വേഗത്തിൽ എഴുതിത്തീർക്കാൻ ശ്രമിക്കുകയും ചെയ്യേണ്ടതാണ്. തന്നിരിക്കുന്ന ഈ ചോദ്യക്കടലാസിൽ എന്തെങ്കിലും എഴുതുകയോ, അടയാളപ്പെടുത്തുകയോ ചെയ്യരുത്. പ്രത്യേകം തന്നിട്ടുള്ള ഉത്തരക്കടലാസിൽ മാത്രമേ ഉത്തരം എഴുതാവൂ.

TEST -I VERBAL ANALOGY

ഈ വിഭാഗത്തിൽ കൊടുത്തിട്ടുള്ള ചോദ്യങ്ങളിൽ മൂന്നു വാക്കുകൾ വീതം തന്നിട്ടുണ്ട്. നാലാമത്തെ വാക്ക് നിങ്ങൾ എഴുതേണ്ടതാണ്. തന്നിരിക്കുന്ന മൂന്നുവാക്കുകളിൽ ആദ്യത്തെ രണ്ടു വാക്കുകൾ തമ്മിലുള്ള ബന്ധം മനസ്സിലാക്കി മൂന്നാമത്തെ വാക്കിനോട് യോജിക്കുന്ന വാക്ക് A, B, C, D, എന്നീ ക്രമത്തിൽ കൊടുത്തിരിക്കുന്ന നാലുവാക്കുകളിൽ നിന്നും തെരഞ്ഞെടുത്ത് ഉത്തരക്കടലാസിൽ അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

ദാഹം : വെള്ളം : വിശപ്പ് :

A. മാംസം B. വിശ്രമം C. ആഹാരം D. ക്ഷീണം

ദാഹം വരുമ്പോൾ വെള്ളം കുടിയ്ക്കുന്നു. അതുപോലെ വിശപ്പുവരുമ്പോൾ ആഹാരം കഴിക്കുന്നു. അത് കൊണ്ട് 'C' യാണ് ശരിയായ ഉത്തരം

A	B	C✓	D
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1. കൗശലം : കുറുകൻ : വിഡ്ഢിത്തം :

A. കുരങ്ങൻ B. കരടി C. മാൻ D. കഴുത

2. ദയ : ക്രൂരത : നിശബ്ദത :

A. നിശ്ചലം B. ശബ്ദം C. ശാന്തത D. ധ്യാനം

3. നാടകം : സംവിധായകൻ : ന്യൂസ്പേപ്പർ :

A. മാനേജർ B. പത്രാധിപർ C. ഉടമസ്ഥൻ D. പ്രസ്സ്

4. കപ്പൽ : ക്യാപ്റ്റൻ : വിമാനം :

A. കടൽ B. എയർപോർട്ട് C. ഡ്രൈവർ D. പൈലറ്റ്

5. കരച്ചിൽ : ചിരി : വിഷമം :

A. സന്തോഷം B. ഉന്മേഷം C. ശാന്തി D. സമാധാനം

6. ഷർട്ട് : തുണി : ചെരുപ്പ് :

A. ഉളി B. തുകൽ C. ചെരുപ്പുകുത്തി D. തയ്യൽക്കാരൻ

7. കാക്ക : കറുപ്പ് : ഹംസം :

A. പക്ഷി B. വെള്ളം C. വെളുപ്പ് D. തവിട്ട്

8. മാസിക : വായനക്കാരൻ : റേഡിയോ :

A. പരസ്യക്കാർ B. അറിയിപ്പുകാർ C. കാഴ്ചക്കാർ D. കേൾവിക്കാർ

9. വിറക് : കോടാലി : തുണി :

A. മെഷീൻ B. സൂചി C. കത്രിക D. നൂല്

- 10. വിദ്യാർത്ഥി : ക്ലാസ്റുഢ : കളിക്കാരൻ :
 A. സ്റ്റേഡിയഢ B. മത്സരഢ C. കോച്ച് D. കളി
- 11. വീട് : മേൽക്കൂര : ഭൂമി :
 A. വായു B. അകാശഢ C. അന്തരീക്ഷഢ D. ധ്രുവങ്ങൾ
- 12. കൂട്ടി : മാതാപിതാക്കൾ : ബുക്ക് :
 A. അധ്യാപകൻ B. പ്രസാധകൻ C. പ്രസ്സ് D. ഗ്രന്ഥകർത്താവ്
- 13. വർഷഢ : മാസഢ : ആഴ്ച :
 A. മണിക്കൂർ B. മിനിറ്റ് C. രണ്ടാഴ്ച D. ദിവസഢ
- 14. രാത്രി : പകൽ : ദേഷ്യഢ :
 A. സഹായഢ B. ദയ C. ഇഷ്ടഢ D. സന്തോഷഢ
- 15. കവി : കവിത : സംഗീതഢ :
 A. രചയിതാവ് B. എഴുത്തുകാരൻ C. നിർമ്മാതാവ് D. കണ്ടക്ടർ
- 16. മഞ്ഞ് : വെളുപ്പ് : കൽക്കരി :
 A. പുക B. ചുവപ്പ് C. കറുപ്പ് D. മഞ്ഞ്
- 17. പശു : മൃഗഢ : കോഴി :
 A. വീട് B. പക്ഷി C. മുട്ട D. കൂട്
- 18. നീന്തൽ : വെള്ളഢ : സ്കേറ്റിംഗ് :
 A. മഞ്ഞ് B. ആകാശഢ C. പർവ്വതഢ D. ശൂന്യാകാശഢ
- 19. മനുഷ്യൻ : ആത്മകഥ : രാഷ്ട്രഢ :
 A. ജനങ്ങൾ B. ജനസംഖ്യ C. ഭൂമിശാസ്ത്രഢ D. ചരിത്രഢ
- 20. മരുന്ന് : രോഗഢ : പുസ്തകഢ :
 A. അറിവ് B. അധ്യാപകൻ C. ഗ്രന്ഥകാരൻ D. രചയിതാവ്

TEST -II VERBAL CLASSIFICATION

ഈ വിഭാഗത്തിലുള്ള ചോദ്യങ്ങളിൽ ഓരോന്നിലും A, B, C, D, എന്നിങ്ങനെ നാലു വാക്കുകൾ വീതം തന്നിട്ടുണ്ട്. അതിൽ ഒരേണ്ണം മറ്റു മൂന്നു വാക്കുകളോടും യോജിക്കാതെ നിൽക്കുന്നു. അത് ഏതെന്ന് കണ്ടുപിടിച്ച് ഉത്തരക്കടലാസിൽ അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

ദാഹം: A. മധുരം B. മുളക് C. എരിവ് D, കയ്പ്

ഇതിൽ A, C, D എന്നിവ വിവിധ രുചികളെ കാണിക്കുന്നു. B.(മുളക്) രുചികളിൽ ഉൾപ്പെടുന്നില്ല. അതുകൊണ്ട് 'B' യാണ് ശരിയായ ഉത്തരം

