Department of Chemistry

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

BSc. CHEMISTRY DEGREE

2022/2023 RAIN SEMESTER EXAMINATION

CHM 208: INTRODUCTION TO ANALYTICAL CHEMISTRY

TIME ALLOWED: 2 HOURS AND 30 MINUTES **DATE: JULY 2024**

QUESTION TYPE 4

Instructions:

1. Use HB pencil. 2. Write your surname and initials and shade appropriately.
3. Write your University registration number and shade. 4. Shade the question paper type.
5. Shade the alphabet corresponding to your correct option horizontally within the space provided.

Name.....Dept..... Reg No.....

1. The molarity of a concentrated HCl purchased for laboratory use is approximately 12.1 M. What volume of this reagent should be diluted to 1.000 L to make a 0.100 M HCl?

(A) 4.30 mL (B) 8.26 mL (C) 12.26 mL (D) 15.20 mL

2 What mass of Ag_2CO_3 is formed from the reaction of $AgNO_3$ with 2.33 g of Na_2CO_3? [Formula mass g/mol: Ag_2CO_3 (275.7); $AgNO_3$ (169.9); Na_2CO_3 (106.0)].

(A) 7.47 g (B) 10.20 g (C) 6.06 g (D) 10.00 g

3 A 2.00 g sample of limestone was dissolved in hydrochloric acid and all the calcium present in the sample was converted to $Ca^{2+}_{(aq)}$. Excess ammonium oxalate solution, $(NH_4)_2C_2O_{4(aq)}$, was added to the solution to precipitate the calcium ions as calcium oxalate, $CaC_2O_{4(s)}$. The precipitate was filtered, dried, and weighed to a constant mass of 2.43 g. Determine the percentage by mass of calcium in the limestone sample.

(A) 50.3% (B) 38.1% (C) 76.2% (C) 42.5%

4. What is the pKa value of an indicator that has a pH transition range of 4 to 6?

A. 1×10^{-5} B. 1×10^{-3} C. 1×10^{5} D. 0.5×10^{1}

5. A titration curve is the plot of:

(i) the concentration of analyte against reagent volume (ii) pH or potential of the electrode against reagent volume (iii) the concentration of analyte against time

(iv) pAg versus volume of $AgNO_3$

A. All of the above B. I, II, and III only C. I and II only D. I, II and IV only

6. In the titration of a strong acid with a strong base, at the pre-equivalence stage, the concentration of the acid is computed from:

A. its starting concentration and the amount of base added B. the hydroxonium ions calculated from the ionic product constant for water C. from the analytical concentration of the excess base used D. None of the options.

7. What is the pH of the resulting solution from the titration of 50.0 mL of 0.0500 M HCl with 26.0 mL of 0.1000 M NaOH solution?

A. 3.87 B. 11.12 C. 7.40 D. 13.87

8. In redox titration, the following are used as reductants:

(i) borohydride (BH_4^-) (ii) Iodine (iii) Ascorbic acid (iv) Stannous (Sn^{2+})

A. I, III and IV only B. I, II and III only C. I, II and IV only D. II, III and IV only

9. In the Volhard method for titration of Cl^- with Ag+, the excess Ag+ is back titrated with:
A. KSCN in the presence of Fe^{3+} as indicator B. $KMnO_4$ in the presence of Fe indicator C. $K_2Cr_2O_7$ in the presence of Fe^{3+} as indicator D. KOH in the presence of Fe indicator

10. What is the concentration of free Fe^{3+} in a solution of 0.10 M FeY^- at (a) pH 2.0, (b) pH 8.07 (K_f=1.3×10^{25}, α_Y^{4-}(pH 2) = 2.6×10^{-14}, α_Y^{4-}(pH 8) = 4.2×10^{-3}).
A. 5.4×10^{-7} and 1.4×10^{-12} B. 5.4×10^{7} and 1.4×10^{12} C. 5.4×10^{-7} and 1.4×10^{12} D. 5.4×10^{7} and 1.4×10^{-12}

