(Time: 3 hours) **Total Marks: 100**

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.

Q.1 **Attempt any four of the following.** **20**

A) Draw a polarogram and label all the regions. Explain the role of supporting electrolyte used in polarographic analysis.

B) Explain the term polarographic maxima with a neat diagram. How is it eliminated?

C) In a polarographic determination of nickel, the wave heights determined for a series of solutions were as follows:

Conc. of Ni^{2+} (mM)	0.25	0.5	0.75	1.0	unknown
Wave height (mm)	31.8	64.0	95.8	128.0	70.0

Find the concentration Ni^{2+} in unknown solution.

D) With the help of labelled diagram, explain dropping mercury electrode. Give any one of its limitation.

E) What are the advantages and limitations of amperometric titrations?

F) Give the basic difference between amperometry and voltammetry. Explain the nature of amperometric titration curve when both titrand and titrant are reducible, and product is non-reducible.

Q.2 **Attempt any four of the following.** **20**

A) Draw schematic diagram of gas chromatograph and explain any two components.

B) Explain electron capture detector in GC and write any one advantage.

C) Give the applications of gas chromatography.

D) In GC, components of A and B were found to have retention time of 16.30 min and 13.30 min respectively on a 30 cm column. The peak width at base for components A and B were 1.00 min and 1.30 min respectively. Calculate the average number of plates in the column and plate height of the column.

E) Explain ion exchange capacity? How is it determined for cation exchanger.

F) Explain any two applications of ion-exchange chromatography in detail.

Q.3. **Attempt any four of the following.** **20**

A) What is food processing? Explain the need of food processing?

B) Explain the Lane Eynon method for analysis of lactose in milk.

C) What are objectives of pasteurization? Explain any two methods of pasteurization.

D) Enlist the types of tea and explain any two in detail.

E) Explain a method to estimate amount of calcium and magnesium in face powder complexometrically.

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F) Write constituents of lipstick and any three properties of antiperspirant.

Q.4 **Attempt any four of the following.** **20**
- **A)** Draw a neat labelled diagram of thermobalance and write the function of any three of its components.
- **B)** Name the factors which influence the TG curve. Explain thermal decomposition of calcium oxalate.
- **C)** Distinguish between TGA and DTA
- **D)** Discuss thermometric titrations of:
  1) HCl v/s NaOH
  2) Boric acid v/s NaOH
- **E)** What are the important applications of DTA?
- **F)** Explain linearity and accuracy w.r.t. method validation.

Q.5 **A)** **Select the correct option and complete the following statements: 05 (any five)**

- **a)** The diffusion of particles from bulk of the solution to the surface of DME due to the difference in concentration is called_____.
  i) decomposition   ii) electrical potential gradient
  iii) concentration gradient

- **b)** The electrode which has its own potential and cannot take up potential applied on it is called _____.
  i) dropping mercury electrode   ii) non-polarizable electrode
  iii) rotating platinum electrode

- **c)** Oxygen dissolved in the electrolytic solutions is easily reduced at the DME produces polarogram consisting of _____ waves.
  i) three   ii) four   iii) two

- **d)** In polarography the time that lapses between the detachment of two successive drops of mercury is called _____.
  i) drop time   ii) dead time   iii) inactive time

- **e)** In polarographic analysis the diffusion current is proportional to the concentration of_____.
  i) supporting electrolyte   ii) reducible ion   iii) triton X-100

- **f)** When titrand is reducible but titrant and product are not in amperometric titration shows _____.
   i) constant current till the equivalence point, then increases.
   ii) decrease in current till the equivalence point, then constant
   iii) increase in current till the equivalence point, then decreases

- **g)** In amperometric titration of Ni^{2+} determined by titrating with _____.
  i) dimethyl glyoxime   ii) silver nitrate   iii) iodine

- **h)** In rotating platinum electrode, the diffusion current is _____ times larger than in case of DME.
  i) 100   ii) 400   iii) 20

Q.5 B) **State whether true or false: (any five)** **05**

a) The retention time of the mobile phase is called dead time.

b) Nitrogen gas is used as carrier gas in gas chromatography.

c) If a component A is more soluble in the stationary phase than component B, then A will come out of the column later than B.

d) Eddy diffusion is a band broadening factor in chromatography caused by the non-equal path of the solute molecules.

e) Diatomaceous earth is the commonly used solid support material in gas chromatography.

f) Standard solution of sodium nitrate is used in the determination of capacity of an anion exchanger.

g) In ion exchange chromatography, density of the resin should be less than that of the water.

Q.5 C) **Fill in the blanks with correct alternatives given in the bracket:** **05**
(any five)
(Sensory, 8-hydroxy quinoline, dimethyl glyoxime, TiO_2, irradiation, caffeine, fructose, alkaline phosphatase, meats.)

a) _____ is a physical method of food preservation.

b) _____ enzyme is present in milk.

c) _____ is the major pharmacologically active compound in coffee.

d) _____ present in talcum powder has UV reflection properties.

e) Honey contains large quantity of _____ than glucose.

f) _____ properties are detected by the five sense organs.

g) In estimation of Zinc from deodorants and antiperspirants _____ is used as a complexing agent.

h) Nitrates and nitrites are generally used for preservation of _____.

Q.5 D) **Match the columns: (any five)** **05**

	A	B
i)	Thermometric titration	a) Reference standard
ii)	TGA thermobalance	b) ΔH
iii)	Plateau in TGA	c) Accuracy
iv)	SiC	d) No loss in mass
v)	Recovery study	e) single pan
vi)	Thermocouple	f) Analysis of polymer
vii)	Application of DTA	g) Ni-Cr Alloy

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