A	B✓	C	D
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- | | | | |
|---------------------|-----------------|----------------|------------------|
| 1. A. അധ്യാപകൻ | B. പ്രിൻസിപ്പാൾ | C. വിദ്യാർത്ഥി | D. പ്രൊഫസർ |
| 2. A. ബസ്സ് | B. വിമാനം | C. സൈക്കിൾ | D. ലോറി |
| 3. A. നടക്കുക | B. ചിന്തിക്കുക | C. നീന്തുക | D. ചാടുക |
| 4. A. വൃത്തം | B. ചതുരം | C. ത്രികോണം | D. ഷഡ്ഭുജം |
| 5. A. സൗന്ദര്യം | B. വാർദ്ധക്യം | C. മിടുക്കൻ | D. യൗവ്വനം |
| 6. A. ഗ്രാമം | B. കിലോഗ്രാമം | C. മീറ്റർ | D. കിന്റൽ |
| 7. A. സമാധാനം | B. ശബ്ദം | C. ധ്യാനം | D. നിശ്ചലം |
| 8. A. സംവിധായകൻ | B. നടൻ | C. പാട്ടുകാരൻ | D. പ്രസംഗികൻ |
| 9. A. ദിവസം | B. കലണ്ടർ | C. മാസം | D. ആഴ്ച |
| 10. A. കിന്റൽ | B. ഇഞ്ച് | C. മൈൽ | D. വാരം |
| 11. A. നാവ് | B. കണ്ണ് | C. പല്ല് | D. മുക്ക് |
| 12. A. ഗോതമ്പ് | B. റാഗി | C. നെല്ല് | D. പയറ്റ് |
| 13. A. പാമ്പ് | B. തിമിംഗലം | C. അരണ | D. ആമ |
| 14. A. പെൻസിൽ | B. കട | C. പെയിന്റ് | D. കാൻവാസ് |
| 15. A. മാവ് | B. പ്ലാവ് | C. തെങ്ങ് | D. തേക്ക് |
| 16. A. മാങ്ങ | B. ആപ്പിൾ | C. തക്കാളി | D. ഉരുളക്കിഴങ്ങ് |
| 17. A. ചെവി | B. വിരൽ | C. കൈ | D. കാൽ |
| 18. A. കോഴി | B. ആട് | C. പശു | D. കാക്ക |
| 19. A. ഓഫീസ് | B. വീട് | C. ബംഗ്ലാവ് | D. കൂടിൽ |
| 20. A. അറിയിപ്പുകാർ | B. കാഴ്ചക്കാർ | C. രചയിതാവ് | D. കേൾവിക്കാർ |

TEST -III NUMERICAL REASONING

താഴെ കൊടുത്തിരിക്കുന്ന 6 ചോദ്യങ്ങളിൽ കൂറെ സംഖ്യകൾ ഓരോ ക്രമത്തിൽ കൊടുത്തിരിക്കുന്നു. ഒന്ന് എഴുതാതെയും വിട്ടിരിക്കുന്നു. താഴെ A, B, C, D എന്നീ ക്രമത്തിൽ നാല് ഉത്തരങ്ങൾ കൊടുത്തിരിക്കുന്നു. ഇവയിൽ നിന്നും ശരിയുത്തരം കണ്ടെത്തി അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

1. 2, 4, 6, --, 10.
 A. 5 B. 8 C. 7 D. 11

A	B✓	C	D
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1. 4, 9, 16, 25, 36, -----
 A. 39 B. 47 C. 49 D. 59
2. 25, 24, 22, 19 --- 10
 A. 15 B. 16 C. 17 D. 14
3. 6, 8, ---, 20 36
 A. 15 B. 14 C. 16 D. 12
4. 2, 6, 12, 20 30 ---
 A. 42 B. 46 C. 40 D. 36
5. 3, 3, 6, 18 ---
 A. 68 B. 33 C. 72 D. 29
6. 0, 2, 4, 6 --- 10
 A. 7 B. 5 C. 8 D. 9

7 മുതൽ 10 വരെയുള്ള ചോദ്യങ്ങളിൽ ഓരോന്നിലും A, B, C, D, എന്നിങ്ങനെ നാലു സംഖ്യകൾ തന്നിട്ടുണ്ട്. അതിൽ ഒരു സംഖ്യ മറ്റു മൂന്നു സംഖ്യകളോടും യോജിക്കാതെ നിൽക്കുന്നു. അത് ഏതെന്ന് കണ്ടുപിടിച്ച് ഉത്തരക്കടലാസിൽ അടയാളപ്പെടുത്തുക.

- A. 1 B. 3 C. 6 D. 7

ഇതിൽ A, B, D എന്നിവ ഒരു സംഖ്യകളെ സൂചിപ്പിക്കുന്നു. എന്നാൽ 'C' ഒരു സംഖ്യയല്ല അതുകൊണ്ട് ഉത്തരം 'C' യാകുന്നു.

A	B	C✓	D
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7. A. 1 B. 5 C. 25 D. 75
8. A. 3 B. 4 C. 7 D. 9
9. A. 12 B. 24 C. 35 D. 48
10. A. 150 B. 36 C. 12 D. 4

11 മുതൽ 20 വരെയുള്ള ചോദ്യങ്ങളിൽ മൂന്നു സംഖ്യകൾ വീതം തന്നിട്ടുണ്ട്. നാലാമത്തെ സംഖ്യ നിങ്ങൾ എഴുതേണ്ടതാണ്. തന്നിരിക്കുന്ന മൂന്നു സംഖ്യകളിൽ ആദ്യത്തെ രണ്ടു സംഖ്യകൾ തമ്മിലുള്ള ബന്ധം മനസ്സിലാക്കി മൂന്നാമത്തെ സംഖ്യയോട് യോജിക്കുന്ന സംഖ്യ A, B, C, D, എന്നീ ക്രമത്തിൽ കൊടുത്തിരിക്കുന്ന സംഖ്യകളിൽനിന്നു. തെരഞ്ഞെടുത്ത് ഉത്തരക്കടലാസ്സിൽ അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

1. 1 : 2 :: 2 : ---
 A. 6 B. 4 C. 1 D. 5

ഒന്നിന്റെ ഇരട്ടിയാണ് രണ്ട്. അതുപോലെ രണ്ടിന്റെ ഇരട്ടിയാണ് നാല് അത് കൊണ്ട് ഉത്തരം 'B' ആണ്.

