ICSE 2024 EXAMINATION

CHEMISTRY

SAMPLE PAPER - 10

Time allowed: Two hours ***Max. Marks : 80***

Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 15 minutes.
This time is to be spent in reading the question paper.
The time given at the head of this Paper is the time allowed for writing the answers.

Section A is compulsory. Attempt any four questions from Section B.
The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A

(Attempt all questions from this Section.)

Question 1 : Choose one correct answer to the questions from the given options : **[15]**

(i) A particular solution contains molecules and ions of the solute so it is a :
(a) weak acid (b) strong acid (c) strong base (d) salt solution.

(ii) A compound which liberates reddish brown gas around the anode during electrolysis in its molten state is :
(a) Sodium chloride (b) Copper(II) oxide (c) Copper(II) sulphate (d) Lead(II) bromide

(iii) An organic compound undergoes addition reactions and gives a red colour precipitate with ammoniacal cuprous chloride. Therefore, the organic compound could be :
(a) Ethane (b) Ethene (c) Ethyne (d) Ethanol

(iv) An organic weak acid is :
(a) Formic acid (b) Sulphuric acid (c) Nitric acid (d) Hydrochloric acid

(v) During ionization metals lose electrons, this change can be called :
(a) Oxidation (b) Reduction (c) Redox (d) Displacement

(vi) Which one of the following is not true of metals :
(a) Metals are good conductors of electricity (b) Metals are malleable and ductile
(c) Metals from non-polar covalent compounds
(d) Metal will have 1 or 2 or 3 electrons in their valence shell

(vii) An example of a complex salt is :
(a) Zinc sulphate (b) Sodium hydrogensulphate
(c) Iron(II) ammonium sulphate (d) Tetrammine copper(II) sulphate.

(viii) Aqua regia is a mixture of :
(a) Dilute hydrochloric acid and concentrated nitric acid.
(b) Concentrated hydrochloric acid and dilute nitric acid.
(c) Concentrated hydrochloric acid [1 part] and concentrated nitric acid [3 parts]
(d) Concentrated hydrochloric acid [3 parts] and concentrated nitric acid [1 part]

(ix) The organic compound mixed with ethanol to make it spurious is :
(a) Methanol (b) Methanoic acid (c) Methanal (d) Ethanoic acid

(x) The number of electrons present in the valence shell of a halogen is :
(a) 1 (b) 3 (c) 5 (d) 7

(xi) Which of the following is a common characteristic of a covalent compound?
(a) High melting point. (b) Conducts electricity when it is in the molten state.
(c) Consists of molecules. (d) Always soluble in water.

(xii) Ammonium hydroxide will produce a reddish brown precipitate when added to a solution of :
(a) $CuSO_4$ (b) $Zn(NO_3)_2$ (c) $FeSO_4$ (d) $FeCl_3$

(xiii) A salt which in solution gives a bluish white precipitate with NaOH solution and a white precipitate with $BaCl_2$ solution is :
(a) $CuSO_4$ (b) $FeSO_4$ (c) $Fe_2(SO_4)_3$ (d) $CuCl_2$

(xiv) Hydrogen chloride can be obtained by adding concentrated sulphuric acid to :
(a) NaCl (b) Na_2SO_4 (c) Na_2CO_3 (d) $NaNO_3$

(xv) Which of the following reactions gives copper as a product?
(a) Passing dry ammonia over heated copper oxide. (b) Adding dilute hydrochloric acid to copper oxide.
(c) Heating copper oxide. (d) Passing oxygen over heated copper oxide?

Question 2

(i) The questions below are related to the manufacture of ammonia. [5]
(a) Name the process. (b) In what ratio must the reactants be taken?
(c) Name the catalyst used. (d) Give the equation for the manufacture of ammonia.
(e) Ammonia can act as a reducing agent — write a relevant equation for such a reaction.

