

**SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, APRIL 2021**

(CBCSS)

Polymer Chemistry

PCH 2C 08—POLYMER TECHNIQUES

(2019 Admissions).

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend all questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Part A

Answer any eight questions.

Each question carries a weightage of 1.

1. Name any *two* stabilisers used in polymer processing.
2. What is the purpose of polymer processing ?
3. What is the function two roll mill.
4. What is the melt fracture of polymer. When would it occur ?
5. What are polymer based adhesives.
6. What is the main function of pigment in paint ?
7. What is a diffusion coating ?
8. What is twin screw extruder ?
9. What is the difference between Kevlar and carbon fiber ?
10. How do pressure sensitive adhesives work ?
11. How will you differentiate between blends and composites.
12. How are glass fibers manufactured ?

(8 × 1 = 8 weightage)

Turn over

Part B

Answer any four questions.

Each question carries a weightage of 3.

13. Mention the type of fillers used in polymer processing and its importance ?
14. Explain the process of compounding. What are its advantages ?
15. Describe the extrusion technique in polymer technology.
16. Compare the hot melt and aqueous dispersion adhesives.
17. What is the importance of compatibilizing agent in polymer blend ?
18. Explain the term reinforcement in polymer composites.
19. What are the uses of coupling agents in polymer composites.

(4 × 3 = 12 weightage)

Part C

Answer any two questions.

Each question carries a weightage of 5.

20. What are Additives ? Mention the importance of additives in polymer processing.
21. Mention the major extrudate defects in polymer processing.
22. What are the mechanisms of adhesion ?
23. How polymer composites are classified and mention its advantages.

(2 × 5 = 10 weightage)

**SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, APRIL 2021**

(CBCSS)

Polymer Chemistry

PCH 2C 07—PHYSICAL CHEMISTRY—I

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

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Section A

Answer any eight questions.

Each question carries a weightage of 1.

1. What are the applications of third law of thermodynamics ?
2. Define chemical potential.
3. What is meant by fugacity of a gas ?
4. Explain the term excess entropy.
5. Define phenomenological coefficient.
6. Find the ionic strength of 0.2 m BaCl₂ in water.
7. Explain Wien effect.
8. What are the advantages of dropping mercury electrode ?
9. Explain the term concentration polarization.
10. What are magic numbers and why are they so called ?
11. What are photonuclear reactions ?
12. What is dosimetry and how it is used medically ?

(8 × 1 = 8 weightage)

Turn over

Section B

*Answer any **four** questions.*

Each question carries a weightage of 3.

13. Deduce Gibb's-Duhem equation.
14. Explain Nernst heat theorem.
15. Write short note on osmosis.
16. Calculate mean ionic activity coefficient for 0.01 M CaCl_2 in water at 25°C .
17. Discuss briefly the theory of over voltage.
18. Write short note on radiolysis of water.
19. Discuss the different types of nuclear reactions.

(4 × 3 = 12 weightage)

Section C

*Answer any **two** questions.*

Each question carries a weight of 5.

20. Discuss the determination relations connecting thermodynamics partial derivatives by the method of Jacobians.
21. Deduce Duhem-Margules equation and discuss its applications.
22. Derive Debye-Huckel-Onsager equation for strong electrolytes ? What are the deviations from DHO equation ?
23. Write short notes on :
 - (a) Principle and working of nuclear power plants.
 - (b) Methods of detection and measurement of radiation.

(2 × 5 = 10 weightage)

**SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, APRIL 2021**

(CBCSS)

Polymer Chemistry

PCH 2C 06—ORGANIC CHEMISTRY—II

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

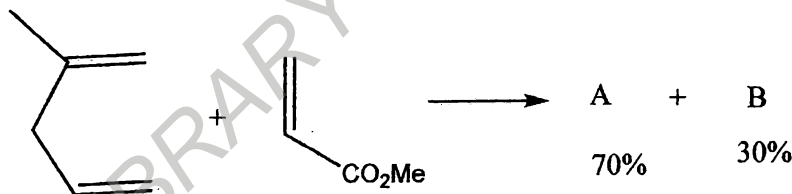
General Instructions

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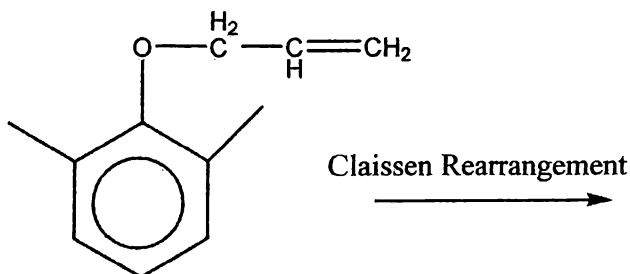
Section A