A	B✓	C	D
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11. 3 : 5, :: 11 : ---
 A. 12 B. 13 C. 14 D. 15
12. 5 : 25 :: 3 : ---
 A. 6 B. 12 C. 15 D. 9
13. 1 : 6, :: 7 : ---
 A. 12 B. 13 C. 11 D. 14
14. 10 : 20 :: 18 : ---
 A. 26 B. 36 C. 46 D. 32
15. 4 : 5 :: 8 : ---
 A. 6 B. 7 C. 5 D. 9
16. 12 : 72 :: 6 : ---
 A. 58 B. 38 C. 46 D. 52
17. 12 : 4 :: 24 : ---
 A. 6 B. 10 C. 8 D. 12
18. 28 : 22 :: 46 : ---
 A. 40 B. 38 C. 42 D. 29
19. 49 : 7 :: 4 : ---
 A. 16 B. 8 C. 2 D. 12
20. 48 : 8 :: 18 : ---
 A. 8 B. 4 C. 2 D. 3

TEST -IV VERBAL REASONING

ഈ വിഭാഗത്തിലുള്ള ഓരോ ചോദ്യങ്ങൾക്കും A, B, C, D എന്ന ക്രമത്തിൽ നാലു വീതം ഉത്തരങ്ങൾ കൊടുത്തിട്ടുണ്ട്. ചോദ്യം ശരിയായി വായിച്ച് മനസ്സിലാക്കി ശരിയായ ഉത്തരം ഉത്തരക്കടലാസിൽ അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

ബിന്ദുവിന് സിന്ധുവിനേക്കാൾ വണ്ണം കൂടുതലാണ്. മഞ്ചുവിന് ബിന്ദുവിനേക്കാൾ വണ്ണം കുറവാണ്. മഞ്ചുവിനും, സന്ധ്യയ്ക്കും തുല്യ വണ്ണമാണുള്ളത്. എന്നാൽ ഇവരിൽ ആർക്കാണ് ഏറ്റവും വണ്ണം കൂടുതൽ?

- A) മഞ്ചു B) ബിന്ദു C) സിന്ധു D) സന്ധ്യ

ബിന്ദുവാണല്ലോ മറ്റൊരാളെക്കാളും വണ്ണം കൂടുതൽ അതുകൊണ്ട് ഉത്തരം 'B' എന്ന് അടയാളപ്പെടുത്തുക.

A	B✓	C	D
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1. അപ്പു ചിപ്പുവിനേക്കാൾ നന്നായി പാടും. ദേവന് കണ്ണനോളം. പാടാൻ കഴിയില്ല. കണ്ണന് അപ്പുവിനേക്കാൾ പാടാൻ കഴിയും. എന്നാൽ ഇവരിൽ ആരാണ് നന്നായി പാടുന്നത്?
 - A) അപ്പു B) കണ്ണൻ C) ചിപ്പു D) ദേവൻ
2. രാമൻ രമയെക്കാൾ പിന്നിലാണ് നടക്കുന്നത്. രമണി രമയെക്കാൾ പിന്നിലും രാമനേക്കാൾ മുന്നിലുമാണ് നടക്കുന്നത്. രാജു രമണിയെക്കാൾ മുന്നിലാണ് നടക്കുന്നത്. എങ്കിൽ ഏറ്റവും പുറകിൽ നടക്കുന്നത് ആര്?
 - A) രാമൻ B) രമണി C) രമ D) രാജു
3. അജയ് വിജയ്നേക്കാൾ ജോലി ചെയ്യും. അശോകും അജിത്തും ജോലി ചെയ്യുന്നതിൽ തുല്യരാണ്. വിജയ് അശോകിനേക്കാൾ നന്നായി ജോലി ചെയ്യും. ഇവരിൽ ഏറ്റവും കൂടുതൽ ജോലി ചെയ്യുന്നതാര്?.
 - A) അശോക് B) അജിത്ത് C) വിജയ് D) അജയ്
4. രമ്യ ഭവ്യയോളം നൃത്തം ചെയ്തില്ല. ദിവ്യ ഭവ്യയേക്കാൾ നന്നായി നൃത്തം ചെയ്യും. വിദ്യ ദിവ്യയേക്കാൾ നൃത്തത്തിൽ മിടുക്കിയാണ്. എങ്കിൽ ഇവരിൽ ആരാണ് നൃത്തത്തിൽ മിടുമിടുക്കി?.
 - A) ദിവ്യ B) ഭവ്യ C) രമ്യ D) വിദ്യ
5. ദീപക്കിന്റെ അച്ഛനാണ് മോഹനന്റെ മകൻ എങ്കിൽ ദീപക്കിനും മോഹനനും തമ്മിൽ ഉള്ള ബന്ധമെന്ത്?
 - A) മകൻ B) സഹോദരൻ C) അനന്തരവൻ D) കൊച്ചുമകൻ
6. റഫീക്കിന് മുനീറിനേക്കാൾ കാഴ്ചയുണ്ട്. ഷമീറിന് സുധീറിനേക്കാൾ കാഴ്ച കുറവാണ്. സുധീറിന് റഫീക്കനോളം കാഴ്ച ശക്തിയില്ല. ഇവരിൽ ആർക്കാണ് കാഴ്ച ഏറ്റവും കൂടുതൽ?
 - A) സുധീറിന് B) ഷമീറിന് C) റഫീക്കിന് D) മുനീറിന്

