

## **Time: 3 Hours**

Max. Marks: 100

## ✓ Answer ANY FIVE FULL Questions.

- 1A. Discuss the various factors affecting the conductance of electrolytic solutions. What is the effect of dilution on specific conductance and equivalent conductance of a solution of an electrolyte?
- 1B.What are conductometric titrations? What are its advantages? Discuss with a suitable example conductometric titration of a mixture of strong and weak acids against a weak base.
- 1C.Describe with a suitable example the potentiometric method of acid-base titration

(8+8+4)

- 2A. Explain the construction and working of calomel electrode. What are its advantages and limitations?
- 2B. Discuss the characteristics of electromagnetic radiation. How are line and band spectrums originated?
- 2C. The specific conductance of a 0.5N solution of KCl at 20°C is 0.054 mhos and equivalent conductivity at infinite dilution is 130.4.Calculate the degree of dissociation of 0.5N KCl at 20°C

(8+8+4)

- 3A. Derive the expression for the potential of a glass electrode. What are the advantages of glass electrode?
- 3B. Obtain the mathematical expressions for the frequency of transitions for a rotating non-rigid diatomic molecule.
- 3C. Give reasons for the following:
  - i) Absorption band corresponding to  $n \rightarrow \pi^*$  transition in the UV spectrum of Pyridine is not found in its acidic solution.
  - ii) ) Intensity of overtone bands are weaker than fundamental IR bands.

(8+8+4)

- 4A. With a Schematic diagram explain the working of HPLC. Discuss the effect of temperature in HPLC.
- 4B. Briefly explain i) the preparation of thin layers in plates and ii) Direct methods of evaluation of chromatogram in TLC.
- 4C. Write notes on the following:
  - i) Bathochromic shift ii) Change transfer transitions

(8+8+4)

- 5A. Discuss with suitable examples the various instrumental factors affecting the TG curve.
- 5B. Draw and explain the thermograms of Mg<sub>2</sub>C<sub>2</sub>O<sub>4</sub> .2H<sub>2</sub>O and Ag<sub>2</sub>CrO<sub>4</sub>
- 5C. Give the different modes of vibrations of CO<sub>2</sub> molecule. How are its IR and Raman spectrums different?

(8+8+4)

- 6A. Explain the classical theory of Raman Effect. Give any four advantages of Raman spectroscopy over IR spectroscopy.
- 6B. What are the essential conditions for the molecules to absorb microwave radiation? Discuss the various applications of microwave spectroscopy.
- 6C. Give reasons for the following:
  - i) Helium is a suitable carrier gas in GLC when TCD is used as a detector.
  - ii) Interference filters are preferred over absorption filters in UV-visible spectrophotometer.

(8+8+4)

- 7A. State and obtain the mathematical expression for Beer's law. Discuss the reasons for deviations from Beer's law.
- 7B. Discuss the sources of IR radiation.With a schematic diagram explain the working of a double beam IR spectrophotometer.
- 7C. The internuclear distance of CO is 1.13A°. Calculate the energy in joules of this molecule in the first rotational energy level.

The atomic masses are:  $^{12}C = 19.9 \times 10^{-27} kg$  and  $^{16}O = 26.6 \times 10^{-27} kg$ . N = 6.023  $\times 10^{23} mol^{-1}$ , c = 3  $\times 10^8 ms^{-1}$ 

(8+8+4)

- 8A. Give the classification of column chromatographic methods. Explain the terms distribution constant and retention time in chromatography.
- 8B. i) Draw a schematic diagram of DTA apparatus and give the function of its different components.
  - ii) TGA studies reveal that Cu (NO<sub>3</sub>)<sub>2</sub> exists as CuO above 280<sup>o</sup>C and AgNO<sub>3</sub> changes to Ag between 480 and 610<sup>o</sup>C. A mixture of Cu(NO<sub>3</sub>)<sub>2</sub> and AgNO<sub>3</sub> obtained from 0.1714 g copper-silver alloy weighed 0.2494g at 400<sup>o</sup>C and 0.1874 g at 700<sup>o</sup>C in a thermo balance. Calculate the % Cu and % Ag in the alloy sample. (At.wts of Cu and Ag are 63.5 and 107.9 respectively)
- 8C. Give reasons for the following:
  - i) Glass electrode is not suitable for measuring  $P^{H}$  of a solution if its value is above 12.
  - ii) Optical parts made of glass or quartz are suitable for Raman spectrometer, but not for IR spectrophotometer.

(8+8+4)

