

[3 Hours]

[Total Marks: 100]

Please check whether you have got the right question paper.

- N.B:**
- All questions are compulsory.
 - Figures to the right indicate full marks.
 - Use of log table/non-programmable calculator is allowed.

1. Answer any four of the following.

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- Explain the importance of quality concepts in industry.
- Arsenic can be determined by titration with iodine solution. The reaction involved is $\text{HAsO}_4 + \text{I}_2 + 2\text{H}_2\text{O} \rightarrow \text{H}_3\text{AsO}_4 + 2\text{H}^+ + 2\text{I}^-$. A sample of pure As_2O_3 weighing 4.0136 g is dissolved in water to make 800 cm^3 of solution. Calculate normality of As_2O_3 solution used for standardizing iodine solution and convert it into its molarity. [Given: molecular weight of $\text{As}_2\text{O}_3 = 197.84$].
- What is the normality of 69% (w/w) HNO_3 , having a density of 1.42 g cm^{-3} . Using this HNO_3 , (69%), how would you prepare 250 cm^3 2N HNO_3 ? [Given: molecular weight of $\text{HNO}_3 = 63$]
- Discuss the sampling of static liquids.
- Discuss any one method of sampling of stack gases, with a labelled diagram.
- Explain the importance of chemical standards and certified reference materials in chemical analysis.

2. A) What are metal ion indicators? Discuss its theory and give one example. 20

- Name the different methods to increase the selectivity of EDTA. Discuss any two of these methods in brief.
- Calculate the potential at the equivalence point in the titration of 20.0 cm^3 of 0.1M Fe(II) solution against 0.02M KMnO_4 solution at pH=2.
Given: $E^0_{\text{pt}/\text{Fe}^{3+}, \text{Fe}^{2+}} = 0.771\text{V}$
 $E^0_{\text{pt}/\text{MnO}_4^-, \text{Mn}^{2+}} = 1.510\text{V}$
- 10.0 cm^3 of 0.1M Fe(II) is titrated with 0.1M Ce(IV) in acidic medium. Calculate the potential on addition of
 - 1.0 cm^3 of titrant, and
 - 10.1 cm^3 of titrant
 Given: $E^0_{\text{pt}/\text{Fe}^{3+}, \text{Fe}^{2+}} = 0.771\text{V}$
 $E^0_{\text{pt}/\text{Ce}^{4+}, \text{Ce}^{3+}} = 1.44\text{V}$
- Discuss the use of diphenylamine indicator in the redox titration, explaining the reactions involved and the function of H_3PO_4 in such titrations
- Give any five advantages of EDTA, as a titrant.

3. Answer any four of the following:

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- Discuss the principle of FES.
- Distinguish between the following:
 - Fluorimetry and Phosphorimetry
 - Fluorimetry and Absorptiometry
- Give any five applications of AAS.
- Describe the construction and working of graphite furnace with a labelled diagram.
- Discuss the applications of turbidimetry in:
 - the determination of molecular weight of macromolecules
 - phase titrations.

F) Draw a neat labelled diagram of nephelometer and explain its working.

4. Answer **any four** of the following

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- Explain Craig's counter current extraction with a neat diagram, giving any two applications.
- Discuss the principle and process with reference to solid phase extraction.
- Draw a graph of percentage extraction versus pH and explain the concept of $[pH]_{1/2}$ and its significance.
- Draw a neat labelled diagram of a typical HPLC unit and mention the function of any three important components.
- Give any five applications of HPLC.
- Name the detectors used in HPTLC and discuss any one of these in brief.

5. A) Answer **any five** of the following in one sentence.

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- What are laboratory reagents?
- What is the percentage composition of 'Na' in sodium hydroxide? (Na = 23, O = 16, H = 1)
- A solution contains 1 mol of sugar and 19 mol of water. What is the mole of fraction of sugar.
- Give a mathematical expression for size to weight ratio, 'b', with reference to sampling of solids.
- Name any one device to be used for sampling of particulate solids.
- Name the equipment used for sampling of flowing liquid.
- What is the colour change at the end point in the redox titration of Fe(II) versus Ce(IV) in the presence of ferroin indicator?
- What is the role of coning and quartering method w.r.t. sampling of solids?

5. B) Answer **any five** of the following in one sentence.

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- What is the criteria for selection of indicator in redox titrations?
- What are redox indicators?
- What should be the ratio, $\frac{[In_{(ox)}]}{[In_{(red)}]}$ in order to see the colour of oxidized form of an indicator in the redox titrations?
- What is tris(1,10-phenanthroline)iron (II) sulphate commonly known as?
- Give the general equation representing the formation of metal-EDTA complex.
- What is the role of auxilliary complexing agent in direct titrations w.r.t. EDTA titrations?
- Name any one most commonly used standard metal ion solution in back titration.
- Give an example of indirect titration with respect to EDTA titrations.

C) Fill in the blanks: (**any five**)

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- Phosphoroscope measures _____ in the presence of fluorescence.
- Phosphorimetric experiments are normally carried out at _____ temperature.
- A process in which atoms of the element are dislodged from the surface of the cathode and transformed in the gaseous atoms, in hollow cathode lamp is called _____.
- If an atom of higher atomic number is introduced in to a π -electron system, it _____ the fluorescence.
- The function of secondary filter, in fluorimeter, is to absorb _____ radiations.

- f) In AAS, the steady light from hollow cathode lamp is converted in to pulsating current by _____.
- g) Only a small portion of sample reaches the flame in _____ burner in flame photometry.

(D) State true or False

- a) HPLC separations are carried out at elevated temperature.
- b) Quantity of sample required in HPTLC is more than that in TLC.
- c) HPTLC can simultaneously handle several samples of divergent nature and composition, at given time.
- d) Screw driven syringe type of pump produces pulse free delivery in HPLC.
- e) Thickness of stationary phase in HPTLC is less than that in TLC.
- f) In HPLC, if the composition of the mobile phase changes with time, it is called as isocratic elution.
- g) Only volatile components can be analysed by HPLC.

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