TY BSC sem I, univ exam
2023-24

(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)   Explain the term quality control and quality assurance.
   B)   Calculate mass percent composition of each element in potassium
        ferrocyanide. $K_4Fe(CN)_6$
        (Given: atomic weight of K = 39, Fe = 55.85, C = 12, N = 14)
   C)   Concentrated H_2SO_4 has specific gravity of 1.71 $g.cm^{-3}$ and it
        contains 80% w/w of H_2SO_4. Calculate 1) Molar concentration 2)
        Normal concentration
        (Given atomic weight of H = 1, S = 32, O = 16)
   D)   Explain the importance of quality concept in industry.
   E)   Describe the sampling of immiscible and flowing liquid.
   F)   Discuss different equipment used for sampling of compact solid.

Q.2   **Attempt any four of the following.**   **20**
   A)   Calculate the potential of the system in the titration when equal
        volumes of equimolar Fe(II) and Ce(IV) solutions are mixed.
        ($E^0_{Pt|Fe+2,Fe+3} = +0.771V$, $E^0_{Pt|Ce+3,Ce+4} = +1.440V$)
   B)   10.0 cm^3 0.1 M Fe (II) solution is titrated with 0.02 M $KMnO_4$ at pH
        = 1. Calculate the potential when
        i) 9.9 cm^3 of 0.02 M $KMnO_4$ added
        ii) 10.1 cm^3 of 0.02 M $KMnO_4$ added
        Given: $E^0_{Pt/Fe^{3+},Fe^{2+}} = +0.771V$, $E^0_{Pt/MnO_4^-,Mn^{2+}} = +1.510$ V
   C)   What are redox indicators? Explain the use of any one redox
        indicator.
   D)   What are the factors which increase the selectivity of EDTA as
        titrant. Explain any two.
   E)   Explain the following types of EDTA titrations:
        i) Back titration   ii) Substitution titration.
   F)   Discuss the theory of metallochromic indicators. What are the
        requirements of metallochromic indicators?

Q.3.   **Attempt any four of the following.**   **20**
   A)   With the help of a diagram explain the working of hollow cathode
        lamp.
   B)   Discuss the principle of Atomic Absorption Spectroscopy. Explain
        the role of rotating chopper in AAS.
   C)   Explain phosphorescence. Give two applications of phosphorimetry.
   D)   Explain Jablonski diagram of energy levels in a molecule.
   E)   Discuss the working of nephelometry with the help a labelled
        diagram.
   F)   Explain: - 1) Turbidimetric titrations 2) Phase titrations

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Q.4   **Attempt any four of the following.**   20

A) Explain the principle of solid phase extraction. Give its advantages.

B) Discuss any two factors affecting solvent extractions.

C) Explain the terms used in HPLC i) isocratic elution   ii) gradient elution. Give any three applications of HPLC.

D) Explain the principle of HPLC. Discuss UV detector used in HPLC.

E) Give applications and limitations of HPTLC.

F) Name the steps involved in HPTLC. Write a note on fluorimetric detector used in HPTLC.

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

a) _____ cannot be used for validation of analytical method.
i) Reference material   ii) Certified reference material   iii) LR grade

b) The reagent of highest grade of purity is _____ grade.
i)AR   ii) GR   iii) LR

c) 30ppm means _____.
i) 30 mg   ii) 30 mg/cm^3 iii)30mg/dm^3

d) 1M $Al(OH)_3$ solution is equivalent to _____ N $Al(OH)_3$ solution.
i) 1   ii) 3   iii) 0.1

e) _____ method is mostly used to draw sample from a cylinder filled with gas at high temperature.
i) Flushing   ii) Static   iii) Displacement

f) The process of rolling and quartering is used for decreasing _____.
i) particle size   ii) sample size   iii) Bulk ratio

g) _____ is used for sampling of particulate solid.
i) Auger sampler   ii) Concentric tube thief   iii) Geo sampler

h) _____acid is excellent solvent for dissolution of many metal oxides and metals above hydrogen.
i) Hydrochloric   ii) Sulphuric   iii) Perchloric

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

a) Sulphuric acid is added to reduce $E^0_{Pt/Fe^{3+},Fe^{2+}}$ in the titration between Fe(II) and potassium dichromate.

b) Nernst's equation is applicable only at equivalence point in redox titrations.

c) Equivalent point potential is independent of concentrations of reactants and products in titration of Fe(II) against MnO_4^{-1}.

d) Ferroin contains 1,10-phenanthroline.

e) EDTA does not form 1:1 complex with most of the metal ions.

f) $K_{MY} = K'_{MY}$ when $\alpha_4 = 0$

g) In the titration of Ca^{+2} against EDTA, concentration of Ca^{+2} is zero at equivalence point.

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Q.5　C)　Fill in the blanks with correct alternatives given in the bracket :　05
(any five)
(alkali & alkali earth metals, phosphorescence, turbidimeter, turbidance, toxic metals, hollow cathode lamp, low, conjugated double)

a) AAS is used to detect _____ like Cu, Ni, Zn and Hg in food products.
b) Flame photometry is extensively used for the estimation of ____.
c) In AAS the source of radiation is _____.
d) Delayed re-emission of absorbed radiation is called _____.
e) Phosphorimetric experiments are normally carried out at _____ temperature.
f) The instrument used to measure turbidance is known as _____.
g) Molecules having _____ bond are suitable for fluorescence and Phosphorescence.
h) A turbidimeter measures _____ as a function of concentration of suspension.

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

Column A		Column B
a) Neutral chelate	(i)	Detection of separated component using scanning instrument
b) Powder silica	(ii)	Extraction of uranyl nitrate
c) HPLC	(iii)	Remove impurities from solvent
d) Multistage separation	(iv)	$pH_{1/2}$
e) HPTLC	(v)	Reciprocating pump
f) TBP solvent	(vi)	Countercurrent extraction
g) Precolumn	(vii)	Solid phase extraction
	(viii)	Easily extracted in water
	(ix)	Easily extracted in organic solvent

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