

Attempt FIVE Questions in all. Section-A is Compulsory. Select TWO Questions from Section-B and TWO Questions from Section-C. All questions carry equal marks.

SECTION-A

1- Briefly answer any SIX of the following:

1x6

- i) Define integration and differentiation.
- ii) Why viscosity of ether is less than water?
- iii) Define mean free path.
- iv) Differentiate between amorphous and crystalline solids.
- v) Define adiabatic process.
- vi) What is azeotropic mixture?
- vii) Define Heisenberg's uncertainty principle.
- viii) Distinguish between homogenous and heterogeneous equilibria.

SECTION-B

2-a) Derive vander wall's equation of state.

4

b) What are x-rays and how they are generated?

2

c) Define molar refraction and calculate its SI units.

2

3-a) What is powder method for the crystal structure determination by x-rays.

4

b) The parachor values of C_2H_6 and C_3H_8 are 110.5 and 150.8 respectively.

What value of parachor do you expect for hexane (C_6H_{14})?

2

c) What are eigen functions and eigen values?

2

4- a) State and explain law of corresponding states.

4

b) What is the momentum of a moving particle which has de-Broglie's wavelength of 150pm?

$$(h = 6.625 \times 10^{-34} \text{ J.S})$$

2

c) How dipole moment of a poly-atomic molecule is determined?

2

5-a) Derive equation for energy of a particle in one dimensional box.

4

b) Derive SI units of vander wall's constants "a" and "b".

2

c) Explain Pauli exclusion principle with one example.

2

SECTION-C

6-a) Write main points of collision theory of reaction rates and derive the equation for the rate constant of a bimolecular reaction.

4

b) Define the following: i) Fractional Distillation ii) Azeotropic Mixture

2

c) What is the significance of entropy?

2

7-a) What is Carnot cycle? Derive an equation for the efficiency of heat engine.

4

b) Calculate unit of rate constant of a zero order reaction.

2

c) Calculate mass of NaOH which is present in 250cm^3 of its 0.5M solution.

2

8-a) Describe differential method for the measurement of order of a reaction.

4

b) What is the relationship between K_p and K_c ?

2

c) Define state and state function with one example.

2

9-a) Derive Gibbs's Helmholtz equation and its application.

4

b) Define energy of activation.

2

c) How molar mass of a non-electrolyte solute can be calculated by the elevation of boiling point?

2