homogenous catalyst.

b) Write down the industrial synthesis of styrene and explain the mechanism of formation of polystyrene by cation, anion and radical polymerization techniques.

c) What is PVC and how is it prepared? Comment on the determination of the structure of PVC.

d) What are fluoropolymers? Give a synthetic method of preparation of any one of the fluoropolymers.

9. Write short notes on *any two* of the following polymers.

2×2

a) Bakelite

b) Polyvinyl alcohol

c) Polyurethanes

d) LLDPE

B. Sc. Chemistry Examination, 2023

(6th Semester)

CHEMISTRY (DSE)

Paper: DSE/Chem/Th/04

Time : Two Hours   Full Marks : 40

UNIT : 6042-O

(Use a separate Answer script for each group)

Group – A

1. Draw a mechanism for the $NaNH_2$-catalyzed polymerization of acrylonitrile. Derive a kinetic rate equation and show the degree of polymerization; hence the length of the polymer is directly proportional to the monomer concentration and inversely proportional to the concentration of ammonia present in the mixture. Explain why anionic polymerization is called *living polymerization*.   1+2+1

2. Differentiate with examples between: 2+2

   a) Plastics and Elastomers

   b) Homopolymers and copolymers

3. a) Illustrate how the polymer chain are formed *via* step-growth kinetics and chain-growth kinetics in the polymerization process. Mention the characteristic difference between the mechanisms.   2

b) What is the T_g of a polymer? How does an amorphous polymer behave above and below the T_g?

2

4. Which one among nylon-6,10 and nylon-6,6 have higher T_m and why?

1

Group – B

5. a) Two ends of each polymer molecule of a sample of Nylon-6 are capped with -COOH groups. 60 mL of 0.6 g of this sample solution consumed 5 mL of 0.006 M potassium hydroxide solution. Calculate the corresponding average molecular weight from the given information?

$2\frac{1}{2}$

b) The molecular weight of a polymer determined by an osmotic pressure measurement in a theta solvent at 30°C is 10,000 g/mol. What is the value of osmotic pressure (in atm) at a polymer concentration of 1.50 g/dL?

$2\frac{1}{2}$

6. a) Explain the trend in T_g for the below given set of polymers.

2
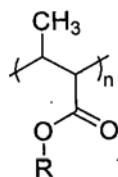
R = CH$_3$, 105°C
= Ethyl, 65°C
= n-Propyl, 38°C
= n-Butyl, −2°C

b) In the rubbery plateau region of a polymer, two cases may arise based on the type of polymer chain. Explain briefly the properties showcased by the two different types of polymers in this region and give an example of each type of polymer.

2

c) T_g values of polymer A and polymer B are 150°C and 100°C, respectively. What will be the T_g (in °C) of a random copolymer of A and B containing 20 wt% of A and 80 wt% of B.

1

7. a) If you need to prepare a solution for polystyrene (δ= 18.61 MPa$^{1/2}$) which solvent would be the best choice amongst the following:
i) THF (δ= 18.61 MPa$^{1/2}$)   ii) Toluene (δ= 18.2 MPa$^{1/2}$) iii) Piperidine (δ= 17.79 MPa$^{1/2}$)
Explain your answer.

2

b) Consider water vapor behaves like an ideal gas. Calculate the solubility parameters (in SI unit, $(Jm^{-3})^{1/2}$) of water at 25°C. [Given, density of water = 0.997 g/mL, molar enthalpy of vaporization of water = 40.7 kJ/mol at 25°C].

Group – C

8. Answer *any three* of the following questions: 3×3

a) What is the basic difference between HDPE and LDPE? Write down the proposed mechanism of Ziegler-Natta polymerization of C_2H_4 using a

[Turn over