

Total No. of Questions : 5]

SEAT No. :

**P1852**

[5323]-34

[Total No. of Pages : 3

M.Sc. - II

**PHYSICAL CHEMISTRY**

**CH - 314 : Polymer Chemistry**

**(2008 Pattern) (Semester - III) (Old)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *All questions are compulsory.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of logarithmic table / calculator is allowed.*
- 5) *Neat diagrams must be drawn wherever necessary.*

Physico - Chemical Constants

1.	Avogadro Number	N	=	$6.022 \times 10^{23} \text{ mol}^{-1}$
2.	Boltzmann Constant	k	=	$1.38 \times 10^{-16} \text{ erg K}^{-1} \text{ molecule}^{-1}$ $= 1.38 \times 10^{-23} \text{ J K}^{-1} \text{ molecule}^{-1}$
3.	Planck Constant	h	=	$6.626 \times 10^{-27} \text{ erg s}$ $= 6.626 \times 10^{-34} \text{ J s}$
4.	Electronic Charge	e	=	$4.803 \times 10^{-10} \text{ esu}$ $= 1.602 \times 10^{-19} \text{ C}$
5.	1 eV		=	$23.06 \text{ k cal mol}^{-1}$ $= 1.602 \times 10^{-12} \text{ erg}$ $= 1.602 \times 10^{-19} \text{ J}$ $= 8065.5 \text{ cm}^{-1}$
6.	Gas Constant	R	=	$8.314 \times 10^7 \text{ erg K}^{-1} \text{ mol}^{-1}$ $= 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ $= 1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$
7.	Faraday Constant	F	=	$96487 \text{ C equiv}^{-1}$
8.	Speed of light	c	=	$2.997 \times 10^{10} \text{ cm s}^{-1}$ $= 2.997 \times 10^8 \text{ m s}^{-1}$
9.	1 cal		=	$4.184 \times 10^7 \text{ erg}$ $= 4.184 \text{ J}$
10.	1 amu		=	$1.673 \times 10^{-27} \text{ kg}$
11.	Bohr magneton	$\beta_e$	=	$-9.274 \times 10^{-24} \text{ J T}^{-1}$
12.	Nuclear magneton	$\beta_n$	=	$5.051 \times 10^{-27} \text{ J T}^{-1}$
13.	Mass of an electron	$m_e$	=	$9.11 \times 10^{-31} \text{ kg}$

**P.T.O.**

## SECTION - I

**Q1)** Attempt any three of the following: **[15]**

- a) Define and explain secondary bond forces in a polymer.
- b) Define polydispersity index with a sketch.
- c) What is instantaneous polymer composition?
- d) Discuss elastomer forming properties of a polymer.
- e) Write a note on Zeigler-Natta Catalyst.

**Q2)** Attempt any three of the following: **[15]**

- a) Discuss what is glass transition temperature.
- b) Write a note on block and graft co-polymer.
- c) Describe the kinetics of condensation polymer.
- d) Derive the rate equation for step polymerization in the presence of a catalyst.
- e) Distinguish between homopolymers and heteropolymers.

**Q3)** Solve any two: **[10]**

- a) Find the viscosity of a polymer having  $C = 0.4$  g/dl Huggin constant = 0.33.

$$K = 1.2 \times 10^{-4} \quad \alpha = 0.73 \quad m = 1.2 \times 10^5$$

- b) The relative viscosities of a fraction of polystyrene of  $\bar{M}_n = 275000$ , in teralin at 20°C were

% conc	0.01	0.05	0.10	0.25
$\eta_r$	1.05	1.25	1.59	2.70

Find  $\alpha$ .

- c) 3 moles of 1,3 butadiene and 2 moles of vinylchloride are co-polymerized. Find polymer composition at 8.8 : 0.035 reactivity ratios respectively.

[At. wts : C = 12 H = 1 Cl = 35.5]

## SECTION - II

**Q4)** Attempt any four of the following: **[20]**

- a) Distinguish between condensation and addition polymers.
- b) Discuss the membrane osmometry technique.
- c) Describe compression molding.
- d) Write a note on melt spinning.
- e) Discuss the use of DTA in polymer analysis. Compare it with IR as an analytical tool.
- f) How is reinforced plastic made?

**Q5)** Attempt any four of the following: **[20]**

- a) Describe the process of Calendering.
- b) Write a note on XRD use in polymer analysis.
- c) Discuss the effects of radiation exposure on polymers.
- d) Describe the process of dyeing a fibre.
- e) Explain what are conducting polymers.

