Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Phil (MS)/SEM-1/MSPH-101/2010
2010
SCIENCE AND TECHNOLOGY OF POLYMER MATERIALS

Time Allotted : 3 Hours   Full Marks : 70

The figures in the margin indicate full marks.

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

Answer any *five* questions. $5 \times 14 = 70$

1. a) From the first principle show that $M_W = \Sigma N_i M_i^2 / \Sigma N_i M_i$ where the symbols have their usual significance.

   b) Use the following data to calculate molecular weight of a polymer sample where

Concentration C (g/100 ml)	19·27	12·53	5·81
Osmotic Pressure π (mm of H_2O)	453	253	112

   What type of molecular weight do you get ? What are the other concepts of molecular wight in vogue ?

2. a) What is meant by "repeat unit" ? Write the repeat units of

   i)   polybutadiene and

   ii)   nylon 6, 6.

   How molecular weight of a polymer is related with repeat unit ?

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b) What is "functionality" ? Why "CH_3COOH" does not form a polymer whereas $CH_2(COOH)_2$ does ? Explain "functionality" in detail.

c) What is polymer blend ? Distinguish between "miscible" and "immiscible" polymer blends.

d) The enthalpy and entropy of methyl methacrylate polymerization are – 57 $kJmol^{-1}$ and $131\cdot3$ $Jmol^{-1}$ K^{-1} respectively. Compute the "ceiling temperature" of the process.

3. Discuss any *three* of the following :

i) Cryoscopy

ii) Hydrogen bonded polymer

iii) Tacticity in polymers

iv) Plastics.

4. a) What do you understand by "polymer degradation" ? Discus the phenomenon comprehensively.

b) What is a "crystal" ? Does polymer form "crystal" ? Discuss the crystallinity in polymers.

5. What is the thermodynamic criterion of polymer solubility ? Compare the physical picture of "polymer-solvent" interaction vis-a-vis "NaCl–water" interaction. What is "solubility parameter" ? How is it important in the dissolution of a polymer ? Discuss.

6. What is a "copolymer" ? How many types of copolymer are possible ? Given that M_1 and M_2 are two monomers for free radical copolymerization. Show that

$$d[M_1]/d[M_2] = ([M_1]/[M_2])(\{r_1[M_1]+[M_2]\}/\{[M_1]+r_2[M_2]\})$$

where r_1 and r_2 are reactivity ratios of M_1 and M_2 respectively.

7. Write short notes on any *three* of the following :

    i) Adhesive

    ii) Lamination

    iii) Moulding

    iv) Fillers.

8. Explain the following :

    i) The PEG gets precipitated from its aqueous solution at high temperature

    ii) The "aramides" have very high melting point

    iii) Crystalline polymers are in general "opaque"

    iv) "Polypropylene" is less thermally stable than "polyethylene".