RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

M.A. /M.Sc. SECOND SEMESTER EXAMINATION, MAY 2018

FIRST YEAR [2017-19]

Date : 19/05/2018 **APPLIED CHEMISTRY**

Time : 11 am – 1 pm **Paper: IX (Polymer Science & Technology – I)** Full Marks : 50

Answer **any five** questions from the following:

1. a) For the following values of r_1 and r_2 what type of polymers will be expected?

   i) $r_1 = 0, r_2 = 0$ ii) $r_1 >> 0, r_2 >> 1$ iii) r_1 = infinity, r_2 = infinity

   b) Why do monomers show different reactivity in binary copolymerization? Which factor influence their relative reactivity? [5+5]

2. a) Write a note on kinetic expressions for polymerization in absence and in presence of a catalyst in a step polymerization.

   b) A linear step polymerization is 98% complete. Calculate: X_n and PDI. [5+5]

3. a) Differentiate between crystallinity and crystalizability. What polymers do not exhibit T_g and T_m ?

   b) Compare the T_g of poly (methyl methacrylate) and syndiotactic poly (methyl methacrylate).

   c) Give your best estimate for the weight fraction of plasticizer required to lower Tg of PVC to 30°C. Assume that the Tg of PVC is 356 K and that of plasticizer is 188K. No other information is available. [3+3+4]

4. a) A 0·2g of insulin was dissolved in 250ml of water at 30°C and the osmotic pressure of the solution was 26·1 torr. Calculate the number average molecular weight of insulin. 1 torr = 760 atm.

   b) Write down the plausible mechanism of ring opening polymerization of ε-caprolactam.

   c) i) Differentiate between SBR and SBS.

   ii) Which of the following will be more rubbery at ambient temperature— isotactic PP, atactic PP and syndiotactic PP

   iii) Which of the following materials will be transparent— PC, PAN, nylon 6, 6

   iv) Name two detectors used in GPC. [4+2+(1+1+1+1)]

5. a) Describe the role of retarders, inhibitors and chain transfer agent in free radical polymerization.

   b) Discuss the role of temperature and pressure on free radical polymerization.

   c) For a reaction of 0·99 mol of phthalic anhydride with 0·99 mol of ethylene glycol and 0·05 mol of glycerol, calculate the DP at 99% conversion.

   d) Differentiate between the terms involved in microscopy— 'Resolution' and 'contrast'. [3+2+3+2]

6. a) What is the importance of stoichiometric ratio of the reactants in condensation polymerization? How do we create an imbalance during a reaction?

   b) I an typical polyesterification, self-catalyzed reaction is third order with respect to the carboxylic acid concentration. However, it is much slower than the similar reaction with

strong acid as a catalyst, which is second order with respect to the carboxylic acid concentration-explain.

c) What is living polymerization? How can you make a cationic polymerization living in nature. [4+4+2]

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