11. Write an appropriate ionic equation for the reaction between $AgNO_3$(aq) and chloride ion in solution.
(A) $Ag^+NO_3^-{}_{(aq)} + Cl^-_{(aq)} \longrightarrow AgCl_{(s)} + NO_3^-{}_{(aq)}$ (B) $AgCl_{aq} + Cl^-_{(aq)} \longrightarrow AgCl_{(s)} + NO_3^-{}_{(aq)}$
(C) $Ag^+NO_3^-{}_{(s)} + Cl^-_{(aq)} \longrightarrow AgCl_{(s)} + NO_3^-{}_{(aq)}$ (D) $Ag^+NO_3^-{}_{(aq)} + Cl_{(s)} \longrightarrow AgCl_{(s)} + NO_3^-{}_{(aq)}$

12. What is the molarity of $AgNO_3$ solution prepared by dissolving 17g of $AgNO_{3(s)}$ in 100 cm^3 of water? [Ag = 108, N = 14, O = 16 g/mol].
(A) 5.2 mol/dm^3 (B) 0.10 mol/dm^3 (C) 3.4 mol/dm^3 (D) 1.0 mol/dm^3

13. Consider the precipitation reaction below:
$Ca(OH)_{2(aq)} + HC_2H_3O_{2(aq)} \rightarrow Ca(C_2H_3O_2)_{2(aq)} + H_2O_{(l)}$
Which of the following options represents the net ionic equation for the reaction?
(A) $2OH^-_{(aq)} + H^+_{(aq)} \rightarrow 3H_2O_{(l)}$ (B) $OH^-_{(aq)} + 4H^+_{(aq)} \rightarrow 2H_2O_{(l)}$
(C) $2OH^-_{(aq)} + 2H^+_{(aq)} \rightarrow 2H_2O_{(l)}$ (D) $2OH^-_{(aq)} + 3H^+_{(aq)} \rightarrow 2H_2O_{(l)}$

14. A 25.00 mL solution containing NaCl plus KCl was treated with excess $AgNO_3$ to precipitate 0.4368 g AgCl. What was the concentration of the Cl^- in ppm? (AM of Cl = 35.5 g/mol)
(A) 4327.50 ppm (B) 2163.75 ppm (C) 1442.50 ppm (D) 1219.10 ppm

15. 50.0 mL of a solution containing an unknown concentration of chloride ions is added to 50.00 mL of 0.0500 molL-1 solution of silver nitrate. The precipitate is filtered, and the filtrate is titrated with 0.0200 molL-1 solution of sodium thiocyanate (NaSCN). The average titre volume after 3 repeated experiments is 25.00 mL. Calculate the concentration of Cl^- ion in the solution (in $molL^{-1}$).
(A) 0.0200 $molL^{-1}$ (B) 0.0800 $molL^{-1}$ (C) 0.0400 $molL^{-1}$ (D) 0.1200 $molL^{-1}$.

16. Which of the following can be used to detect the endpoint of precipitation titration?
(i) The appearance of excess titrant (ii) The concentration of ions
(iii) The disappearance of the reactant
(A) (i) and (iii) (B) (i) and (ii) (C) (ii) and (iii) (D) (i), (ii) and (iii)

17. Argentometric titration is the precipitation titration that is involved with:
(A) Silver chromate (B) Potassium chromate (C) Sodium nitrate (D) Silver nitrate18.

18 Which of the following is true of a Precipitation reaction:

(i) A precipitation reaction occurs when two solutions containing soluble salts are mixed.
(ii) The reaction results in the formation of an insoluble salt.
(iii) Precipitation reactions in the solution can aid in determining the identity of various ions.
(iv) The precipitate is the insoluble salt that emerges from the solution.
(A) (i), (ii) and (iii) (B) (i) and (iii) (C) (i), (ii) and (iv) (D) All of the above

19. Which of the following traditional methods based on colour indicators can be used to identify endpoints in argentometric titration?
(i) The formation of coloured precipitate at the endpoint in Mohr's titration.

