Seat No. : _____

FD-139

February-2025

M.Sc., Sem.-I

CHE-404 : Chemistry

(Analytical Chemistry)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (i) Define mole fraction, molarity, and molality. Calculate the mole fraction, molarity, and molality of NH_3 solution that is composed of 34 g NH_3 in 180 g of H_2O. The density of the solution is 1.00 g/mL and the density of water is 1.00 g/mL (Mol. wt. of NH_3 17 g/mol ; Mol. wt. of H_2O 18 g/mol.) **7**

   (ii) What are significant digits and explain the rules for assigning significant digits. How many significant digits are there in 97540, when written in scientific notation ? **7**

   OR

   (i) Give the scope of analytical chemistry and discuss the role of analytical chemist. **7**

   (ii) What are non-aqueous titrations ? Discuss their fundamentals and give some applications. **7**

2. (i) Write a short note on standard addition technique and the use of internal standards in separation science. **7**

   (ii) What is a calibration line ? Describe the least square linear regression for drawing the best straight line. **7**

   OR

   (i) What is meant by validation ? Discuss in brief different validation parameters. **7**

   (ii) Compare and discuss the salient features of 'quality control' and 'quality assurance'. **7**

3. (i) Explain acid and alkaline errors in pH measurement. **7**

   (ii) Write a note on accuracy of pH measurement. **7**

   OR

   (i) Write a note on calibration of pH meter. **7**

   (ii) Explain in detail electrical conductance of electrolytic solution. **7**

4. (i) Discuss the principle and properties of an ion selective electrode. **7**

(ii) Write a short note on gas-sensing probes with an example. **7**

OR

(i) Give the detailed comparison of metallic indicator electrodes and ion selective electrodes. **7**

(ii) Write a short note on enzyme substate electrodes with an example. **7**

5. Answer any **seven** out of twelve (each question carries **2** marks) **14**

(i) Define sample matrix.

(ii) For titrimetric analysis, why it is recommended to prepare standard solutions in normality ?

(iii) State the difference between end point and equivalence point.

(iv) Define a normal Gaussian curve.

(v) What is meant by the term "degrees of freedom" ?

(vi) What is the greatest possible error in any measurement ?

(vii) Why equivalent conductance for a weak electrolyte cannot be determined experimentally ?

(viii) What is combination pH electrode ?

(ix) What is apparent pH ?

(x) Define cell constant.

(xi) What is isopotential point ?

(xii) Define boundary potential.
