DMI COLLEGE OF ENGINEERING

Palanchur , Chennai - 600123

QUESTION BANK

CY6151- ENGINEERING CHEMISTRY – I

UNIT I - POLYMER CHEMISTRY

1. Define polymer with examples.
2. Define monomer. Give examples.
3. What is functionality? Write its significance.
4. What is meant by degree of polymerization.
5. Classify polymers with suitable examples.
6. Differentiate ionic polymerisation and free radical polymerization.
7. What is co-polymerisation? Give example.
8. What is Glass Transition Temperature(T_g)
9. What is Tacticity? Write its significance.
10. What is polydispersity index?
11. Why thermosetting polymer cannot be recycled.
12. What is meant by polymerization?
13. Name the monomers involved in the synthesis of nylon 6,6 and epoxy resin.
14. What are the advantages and disadvantages of emulsion polymerization?
15. What are the advantages and disadvantages of pearl polymerization?
16. What are the applications of nylon 6,6?
17. What are the applications of epoxy resin?
18. What is number-average molecular mass?
19. What is the condition for a monomer for cationic polymerization to be carried out.

20. Give two examples for thermoplastic and thermoset.

PART B

1. (a)Distinguish between thermoplastics and thermosetting plastics. (8)

   (b) Discuss cationic polymerization mechanism in detail. (8)

2. (a)Explain the free radical mechanism of addition polymerization. (8)

   (b) Distinguish between addition and condensation polymerization. (8)

3. (a)Explain the condensation and co- polymerization with example (8)

   (b)Discuss the synthesis, properties and uses of nylon 6,6 (8)

4. (a)Write the preparation and uses of epoxy resin. (8)

   (b)Explain the bulk and solution polymerization techniques and mention the name of any two polymers synthesized by this technique (8)

5. Explain any four properties of polymers in detail. (16)

6. Explain ionic mechanism of addition polymerization. (16)

7. Discuss the polymerization techniques with advantages and disadvantages. (16)

8. (a)Explain the formation of polystyrene by anionic mechanism. (8)

   (b)Write notes on (i) Tg (ii) Tacticity (8)

9. (a)Write notes on

   (i)Number average molecular weight (ii) weight average molecular weight

   (iii) Poly Dispersity Index (12)

   (b)Compare bulk and solution polymerization. (4)

10. (a)Explain the technique, advantages and disadvantages of suspension and emulsion polymerization. (10)

    (b) Write the chemical equation equations for i) Initiation ii) Propagation iii) Termination steps involved in free radical mechanism (6)

DMI COLLEGE OF ENGINEERING

Palanchur , Chennai - 600123

QUESTION BANK

CY6151- ENGINEERING CHEMISTRY – I

UNIT II – CHEMICAL THERMODYNAMICS

1. Define entropy for an ideal gas.
2. What is spontaneity.
3. Define Clausius inequality.
4. State II law of thermodynamics. Represent by a mathematical equation.
5. Define the term standard free energy.
6. State I law of thermodynamics
7. What is third law of thermodynamics?
8. What are the conditions for a process to be spontaneous?
9. What is Helholtz work function(A)?
10. What is the significance of free energy?
11. Write Gibbs-Helmholtz equation? What is it application?
12. Write down the different Maxwell relations.
13. What is Van't Hoff isotherm? Give its relationship.
14. Calculate the change in entropy accompanying the isothermal expansion of 4 moles of an ideal gas at 300K until its volume has increased three times.
15. The value of equilibrium constant for a reaction is found to be 7.079×10^{10} at 25^0 C. Calculate ΔG^0 for the reaction.
16. Prove that $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$
17. Predict whether the following reaction is spontaneous at 25^0 C. Given that ΔH and ΔS are -84 KJ mol^{-1} and 0.75 KJ deg^{-1}
18. Define the term standard free energy. Illustrate with an example,

19. What is the influence of ΔH and ΔS values in the spontaneity of the reaction?

20. What are the significances of Maxwell relations?

PART B

1. (a)What is meant by Van't Hoff reaction isotherm? Derive an expression for the reaction isotherm for the general reaction

$$aA + b\,B \leftrightarrow \mathbf{cC + dD}$$ (8)

(b)Derive an expression for Van't Hoff isochore. (8)

2. (a) Derive Clausius-Clapeyron equation. Discuss its applications. (12)

(b) Explain Clausius inequality with a proof. (4)

3. Derive all the four Maxwell relations. (16)

4. (a) Discuss the criteria for chemical reaction to be spontaneous. (8)

(b) Explain the significance of free energy. (8)

5. (a) Derive an expression for entropy change of an ideal gas at constant temperature. (8)

(b) Derive Gibbs Helmholtz equation and discuss its applications. (8)

6. (a) Derive an expression for the variation of equilibrium constant of a reaction with temperature.(8)

(b) Write short notes on (i) intensive property (ii) extensive property (iii) homogeneous system (iv) Heterogeneous system (8)

7. (a) Show that $\Delta S_{total}=0$ for reversible process and $\Delta S_{total}>0$ for irreversible process (8)

(b) The equilibrium constant K_P for a reaction is 3.0 at 673K and 4.0 at 773K.Calculate the value of ΔH^0 for the reaction.(R=8.3J) (8)

8. (a) Explain the significance of work function. (8)

(b)The equilibrium constant for a reaction at 500 and 700^0 C are 1.64×10^{-4} and 0.64×10^{-4} respectively. Calculate the enthalpy of a reaction, assuming it to be a constant over this temperature range. (8)

9. (a) (i) Differentiate reversible and irreversible process.

(ii)Define entropy

(iii)Prove that $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$

(iv)What will happen to entropy of the following processes?

a) Water $\rightarrow$ice b)N_2 (g) +3H_2 (g)$\rightarrow$2NH_3 (g)

(4*2=8)

(b)The free energy change ΔG for process is -138 k J at 30^0 C and -135 k J at 40^0 C. Calculate the change in enthalpy, ΔH accompanying the process at 35^0 C. (8)

10.(a)The free energy changes at 298 K and 308 K are -3.98 k Cal mol^{-1} and -3.37 k Cal mol^{-1} for the following reaction

N_2 (g) +3H_2 (g) $\leftrightarrow$2NH_3 (g)

Calculate the enthalpy change of the reaction at 308 K (8)

(b) Derive any one form of Gibbs Helmholtz equation. (8)