(ii) Match the alloys given in column A to the uses given in column B : [5]

Column A	Column B
(a) Duralumin	1. Electrical fuse
(b) Solder	2. Surgical instruments
(c) Brass	3. Aircraft body
(d) Stainless Steel	4. Decorative articles
(e) Bronze	5. Statues, medals, etc.

(iii) Complete the following by choosing the correct answers from the bracket : [5]
(a) Metals are good _____ (oxidizing agents / reducing agents) because they are electron _____ (acceptors / donors).
(b) Electrovalent compounds have _____ (high / low) melting points.
(c) Higher the pH value of a solution, the more _____ (acidic / alkaline) it is.
(d) _____ ($AgCl$ / $PbCl_2$), a white precipitate is soluble in excess NH_4OH.
(e) Conversion of ethene to ethane is an example of _____ (hydration / hydrogenation).

(iv) Identify the following : [5]
(a) An acidic gas which gives dense white fumes with NH_3 .
(b) An alkane whose molecular mass is 58. (H = 1; C = 12)
(c) A solid which when kept in the open, forms a solution after sometime.
(d) An alloy used in electrical fittings.
(e) A metal which gives hydrogen gas on reacting with both dilute acid and alkali.

(v) Draw different isomers having the following molecular formula : [5]
(a) C_5H_{12} (chain) (b) C_4H_8 (position).

Section B

*(Attempt **any four** questions.)*

Question 3

(i) Aqueous copper sulphate solution is electrolysed using copper electrode. [2]
(a) What happens to anode?
(b) What happens to electrolyte (copper sulphate solution)?

(ii) Write the products and balance the equation. [2]

(a) $(NH_4)_2SO_4 + NaOH \longrightarrow$ (b) $KMnO_4 + HCl \longrightarrow$

(iii) Li, Be, B, C, N, O, F, Ne, Na, Mg, Al, Si, P, S, Cl, Ar, K and Ca. [3]

Amongst the list of elements given above pick out :

(a) Most electropositive element (b) Most electronegative element (c) Noble gases

(iv) Complete the following by selecting the correct option from the choices given : [3]

(a) pH of acetic acid is greater than dilute sulphuric acid. So acetic acid contains _____ concentration of H^+ ions. (greater, same, low)

(b) The indicator which does not change colour on passage of HCl gas is _____. (methyl orange, moist blue litmus, phenolphthalein)

(c) The acid which cannot act as an oxidizing agent is _____. (conc. H_2SO_4, conc. HNO_3, conc. HCl)

Question 4

(i) The following questions are relevant to the extraction of Aluminium : [2]

(a) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite.

(b) Give a balanced chemical equation for the above reaction.

(ii) A compound made up of two elements X and Y has an empirical formula X_2Y. If the atomic weight of X is 10 and that of Y is 5 and the compound has a vapour density 25, find its molecular formula. [2]

(iii) (a) What is the special feature of the apparatus that is used in the laboratory preparation of nitric acid? [3]

(b) Why should the temperature of the reaction mixture of nitric acid not be allowed to rise above 200°C?

(iv) Explain the following : [3]

(a) During electrolysis of molten lead bromide graphite anode is preferred to other electrodes.

(b) The electrical conductivity of acetic acid is less in comparison to the electrical conductivity of dilute sulphuric acid at a given concentration.

(c) Difference between calcination and roasting.

Question 5

(i) (a) Why do covalent compounds exist as gases, liquids or soft solids? [2]

(b) Which electrode : anode or cathode is the oxidising electrode? Why?

(ii) Name a probable cation present based on the following observations : [2]

(a) Dirty green precipitate insoluble in ammonium hydroxide.

(b) White precipitate sparingly soluble in sodium hydroxide.

(iii) Give **balanced chemical equations** for the following conversions A, B and C : [3]

$$Fe \xrightarrow{A} FeCl_3 \xrightarrow{B} FeCO_3 \xrightarrow{C} Fe(NO_3)_2$$

(iv) State one **relevant** observation for each of the following: [3]

(a) Ammonium hydroxide solution is added to copper (II) nitrate solution in small quantities and then in excess.

