

6. (a) Differentiate between the use of a cation exchange resin and an anion exchange resin in terms of whether the charged sites are positive or negative and whether cations or anions are exchanged. Explain in detail any one type of ion exchange resin with an example.

(10)

(b) Draw a block diagram of a double-beam UV-vis spectrophotometer.

(5)

7. (a) Twenty milliliters of an aqueous solution of 0.10 M butyric acid is shaken with 10 ml ether. After the layers are separated, it is determined by titration that 0.5 m mol butyric acid remains in the aqueous layer. What is the distribution ratio? What is the percentage extracted?

(5)

(b) Discuss in detail the major factors affecting solvent extraction.

(10)

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Total Pages : 4

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B.Sc. (Chemistry) - V SEMESTER

Analytical Chemistry (DECC-501)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any four questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A

1. (a) The number of binding sites per molecule in a sample of monoclonal antibody is determined four times, with results of 1.95, 1.95, 1.92, and 1.97. Comment on the precision, and accuracy of these results. (1.5)
- (b) What is the function of flame in Flame atomic absorption spectroscopy? (1.5)
- (c) Draw and interpret a normal distribution curve for indeterminate errors. (1.5)
- (d) Discuss the choice of flame and burner design used in FES. (1.5)

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91 [P.T.O.]

(e) Consider a mixture of compound A, a somewhat nonpolar liquid, and compound B, a somewhat polar liquid. Tell which liquid, A or B, would emerge from a chromatography column first under the following conditions and why?

(i) A polar liquid mobile phase and a nonpolar liquid stationary phase.

(ii) A nonpolar liquid mobile phase and a polar liquid stationary phase. (1.5)

(f) Suggest a method for separation of aniline,  $C_6H_5NH_2$ , from nitrobenzene,  $C_6H_5NO_2$ . (1.5)

(g) Draw the diagram of a combination electrode used in the pH meter. Label the various parts of the electrode. (1.5)

(h) Plot a graph for conductometric titration between a strong acid and a strong base. Explain the nature of the graph. (1.5)

(i) Give the relationship between pH and pKa using the Henderson-Hasselbach equation. (1.5)

(j) Write the principle of thermal gravimetric analysis. (1.5)

### PART-B

2. (a) Mention in detail the source used and various types of detectors used in UV-visible spectrophotometers. (10)

(b) Four replicate values were obtained for the determination of a pesticide in the river water 0.403, 0.410, 0.401, 0.380  $mg\ dm^{-3}$ . Does the outlier value be retained or rejected? ( $Q_{tab} = 0.83$ ) (5)

3. (a) Describe any two interferences in the case of flame emission spectroscopy. Mention the method used to remove the respective interferences. (10)

(b) How does UV-vis spectroscopy help in distinguishing cis-trans isomerism and keto-enol tautomerism? Explain. (5)

4. Write short notes on :

(i) Continuous method of solvent extraction.

(ii) Adsorption and partition chromatography.

(iii) Beer Lambert's Law and its validity. (15)

5. (a) Using a Thermogram, describe the thermal decomposition events of calcium oxalate monohydrate in the temperature range between 25°C and 1000°C. (5)

(b) Explain the working and components of the standard calomel electrode used during potentiometric titration. Mention the half-cell reaction and Nernst equation for potential at 25°C for the SCE. (10)