Answer any **eight** questions.
Each question carries a weight of 1.

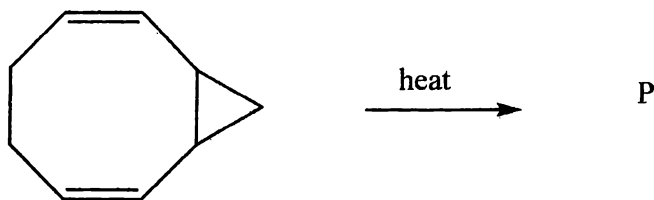
1. Identify the products A and B :



2. Identify the product of the following reaction :

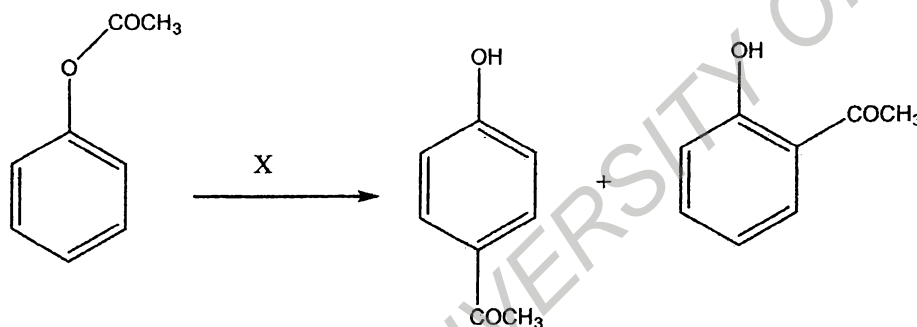


3. Write the product, P :

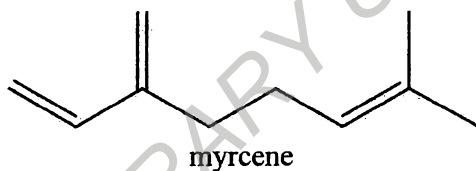


4. What are photosensitizers ?

5. Name the following rearrangement and the reagent X :



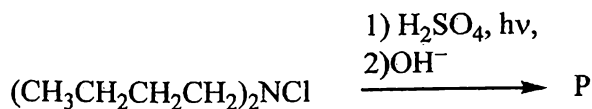
6. Calculate the λ_{max} for



7. Write the major two fragmentation product of dibenzylamine.

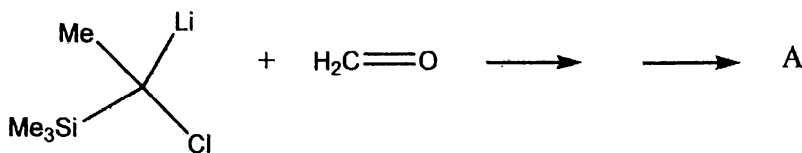
8. In a 60 MHz NMR machine protons of acetone absorb at approximately 120 Hz. What will be the absorption position of the same proton when measured in a 100 MHz instrument?

9. Draw the structure of the product, P in the reaction below

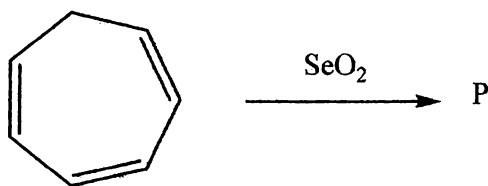


10. Write down the structures of two common precursors in alkaloid biosynthesis.

11. Write the product A in the following reaction.



12. Write the product, P in the following reaction.

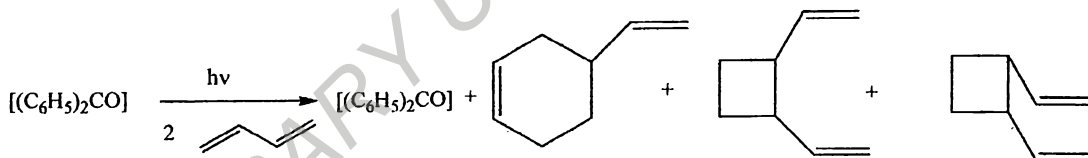


(8 × 1 = 8 weightage)

