

**2015**

**M.Sc. 3rd Seme. Examination**

**CHEMISTRY**

**PAPER—CEM-304**

*Full Marks : 40*

*Time : 2 Hours*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

**Polymer (Physical + Organic)**

Answer any four questions.

1. (a) Why the average molecular weight is more appropriate to determine the molecular weight of a polymer ?
- (b) Define co-polymer and classify it.

*(Turn Over)*

- (c) Calculate the polydispersity index (PI) of a polymer having composition 85% of molecular weight  $5 \times 10^4$  and 15% of molecular weight  $7 \times 10^5$ . Interpret the result.

$$2 + (2+1) + (4+1)$$

2. (a) What is intrinsic viscosity and how is it determined ?  
 (b) What are glass transition temperature ( $T_g$ ) and melting temperature ( $T_m$ ) of a polymer ?  
 (c) Classify polymer based on application and give one example of each type.

$$(1+2)(1\frac{1}{2} + 1\frac{1}{2}) + (2+2)$$

3. (a) Find out the rate of ideal free radical polymerization system and show that rate of such polymerization linearly varies with  $[I]^{\frac{1}{2}}$ , where [I] is the initiator concentration.  
 (b) What is meant by kinetic chain length of a polymer and show that kinetic chain length is inversely proportional to the rate of polymerization.

$$(5+2)+3$$

4. (a) What is the number average degree of polymerization ( $\bar{X}_n$ ) and show that

$$\bar{X}_n = \frac{2}{2-a} \times \frac{k_p^2 [M]^2}{2k_t R_p}$$

where  $a$  is the fraction of chain radicals that undergoing termination by coupling and other terms have their usual meanings.

- (b) Write down the differences between addition and condensation polymerization. (2+3)+5
5. (a) Find out the composition of the copolymer when the copolymerization is performed by taking two monomers.
- (b) Write down the structures of
- (i) Nylon 66 ;
  - (ii) AIBN ;
  - (iii) SBR. 7+3
6. (a) Derive Carothers equation.
- (b) What is chain transfer ?

- (c) Give two examples of inhibitor of polymerization.
- (d) What is the composition of LATEX ?

$$4+1\frac{1}{2}+1\frac{1}{2}+3$$

7. (a) What is vulcanization ? Write the name of two vulcanizing agent.
- (b) Write down the names of different processes of deformation of natural rubber with suitable examples.
- (c) Write the name of two antiozonating agents.
- (d) What is compounding of rubber ?

$$(2+1)+4+2+1$$

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***Environmental (Inorganic)***

Answer any *five* questions.

1. (a) Illustrate and explain 'The Oxygen Cycle'. 3
- (b) Discuss 'Photochemical Smog'. 3

6. (a) Illustrate the structure of the atmosphere. 4  
(b) Briefly discuss 'Earth's radiation balance'. 4
7. Write notes on : (any two) 4+4  
(a) El-nino.  
(b) Bio-chemical effect of mercury.  
(c) Mode of action of DDT.
8. (a) What do you mean by knocking? 2  
(b) Discuss the use of Catalytic Converter. 3  
(c) Write a brief note on 'Carbon cycle'. 3
9. Discuss the chemical and photochemical reactions of sulphur dioxide and nitrogen oxides in the atmosphere. 4+4
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2. (a) Discuss the chemical processes for the formation of  
(i) Inorganic particulate matter ;  
(ii) Organic particulate matter. 3+3
- (b) What do you mean by CFC substituents ? 2
3. (a) Discuss CO pollution in the light of  
(i) Sources and sinks ;  
(ii) Concentration profile ;  
(iii) Control. 2+2+2
- (b) What is Octane number ? 2
4. (a) Illustrate the biochemical effect of 'Arsenic'. 5
- (b) Discuss the impact of toxic chemicals on enzymes. 3
5. (a) What is 'Acid rain' ? 2
- (b) How  $\text{NO}_x$  pollution can be controlled? 3
- (c) Discuss 'Ozone hole' formation. 3