2023

Chemistry

B.Sc. Fifth Semester End Examination - 2023

PAPER - DSE-2T

Full Marks : 40 *Time : 2 hours*

The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group - A

1. Answer any five questions : 5×2=10

(i) Find the percentage of mass loss during the thermogravimetric analysis for the following reaction

$CuSO_4(S) \xrightarrow{\Delta} CuO + SO_2(g)$

(ii) What are the essential criteria for the selection of suitable solvents for paper chromatography. 2

(iii) Distinguish between "End point' and 'Equivalence point'? 2

(Turn Over)

(iv) What are the common instrumental factors that affect the thermogravimetric curve.

(v) What is meant by 'R_f' value? Compare the 'R_f' value for ascending and descending chramatography. 1+1=2

(vi) Which of the following molecules absorb at the longest wavelength? 2

(a) 1,3-hexadiene

(b) 1,4-hexadiene.

Explain.

(vii) A mixture of $CaCO_3$ and CaO is analysed using TGA technique. Thermogram shows a mass change from 145.3 mg to 115.4 mg between 500°-900°C. Calculate the percentage of $CaCO_3$ in the given sample.

(viii) The molar extinction co-efficient of an Fe(111) complex is 12000 $dm^3mol^{-1}cm^{-1}$, and the minimum absorbance is 0.01. Calculate the minimum concentration of the complex that can be detected by Lambert-Beirs law (Path length = 1.00 dm)

Group - B

2. Answer tny four questions : 4×5=20

(i)
- Construct the cell and write down the complete cell reaction for the potentiometric titration of a suitable precipitation titration.
- Mention Cathode, Anode, Cathode reaction and Anode reaction.
- Draw the potentiometric titration curve mentioning the process of its end point detection. 1+2+1+1=5

(ii)
- Write down the principle of Flame atomic Absorption Spectroscopy.
- Cite two examples of the fuel-oxidant mixture used for purpose and mention their ignition temperatures. 4+1=5

(iii)
- Define sampling.
- What are the limitations of Lambert-Beer's law.
- How can you differentiate between Intermolecular and Intramolecular Hydrogen bending using IR spectroscopy.
- How wan you identify geometric isomerism using the UV spectroscopy. 1+1+½+½=5

(iv) ● A spectrometer cell when filled with 'liquid X' transmits 60% and when filled with 'liquid Y' transmits 40% of the incident light of a certain wavelength. What would be the absorbance at this wave length when the same cell is filled with a mixture of equal volume of the two liquids.

● Write a short nove on 'Bathochromic Shift'. 3+2=5

(v) ● Result found from a TLC experiment that 'R_f' value of a compound is 2.0. It is also noted that the solvent travelled a sistance of 4 cm on the plate. What can you conclude about this experiment. 3+1+1=5

(a) The solvent is not volatile.

(b) The reported data is invalid.

(c) The compound travelled a distance of 8 cm.

(d) There are multiple components in the mixture.

—Explain.

● What is the wavelength range of UV-spectrum?

● What will be the value of wave number of the photon which is associated with the wavelength 400 nm. 3+1+1=5

(vi) ● Explain 'Random Error'.

● **Write down the two applications of TGA.**

● **Distinguish between the 'Idial' and 'Non-ideal' chromatography.**

● **Draw the conductometric titration curve for $AgNO_3$ vs KCl titration with a proper explanation.**

1+1+1+2=5

Group - C

3. Answer any 1 question **1×10=10**

(i) ● The resistance of an aqueous solution containing 0.624 gm of $CuSO_4 . 5H_2O$ per 100 cc of the solution in a conductance cell of cell sonstant 153.7 m^{-1} is 520 homs at 298 K. Calculate the molar and equivalent condictivity of the given solution.

4+2+2+2=10

● Write a short note on TLC.

● What do you mean by 'Chiral Solvent' and 'Chiral Shift Reagent'.

● Why TGA is known as 'qualitative' as well as 'quantitative analysis.

(ii)
- The specific rotation of (R)–(–)2-bromooctane is (–36°), what is the % of compositon of mixture of exantiomers of 2-bromooctane whose rotation is (+18°)
- Write a short note on Auxochrome.
- What are the factors on which the optical density of a solution depends.
- Draw the conductometric titration curve for 'strong acid' vs 'weak base' titration with a proper explanation. 3+2+2+3=10