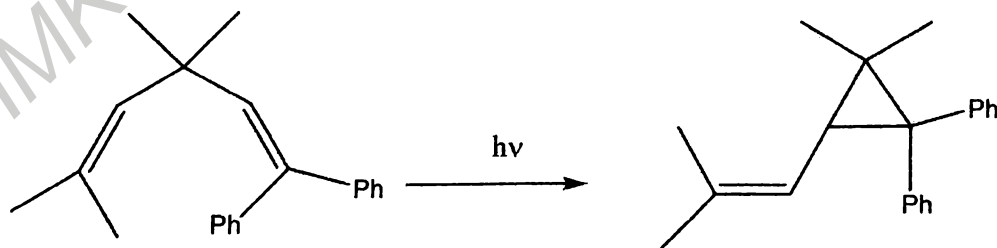
Section B

Answer any **four** questions.
Each question carries a weight of 3.

13. Explain the following reaction :

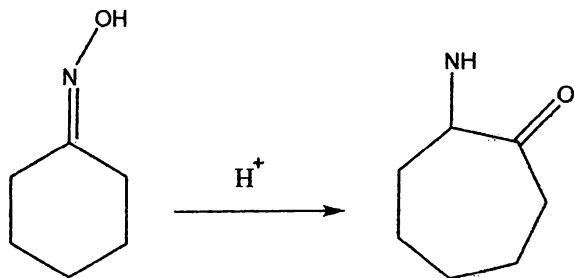


14. Explain the reason for the formation of product in the following reaction :

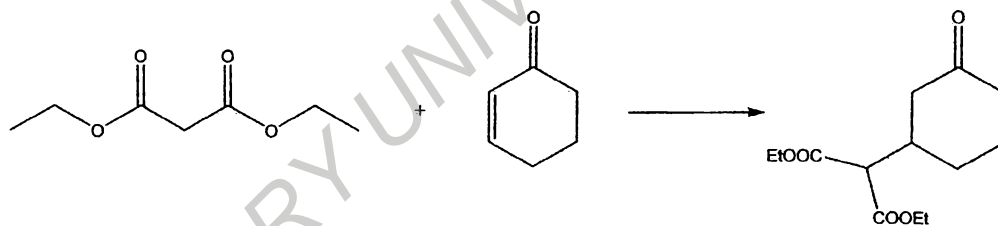


Turn over

15. Name the rearrangement and explain the mechanism of the following reaction :



16. Draw the fragmentation products of benzyl alcohol with m/e for each.
17. Explain the proton NMR spectrum of the compound C_8H_7OBr . (1H NMR spectrum is given in the set of spectra given for Question No. 22) (on page 6).
18. Name the following reaction and explain the mechanism.



19. Write the scheme of any *one* method each for the synthesis of pyrazole and Thiazole?

(4 × 3 = 12 weightage)

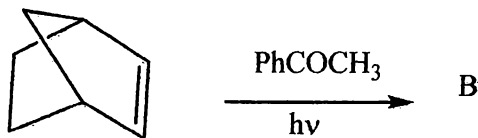
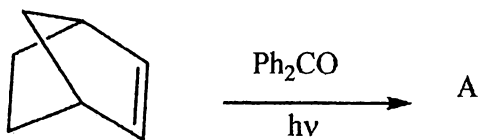
Section C

Answer any **two** questions.

Each question carries a weight of 5.

