



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Programme Name: B.Tech (Refining & Petrochemicals)
Course Name : Polymer Science & Engineering
Course Code : CHCE 3011P

Semester : VII
Duration : 03 hrs
Max. Marks: 100

SECTION-A (5 x 4 = 20 Marks)
Attempt all questions

Sl. No.	Answer in one or two lines (short answer type)	Marks	CO
Q1	Why are rubbers called elastomers?	4	CO1
Q2	How monodisperse polymer is different from polydisperse polymer?	4	CO2
Q3	Why does Ziegler-Natta polymerization result in isotactic polymers?	4	CO3
Q4	Write two major differences between solution and suspension polymerization?	4	CO4
Q5	What is aminolysis? Give an example.	4	CO5

SECTION-B (4 x 10 = 40 Marks)
Attempt Q6, Q7, Q8 (all three compulsory) and Q9 or Q10 (any one)

Answer in few lines (medium duration type)

Q6	A polymer has the following molar mass distribution.	10	CO2						
	<table border="1"><thead><tr><th>Number of molecules</th><th>Molar mass (g.mol⁻¹)</th></tr></thead><tbody><tr><td>50</td><td>5000</td></tr><tr><td>75</td><td>6000</td></tr></tbody></table>			Number of molecules	Molar mass (g.mol ⁻¹)	50	5000	75	6000
	Number of molecules			Molar mass (g.mol ⁻¹)					
	50			5000					
75	6000								
(a) Calculate weight average and z-average molar mass of the polymer									
(b) Calculate polydispersity index? Is it monodisperse polymer?									
Q7	Write mechanism and influencing factors for thermos-oxidative degradation.	10	CO5						
Q8	Write the differences between step-growth and chain-growth polymerization.	10	CO1						
Q9	What feed ratio of hexamethylene diamine and adipic acid should be employed in order to obtain a polyamide with number average molecular weight of 10,000 at 99% conversion?	10	CO3						
Q10	Consider the RAFT polymerization of 6.55 M methyl methacrylate (100.12 molecular weight) in benzene using a 1,1'-azobis(1-cyclohexanenitrile) (0.0018 M) initiator and 2.48×10 ⁻² M of the RAFT agent <i>S</i> -dodecyl <i>S</i> -(2-cyano-4-carboxy)but-2-yl trithiocarbonate at 90°C. At a conversion of 92% of the monomer, estimate the number-average molecular weight.	10	CO3						

SECTION-C (20 x 2 = 40 Marks)
Attempt Q11 (compulsory) and Q12 or Q13 (any one)

Answer comprehensively (long answer type)

Q11	Briefly explain how copolymerization can be classified based on the monomer reactivity ratios.	20	CO4
Q12	Briefly explain the differences between self-catalyzed and catalyzed polymerization.	20	CO3
Q13	Briefly explain the differences between cationic and anionic polymerization.	20	CO3