

(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) Discuss the importance of quality concepts in industry.
- B) Determine the percentage composition of each element in  $K_2CO_3$   
(Given – Atomic weight of K=39, C=12, O=16)
- C) Find the molarity of 0.05 N solution of i)  $KMnO_4$  (acidic medium)  
ii)  $H_3PO_4$
- D) Explain the terms bulk ratio and size to weight ratio with respect to sampling of solids.
- E) With the help of a neat labelled diagram, discuss any one method for sampling of gases.
- F) Explain any five grades of reagents used in the laboratory.

Q.2

Attempt any four of the following.

20

- A) Calculate the potential of the system at the equivalence point in the titration of  $10.0\text{ cm}^3$  of  $0.25\text{M Fe(II)}$  against  $0.25\text{M Ce(IV)}$  solutions.  
( $E^0_{Pt|Fe^{2+},Fe^{3+}} = +0.771\text{V}$ ,  $E^0_{Pt|Ce^{3+},Ce^{4+}} = +1.440\text{V}$ )
- B) Explain the theory of redox indicators. Give two examples of redox indicators.
- C) Calculate the potential of the system when  $11.0\text{ cm}^3$  of  $0.02\text{M}$  permanganate solution is added to  $10.0\text{ cm}^3$  of  $0.1\text{M Fe(II)}$  solution having pH 1  
(Given:  $E^0_{Pt|Fe^{3+},Fe^{2+}} = +0.771\text{V}$ ,  $E^0_{Pt|MnO_4^-,Mn^{2+}} = +1.510\text{V}$ .)
- D) How is selectivity of EDTA as titrant increased with respect to:  
i) pH of the solution ii) use of masking and demasking agents.
- E) Give any five advantages of EDTA as titrant.
- F) Name the indicators used in complexometric titrations. Explain any one indicator used in complexometric titrations.

Q.3.

Attempt any four of the following.

20

- A) Discuss in detail the principle of AAS.
- B) Describe the calibration curve method and standard addition method for the estimation of a sample solution in FES.
- C) Give any three applications and two limitations of AAS
- D) What is fluorescence? What are the factors affecting fluorescence and phosphorescence?

- E) Draw a schematic diagram of turbidimeter and explain its working.  
 F) Explain any two factors affecting scattering of radiation.

Q.4 Attempt any four of the following. 20

- A) Write any two functions of precolumn used in HPLC? Discuss reciprocating pump used in HPLC.  
 B) Discuss single beam densitometer used in HPTLC.  
 C) Give comparison between TLC and HPTLC.  
 D) Explain the principle of solid phase extraction with example. Give any three advantages of it.  
 E) With a neat and labelled diagram explain the working of HPLC.  
 F) What is meant by chelation? How does it affect solvent extraction?

Q.5 A) Select the correct option and complete the following statements: 05

- (any five)
- a) A chemical of highest purity is \_\_\_\_\_ grade.  
 (i) AR (ii) LR (iii) GR
- b) 1 ppm is equal to \_\_\_\_\_  
 (i) 1 ppb (ii) 1000 ppb (iii) 100 ppb
- c) The number of moles of solute dissolved per kilogram of solvent is known as \_\_\_\_\_.  
 (i) molarity (ii) normality (iii) molality
- d) \_\_\_\_\_ acid is an excellent solvent for the dissolution of many metal oxides.  
 (i) hydrochloric (ii) sulphuric (iii) perchloric
- e) \_\_\_\_\_ method is mostly used for sampling of atmospheric gases.  
 (i) ambient sampling (ii) stack sampling (iii) rolling and tabelling
- f) \_\_\_\_\_ is used for sampling of flowing liquids.  
 (i) Split tube thief (ii) Multiple tube sampler (iii) Auger sampler
- g) Hydrogen percent in water is 11.11 % therefore oxygen percent in water is \_\_\_\_\_.  
 (i) 11.11 (ii) 22.22 (iii) 88.89
- h) \_\_\_\_\_ cannot be used for validation of analytical method.  
 (i) Reference material (ii) certified reference material (iii) LR grade material