[Time : 2½ Hours **[Total Marks : 75**

Please check whether you have got the right question paper.

N.B. : 1. **All** Questions are **compulsory.**
2. **Figures** to the **right** indicate **full** marks.
3. Use of **log-table/non-programmable calculator** is **allowed.**
4. Answers for the same question as far as possible should be written together.

1. Attempt any **three** of the following :

(A) Explain the terms residual current, diffusion current, limiting current and half wave potential with respect to a polarographic wave. **5**

(B) How is the equivalence point located in potentiometric titrations? **5**

(C) Describe the rotating platinum electrode. State its advantages. **5**

(D) Explain various types of amperometric titrations with suitable examples. **5**

(E) Diffusion current for Cadmium ions in an unknown solution was found to be 20.4 µA. When 1 cm^3 of 1×10^{-3} M dm^{-3} solution of Cadmium ions was added to 25 cm^3 of the sample solution, the current increased to 40 µA. Calculate the concentration of Cadmium ions in the sample solution. **5**

(F) An organic substance was reduced polarographically. 1×10^{-3} M dm^{-3}solution gave a diffusion current of 24.0 µA, with a mercury flow rate of 3.2 mgs^{-1} and a drop time of 2.8 s. If the diffusion coefficient of the compound is$1 \times 10^{-5} cm^2 s^{-1}$, calculate the number of electrons transferred in the reduction reaction. **5**

2. Attempt any **three** of the following :

(A) What are food preservatives? Classify modern methods of food preservation. **5**

(B) Describe Lane-Eynon method of estimation of lactose in milk. **5**

(C) Give an account of the composition of honey. Compare the physicochemical parameters of ripened and unripened honey. **5**

(D) How is caffeine estimated in coffee? **5**

(E) What are cosmetics? Explain its functions. **5**

(F) Explain the method for estimation of chloride in a deodorant sample. **5**

3. Attempt any **three** of the following :

(A) Draw a schematic diagram of a gas chromatograph and describe the functions of any three of its components. **5**

(B) Give important applications of gas chromatography. **5**

(C) Substance A and B have retention times 16.40 and 17.63 min. respectively, on a 287mm column. An unretained species passed through the column in 1.30 minutes. The peak width at the base for A and B were 1.11 and 1.21min.respectively. Calculate; the average number of plates in the column and plate height. **5**

(D) What is a cation exchanger? How capacity of anion-exchange resin is determined? **5**

(E) Explain the following applications of ion exchange chromatography- **5**
(a) Separation of lanthanides and
(b) Preparation of exact concentration of acid and base.

(F) Give applications of size exclusion chromatography. **5**

4. Attempt any **three** of the following :

(A) What is TGA? Describe the components of thermo balance. **5**

(B) What are the factors which influence the TG Curve? Explain thermal decomposition of $CuSO_4.5H_2O$. **5**

(C) What is the principle of DTA? Explain DTA Curves of $CaC_2O_4.H_2O$. **5**

(D) What is thermometric titration? Explain its basic principle. **5**

(E) Explain the principle and theory of Neutron Activation Analysis. **5**

(F) How will you classify Radio-Analytical Techniques? **5**

5. (A) Fill in the blanks:- **4**
(a) KCl is used in polarography as a _____electrolyte.
(b) A graph of _____ vs. volume of titrant is plotted in potentiometric titrations.
(c) Ilkovic equation forms the basis of _____ analysis in polarography.
(d) _____- is plotted on Y axis in amperometric titrations.

OR

(A) State true or false:- **4**
(p) Half wave potential is half of diffusion current.
(q) Triton X 100 is used as a maxima suppressor.
(r) Quinhydrone electrode is used as a reference electrode in potentiometric titrations.
(s) Amperometric titrations can be carried out at more negative potentials than −2 volts.

5. (B) Fill in the blanks:- **4**
(a) _____ is a physical method of food preservation.
(b) Tea is made from the leaves of the shrub called _____.
(c) _____ is the ability to impart a velvety finish to the skin in face powders.
(d) Dyes like _____ are used predominantly in lipsticks.

OR

(B) State true or false:- **4**
(p) Sulphur dioxide is used as a preservative for fruits and vegetables.
(q) Milk contains high percentage of Vitamin C.
(r) LTLT method involves heating milk to 72°C for at least 15 sec.
(s) The main ingredient in face powder is calcium carbonate.

5. (C) Fill in the blanks:- **4**

(a) In gas chromatography when stationary phase is solid adsorbent, the technique is called as _____.

(b) The contribution from the non equal paths of the molecules of the solute leading to the broadening of the peak is known as _____.

(c) Density of the resin should be_____ than that of water.

(d) In size exclusion chromatography separation of the solute is based on _____ .

OR

(C) State true or false:- **4**

(p) A plot of mass of the component versus carrier gas velocity (u), is known as van Deemter plot.

(q) In GC, resolution can be improved by changing the temperature.

(r) Capacity of an ion-exchange resin is expressed as milliequivalent per gram of dry resin.

(s) Isomers can be separated from one another using size exclusion chromatography.

5. (D) Fill in the blanks:- **3**

(a) Geological specimens are analysed by _____technique.

(b) Furnace Temperature Programmer consists of thermocouple made up of _____.

(c) Radioactive product per second is called _____.

OR

(D) State true or false:- **3**

(p) The function of atmosphere control is to remove the gaseous products evolved during thermogravimetry.

(q) A flat plate shaped crucible is preferred because of easy diffusion of evolved gases.

(r) The thermometric titration graph of Boric Acid against NaOH shows two end points.

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