20. What do you mean by sigmatropic rearrangement ? Explain the cope rearrangement.

21. (a) Discuss the Paterno -Buchi reaction, (b) Write the product of the following reaction :

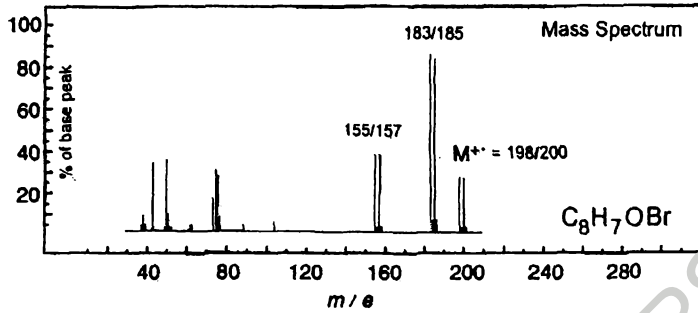
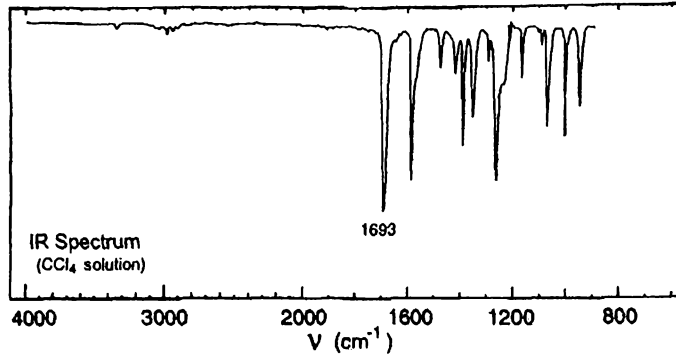


22. Predict the structure of the organic compound from the given spectra. (on page 6) (Explanation required and you may also use the information from Q.No.17) :

23. Explain the synthetic applications of DDQ.

(2 × 5 = 10 weightage)

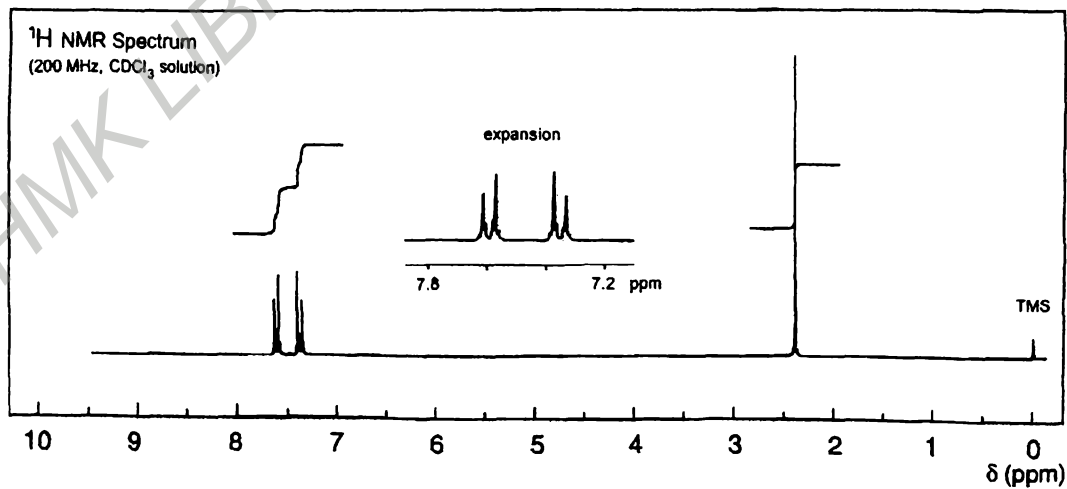
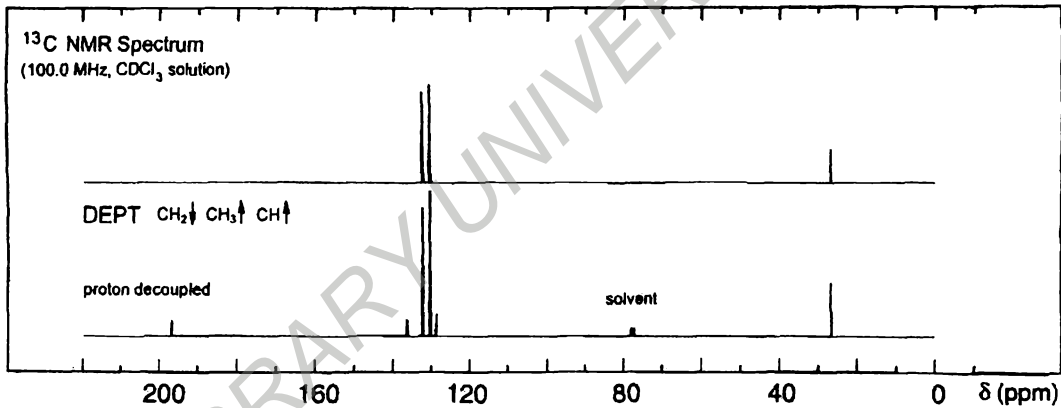
Spectra for Q.No.22