(ii) The formation of a soluble, coloured complex at the endpoint of Volhard's titration.
(iii) Adsorption of a coloured indicator on the precipitate at the endpoint in Fajan's titration. (iv) The formation of an insoluble, coloured complex at the endpoint of Volhard's titration.
(A) (i), (ii) and (iii) (B) (i), (ii) and (iv) (C) (ii), (iii) and (iv) (D) All of the above

20. Find the molarity and molality of 37.0 wt % HCl (density = 1.19 g/mL).
(A) 12.1 M, 16.1 m (B) 36.4 M, 32.2 m (C) 42.3 M, 80.8 m (D) 16.8 M, 24.3 m

21. Which of the following statement(s) is/are correct about Precision and Accuracy?
(i) Precision reflects how close a measurement is to a known or accepted value, while accuracy reflects how reproducible measurements are, even if they are far from the accepted value.
(ii) Accuracy is defined as 'the quality of being exact' and refers to how close two or more measurements are to each other,
(iii) It is possible for precision measurements not to be accurate.
(iv) Accuracy is defined as 'the degree to which the result of a measurement conforms to the correct value or a standard.
(A) All of the above (B) (ii) and (iii) (C) (iii) and (iv) (D) (i), (ii) and (iii)

22. The following are examples of Systematic Errors:
(i) Operational/Personal errors (ii) Errors manifest due to slight variations in successive measurements
(iii) Instrumental and Reagent errors (iv) Error of method
(A) (i) and (iv) (B) (ii) and (iii) (C) (i), (ii) and (iv) (D) (i), (iii) and (iv)

23. The mean of four determinations of the copper content of a sample of an alloy was 8.27% with a standard deviation = 0.17 percent. What will be the range of values for the Pb content of the alloy at 95% confidence level? (Note: the value of "t" for the 95 percent confidence level with (n-1) is 3.18).
(A) 8.00 - 8.14 % (B) 7.20 - 8.54 % (C) 8.00 - 8.54 % (D) 7.80 - 8.50 %

$\bar{x} \pm \frac{ts}{\sqrt{n}}$

$8.27 \pm \frac{3.18 \times 0.}{2}$

$7.9991 - 8.54$

24. Which of the properties below describes appropriately volumetric methods of analysis?
(I) measuring the volume of a solution of known concentration that is needed to react completely with the analyte (II) the product formed is filtered and washed free of contaminants (III) the point at which the colour change of an indicator is apparent to the eye is called the equivalent point
(IV) sufficiently low solubility of the product so that no significant loss of the analyte occurs during filtration and washing
A. I and II only B. I, II and III only C. I only D. I, II, and IV only

25. Which of the following are not volumetric methods of analysis?
(I) UV-visible method (II) Volhard method (III) microscopic method
(IV) Complexometric method.
A. I and III only B. I, II and III only C. I, III and IV only D. II and IV only

26. Consider the equation: $Ag^+ + Cl^- = AgCl_{(s)}$
At the equivalence point, what happens to the concentration of $Ag^+ + Cl^-$ which remains un-precipitated?
(A) $Ag^+ > Cl^-$ (B) $Ag^+ \leq Cl^-$ (C) $Ag^+ = Cl^-$ (D) $Ag^+ \geq Cl^-$

27. Complexometric titration with EDTA have been applied in the determination of virtually every metal cation with the exception of:
(A) Mg and Ca ions (B) alkali metal ions (C) trivalent cations (D) multivalent cations

28. Which of the following is not a component of the potentiometric electroanalytical method
a. reference electrode
b. indicator electrode

c. auxiliary electrode
d. salt bridge

29. These are among the desired characteristics of an ideal reference electrode except
a. known or fixed potential, E_{ref}
b. constant response (even when there is a net current in the cell)
c. sensitivity to composition of the solution under study
d. obeys Nernst Equation

30. The following are types of indicator electrodes except
a. Metallic Indicator Electrodes
b. Membrane Indicator Electrodes
c. Ion-selective Electrode (field effect transistor) ISFET
d. Non-metallic indicator electrode

