This question paper contains **4** printed pages]

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. **1** is compulsory.

1. Fill in the blanks :   1.5×10=15

    (*a*) As the partition coefficient is increased, the solute takes .... to elute from the column.

    (*b*) Retention volume is the volume of solvent that is used to elute .... of the solute.

    (*c*) The faster the rate of solvent flow .... the retention time.

    (*d*) .... is used for the extraction of component of a mixture using solvent extraction when the solute is in solid form.

(*e*)   The distribution ratio D used in solvent extraction is .... to the D used in partition chromatography.

(*f*)   In elution analysis making a column .... will increase the degree of separation.

(*g*)   The relative ability of solvent to elute a solute using column chromatography is given by an ....

(*h*)   D is .... than K_D when dissociation takes place.

(*i*)   In paper chromatography R_f is .... proportional to K_D.

(*j*)   Spraying reagent used for detection of amino acids is ....

2.   (*a*)   Define distribution ratio and prove the following relationship in the case of dissociation an acid HBz in water :   6

$$D = \frac{K_D}{1 + \dfrac{K_a}{\left[H^+\right]}}.$$

(*b*)   50 mL of water containing 0.1 g of iodine was extracted with 25 mL of carbon tetrachloride. The K_D of Iodine between water and carbon tetrachloride at ordinary temperature is 1/85. What fraction of I_2 remains in water ?   5

(*c*)   What are different criteria for the selection of extracting solvent ?   4

3. (a) What are the different techniques used in chromatographic separation ? Explain any *one*. 6

(b) Why silica gel is not preferred for the separation of amines ? 5

(c) Give the name of spraying reagent that is used to detect the Ni^{2+} and Co^{2+}. Write the structure of complex. 4

4. (a) Define the following terms : 6

    (i) Eluate

    (ii) Eluent

    (iii) Elution and

    (iv) Selective retardation.

(b) Define R_f. Give reason why literature values of R_f cannot be used in laboratory for experimental work ? 4

(c) Define adsorption isotherm and sketch the graph of S, L and H adsorption isotherm. 5

5. (a) What are the advantages of thin layer chromatography over paper chromatography ? 4

(b) Explain the steps involved for the separation of mixture of amino acids using radial paper chromatography. 4

(c) What *two* properties of a solute spot determine whether it can be resolved from its closest neighbour ? 4

(d) Explain how two-dimensional thin layer chromatography is useful in the detection of spots ? 3

6. (a) What is the minimum difference between two R_f values for two adjacent spots in order to be able to resolve them ?   4

 (b) What type of distribution processes can be used in thin-layer form to separate mixture of solutes ?   4

 (c) What disadvantages do mixed solvents systems possess when used as eluting agents in thin-layer chromatography ? What advantages do they possess that cause them to be so widely used ?   4

 (d) Explain how adsorbent properties can alter the observed R_f values for a particular solute.   3