


Name: Enrolment No:	
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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Polymer Chemistry
Program: B.Sc. (H) Chemistry
Course Code: CHEM-3006

Semester: V
Time : 03 hrs.
Max. Marks: 100

Instructions: Read all the below mentioned instructions carefully and follow them strictly:

- 1) Mention Roll No. at the top of the question paper.
- 2) ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO								
Q 1	<p>Write down the correct answer.</p> <p>A. Which of the following is an example of condensation polymers?</p> <p>(i) Polythene (ii) PVC (iii) Orlon (iv) Terylene</p> <p>B. Which is a naturally occurring polymer?</p> <p>(i) Polythene (ii) PVC (iii) Amino acid (iv) Protein</p> <p>C. Whether small molecules liberate in addition polymerization?</p> <p>(i) Yes (ii) No (iii) Sometimes (iv) Only Water</p> <p>D. Which one among the following is a thermosetting plastic?</p> <p>(i) PVC (ii) PVA (iii) Bakelite (iv) Perspex</p>	1 × 4	CO1								
Q 2	<p>Match the Polymers in column I with the correct monomer in column II.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">a. High density polymer</td> <td style="width: 50%;">1. Isoprene</td> </tr> <tr> <td>b. Neoprene</td> <td>2. Tetrafluoroethene</td> </tr> <tr> <td>c. Natural rubber</td> <td>3. Chloroprene</td> </tr> <tr> <td>d. Teflon</td> <td>4. Ethene</td> </tr> </table>	a. High density polymer	1. Isoprene	b. Neoprene	2. Tetrafluoroethene	c. Natural rubber	3. Chloroprene	d. Teflon	4. Ethene	1 × 4	CO1
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Q 3	Define the extent of polymerization? Write down the formula of degree of polymerization (DP) for a reaction between two bifunctional monomers having a molar ratio r.	1 + 3	CO2								
Q 4	Fill in the gaps. a. The mass average molecular mass & number average molecular mass of a polymer are respectively 40,000 and 30,000. The polydispersity index of polymer will be -----. b. The degree of polymerization of a poly(methyl methacrylate) sample having number average molecular weight of 1,50,000 g/mol is _____. (C = 12, H = 1, O = 16 g/mol).	2 + 2	CO2								
Q 5	Match the following. <table border="1" style="margin-left: 20px;"> <tr> <td>a. Plastic egg container</td> <td>1. Injection moulding</td> </tr> <tr> <td>b. Water tank</td> <td>2. Extrusion</td> </tr> <tr> <td>c. Chair</td> <td>3. Rotational moulding</td> </tr> <tr> <td>d. Cable</td> <td>4. Thermoforming</td> </tr> </table>	a. Plastic egg container	1. Injection moulding	b. Water tank	2. Extrusion	c. Chair	3. Rotational moulding	d. Cable	4. Thermoforming	1 × 4	CO 1
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SECTION B (4Qx10M= 40 Marks)											
Q 1	Describe the polymerization of isobutylene in presence of BF ₃ as catalyst and water as co-catalyst.	10	CO2								
Q 2	Explain the types of all possible intermolecular bonds in polymers (with proper illustration). How does these bonding influences the processibility (thermal and solvent based) of polymers?	5 + 5	CO1								
Q 3	Write a note about the structural parameters influencing the melting point and glass transition temperature of polymers? Mention proper examples.	10	CO2								
Q 4	Draw a general stress-strain curve of polymer and describe all the terminologies to explain the mechanical properties of polymers (with a comparative statement on plastic, rubber, and thermoplastic elastomer). How can we characterize the thermal properties of polymers. Give example. Or Define polymer composite and its components? What are the objectives of making polymer composites. If you want to prepare composites of graphene with PU and PP which form of graphene (oxidized or unoxidized) will be preferred for the PU and PP? Justify.	7 + 3 3 + 3 + 4	CO3								
SECTION-C (2Qx20M=40 Marks)											

Q 1	<p>Explain the term “structure of polymer”. Exemplify to describe the correlation of thermal and mechanical properties of the polymers with their structures (Give at least four examples). PP and PE are crystalline polymers, but their copolymers are amorphous. Explain.</p>	<p>4 + 10 + 6</p>	<p>CO2</p>
Q 2	<p>Define conducting polymers? Write the synthetic steps for the preparation of PANI. For a flexible piezo device, write down the possibility of PANI as a flexible electrode (with proper schematic diagrams).</p> <p style="text-align: center;">Or</p> <p>Compare the NR and TPI as per their structure, properties and applications. Provide a comparative note on the synthetic mechanism, thermal and mechanical properties of novolac, resol and bakelite.</p>	<p>2 + 10 + 8</p> <p>5 + 15</p>	<p>CO3</p>