04/11/25

TYBSc/S-V

[Time : 2 ½ Hours] [Total marks: 75]

N.B. : (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Use of logarithmic table/non-programmable calculator is allowed.

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1. Attempt **Any Three** of the following: 15

A. Explain the terms 'quality control' and 'quality assurance'.

B. Discuss any five grades of laboratory reagents.

C. Define the term Molarity. Calculate the percentage composition of Nitrogen in (i) NH_4NO_3 (ii) $(NH_4)_2SO_4$
(Given – Atomic weight of N=14, H=1, O=16, S=32)

D. Explain the term bulk ratio and size to weight ratio with respect to sampling of solids.

E. Discuss the use of mineral acids for the decomposition of sample. Give any two advantages of microwave combustion method.

2. Attempt **Any Three** of the following: 15

A. 10.0 cm^3 of 0.1M HCl solution to be titrated with 0.1M NaOH. Calculate the pH of the solution when:
i) At the beginning of the titration.
ii) 1.0 cm^3 of 0.1M NaOH is added after the equivalence point.

B. Give the three the advantages and two limitations of EDTA as titrant.

C. Calculate potential of system at equivalence point in the titration of 20 cm^3 of 0.1M Fe(II) against 0.1M Ce(IV) solutions.
($E^0_{Pt|Fe+2,Fe+3} = +0.771V$, $E^0_{Pt|Ce+3,Ce+4} = +1.440V$)

D. Explain any two factors used to increase selectivity of EDTA as titrant

E. Explain the following types of EDTA titrations:
i) direct titration ii) substitution titration.

3. Attempt **Any Three** of the following: 15

A. Name the different types of burners used in flame photometry. Explain any one of them with the help of a labelled diagram.

B. Discuss in detail the principle of AAS.

C. Give any three applications and two limitations of FES.

D. What is phosphorimetry? What are the factors affecting fluorescence and phosphorescence?

E. Draw a neat, labelled diagram of Nephelometer and explain its working.

4. Attempt **Any Three** of the following: 15

A. Discuss the following factors affecting the solvent extraction,
1] ion pair formation 2] solvation

B. Components 'A' and 'B' found to have retention times 10.35 min. and 11.55 min. respectively on a 20 cm column. An unretained species passed through the column in 1.50 minutes. The peak widths at the base for 'A' and 'B' were 1.17 min. and 1.34 min. respectively. Calculate the number of plates in each peak, average number of plate and the plate height.

C. Explain the principle of solid phase extraction. Give any three advantages of it.

D. Distinguish between GLC and GSC.

E. Explain flame ionization detector (FID) used in gas chromatography.

5. **Answer the following:**

A. **Select whether the following statements are true or false (Any five)** 5

a. 1 M of sodium chloride contains 2 moles of sodium and 1 mole of chlorine.
b. A multiple tube sampler is used for sampling of flowing liquids.
c. The conductivity cell is used to measure the electrode potential during redox titration.
d. Complexation using EDTA is a multistep reaction.
e. In AAS, absorption of radiation by ground-state atoms is measured.
f. In phosphorescence, emission ceases immediately after the source of excitation is removed.
g. In solid phase extraction, silica is bonded to hydrophobic phase.
h. Immiscible solvent pair are used in solvent extraction method.

B. **Select the correct option and complete the following statements. (Any five)** 5

a. 1ppm is equal to _____
1) 1 mg/dm^3 b) 1 gm/dm^3 c) 1 $\mu g/dm^3$ d) 10 gm/dm^3

b. Sampling of _____is done using the ambient sampling method.
1) liquids b) atmospheric gases c) solids d) gases filled in a cylinder

c. _____ is an example of redox indicator.
a) Diphenyl amine b) Eriochrome black T c) Methyl orange d) Murexide

d. A known excess amount of EDTA is added in _____ titrations.
1) direct b) indirect c) back d) replacement

e. In AAS, the steady light from the hollow cathode lamp is converted into pulsating light by a _____.
1) Chopper b) Burner c) Filter d) Monochromator

f. A turbidimeter measures the _____ light passing through a suspension.
1) Scattered b) Absorbed c) Transmitted d) Fluorescent

g. Carrier gas used in gas chromatography also called_____
1) Stationary phase b) Mobile phase c) Mixture of solids
d) Mixture of liquids

h. Tributyl phosphate is used for the extraction of _____ ions.
1) Uranium b) Sodium c) Titanium d) Magnesium

C. **Match the column: (Any five)** 5

a.	Auger sampler	i.	Hydrolysis
b.	Basicity of CH_3COOH	ii.	Short-lived emission after excitation
c.	Sodium acetate	iii.	Hydrogen gas fuel
d.	Coordination compound	iv	1
e.	Fluorescence	v.	Countercurrent extraction
f.	Electrothermal atomizer	vi.	Sampling of soil
g.	Separation chamber	vii.	Complexometric titration
h.	Inert solid support	viii	4
		ix.	AAS
		x.	Celite

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