

Duration: 2 ½ Hrs

Total Marks: 75

**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 THREE of the following:****(15)**

- A** Describe the characteristics of Normal Error Curve.
- B** Following are the sets of observations for the analysis of Calcium in the given sample of lime stone by two independent methods. Verify whether the two standard deviations are same or different.

Set-I (%)	10.25	10.32	10.40	-----
Set -II (%)	10.42	10.29	10.35	10.26

Given  $F_{table} = 19.16$ 

- C** What is Q-Test? In the analysis of a sample for its arsenic contents, the following values were reported: 4.6, 4.7, 4.5, 4.9.  
On the basis of Q-Test find whether value 4.9 can be rejected or retained. Given  $Q_{table} = 0.76$
- D** What is Sampling? Describe the importance of sampling.
- E** What is a sample thief? Explain the method of collecting a sample of flowing liquids.
- F** With the help of a diagram of the sampling device, explain Stack sampling of gases by Displacement method.

**Q.2) Attempt ANY THREE of the following:****(15)**

- A** What is chromatography? Discuss the classification of chromatographic methods based on the principle involved?
- B** Give a brief account of following with respect to paper chromatography:-  
(i) Two dimensional development and  
(ii) Radial development.
- C** Draw a schematic diagram of HPLC and explain the function of :-  
(i) High pressure pump and  
(ii) Precolumn.
- D** Discuss the applications of HPLC.
- E** Explain the preparation of Chromatoplates. Give any two applications of thin layer chromatography.
- F** Give any three applications and two limitations of HPTLC.

**Q.3) Attempt ANY THREE of the following:****(15)**

- A** Discuss the basic principles of atomic absorption spectroscopy.
- B** Draw a schematic diagram of a flame photometer and explain the working.
- C** Explain the phenomena of fluorescence and phosphorescence. Compare the two techniques and state how they are different from absorption methods.
- D** Discuss the factors which affect the intensity of scattered radiation.

- E Describe the applications of nephelometry and turbidimetry.
- F Explain the calibration curve method and internal standard method used in atomic spectroscopic techniques.

**Q.4)** Attempt **ANY THREE** of the following: **(15)**

- A What are redox indicators? Give a brief account of use of Diphenylamine as a redox indicator.
- B 10.0 cm<sup>3</sup> of 0.1M Fe(II) solution is titrated with 0.1M Ce(IV) in acidic medium. Calculate the potential (i) at half the equivalence point and (ii) on addition of 11.1 cm<sup>3</sup> of titrant. [ $E^0_{\text{Pt/Fe}^{+3}, \text{Fe}^{+2}} = 0.770 \text{ V}$  and  $E^0_{\text{Pt/Ce}^{+4}, \text{Ce}^{+3}} = 1.44 \text{ V}$ ]
- C Describe the different light dispersing devices used in UV-Visible spectrophotometers.
- D Differentiate between colorimeters and spectrophotometers. (any 5 points)
- E What are crown ethers? How are they useful in solvent extraction?
- F Discuss the applications of solid phase extraction.

**Q.5)** A Fill in the blanks. **(04)**

- a) Null Hypothesis is often used as \_\_\_\_\_.
- b) F-Test is used to find out whether the two \_\_\_\_\_ differ from each other statistically.
- c) \_\_\_\_\_ sampling requires minimum knowledge of bulk material.
- d) The sample prepared by mixing the increments is called \_\_\_\_\_.

**OR**

A State true or false. **(04)**

- p) Random errors are incapable of analysis.
- q) If  $t_{\text{cal}} > t_{\text{table}}$ , then null hypothesis is not valid.
- r) HF is the only acid used for the dissolution of Silicates.
- s) Coning and Quartering is used for decreasing the particle size.

**Q.5)** B Fill in the blanks. **(04)**

- a) In chromatographic technique, the components of the mixture are carried through the stationary phase by the flow of \_\_\_\_\_ phase.
- b) In HPLC, pneumatic pumps have \_\_\_\_\_ capacity with respect to the solvent.
- c) In HPLC, if the composition of mobile phase is same then it is called as \_\_\_\_\_ elution.
- d) Separation of solutes in HPTLC takes place by the phenomenon of \_\_\_\_\_.

**OR**

B State true or false. **(04)**

- p) It is quite easy to achieve reproducibility of  $R_f$  values in TLC.
- q) Photomultiplier tube (PMT) works as a detector in HPLC.
- r) In gradient elution, two or more solvents of different polarity are used.
- s) HPTLC can simultaneously handle several samples of divergent nature and composition at a given time.

**Q.5) C** Fill in the blanks. **(04)**

- a) \_\_\_\_\_ involves the measurement of the intensity of transmitted radiation as the function of concentration of the dispersed phase.
- b) If all the electrons in an energy level are paired, it is called a ----- state.
- c) A hollow cathode lamp is a source used in a -----.
- d) 589.0 nm and 589.6 nm are the most intense lines emitted by ----- atoms.

**OR**

**C** State true or false. **(04)**

- p) Flame photometry is a study of emitted radiation by ground state atoms.
- q) Molecules with unpaired electrons give rise to fluorescence.
- r) A detector is placed at right angle to the sample cell in a nephelometer.
- s) Phosphorescence measurements are done at elevated temperature.

**Q.5) D** Fill in the blanks. **(03)**

- a)  $\text{MnO}^{4-}$  in acidic medium changes to \_\_\_\_\_.
- b) Beer-Lambert's law is not obeyed at concentrations above \_\_\_\_\_.
- c) Extraction of  $\text{Pb}^{+2}$  using dithizone is an example of \_\_\_\_\_.

**OR**

**D** State true or false. **(03)**

- p) Conjugated systems absorb radiation in the visible region.
- q) The titration curve for Fe(II) vs  $\text{KMnO}_4$  is symmetrical.
- r) In SPE substantial waste disposal is a problem.

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