- 7. രണ്ടുപേർ ചേർന്ന് പത്ത് ദിവസം കൊണ്ട് ഒരു ജോലി ചെയ്തുതീർത്തു എങ്കിൽ ഒരാൾക്ക് ഒരു ദിവസം കൊണ്ട് എത്ര ജോലി ചെയ്യാൻ കഴിയും.
A) 1/2 B) 1/5 C) 1/10 D) 1/20
- 8. ഒരു വെടിയൊച്ച A എന്ന സ്ഥലത്തുനിന്നും B എന്ന സ്ഥലത്തെത്താൻ എടുക്കുന്ന സമയം 2 മിനിറ്റ്. എന്നാൽ അഞ്ച് വെടിയൊച്ചകൾ A എന്ന സ്ഥലത്തുനിന്നും B എന്ന സ്ഥലത്തെത്താൻ എത്ര സമയം എടുക്കും?.
A) 10 മി. B) 2 മി. C) 4 മി. D) 5 മി.
- 9. ഷർമിളക്ക് മാലയേക്കാൾ പ്രായം കുറവാണ്. കുഞ്ചനും നന്ദക്കും തുല്യ പ്രായമാണു ഉള്ളത്. സുധീഷിന് നന്ദയേക്കാൾ പ്രായം കുറവാണ്. സുധീഷിന് ഷർമിളയേക്കാൾ കൂടുതലാണ്. മാലക്ക് സുധീഷിനോളം പ്രായം ഇല്ല. എന്നാൽ ഏറ്റവും കൂടുതൽ പ്രായം ആർക്ക്?.
A) സുധീഷ് B) മാല C-) ഷർമിള D) കുഞ്ചൻ
- 10. ഒരു കോളേജിലെ ഫീസടയ്ക്കാൻ നിൽക്കുന്ന ക്യൂവിലെ കുട്ടികളുടെ എണ്ണം 70 ആകുന്നു അതിൽ മോഹനന്റെ സ്ഥലം ജനലിന്റെ അടുത്തുനിന്നും 54-ാമത്തേതാണെങ്കിൽ അവന്റെ പുറകിൽ എത്ര പേരു കാണും?
A) 15 B) 16 C) 17 D) 18
- 11. തെക്കു പടിഞ്ഞാറ്, വടക്കാണെങ്കിൽ വടക്കു കിഴക്ക് എന്തായിരിക്കും?
A) പടിഞ്ഞാറ് B) തെക്ക്പടിഞ്ഞാറ് C) കിഴക്കുപടിഞ്ഞാറ് D) തെക്ക്
- 12. A, B യുടെ മകനാണ്. B യും C യും സഹോദരികളാണ്. D, C യുടെ അമ്മയും E, Dയുടെ മകനുമാണ്. എന്നാൽ താഴെ പറയുന്നതിൽ ഏതാണ് ശരി?.
A) A യുടെ അമ്മയുടെ സഹോദരിയാണ് E
B) C യും E യും സഹോദരീസഹോദരന്മാരാണ്
C) C, A യുടെ അമ്മമ്മയാണ്
D) A യും E യും സഹോദരന്മാരാണ്
- 13. ഒരു കമ്പനിയിലെ തൊഴിലാളികളുടെ എണ്ണം 60 ആകുന്നു അതിൽ 1/4 പേർക്ക് കാറും 1/2 പേർക്ക് സ്കൂട്ടറും, 1/10 പേർക്ക് കാറും സ്കൂട്ടറും ഉണ്ട്. എന്നാൽ എത്ര പേർക്കാണ് കാരോ സ്കൂട്ടറോ ഇല്ലാത്തത്?.
A) 12 B) 32 C) 30 D) 28
- 14. 51 പേരുള്ള ഒരു ക്ലാസിൽ അഖിലിന് 21-ാമത്തെ റാങ്കാണ്. ഏറ്റവും ഒടുവിലത്തെ റാങ്കുള്ള കുട്ടിയിൽ നിന്നും കണക്കാക്കുമ്പോൾ അഖിലിന് എത്രാമത്തെ റാങ്കായിരിക്കും ഉണ്ടാവുക?
A) 12 B) 30 C) 31 D) 35
- 15. ഒരാൾ, 'X' എന്ന സ്ഥലത്തുനിന്നും നാല് മൈൽ കിഴക്കോട്ടു നടന്ന് ഇടത്തോട്ട് തിരിഞ്ഞ് വീണ്ടും അഞ്ച് മൈൽ നടന്ന് വീണ്ടും ഇടത്തോട്ട് തിരിഞ്ഞ് രണ്ട് മൈൽ നടന്നു. എങ്കിൽ അയാൾ ഇപ്പോൾ നടക്കുന്ന ദിശ ഏത്?
A) വടക്ക് B) പടിഞ്ഞാറ് C) കിഴക്ക് D) തെക്ക്

- 16. F, A യുടെ സഹോദരനാണ്. C, A യുടെ മകളാണ്. K, F ന്റെ സഹോദരിയാണ്. G, C യുടെ സഹോദരനാണ്. ഇതിൽ ആരാണ് G യുടെ അമ്മാവൻ?
 A) F B) C C) K D) A
- 17. വിനുവിനേക്കാൾ 2 വയസ്സുള്ള ജിനുവിന് മിനുവിനേക്കാൾ മൂന്നു മടങ്ങ് പ്രായമുണ്ട്. മൂന്നു പേരുടേയും വയസ്സ് കൂട്ടിയാൽ 19 കിട്ടും. എങ്കിൽ ജിനുവിന്റെ വയസ്സത്രെ?
 A) 5 B) 3 C) 9 D) 10
- 18. ഒരു മാവേലിസ്റ്റോറിന്റെ മൂന്നിലുള്ള ക്യൂവിൽ നിൽക്കുന്ന X എന്ന ആളിന്റെ സ്ഥാനം മൂന്നിൽ നിന്നും 22-ാമത്തേതും പിന്നിൽനിന്നും 28-ാമത്തേതും ആണെങ്കിൽ ആകെ ക്യൂവിലുള്ള ആളുകളുടെ എണ്ണം എത്ര?
 A) 49 B) 52 C) 50 D) 54
- 19. A യ്ക്ക് Y യേക്കാൾ നീളം കൂടുതലാണ്. B യ്ക്ക് X നേക്കാൾ നീളം കുറവാണ്. X നും Y ക്കും തുല്യ നീളമാണുള്ളത്. Zന് A യേക്കാൾ നീളം കൂടുതലുണ്ട്. എങ്കിൽ ഏറ്റവും നീളം കുറവാർക്ക്?
 A) X B) Y C) A D) B
- 20. ശ്യാമിന്റെ അച്ഛനാണ് സജ്ജയിന്റെ മകനെങ്കിൽ, ശ്യാമും സജ്ജയും തമ്മിലുള്ള ബന്ധമെന്ത്?
 A) മകൻ B) കൊച്ചുമകൻ C) സഹോദരൻ D) അനന്തരവൻ

TEST -V COMPREHENSION

ഈ വിഭാഗത്തിലുള്ള ചോദ്യങ്ങളിൽ ഓരോന്നിലും ഏതാനും പ്രസ്താവനകൾ കൊടുത്തിട്ടുണ്ട്. ഇവ ശ്രദ്ധാപൂർവ്വം വായിച്ച് അതിനു താഴെ കൊടുത്തിരിക്കുന്ന ചോദ്യങ്ങൾക്ക് ഉത്തരം കണ്ടെത്തുക. A, B, C, D എന്നീ ക്രമത്തിൽ നാല് ഉത്തരങ്ങൾ കൊടുത്തിരിക്കുന്നു. ശരി ഉത്തരം കണ്ടെത്തി ഉത്തരക്കടലാസ്സിൽ അടയാളപ്പെടുത്തുക.

ഉദാഹരണം:

സതീഷിന്റെ പുത്രന്മാരാണ് A യും B യും, പുത്രിമാരാണ് C യും D യും. ശ്യാമയുടെ മക്കളാണ് X ഉം Y യും. മനോജിന്റെ മക്കളായ E യും F ഉം ഒരു കമ്പനിയിൽ ജോലിയുള്ളവരാണ്. A യും D യും വിവാഹിതരാണ്. X, വിവാഹം ചെയ്തിരിക്കുന്നത് C യെയും F, വിവാഹം ചെയ്തിരിക്കുന്നത് A യെയും ആണ്. മനോജിനും ശ്യാമയ്ക്കും തമ്മിൽ സഹോദരിസഹോദര ബന്ധമാണ്.

