

(ix) Ultrafiltration can be conducted in a centrifuge.

(x) Properties of biomolecules such as molecular weight can be obtained from analytical techniques. (1.5×10)

(b) Match the following:

(i) Partition coefficient CsCl

(ii) Salt fractionation tryptophan

(iii) Intrinsic fluor ammonium sulphate

(iv) Density gradient water:CHCl₃ (0.5×4)

(c) Briefly indicate the contribution of the following scientists:

(i) Arne Tiselius

(ii) Theodar Svedberg (1×2)

2. (a) Why is the concept of theoretical plates important in chromatographic separations?

(b) Indicate with examples how the resolution can be improved in the following techniques.

(i) TLC

(ii) Gel chromatography

(iii) Paper chromatography (5,3,3,3)

3. (a) Using a schematic diagram describe the structure of an analytical ultracentrifuge.

(b) Differentiate between rate zonal and isopycnic method of centrifugation with an example in each case. (5,9)

4. Differentiate between the following with applications to illustrate your answer:
- (a) Native and denatured gel electrophoresis.
 - (b) Absorbance and fluorescence.
 - (c) Clinical and high-speed centrifuges.
 - (d) Salt fractionation and isoelectric precipitation. (4,3,3,4)
5. Indicate the technique which can be used to separate the following mixtures with a brief account of the principle involved.
- (a) Amino acid and galactose
 - (b) DNA and RNA
 - (c) Protein and nucleic acid
 - (d) Phospholipid and glycolipids (4,4,4,2)
6. Explain the following statements:
- (i) Cuvettes used in fluorimetry are transparent on all four sides.
 - (ii) Sephadex gels cannot be used in LPLC
 - (iii) Amino acids cannot be separated using gas-liquid chromatography.
 - (iv) In spectrophotometry glass cuvettes cannot be used in the UV region.
 - (v) In salting out procedures chloroform cannot be used as a solvent.
 - (vi) In density gradient centrifugation sucrose is used for the separation of organelles.
 - (vii) Cellulose acetate is preferred over cellulose in the separation of amino acids by paper electrophoresis. (2×7)
7. (a) With a schematic diagram describe the working of a spectrophotometer.

- (b) Two molecules X and Y have their λ_{max} value at 400 and 600nm, respectively. The absorbance of a mixture containing $1\mu\text{M}$ concentration of each, the absorbance was 0.5 at 400nm and 0.6 at 600nm measured using a cuvette of path length 1cm. What is the molar extinction coefficient of X and Y? What assumption has to be made before you can calculate either?
- (c) State the Lambert-Beers law and two applications of its use. (6,3,5)
8. Write short notes on the following:
- (a) HPLC columns
- (b) Ampholytes
- (c) Rotors used in centrifuges. (5,5,4)