Q.1 Choose the correct option for the following:

(i) How many significant figure is present in the data : 0.1025 ?
   (a) 1    (b) 2    (c) 3    (d) 4

(ii) The analysis in which we find out selected constituents of the sample is known as ...............
   (a) Proximate analysis  (b) Partial analysis
   (c) Trace constituent analysis  (d) Complete analysis

(iii) The instrumental technique in which the measurement of difference in temperature between sample and reference material is called ...........
   (a) DTA  (b) TGA  (c) DSC  (d) Electrogravimetry

(iv) Addition of small amount of NaCl to saturated solution of AgCl will ...........
   (a) Increase the solubility of AgCl  (b) Decrease the solubility of AgCl
   (c) Not effect on the solubility of AgCl  (d) None of these

(v) Which of the following is Lowry – Bronsted as well as Lewis base ?
   (a) NH₃  (b) NH₄⁺  (c) BF₃  (d) CO₂

(vi) Which of the following compound is alkenol ?
   (a) Cyclohexanol  (b) Amyl alcohol  (c) 2 - butenal  (d) Allyl alcohol

(vii) ............. formula of a compound which shows the simplest ratio of the atoms present in it.
   (a) Structural  (b) Molecular  (c) Empirical  (d) None of these

(viii) A tertiary carbon is bonded directly to ............
   (a) 4 carbon  (b) 3 carbon  (c) 2 carbon  (d) 1 carbon

(ix) Which of the following is used in the elimination of harmful radioactive metals from the body ?
   (a) Glycinato  (b) Ethylene diamine  (c) pyridine  (d) EDTA

(x) Which of the following geometry is exist in [Ni (DMG)₂]⁺ ?
   (a) Tetrahedral  (b) Octahedral  (c) Square planer  (d) Linear

Q-2 Answer the following (Attempt any ten):

(i) Define: Accuracy and Precision.

(ii) Write advantages of instrumental method.

(iii) The following values were obtained for the determination of cadmium in a sample of dust: 4.3, 4.1, 4.0, 3.2, 4.2, 3.9 and 4.0 μg g⁻¹. Should the value, 3.2, be rejected? [Given Qcrit is 0.570].

(iv) Define: Lewis acids and Lewis bases.
(v) Discuss in detail about self ionization of water and prove that \( \text{pH} + \text{pOH} = \text{pK}_w = 14 \).

(vi) Calculate the solubility of AgCl in pure water. 
[Given \( K_{sp} \) of AgCl = \( 2.8 \times 10^{-10} \)].

(vii) Describe Lassaign test for the detection of nitrogen and Sulphur.

(viii) Draw E, Z structure for 2-Chloro-2-butene.

(ix) Draw all possible isomeric structure for aliphatic compound having molecular formula \( C_4H_{10} \) and give their IUPAC name.

(x) Define: Ligands and Coordination sphere.

(xi) Give the structural formula for,
(a) Potassium hexacyanoferrate (III)  (b) Dichloroargentate (I) ion.

(xii) Differentiate between: Double salt and complex compound.

Q-3 Give broad classification and application of chemical analysis. [10]

OR

Q-3 Give classification of error and list out different methods for the minimization of systematic error and describe any three of them. [10]

Q-4 [A] Explain selective precipitation with suitable example. [4]
[B] "All Lowri – Bronsted bases are Lewis bases whereas all Lowri – Bronsted acids are not Lewis acids." Explain. [3]
[C] Calculate the solubility of \( \text{PbSO}_4 \) in (i) pure water and in (ii) 0.1 M \( \text{Pb(NO}_3\)\)\(_2\). [3]
[Given \( K_{sp} \) of \( \text{PbSO}_4 = 1.8 \times 10^{-8} \)].

OR

Q-4 [A] Discuss the Arrhenius concept of acids and bases. What are the limitation of this concept? [4]
[B] Define: (i) Sparingly soluble salt (ii) common ion effect (iii) Lowery- Bronsted acids. [3]
[C] Calculate the solubility of \( \text{CaF}_2 \) in (i) pure water and in (ii) 0.1 M \( \text{Ca(NO}_3\)\)\(_2\). [3]
[Given \( K_{sp} \) of \( \text{CaF}_2 = 1.7 \times 10^{-10} \)].
Q-5 [A] The names given below are objectionable. Write their structure and correct IUPAC name.
(i) 2-isopropyl-1-propene
(ii) 2,4,5-trimethylpentane
(iii) 2,2-diethylbutane
(iv) 2-ethyl-1-pentane.
[B] Explain: Boiling point of n-pentane, isopentane and neopentane are 36°, 28° and 9.5°C respectively.
[C] Combustion of a 5.17 mg sample of a compound gave 10.32 mg of CO₂ and 4.23 mg of H₂O. The molecular weight of compound is 88 gm/mole. What is the molecular formula of the compound?
(Given: Atomic Weight of C = 12.01, H = 1.008, O = 16.0 gm/mole)

OR

Q-5 [A] Draw the structure for the following and write their IUPAC name.
(i) Vinyl chloride
(ii) Isobutane
(iii) Allyl bromide
(iv) Neopentane.
[B] Write kjeldahl’s method for the quantitative analysis of nitrogen.
[C] What is the percentage composition of C, H and Cl in the molecular formula of C₃H₅Cl?
(Given: Atomic Weight of C = 12.01, H = 1.008, Cl = 35.45 gm/mole)

Q-6 [A] Define Chelates and describe their uses.
[B] Describe the possible geometries of complex having coordination number six.
[C] Give the name and structure for the following abbreviations.
(i) en
(ii) (dmg)
(iii) pn

OR

Q-6 [A] Give the classification of ligands.
[B] Define: (i) Ambidentate ligand (ii) Coordination number (C.N.)
(iii) Simple salt
[C] Write IUPAC name for the following coordination compounds:
(i) [Ag(NH₃)₂]⁺
(ii) [Co(NH₃)₆]Cl₃
(iii) Na₃[Fe(CN)₆]

\[ \times : \text{X} \rightarrow \text{X} \]