(b) Ammonium hydroxide solution is added to zinc nitrate solution in minimum quantities and then in excess.

(c) Lead nitrate crystals are heated in a hard glass test tube.

Question 6

(i) State what would you observe when : [2]

(a) Washing soda crystals are exposed to the atmosphere.

(b) The salt ferric chloride is exposed to the atmosphere.

(ii) LPG stand for liquefied petroleum gas. Varieties of LPG are marketed including a mixture of propane (60%) and butane (40%). If **10 litre** of this mixture is burnt, find the total volume of carbon dioxide gas added to the atmosphere. Combustion reactions can be represented as: [2]

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$$

$$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(g)$$

(iii) Some properties of sulphuric acid are listed below. Choose the property A, B, C, or D which is responsible for the reactions (a) to (c). [3]

A : Acid B : Dehydrating agent C : Non-volatile acid D : Oxidizing agent

(a) $S + 2H_2SO_4 \longrightarrow 3SO_2 + 2H_2O$ (b) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$

(c) $CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$

(iv) Identify **the acid** which matches the following description (a) to (c) : [3]

(a) The acid which produces sugar charcoal from sugar.

(b) The acid which is prepared by catalytic oxidation of ammonia.

(c) The acid on mixing with lead nitrate solution produces a white precipitate which is insoluble even on heating.

Question 7

(i) A gaseous hydrocarbon of vapour density 29, contains 82.76% of carbon. Calculate its empirical formula and molecular formula. [C = 12, H = 1] [2]

(ii) Name the functional group present in [2]

(a) CH_3COCH_3 (b) CH_3CHO

(iii) A metal article is to be electroplated with silver. The electrolyte selected is sodium argentocyanide. [3]

(a) State one condition to ensure that the deposit is smooth, firm and long lasting.

(b) Write the reaction taking place at the cathode.

(c) Write the reaction taking place at the anode.

(iv) (a) Give two examples of weak acids. [3]

(b) Give two examples of bases which are not soluble in water.

(c) The pH of a solution is 5. To this solution is added a liquid when the pH decreases to 3. What is nature of liquid added to the solution?

Question 8

(i) Give the electron dot structure of the following : [2]

(a) NH_3 (b) H_3O^+

(ii) Answer the following questions: [2]

(a) How will you distinguish between Ammonium hydroxide and Sodium hydroxide using copper sulphate solution?

(b) How will you distinguish between dilute hydrochloric acid and dilute sulphuric acid using lead nitrate solution?

(iii) Name the particles present in : [3]

(a) Strong electrolyte (b) Non-electrolyte (c) Weak electrolyte

(iv) The metals of Group 2 from top to bottom are Be, Mg, Ca, Sr, and Ba. [3]

(a) Which one of these elements will form ions most readily and why?

(b) State the common feature in the electronic configuration of all these elements.

SOLUTION

Time allowed: Two hours *Max. Marks* : **80**

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SECTION A

*(Attempt **all** questions from this Section.)*

Question 1 : Choose one correct answer to the questions from the given options : **[15]**

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(iii) An organic compound undergoes addition reactions and gives a red colour precipitate with ammoniacal cuprous chloride. Therefore, the organic compound could be :
(a) Ethane (b) Ethene (c) Ethyne (d) Ethanol

(iv) An organic weak acid is :
(a) Formic acid (b) Sulphuric acid (c) Nitric acid (d) Hydrochloric acid

(v) During ionization metals lose electrons, this change can be called :
(a) Oxidation (b) Reduction (c) Redox (d) Displacement

(vi) Which one of the following is **not** true of metals :
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(c) Metals from non-polar covalent compounds
(d) Metal will have 1 or 2 or 3 electrons in their valence shell

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(b) Concentrated hydrochloric acid and dilute nitric acid.
(c) Concentrated hydrochloric acid [1 part] and concentrated nitric acid [3 parts]
(d) Concentrated hydrochloric acid [3 parts] and concentrated nitric acid [1 part]

(ix) The organic compound mixed with ethanol to make it spurious is :

(a) Methanol (b) Methanoic acid (c) Methanal (d) Ethanoic acid

(x) The number of electrons present in the valence shell of a halogen is :

(a) 1 (b) 3 (c) 5 (d) 7

(xi) Which of the following is a common characteristic of a covalent compound?