31. The electrodes of the first kind are not very popular because
a. Metallic indicator electrodes are not very selective
b. Many metal electrodes cannot be used in neutral or basic solutions
c. Easily oxidized, can be used only when analyte solutions are deaerated to remove oxygen
d. Certain hard metals (Fe, Cr, Co, Ni) do not provide reproducible potentials

32. The following are true of ion-selective electrodes, except
a. It responds absolutely to only one target ion in the solution without any interference by the presence of other ions in the test solution.
b. The operation of ISE devices does not depend on redox processes.
c. The key feature of an ISE is a thin selective membrane across which only the target ion can migrate.
d. Ion-selective membranes are usually made of hydrophobic organic polymer impregnated with ionophore

33. Which of the following is not correct about ionophore
a. It is a polydentate binding agent
b. It assists the target ion to transport across the membrane in an ion-selective electrode
c. Calcimycin as Ca^{2+} ionophore and valinomycin as K^+ ionophore
d. It contains a low concentration of the target ion

34. pH electrode as an example of an ion-selective electrode has the following limitations, except
a. The alkaline error
b. Errors in low ionic strength solutions
c. High junction potential
d. Error in the pH of the standard buffer

35. Whenever current flows, the following factors act to decrease the output voltage of a galvanic cell or to increase the applied voltage needed for electrolysis, except
a. ohmic potential
b. the concentration of ions in the solution
c. concentration polarization
d. Kinetic polarization

36. Which of the following is not correct about the coulometry method of analysis?
a. It is an electrochemical method based on the measurement of the quantity of electricity needed to convert the analyte quantitatively to a different oxidation state
b. Current is applied from an external source forcing a nonspontaneous chemical reaction to take place
c. standardization is not usually necessary

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d. It is faster and more convenient than gravimetric measurements

. Coulometric titrations are subject to the following potential sources of error, except:

a. variation in the current during electrolysis
b. the departure of the process from 100% current efficiency
c. error in the potential measurement
d. Error in the measurement of time

38. A 0.3619 g (1.39×10^{-5} moles) sample of tetrachloropicolinic acid, $C_6HNO_2Cl_4$, is dissolved in distilled water, transferred to a 1000-ml, volumetric flask, and diluted to volume. An exhaustive controlled-potential electrolysis of a 10.00-mL portion of this solution at a spongy silver cathode requires 5.374 C of charge. What is the number of moles of electrons (n) transferred for this reduction reaction? (Faradays constant = 96487 C)
Hint: $n_A=Q/nF$

$n_A = \frac{Q}{nF}$

A. 4.01 B. 0.25 C. 0.02 D. 5.00

39. Which of the following is not correct about your operation in the lab?

A. Do not touch or smell any chemical in the laboratory without an instruction from the lab instructor
B. Do not touch your face, eyes, or mouth while in the laboratory except after removing your gloves
C. Always hold chemical containers away from your body
D. Carefully check the label on the bottle before using its content.

$Cl^- + AgNO_3$

40. Correct practice to ensure accuracy in the use of a burette includes the following except:

A. When reading the liquid level in a burette, your eyes should be at the same height as the top of the liquid to avoid the error of parallax
B. Liquid should drain evenly down the wall of a burette, the tendency of liquid to stick to the glass wall is reduced by draining the burette slowly
C. A common burette error is caused by failure to expel the air bubble often found beneath the valve, you can dislodge the bubble by shaking the burette a couple of times
D. Before filling a burette with fresh solution, rinse it several times with small portions of the new solution, discarding each wash.

41. In the Volhard and Mohr methods, the solutions filled in the burette are?

(A) Silver nitrate and potassium chromate (B) Ferric ammonium sulphate and silver nitrate (C) Potassium thiocyanate and silver nitrate (D) Potassium chromate and silver nitrate

42. The indicators used in the Mohr and Volhard methods are?

(A) Fe^{3+} indicator and Phenolphthalein (B) Potassium chromate and Ferric ammonium sulfate ($NH_4Fe(SO_4)_2.\ 12H_2O$) (C) Fluorescein and potassium chromate (D) Eosin and methyl orange

43. Arsenic in a 9.13 g sample of pesticide was converted to AsO_4^{3-} and precipitated as Ag_3AsO_4 with 50.00 mL of 0.02105 M $AgNO_3$. The excess Ag^+ was then titrated with 4.75 mL of 0.04321 M KSCN. Calculate the % of As_2O_3 in the sample.

A. 2.331% B. 0.528% C. 0.291% D. 5.267%

44. What mass of Ag_2CO_3 (in mg) is formed from the reaction of $AgNO_3$ with 2.33 g of Na_2CO_3? [Formula mass g/mol: Ag_2CO_3 (275.7); $AgNO_3$ (169.9); Na_2CO_3 (106.0)].

(A) 6.06 mg (B) 10.20 mg (C) 6.06 g (D) 0.0061 g

$2AgNO_3 + Na_2CO_3 \rightarrow Ag_2CO_3 + 2NaN$
2.33g 2.33g ?

45. An excess amount of 0.0500 $molL^{-1}$ solution of silver nitrate is added to 50.0 mL of a solution containing an unknown concentration of chloride ions. Some amount of potassium chromate is added and used as an indicator. The endpoint of the titration is marked by the formation of silver chromate ions according to the reaction:

$2Ag^+_{(aq)} + CrO_4^{2-}{}_{(aq)} \longrightarrow Ag_2CrO_{4(s)}$

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$AsO_4^{3-} + 3AgNO_3 \rightarrow Ag_3AsO_4 + 3NO_3^-$

$6.06g \times \frac{1mg}{10^{-3}}$

$Ag + KSCN$
4.75mL

The average titre value after 5 repeated experiments is 18.50 mL. Calculate the concentration of chloride in $mmolL^{-1}$.

(A) 185.0 $mmolL^{-1}$ (B) 61.7 $mmolL^{-1}$ (C) 92.5 $mmolL^{-1}$ (D)18.5 $mmolL^{-1}$

46. A 5.0 mL portion of vinegar with a density of 1.008 g/mL requires 42.03 mL of 0.1002 M NaOH solution for titration. Calculate the weight percent (wt%) of acetic acid in the sample. (Molar mass of acetic acid = 60 g/mol).

(A) 25.0% (B) 50.2 % (C) 100.0% (D) 112.4%

47. Calculate the standard deviation or error margin in the weight of these vitamin C tablets: 0.11 g, 0.12 g, and 0.10 g.

(A) 0.01 (B) 0.20 (C) 0.05 (D) 0.10

48. From question 47 above, calculate the % ascorbic acid in the first tablet if the actual weight found when dissolved in 10 cm^3 of water is 0.09 g?

(A) 163.62% (B) 81.81% (C) 41.00% (D) 20.52%

49. Provide the name, colour, and formula of the compound that is precipitated during the precipitation titration using Mohr's method.

(A) Silver chromate, Red-brown precipitate, $Ag_2Cr_2O_4$ (B) Potassium thiocyanate, Red-brown precipitate, KSCN (C) Siver nitrate, brick-red, $AgNO_3$ (D) Silver nitrate, Red-brown precipitate, $AgNO_3$

50. State the function of $BaCl_2$ in the gravimetric determination of sulphate?

(A) Complexometric agent
(B) Hydrating agent
(C) Precipitating agent
(D) Drying agent

51. An empty weighing bottle has a mass of 10.283 g. After water was added from a 25-mL pipet, the mass was 35.225g. The prevailing temperature was 23°C. Find the true volume of the water delivered by the pipet if 1g of H_2O has a volume of 1.0035 mL at 23°C.

A. 25.03 mL B. 24.86 mL C. 25.30 mL D. 224.68 mL

52. A standard solution of 0.0500 M that was prepared at 10 °C was re-standardized before use in summer with a temperature of 30°C. and its concentration was found to be 0.0498 M. What is the expected concentration of the solution with the prevailing summer temperature? (density of the solution is 0.99970g/mL @ 10°C and 0.99570 g/mL @ 30°C)

A. 0.0502M B. 0.0498 C. 0.0489 M D. 0.0520 M

53. How would you use a volumetric flask to prepare 250.00 mL of 0.0150 M K_2SO_4? (K = 39 g/mol, S = 32 g/mol, O = 16 g/mol)

A. Dissolve 652.5 mg K_2SO_4 salt in 250 mL distilled water
B. Dissolve 625.5 mg K_2SO_4 salt in 250 mL distilled water
C. Dissolve 625.5 mg K_2SO_4 salt in distilled water to make 250 mL
D. Dissolve 652.5 mg K_2SO_4 salt in distilled water to make 250 mL

54. You are to prepare 250.00 mL of 1.00 M solution of KNO_3 at 20°C, but the lab (and water) temperature is 25°C at the time of preparation. How many grams of the solid KNO_3 (density = 2.109 g/mL) should be dissolved in a volume of 250.00 mL at 25°C to give a 1.00 M solution at 20°C? (K = 39 g/mole, O = 16 g/mole, N = 14 g/mole, the density of water equals 0.9982071 g/mL and 0.9970479 g/mL at 20°C and 25°C respectively)

A. 25.2210 g B. 25.2794 g C. 25.2749 g D. 25.2207 g

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55. The true volume of a 25 mL volumetric flask is 25.037 mL at 25 °C. What mass of water would be contained in the flask at this temperature? (1 g of water has a volume of 1.0039 mL/g at 25°C)

A. 24.9397 g B. 25.1335 g C. 25.0975 g D. 24.9039 g

56. The pH of a buffer solution is 3.09. What is the activity of H^+ in the buffer?

A. 1.23×10^{4} B. 8.12×10^{-4} C. 1.23×10^{4} D. 8.13×10^{-4}

57. Which of the following statements is/are correct?

I. Saturated reference electrodes are most widely used because the $[Ag^+]$ does not change with loss of liquid to evaporation.

II. A good reference electrode responds to the components of the test solution.

III. The half cell reaction at the silver/silver reference electrode is given as:

$$AgCl_{(s)} + e^- \rightleftharpoons Ag_{(s)} + Cl^-_{(aq)}.$$

IV. Calomel reference electrode with 1 M KCl is the most stable.

A. I & II only B. III & IV C. II only D. III only

58. A solution of potassium permanganate ($KMnO_4$) was found to be 0.0514 M at 27 °C. What was the percentage change in its molarity when the lab temperature dropped to 16 °C? (density of water = 0.9965162 g/mL @ 27 °C & 0.9989460 g/mL @ 16°C)

A. -0.39% B. -0.19% C. 0.19% D. 0.39%

59. Calculate the concentration of H^+ for a water sample that has a pH of 6.25 if the activity coefficient of the sample is 0.854 at an ionic strength of 0.025.

A. 4.80×10^{-7} M B. 2.25×10^{-5} M C. 6.58×10^{-7} M D. 5.62×10^{-7} M

60. Calculate the concentration of H^+ for a water sample that has a pH of 3.25 if the activity coefficient of the sample is 0.854 at an ionic strength of 0.025.

A. 5.62×10^{-4} M B. 1.78×10^{3} M C. 6.58×10^{-4} M D. 2.08×10^{3} M

61. A cyanide ion selective electrode obeys the equation: E = constant – 0.05916 log[CN^-]. When the electrode was immersed in a standard solution of 0.001M NaCN, the potential reading was -0.230 V. What will be the potential reading when the electrode is immersed in a 0.003M solution of NaCN?

A. -0.258 V B. 0.258 V C. -0.557 V D. 0.557 V

62. Which of the following is true about Ethylenediaminetetraacetic acid (EDTA)?

(i) It is an aminocarboxylic acid (ii) Its fully deprotonated form is Y^{2-} (iii) it has three binding sites (iv) can donate six pairs of electrons to a metal ion.

(A) All of the above (B) (i), & (ii) only (C) (ii) & (iv) only (D) (i) & (iv) only

63. Which of the following properties is not true about the EDTA metal ligand complex, in which EDTA forms a cage-like structure around the metal ion?

(A) form an unstable compound (B) all metal–EDTA complexes have a 1:1 stoichiometry

(C) The actual number of coordination sites depends on the size of the metal ion (D) Option A and C

64. Which of the following options represents an inorganic chelating agent?

(A) 8-hydroxyquinoline and Cupferron (B) Cupferron and water

(C) Dimethylglyoxime and ammonia (D) Salicylaldoxime and ammonia.

65. Glycine (Gly) is an example of:

(A) Monodentate ligand (B) tridentate ligand

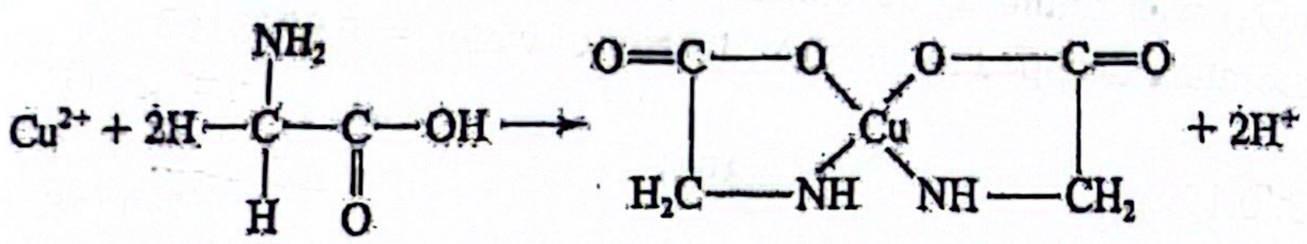
(C) Hexadentate ligand (D) Bidentate ligand

66. A chelate is produced when a metal ion coordinates with two or more donor groups of a single ligand to form:
(i) five- or six-membered heterocyclic ring (ii) three or four-membered heterocyclic ring (iii) four or six-membered heterocyclic ring (iv) three or five-membered heterocyclic ring.
(A) (iv) only (B) (i) & (ii) only (C) (i) only (D) (i), (ii) & (iii) only

67. Fraction (α) of the most basic form of EDTA (Y^{4-}) is defined by the H^+ concentration and acid-base equilibrium constants. Calculate the molar concentration of Y^{4-} in a 0.0200 M EDTA solution buffered to a pH of 4.00. (Note: the value of $\alpha_{Y^{4-}}$ for EDTA at 20 °C and pH 4 = 3.0×10^{-9}).
(A) 6.0×10^{-3} M (B) 60.0×10^{-3} M (C) 6.0×10^{-11} M (D) 60.0×10^{-11} M

68. If the equilibrium concentration of Ni^{2+} in a solution with an analytical NiY^{2-} concentration of 0.0150M at pH 8.0 is 2.9×10^{-9} M. Calculate K_f
(A) 42.0×10^{-17} (B) 42.0×10^{17} (C) 3.1×10^{18} (D) 3.1×10^{-18}

69. The name of the complex formed from the reaction below is:



(A) Chlorophyllin (B) Copper phthalocyanine
(C) Copper(II) glycinate (D)Copper(II) acetylacetonate.

70. Which of the following is/are correct about a complexometric titration?
(i) The technique involves titrating metal ions with a complexing or chelating agent (Ligand).
(ii) Ligands can be any electron-donating entity, which can bind to the metal ion and produce a complex ion.
(iii)The number of electrovalent bonds a cation tends to form with electron donors is its coordination number.
(iv) Typical values for coordination numbers are two, four, and six. (v) The species formed as a result of coordination can only be electrically positive.
(A) All of the above (B) (i), (ii) & (iii) (C) (i), (ii) & (iv) (D) (ii), (iii) & (iv)

71. Calculate the pAg of the solution during the titration of 50.00 mL of 0.0500 M NaCl with 0.1000 M $AgNO_3$ after the addition of 24.50 mL of $AgNO_3$ [K_{sp} (AgCl) = 1.82×10^{-10}].
A. 6.57 B. 4.87 C. 3.18 D. 10.25

NaCl + $AgNO_3$

C_1V_1 =

$n = CV$

TYPE 4