[Time: 2.30 Hours] **[Marks:60]**

Please check whether you have got the right question paper.

N.B: 1.   **All questions are compulsory.**
        2.   **Figures to the right indicate full marks.**
        3.   **The use of a log table or a non-programmable calculator is permitted.**

1.   **A)** Attempt **any two** of the following: **08**
        i)   State the reasons for obtaining incorrect analytical results. How one can correct the results?
        ii)   With reference to chemical industry, explain the terms: "Quality Control" and "Quality Assurance".
        iii) Write in detail a note on "Good Laboratory Practices".
        iv)   Explain the terms "Calibration" and "Verification".

   B) What are the performance parameters for the methods used to determine the analytical sample   **04**
        from the complex matrix?

<center>**OR**</center>

   B) How are 'Reference Materials' different from 'Laboratory Chemicals''?   **04**

2.   **A)** Attempt **any two** of the following: **08**
        i)   Discuss 'Repeatability' and 'Reproducibility' with reference to chemical data analysis.
        ii)   Account for the following potential sources of uncertainty: Sampling & Reagent purity.
        iii) What is FDA? Discuss its role in Pharmaceutical and Food Industry?
        iv)   Explain the Boxcar Technique used to reduce noise.

   B) Three measured quantities are a= 119.78, b = 104.96, c = 135.02 and their respective   **04**
        measurement uncertainties are 0.07, 0.02, 0.09; If the final measurement is of the type
        Y = a + b + c, calculate the combined uncertainty in the measurement of Y.

<center>**OR**</center>

   B) The following data in 'mg' were obtained for the replicate weighing of a 200.0 mg standard   **04**
        weight on a balance:
        200.9, 199.3, 201.1, 200.5, 202.6, 197.9, 203.1, 199.8, 200.7, 196.1 Assuming the noise is
        random, calculate the signal to noise ratio for the balance.

3.   **A)** Attempt any two of the following: **08**
        i)   With suitable examples, explain Synthetic Ion Exchangers.
        ii)   What do you mean by critical and supercritical state of the matter?
        iii) Give an account of non-aqueous ion exchangers.
        iv)   How would you differentiate between ion exchange equilibrium and breakthrough capacity?

   B) 100 cm^3 of sodium ion solution containing 25 g/dm^3 sodium chloride is allowed to pass   **04**
        through a cation exchanger with 7.5 m mol/g exchange capacity dry resin. What is the
        minimum weight of the resin required to remove sodium ions completely from the solution?
        (Na = 23, C1 = 35.5)

<center>**OR**</center>

   B) With a schematic diagram explain the assembly for supercritical fluid extraction and discuss its   **04**
        applications with special reference to environmental analysis.

4. **A)** Attempt any two of the following: **08**
    i)   Discuss the technique of inverse gas chromatography.
    ii)   Write note on "Inorganic Molecular Sieves".
    iii) Explain pressure programming in supercritical fluid chromatography? Why is it used?
    iv)   Give an account of the differences between gel permeation chromatography and size exclusion chromatography?

   B) What are affinity ligands? Discuss it with suitable examples. **04**
                              OR
   B) How is exclusion chromatography used in the determination of molecular weights of polymers? **04**

5.   Attempt **any four** of the following: **12**
    i)   What is holding time with respect to analytical sample?
    ii)   Explain: Scheme of sampling.
    iii) What is thermal noise?
    iv)   Give a brief account of the abbreviation 'ISO 9000'.
    v)   Discuss the need of suppressor column in Ion Chromatography.
    vi)   How are chelating resins used in separation of inorganic compounds?
    vii) List the applications of super critical fluid chromatography.
    viii) State the characteristics for an ideal matrix with respect to affinity chromatography.

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