

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.

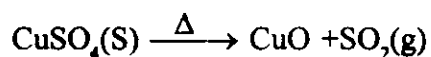
Candidates are required to give their answers in their own words as far as practicable.

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



- (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)

(2)

- (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 chromatography. 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°C - 900°C . Calculate the percentage of CaCO_3 in the given sample.

(viii) The molar extinction co-efficient of an Fe(II) complex is $12000 \text{ dm}^3\text{mol}^{-1}\text{cm}^{-1}$, 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)

(3)

Group - B

2. Answer any 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 bonding using IR spectroscopy.
 - How can you identify geometric isomerism using the UV spectroscopy. 1+1+½+½=5

(4)

- (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 note 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 distance 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'.

(5)

- Write down the two applications of TGA.
● Distinguish between the 'Ideal' 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 $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ per 100 cc of the solution in a conductance cell of cell constant 153.7 m^{-1} is 520 ohms at 298 K. Calculate the molar and equivalent conductivity 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 composition of mixture of enantiomers of 2-bromooctane whose rotation is $(+18^\circ)$
- 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