(a) High melting point.

(b) Conducts electricity when it is in the molten state.

(c) Consists of molecules.

(d) Always soluble in water.

(xii) Ammonium hydroxide will produce a reddish brown precipitate when added to a solution of :

(a) $CuSO_4$ (b) $Zn(NO_3)_2$ (c) $FeSO_4$ (d) $FeCl_3$

(xiii) A salt which in solution gives a bluish white precipitate with NaOH solution and a white precipitate with $BaCl_2$ solution is :

(a) $CuSO_4$ (b) $FeSO_4$ (c) $Fe_2(SO_4)_3$ (d) $CuCl_2$

(xiv) Hydrogen chloride can be obtained by adding concentrated sulphuric acid to :

(a) NaCl (b) Na_2SO_4 (c) Na_2CO_3 (d) $NaNO_3$

(xv) Which of the following reactions gives copper as a product?

(a) Passing dry ammonia over heated copper oxide. (b) Adding dilute hydrochloric acid to copper oxide.

(c) Heating copper oxide. (d) Passing oxygen over heated copper oxide?

ANSWERS

(i) (d) **(ii)** (d) **(iii)** (c) **(iv)** (a) **(v)** (a) **(vi)** (c) **(vii)** (d) **(viii)** (d)

(ix) (a) **(x)** (d) **(xi)** (c) **(xii)** (d) **(xiii)** (a) **(xiv)** (a) **(xv)** (a)

Question 2

(i) The questions below are related to the manufacture of ammonia. [5]

(a) Name the process.

(b) In what ratio must the reactants be taken?

(c) Name the catalyst used.

(d) Give the equation for the manufacture of ammonia.

(e) Ammonia can act as a reducing agent — write a relevant equation for such a reaction.

Ans. (a) Haber's process.

(b) Nitrogen (1 part), hydrogen (3 parts) by volume.

(c) Iron containing molybdneum as promoter.

(d) $N_2(g) + 3H_2(g) \underset{450°C - Fe\text{-}Mo}{\overset{200 - 900\ Atms}{\rightleftharpoons}} 2NH_3(g)$

(e) $3CuO + 2NH_3(g) \xrightarrow{heat} 3Cu + N_2 + 3H_2O$

(ii) Match the alloys given in column A to the uses given in column B : [5]

Column A	Column B
(a) Duralumin	1. Electrical fuse
(b) Solder	2. Surgical instruments
(c) Brass	3. Aircraft body
(d) Stainless Steel	4. Decorative articles
(e) Bronze	5. Statues, medals, etc.

Ans. (a) 3. (b) 1. (c) 4. (d) 2. (e) 5.

(iii) Complete the following by choosing the correct answers from the bracket : [5]

(a) Metals are good _____ (oxidizing agents / reducing agents) because they are electron _____ (acceptors / donors).

(b) Electrovalent compounds have _____ (high / low) melting points.

(c) Higher the pH value of a solution, the more _____ (acidic / alkaline) it is.

(d) _____ ($AgCl$ / $PbCl_2$), a white precipitate is soluble in excess NH_4OH.

(e) Conversion of ethene to ethane is an example of _____ (hydration / hydrogenation).

Ans. (a) 1. Reducing agents 2. Donors

(b) High (c) Alkaline (d) AgCl (e) Hydrogenation.

(iv) Identify the following : [5]

(a) An acidic gas which gives dense white fumes with NH_3 .