UV Spectrum

 λ_{\max} 258 nm (log₁₀ ϵ 4.2)

solvent : ethanol



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Polymer Chemistry

PCH 2C 05—THEORETICAL CHEMISTRY—II

(2019 Admissions)

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Maximum : 30 Weightage

General Instructions

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Section A

*Answer any **eight** questions.*

Each question carries a weight of 1.

1. How we can find out the spectral transition probability using direct product ?
2. Write down one method to convert reducible representation in to irreducible representation.
3. Explain standard reduction formula.
4. Construct the reducible representation to find out the vibrations of water molecule using normal coordinate analysis.
5. What are the selection rules for Raman absorption for a molecule ?
6. What is the need of separation of variables in higher level quantum mechanics ?
7. When is an integral said to vanish ?
8. Explain the hyperfine interactions in Mossbauer spectroscopy.
9. The bond length of CO is 112.8pm. At what wave numbers do the first three rotational transitions appear ?
10. Explain the factors affecting the width and intensity of spectral lines.

Turn over

11. Explain the impact of electric field on the rotational spectrum.
12. State Frank-Condon principle with the help of a diagram.

(8 × 1 = 8 weightage)

Section B

Answer any four questions.

Each question carries a weightage of 3.

13. Explain briefly the mathematical requirements for a point group.
14. Construct the character table for C_{2h} point group.
15. Explain the properties of Irreducible representations.
16. Explain the electronic transition in formaldehyde using the concepts of group theory.
17. Explain the basic principle of Mossbauer spectroscopy.
18. What is chemical shift: What are the factors affecting it ?
19. Explain the theory and applications of FTIR technique.

(4 × 3 = 12 weightage)

Section C

Answer any two questions.

Each question carries a weightage of 5.

20. Derive character table for C_{3v} and C₃.
21. Discuss the normal mode analysis of NH₃ for vibrational motion.
22. a) Explain the theory of a diatomic vibrating rotator.
b) The fundamental and first overtone transitions of ¹⁴N¹⁶O are centred at 1876 cm⁻¹ and 3724 cm⁻¹. Evaluate the equilibrium vibration frequency, the anharmonicity, the exact zero point energy and the force constant
23. Explain the following terms a) FTNMR ; b) Non-rigid rotator ; and c) Vibrational-rotational Raman spectra.

(2 × 5 = 10 weightage)

Section B

*Answer at least **three** questions.
Each question carries 4 weightage.
All questions can be attended.
Overall Ceiling 12.*

13. Distinguish LDPE and HDPE.
14. Explain the synthesis of nylon 6 and nylon 6, 6.
15. Discuss industrial applications of cellulose.
16. Explain the structure, preparation and properties of styrene-butadiene rubber.
17. Give the structure, synthesis and uses of phenol formaldehyde resins.
18. Write short note on silicone oils.
19. Give a note on modified form of natural rubber.

(3 × 4 = 12 weightage)

Section C

*Answer at least **two** questions.
Each question carries 6 weightage.
All questions can be attended.
Overall Ceiling 12.*

20. Explain the structure, preparation, properties and applications of polyesters PET and PBT.
21. Write short notes on a) Thermally resistant polymers ; and b) Photoresists.
22. Discuss the synthesis, properties and uses of fluoro polymers.
23. Briefly explain the structure of DNA and RNA.

(2 × 6 = 12 weightage)