ചോദ്യങ്ങൾ:

X - ഉം E യും തമ്മിലുള്ള ബന്ധമെന്ത്?

A. മകനും അച്ഛനും

B. സഹോദരീസഹോദരൻമാർ

C. സഹോദരീസഹോദരൻമാരുടെ മക്കൾ

D. മകളും അച്ഛനും

A	B	✓C	D
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(1) ഒരു വീട്ടിലെ നാല് അംഗങ്ങളാണ് W, X, Y, Z. ഇവരിൽ W, X, Y വിദ്യാഭ്യാസമുള്ളവരാണ് W, Y, Z, സത്യസന്ധരും Y, Z എന്നിവർ ജോലിയുള്ളവരുമാകുന്നു. W, X, Z എന്നിവർക്ക് വിനയവുമുണ്ട്.

1. ആർക്കാണ് വിദ്യാഭ്യാസം, സത്യസന്ധത എന്നീ ഗുണങ്ങളുള്ളതും എന്നാൽ ജോലിയില്ലാത്തതും?

A. W B. X C. Y D. Z

2. ജോലിയും, വിദ്യാഭ്യാസവും, സത്യസന്ധതയും ഉള്ളതാർക്കാണ്?

A. W B. X C. Y D. Z

3. ആർക്കാണ് ജോലിയും, സത്യസന്ധതയുമുള്ളതും എന്നാൽ വിദ്യാഭ്യാസമില്ലാത്തതും?

A. W B. X C. Y D. Z

4. വിദ്യാഭ്യാസവും വിനയവും ഉണ്ടെങ്കിലും സത്യസന്ധതയും ജോലിയും ഇല്ലാത്തതാർക്ക്?

A. W B. X C. Y D. Z

5. സത്യസന്ധതയും, ജോലിയും വിനയവും ഉണ്ടായിട്ടും വിദ്യാഭ്യാസമില്ലാത്തതാർക്കാണ്?

A. W B. X C. Y D. Z

(2) ദിനേശിന് A എന്ന പുത്രിയും B, C എന്നീ പുത്രന്മാരുമുണ്ട്. ശ്യാമിന് R, Q എന്ന പുത്രന്മാരും P എന്ന പുത്രിയുമുണ്ട്. P യും C യും വിവാഹിതരാണ്. M ഉം, N ഉം അവരുടെ പുത്രന്മാരും. രോഹിതിന്റെ പുത്രൻ S, പുത്രി T യുമാണ്. T വിവാഹം കഴിച്ചിരിക്കുന്നത് B യെ, അവരുടെ പുത്രിമാരാണ് D യും E യും പുത്രൻ G.

6. Q വിന് N മായുള്ള ബന്ധമെന്ത്?

A. അച്ഛൻ

B. മുത്തച്ഛൻ

C. അമ്മാവൻ

D. പുത്രൻ

7. ദിനേശിന് E യുമായുള്ള ബന്ധമെന്ത്?

- A. മുത്തച്ഛൻ B. അമ്മാവൻ C. അച്ഛൻ D. പുത്രൻ

8. Mന് R നോടുള്ള ബന്ധമെന്ത്?

- A. അമ്മ B. മകൾ C. അനന്തിരവൾ D. അമ്മാവൻ

9. Bയ്ക്ക് Gയോടുള്ള ബന്ധമെന്ത്?

- A. മകൻ B. അമ്മ C. അമ്മായി D. അനന്തിരവൾ

10. Eയ്ക്ക് S നോടുള്ള ബന്ധമെന്ത്?

- A. പേരക്കുട്ടി B. അമ്മാവൻ C. സഹോദരിപുത്രി D. അച്ഛൻ

(4) $5 \text{ PQ } 8 = 5^2 + 8 = 25 + 8 = 33$ ആയാൽ

11. $4 \text{ PQ } 4 = ?$

- A. 16 B. 20 C. 24 D. 12

12. $4 \text{ PQ } 1 = ?$

- A. 17 B. 12 C. 8 D. 9

13. $5 \text{ PQ } 5 = ?$

- A. 20 B. 30 C. 15 D. 25

14. $6 \text{ PQ } ? = 108$

- A. 72 B. 82 C. 52 D. 42

15. $? \text{ PQ } 9 = 109$

- A. 50 B. 25 C. 20 D. 10

(5) ഒരു വീട്ടിലെ ആറ് അംഗങ്ങളാണ് U, V, W, X, Y, Z. ഇവരിൽ ഒരാൾ ഫുഡ്ബോൾ കളിക്കാരനും മറ്റൊരാൾ ചെസ്സ് കളിക്കാരനും, ഇനിയുമൊരാൾ ക്രിക്കറ്റുകളിക്കാരനുമായി. അവിവാഹിതനായ U ഉം X ഉം ഒരു കളിയിലും പങ്കെടുക്കുന്നില്ല. ഒറ്റ സ്ത്രീകളും ഫുഡ്ബോൾ കളിയിലോ ക്രിക്കറ്റ് കളിയിലോ ഏർപ്പെടുന്നില്ല. ഇവരിൽ ഒരു വിവാഹജോടിയയിലെ ഭർത്താവാണ് Z. Wന്റെ സഹോദരനായ V ഒരു ചെസ്സ് കളിക്കാരനോ ക്രിക്കറ്റ് കളിക്കാരനോ അല്ല, Y, V യുടെ കൂട്ടുകാരനും ക്രിക്കറ്റ് കളിക്കാരനുമായി.

16. ആരാണ് ഫുഡ്ബോൾ കളിക്കാരൻ?

- A. X B. U C. Y D. Z

17. ആരാണ് ചെസ്സ് കളിക്കാരി?

- A. U B. V C. W D. X

18. ആരാണ് 'Z' ന്റെ ഭാര്യ?

- A. W B. V C. U D. Y

19. ആരെല്ലാമാണ് സ്ത്രീകൾ?

- A. UXV B. VYX C. XZY D. UXW

20. ആരെല്ലാമാണ് പുരുഷന്മാർ?

- A. XUY B. UXV C. VYZ D. WXZ

APPENDIX - XXII

UNIVERSITY OF CALICUT
DEPARTMENT OF EDUCATION

VERBAL GROUP TEST OF INTELLIGENCE

Dr. P.K. Sudheesh Kumar
Hameed. A. & Prasanna. A.

This test is prepared to check the mental abilities of students. This includes 5 different types of tests. Carefully read the instructions given in the beginning of each test. The way to answer the questions is illustrated with examples. Try to answer the questions within the time limit. Do not write or mark anything in the question paper. Mark your responses on the given answer sheet only.

TEST I - VERBAL ANALOGY

In this section three words are given, the fourth one being left blank. The first two words of the three show a relationship. You have to select the fourth word from the given alternatives A,B,C,D which will establish the same kind of relationship with the third word and you should mark in the answer sheet.