(b) An alkane whose molecular mass is 58. (H = 1; C = 12)

(c) A solid which when kept in the open, forms a solution after sometime.

(d) An alloy used in electrical fittings.

(e) A metal which gives hydrogen gas on reacting with both dilute acid and alkali.

Ans. (a) HCl gas (b) Butane (c) Anhydrous calcium chloride (d) Brass (e) Zinc metal

(v) Draw different isomers having the following molecular formula : [5]

(a) C_5H_{12} (chain) (b) C_4H_8 (position).

Ans. (a) $H_3C—CH_2—CH_2—CH_2—CH_3$ Pentane or *n*-pentane

$H_3C—CH(CH_3)—CH_2—CH_3$ 2-methyl butane or isopentane

$H_3C—C(CH_3)_2—CH_3$ 2-2 dimethyl propane or neopentane

(b) $H_3C—CH_2—CH=CH_2$ 1-butene

$H_3C—CH=CH—CH_3$ 2-butene

Section B

*(Attempt **any four** questions.)*

Question 3

(i) Aqueous copper sulphate solution is electrolysed using copper electrode. [2]

(a) What happens to anode?

(b) What happens to electrolyte (copper sulphate solution)?

Ans. (a) The anode slowly dissolves i.e., the loss in weight of the anode.

(b) The colour of copper sulphate does not change because loss in weight of the anode is always equal to the gain in weight of the cathode.

(ii) Write the products and balance the equation. [2]

(a) $(NH_4)_2SO_4 + NaOH \longrightarrow$

(b) $KMnO_4 + HCl \longrightarrow$

Ans. (a) $(NH_4)_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O + 2NH_3(g)$

(b) $2KMnO_4 + 16HCl \longrightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$

(iii) Li, Be, B, C, N, O, F, Ne, Na, Mg, Al, Si, P, S, Cl, Ar, K and Ca. [3]

Amongst the list of elements given above pick out :

(a) Most electropositive element

(b) Most electronegative element

(c) Noble gases

Ans. (a) Most electropositive element — K

(b) Most electronegative element — F

(c) Noble gases — Ne and Ar

(iv) Complete the following by selecting the correct option from the choices given : [3]

(a) pH of acetic acid is greater than dilute sulphuric acid. So acetic acid contains _____ concentration of H^+ ions. (greater, same, low)

(b) The indicator which does not change colour on passage of HCl gas is _____. (methyl orange, moist blue litmus, phenolphthalein)

(c) The acid which cannot act as an oxidizing agent is _____. (conc. H_2SO_4, conc. HNO_3, conc. HCl)

Ans. (a) Low (b) Phenolphthalein (c) Conc. HCl

Question 4

(i) The following questions are relevant to the extraction of Aluminium : [2]

(a) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite.

(b) Give a balanced chemical equation for the above reaction.

Ans. (a) The caustic alkali dissolves aluminium oxide to form sodium aluminate, but impurities do not dissolve in it.

(b) $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

(ii) A compound made up of two elements X and Y has an empirical formula X_2Y. If the atomic weight of X is 10 and that of Y is 5 and the compound has a vapour density 25, find its molecular formula. [2]

Ans. Empirical weight of $X_2Y = 2(10) + 1(5) = 25$

Vapour density of $X_2Y = 25$.

$\therefore$ Molecular weight of X_2Y $= 2 \times$ vapour density

$= 2 \times 25 = 50.$

Now, Molecular weight $= n \times$ empirical weight

$50 = n \times 25$

$\therefore \quad n = 2.$

$\therefore$ Molecular formula of compound $= n \times$ Empirical formula

$= 2 \times (X_2Y) = \mathbf{X_4Y_2}.$

(iii) (a) What is the special feature of the apparatus that is used in the laboratory preparation of nitric acid? [3]

(b) Why should the temperature of the reaction mixture of nitric acid not be allowed to rise above 200°C?

Ans. (a) The apparatus is all glass as nitric acid vapour is highly corrosive.

(b) If the temperature rises above 200°C, sodium sulphate is formed, which partially fuses in glass apparatus. Thus, glass apparatus becomes useless for further use.

(iv) Explain the following : [3]

(a) During electrolysis of molten lead bromide graphite anode is preferred to other electrodes.

(b) The electrical conductivity of acetic acid is less in comparison to the electrical conductivity of dilute sulphuric acid at a given concentration.

(c) Difference between calcination and roasting.

Ans. (a) Bromide ions discharge at anode to form bromine gas. This gas is highly corrosive and reacts with metallic anode. To avoid corrosion of anode, graphite is preferred as it does not react with bromine and is a good conductor of electricity.

(b) The acetic acid molecules dissociate very little (about 4%) compared to sulphuric acid molecules (about 90%). Thus, electrical conductivity of dilute acetic acid is less than dilute sulphuric acid.

(c) Calcination is the process of heating the concentrated ore in the absence of air, such that the temperature is not sufficient to melt it. But roasting is the process of heating the concentrated ore in the presence of air to a high temperature.

Question 5

(i) (a) Why do covalent compounds exist as gases, liquids or soft solids? [2]

(b) Which electrode : anode or cathode is the oxidising electrode? Why?

Ans. (a) The molecules of covalent compounds are acted upon by weak intermolecular forces. These forces are comparatively more than van der Waals' forces. However, they are fairly small, such that the molecules are not held firmly. So, the covalent compounds exist as gases or liquids or soft solids.

(b) Cathode is oxidising electrode. It is because it donates the electrons to positively charged ions and loss of electron means oxidation.

(ii) Name a probable cation present based on the following observations : [2]

(a) Dirty green precipitate insoluble in ammonium hydroxide.

(b) White precipitate sparingly soluble in sodium hydroxide.

Ans. (a) Fe^{2+} (b) Ca^{2+}

(iii) Give **balanced chemical equations** for the following conversions A, B and C : [3]

$$Fe \xrightarrow{A} FeCl_3 \xrightarrow{B} FeCO_3 \xrightarrow{C} Fe(NO_3)_2$$

Ans. A. $2Fe + 3Cl_2 \xrightarrow{Heat} 2\ FeCl_3$

B. (i) $2FeCl_3 + SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2FeCl_2 + 2HCl$

(ii) $FeCl_2 + Na_2CO_3 \longrightarrow FeCO_3 + 2NaCl$

C. $FeCO_3 + 2HNO_3 \longrightarrow Fe(NO_3)_2 + H_2O + CO_2$

(iv) State one **relevant** observation for each of the following: [3]

(a) Ammonium hydroxide solution is added to copper (II) nitrate solution in small quantities and then in excess.

(b) Ammonium hydroxide solution is added to zinc nitrate solution in minimum quantities and then in excess.

(c) Lead nitrate crystals are heated in a hard glass test tube.

Ans. (a) With small amount of ammonium hydroxide, a bluish white precipitate is formed. This precipitate dissolves in excess of ammonium hydroxide to form a deep blue solution.

(b) A white gelatin like precipitate is formed which dissolves in excess of ammonium hydroxide.

(c) It gives off a reddish brown gas (NO_2). The crystals crumble to form a powdery mass, which is yellow when hot and white when cold.

Question 6

(i) State what would you observe when : [2]

(a) Washing soda crystals are exposed to the atmosphere.

(b) The salt ferric chloride is exposed to the atmosphere.

Ans. (a) A fluffly white deposit is formed on the surface of crystals. The fluffy white deposit is $Na_2CO_3.H_2O$.

(b) It absorbs moisture from air to form reddish brown liquid.

(ii) LPG stand for liquefied petroleum gas. Varieties of LPG are marketed including a mixture of propane (60%) and butane (40%). If **10 litre** of this mixture is burnt, find the total volume of carbon dioxide gas added to the atmosphere. