(3 Hours) [Total marks:70 ]

Please check whether you have got the right question paper.

N.B. (1) All questions are compulsory

(2) Draw neat labelled diagrams wherever necessary.

1. (a) List out different types of liquid crystals and give their characteristics. 3
   (b) Define specific rotation and give the applications of Polarimeter. 2
   (c) 0.44g of a substance dissolved in 22.2g of benzene lowered the freezing point of benzene by 0.567◦ C. Calculate the molecular mass of the substance. ($K_f$ =5.12◦ C $mol^{-1}$). 3
   (d) Distinguish between reversible and irreversible process. Give different statements of first law of thermodynamics. 4

   (e) State Faraday's first law of electrolysis. Discuss the variation of equivalent conductance with dilution. 3

2. (a) Explain Linde's method of liquefaction of gases. 4

**OR**

   (a) Write a short note on liquefaction of gases by Claude's method.
   (b) Define dielectric constant and give its significance. 3
   (c) State Kirchhoff's equation. Explain Hess's law of constant heat summation. 4

3. (a) State Raoults law? Explain positive and negative deviations from Raoults law. 4
   (b) The resistance of a 0.1N solution of a salt is found to be 2.5 X $10^3$ ohms. Calculate the equivalent conductance of the solution if cell constant is 1.15$cm^{-1}$. 3
   (c) Explain efficiency of heat engine. Calculate the maximum efficiency of an engine operating between 110 ◦C and 25◦C. 4

**OR**

   (c) Define Chemical Potential. State the following:-
   (i)Carnot theorm
   (ii)Gibb's Helmholtz equation
   (iii)Third law of thermodynamics.

**4.** (a) Derive the relationship between Van der Waals constants and critical constants. 4
   (b) Explain the principle and working of Abbes Refractometer. 3
   (c) Explain any one method for determination of molecular weight of nonvolatile solute. 4

**OR**

   (c) Establish the correlation between depression of freezing point and lowering of vapor pressure. How is it used for determination of molecular weight?

5. (a) Write a Short note on Polymorphism. 4
   (b) State and explain the following 3
      i) Clausius clapeyeron equation
      ii) Vant Hoff equation.

**OR**

   (b) Calculate the heat of reaction for:
   $C_2H_4$ (g) + $3O_2$(g) → $2CO_2$ (g) +$2H_2O$ (g)
   From the following values of bond energies in kJ:
   C-H : 414 C=O : 724 C=C :619
   O=O : 499 O-H : 460

   (c) What is osmotic pressure? Describe any one method for its determination. 4

6. (a) Van der Waal's constants for hydrogen chloride gas are
   a = 3.67 atm $lit^2$ $mol^{-1}$ , b = 0.0408 lit $mol^{-1}$. 3
   If the gas constant R= 0.0821 lit atm $K^{-1}$ $mol^{-1}$, calculate the critical temperature and critical pressure of the gas.
   (b) Write a short note on steam distillation. 3
   (c) What do you mean by entropy? State its importance in thermodynamics. 3
   (d) State postulates of Arrhenius theory of electrolyte dissociation. 2

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