Example:

Thirsty: Water: Hungry: _____
A. Meat B. Rest C. Food D. Tired.

If we feel thirsty, we drink water. Similarly if we feel hungry, we eat food. So the answer is 'C'.

A	B	C✓	D
---	---	----	---

1. Cunning : fox : foolish : _____
A. Monkey B. Bear C. Deer D. Donkey
2. Kindness: cruelty: silence : _____
A. Still B. Sound C. Calmness D. Meditation.
3. Drama : Director : Newspaper : _____
A. Manager B. Editor C. Owner D. Press
4. Ship : Captain : Aeroplane: _____
A. Sea B. Airport C. Driver D. Pilot
5. Cry : Laugh : Sad : _____
A. Happy B. Energetic C. Calm D. Peace
6. Shirt : cloth : chappal : _____
A. Chisel B. Leather C. Cobbler D. Tailor

- 7. Crow : Black : Black : Swan : _____
A. Bird B. Water C. White D. Brown
- 8. Magazine : Reader : Radio : _____
A. Advertiser B. Announcer C. Audience D. Listener
- 9. Log : Axe : Cloth : _____
A. Machine B. Needle C. Scissors D. Thread
- 10. Student : Classroom : Player : _____
A. Stadium B. Competition C. Coach D. Play
- 11. House : Roof : Earth : _____
A. Air B. Sky C. Atmosphere D. Poles
- 12. Child : Parents : Book : _____
A. Teacher B. Publisher C. Press D. Author
- 13. Year : Month : Week : _____
A. Hour B. Minute C. Fortnight D. Day
- 14. Night : Day : Angry : _____
A. Help B. Kind C. Love D. Happy
- 15. Poet : Poem : Music : _____
A. Lyricist B. Writer C. Producer D. Conductor
- 16. Snow : White : Coal : _____
A. Smoke B. Red C. Black D. Yellow
- 17. Cow : Animal : Hen : _____
A. House B. Bird C. Egg D. Nest
- 18. Swimming : Water : Skating : _____
A. Snow B. Sky C. Mountain D. Space
- 19. Man : Autobiography : Nation : _____
A. People B. Population C. Geography D. History
- 20. Medicine : Disease : Book : _____
A. Knowledge B. Teacher C. Author D. Writer

TEST II – VERBAL CLASSIFICATION

In this section four alternatives A, B, C and D are given. Among these, one is entirely different from others. Find out that one and mark in your answer sheet.

Example :

1. A. Sweet B. Chillie C. Chillie taste D. Bitter

In these, A, C and D are different tastes. But B (Chillie) is not a taste. So the correct answer is 'B'.

A	B✓	C	D
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- 1) A. Teacher B. Principal C. Student D. Professor
- 2) A. Bus B. Aeroplane C. Cycle D. Lorry
- 3) A. Walking B. Thinking C. Swimming D. Jumping
- 4) A. Circle B. Square C. Triangle D. Hexagon
- 5) A. Beauty B. Old age C. Smart D. Young
- 6) A. Gram B. Kilogram C. Meter D. Quintel
- 7) A. Peace B. Sound C. Meditation D. Static
- 8) A. Director B. Actor C. Singer D. Speaker
- 9) A. Day B. Calendar C. Month D. Week
- 10) A. Quintel B. Inch C. Mile D. Yard
- 11) A. Tongue B. Eye C. Tooth D. Nose
- 12) A. Wheat B. Ragi C. Paddy D. Cereal
- 13) A. Snake B. Whale C. Lizard D. Tortoise
- 14) A. Pencil B. Shop C. Paint D. Canvas
- 15) A. Mango Tree B. Jack fruit tree C. Coconut tree D. Teak
- 16) A. Mango B. Apple C. Tomato D. Potato
- 17) A. Ear B. Finger C. Hand D. Leg
- 18) A. Hen B. Goat C. Cow D. Crow
- 19) A. Office B. House C. Bunglow D. Hut
- 20) A. Announcer B. Audience C. Writer D. Listener

TEST III – NUMERICAL REASONING

In the following questions some numbers are given in an order. One is left blank. You have to select the correct response from the given alternatives A,B,C and D and mark in your answer sheet.

Example:

1. 2, 4, 6 ____, 10

A. 5 B. 8 C. 7 D. 11

A	B✓	C	D
---	----	---	---

1. 4, 9, 16, 25, 36, ____

A. 39 B. 47 C. 49 D. 59

2. 25, 24, 22, 19, ____, 10

A. 15 B. 16 C. 17 D. 14

3. 6, 8, ____, 20, 36

A. 15 B. 14 C. 16 D. 12

4. 2, 6, 12, 20, 30 ____

A. 42 B. 46 C. 40 D. 36

5. 3, 3, 6, 18 ____

A. 68 B. 33 C. 72 D. 29

6. 0, 2, 4, 6, ____ 10

A. 7 B. 5 C. 8 D. 9

From question 7 to 10, four numbers namely A, B, C and D are given. One among them is different from the other three. Find out that one and mark in your answer sheet,

Example:

A. 1 B. 3 C. 6 D. 7

In this, A, B and D show odd numbers. But 'C' is an even number. So the answer is 'C'.

A	B	C✓	D
---	---	----	---

7. A. 1 B. 5 C. 25 D. 75

8. A. 3 B. 4 C. 7 D. 9

9. A. 12 B. 24 C. 35 D. 48

10. A. 150 B. 36 C. 12 D. 4

From question 11 to 20, three numbers are given. You have to write the fourth one. After comparing the relation between the first two numbers, find out the correct number which suits to the third number from the alternatives A, B, C, and D.

1. $1 : 2 :: 2 : \underline{\hspace{1cm}}$

- A. 6 B. 4 C. 1 D. 5

Two is the double of one. Similarly four is the double of two. So the answer is 'B',

A	B✓	C	D
---	----	---	---

11. $3 : 5 :: 11 : \underline{\hspace{1cm}}$

- A. 12 B. 13 C. 14 D. 15

12. $5 : 25 :: 3 : \underline{\hspace{1cm}}$

- A. 6 B. 12 C. 15 D. 9

13. $1 : 6 :: 7 : \underline{\hspace{1cm}}$

- A. 12 B. 13 C. 11 D. 14

14. $10 : 20 :: 18 : \underline{\hspace{1cm}}$

- A. 26 B. 36 C. 46 D. 32

15. $4 : 5 :: 8 : \underline{\hspace{1cm}}$

- A. 6 B. 7 C. 5 D. 9

16. $12 : 72 :: 6 : \underline{\hspace{1cm}}$

- A. 58 B. 38 C. 46 D. 52

17. $12 : 4 :: 24 : \underline{\hspace{1cm}}$

- A. 6 B. 10 C. 8 D. 12

18. $28 : 22 :: 46 : \underline{\hspace{1cm}}$

- A. 40 B. 38 C. 42 D. 29

19. $49 : 7 :: 4 : \underline{\hspace{1cm}}$

- A. 16 B. 8 C. 2 D. 12

20. $48 : 8 :: 18 : \underline{\hspace{1cm}}$

- A. 8 B. 4 C. 2 D. 3

TEST IV – VERBAL REASONING

For each question of this section, four alternatives A, B, C, and D are given. Read them carefully and mark your correct response in the answer sheet.

Example :

1. Bindu is fatter than Sindhu. Manju is leaner than Bindu. Manju is as fat as Sandhya. Then who is the fattest among them?

- A. Manju B. Bindu C. Sindhu D. Sandhya

As Bindu is the fattest, the answer is 'B'

A	B✓	C	D
---	----	---	---

1. Appu sings well than Chippu. Devan cannot sing as good as Kannan. Kannan can sing well than Appu. Then who is the best singer among them?

- A. Appu B. Kannan C. Chippu D. Devan

2. Raman is walking much behind than Rema. Remani is walking behind Rema and in front of Raman. If Raju walks in front of Remani, who is far behind?

- A. Raman B. Remani C. Rema D. Raju

3. Ajay works more than Vijay. Ashok works as good as Ajith. Vijay works more than Ashok. Then who works most?

- A. Ashok B. Ajith C. Vijay D. Ajay

4. Remya cannot dance as good as Bhavya. Divya do better than Bhavya. If Vidhya dances better than Divya, then who is the best dancer?

- A. Divya B. Bhavya C. Remya D. Vidhya

5. If Deepak's father is Mohan's son, what is the relation between Deepak and Mohan?

- A. Son B. Brother C. Nephew D. Grandson

6. Rafeek has more sight than Muneer. Shameer has less sight than Sudheer. Sudheer has less sight than Rafeek. Then who has the best sight?

- A. Sudheer B. Shameer C. Rafeek D. Muneer

7. If two men did a work in ten days, then how much work can be done by a man in one day?

- A. 1/2 B. 1/5 C. 1/10 D. 1/20

8. A firing sound takes two minutes to reach from the place A to B. Then how much time will it take for five firing sounds to reach from the place A to B?

- A. 10 metre B. 2 metre C. 4 metre D. 5 metre

9. Sharmila is younger than Mala. Kunjan is as old as Nanda. Sudheesh is younger than Nanda. Sudheesh is older than Sharmila. Mala is not so old as Sudheesh. If so, who is the oldest?

- A. Sudheesh B. Mala C. Sharmila D. Kunjan

- 153
10. There are 70 students in a queue, who are standing to pay their fees in a college. In this, the position of Mohan is 54 from the window, then how many students will be behind him?
A. 15 B. 16 C. 17 D. 18
 11. If South-WEST is North, what will be North-East?
A. West B. South-West C. East-West D. South
 12. A is the son of B. B and C are sisters. D is the mother of C and E is the son of D. Then what is correct in the following?
A. E is the sister of A's mother
B. C and E are siblings
C. C is the grandmother of A
D. A and E are brothers
 13. The number of employees in a company is 60. Among them $\frac{1}{4}$ th have car, $\frac{1}{2}$ have scooter and $\frac{1}{10}$ have both car and scooter. Then, how many of them have neither car nor scooter?
A. 12 B. 32 C. 30 D. 28
 14. In a class of 51 students, Akhil has 21st rank. Then what is the position of Akhil from the last one?
A. 12 B. 30 C. 31 D. 35
 15. A person walked 4 miles east from the place x and turned left and walked 5 miles and again turned left and walked 2 miles. Then what is the direction he is walking now?
A. North B. West C. East D. South
 16. F is the brother of A. C is the daughter of A. K is the Brother of F. G is the brother of C. Then who is the uncle of G?
A. F B. C C. K D. A
 17. Jinu is two years older than Vinu. Jinu is three times older than Minu. If the sum of the ages of three is 19, then what will be the age of Jinu?
A. 5 B. 3 C. 9 D. 10
 18. If the position of a man named x in a queue of Maveli store is 22 from the front and 28 from behind, then what will be the total number of men in that queue?
A. 40 B. 52 C. 50 D. 54
 19. A is longer than Y. B is shorter than X, X and Y are equal in length. If Z is longer than A, then which is the shortest one?
A. X B. Y C. A D. B
 20. If Shyam's father is Sanjay's son, then what is the relation between Shyam and Sanjay?
A. Son B. Grandson C. Brother D. Nephew

8. What is the relation of M to R?
 A. Mother B. Daughter C. Niece D. Uncle
9. What is the relation of B to G?
 A. Son B. Mother C. Aunt D. Niece
10. What is the relation of E to S?
 A. Grand child B. Uncle C. Cousin D. Father
- (3) If $5 \text{ PQ } 8 = 5^2 + 8 = 25 + 8 = 33$
11. $4 \text{ PQ } 4 = ?$
 A.16 B. 20 C. 24 D. 12
12. $4 \text{ PQ } 1 = ?$
 A.17 B. 12 C. 8 D. 9
13. $5 \text{ PQ } 5 = ?$
 A.20 B. 30 C. 15 D. 25
14. $6 \text{ PQ } ? = 108$
 A.72 B. 82 C. 52 D. 42
15. $? \text{ PQ } 9 = 109$
 A.50 B. 25 C. 20 D. 10
- (4) U,V,W,X,Y, and Z are the six members of a house. Among them one is a foot ball player, one is a chess player and another one is a cricket player. The unmarried U and X do not participate in any games. No ladies participate in either football or cricket. Among the one couple, Z is the husband. V who is he brother of W is neither a chess player nor a cricket player. Y is the friend of V and also a cricket player.
16. Who is the football player?
 A. X B. U C. Y D. Z
17. Who is the chess player?
 A. U B. V C. W D. X
18. Who is the wife of Z?
 A. W B. V C. U D. Y
19. Who among them are women?
 A. UXV B. VYX C. XZY D. UXW
20. Who among them are men?
 A. XUY B. UXV C. VYZ D. WXZ

APPENDIX XXIII

UNIVERSITY OF CALICUT
DEPARTMENT OF EDUCATION

VERBAL GROUP TEST OF INTELLIGENCE

RESPONSE SHEET

Name of Student:.....Class.....Age

School: Government/Private.....Sex.....

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

TEST IV – VERBAL REASONING

For each question of this section, four alternatives A, B, C, and D are given. Read them carefully and mark your correct response in the answer sheet.

Example :

1. Bindu is fatter than Sindhu. Manju is leaner than Bindu. Manju is as fat as Sandhya. Then who is the fattest among them?

- A. Manju B. Bindu C. Sindhu D. Sandhya

As Bindu is the fattest, the answer is 'B'

A	B✓	C	D
---	----	---	---

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19. A is longer than Y. B is shorter than X, X and Y are equal in length. If Z is longer than A, then which is the shortest one?
A. X B. Y C. A D. B
20. If Shyam's father is Sanjay's son, then what is the relation between Shyam and Sanjay?
A. Son B. Grandson C. Brother D. Nephew

8. What is the relation of M to R?

- A. Mother B. Daughter C. Niece D. Uncle

9. What is the relation of B to G?

- A. Son B. Mother C. Aunt D. Niece

10. What is the relation of E to S?

- A. Grand child B. Uncle C. Cousin D. Father

(3) If $5 \text{ PQ } 8 = 5^2 + 8 = 25 + 8 = 33$

11. $4 \text{ PQ } 4 = ?$

- A.16 B. 20 C. 24 D. 12

12. $4 \text{ PQ } 1 = ?$

- A.17 B. 12 C. 8 D. 9

13. $5 \text{ PQ } 5 = ?$

- A.20 B. 30 C. 15 D. 25

14. $6 \text{ PQ } ? = 108$

- A.72 B. 82 C. 52 D. 42

15. $? \text{ PQ } 9 = 109$

- A.50 B. 25 C. 20 D. 10

(4) U,V,W,X,Y, and Z are the six members of a house. Among them one is a foot ball player, one is a chess player and another one is a cricket player. The unmarried U and X do not participate in any games. No ladies participate in either football or cricket. Among the one couple, Z is the husband. V who is he brother of W is neither a chess player nor a cricket player. Y is the friend of V and also a cricket player.

16. Who is the football player?

- A. X B. U C. Y D. Z

17. Who is the chess player?

- A. U B. V C. W D. X

18. Who is the wife of Z?

- A. W B. V C. U D. Y

19. Who among them are women?

- A. UXV B. VYX C. XZY D. UXW

20. Who among them are men?

- A. XUY B. UXV C. VYZ D. WXZ

APPENDIX XXIII

UNIVERSITY OF CALICUT
DEPARTMENT OF EDUCATION

VERBAL GROUP TEST OF INTELLIGENCE
RESPONSE SHEET

Name of Student:.....Class.....Age

School: Government/Private.....Sex.....

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

Sl. No	Answers			
1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D

APPENDIX - XXIV

SCORING KEY OF VERBAL GROUP TEST OF INTELLIGENCE

TEST - I		TEST - II		TEST - III		TEST - IV		TEST - V	
1.	D	1.	C	1.	C	1.	B	1.	A
2.	B	2.	B	2.	A	2.	A	2.	C
3.	B	3.	B	3.	D	3.	D	3.	D
4.	D	4.	A	4.	A	4.	B	4.	B
5.	A	5.	C	5.	C	5.	D	5.	D
6.	B	6.	C	6.	C	6.	C	6.	C
7.	C	7.	B	7.	A	7.	D	7.	A
8.	D	8.	A	8.	B	8.	B	8.	D
9.	C	9.	B	9.	C	9.	D	9.	A
10.	A	10.	A	10.	A	10.	B	10.	B
11.	B	11.	C	11.	B	11.	D	11.	B
12.	D	12.	D	12.	D	12.	B	12.	A
13.	D	13.	B	13.	A	13.	A	13.	B
14.	C	14.	B	14.	B	14.	C	14.	A
15.	A	15.	D	15.	D	15.	B	15.	D
16.	C	16.	D	16.	B	16.	A	16.	D
17.	B	17.	A	17.	C	17.	C	17.	C
18.	A	18.	D	18.	A	18.	A	18.	A
19.	D	19.	A	19.	C	19.	D	19.	D
20.	A	20.	C	20.	D	20.	B	20.	C

APPENDIX – XXV

**DEPARTMENT OF ADULT EDUCATION
AND EXTENSION SERVICES**

UNIVERSITY OF CALICUT

നിർദ്ദേശങ്ങൾ :-

ഗവേഷണത്തിനുപയോഗിക്കാൻ തിങ്ങളുടെ വ്യക്തിപരമായ വിവരങ്ങൾ ശേഖരിക്കാനാണ് ഇതുകൊണ്ട് ഉദ്ദേശിക്കുന്നത്. കുടുംബാംഗങ്ങളെക്കുറിച്ചുള്ള വിവരങ്ങൾ കഴിയുന്നിടത്തോളം ശരിയായി രേഖപ്പെടുത്തുക.

1. പേര് :
2. ആൺകുട്ടി / പെൺകുട്ടി :
3. വയസ്സ് :
4. മതം :
5. സ്കൂൾ :
6. സ്കൂൾ സ്ഥിതി ചെയ്യുന്ന സ്ഥലം
പഞ്ചായത്ത് / മുൻസിപ്പാലിറ്റി /
കോർപ്പറേഷൻ :

സാമൂഹിക - സാമ്പത്തിക നിലവാര സൂചിക

ക്രമ നമ്പർ	കുടുംബാംഗത്തിന്റെ പേര്	കുടുംബസ്ഥാനം ഉൾപ്പെടെയുള്ള ബന്ധം	വിദ്യാഭ്യാസയോഗ്യത	തൊഴിൽ	പ്രതിമാസ വരുമാനം
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

കഴിഞ്ഞ പരീക്ഷയിൽ കിട്ടിയ മാർക്ക്

- a) മലയാളം :
- b) ഇംഗ്ലീഷ് :
- c) ഹിന്ദി :
- d) ഫിസിക്സ് :
- e) ബയോളജി :
- f) കെമിസ്ട്രി :
- g) സോഷ്യൽ സയൻസ് :
- h) കണക്ക് :

APPENDIX - XXVI**DETAILS OF SCHOOLS SELECTED AS FINAL SAMPLE**

Sl. No.	Name of schools	Type of the school G/B/Co-Ed	Management of the school Govt./Pvt.	Locale of the School R/U
1.	Farook H.S.S. Farook College,	Co-Ed	Private	Rural
2.	G.H.S.S. Mampad	Co-Ed	Government	Rural
3.	Govt. Model. H.S.S C.U. Campus	Co-Ed	Government	Rural
4.	Victory G.H.S. Nemom	Girls	Private	Rural
5.	G.H.S.S. Ernakulam	Girls	Government	Urban
6.	S.R.V.H.S.S. Ernakulam	Boys	Government	Urban
7.	St. John's Model H.S. Nalanchira	Co-Ed	Private	Urban
8.	Government H.S. Chala	Co-Ed	Government	Rural
9.	G.H.S. Pappanamcode	Co-Ed	Government	Rural
10.	Govt. Ganapath V.H.S., Feroke	Co-Ed	Government	Rural
11.	St. Theresa's G.H.S. Shoranur	Girls	Private	Urban
12.	K.V.R.H.S. Shoranur	Boys	Private	Urban
13.	G.V.H.S.S. Ambalamugal	Co-Ed	Government	Rural

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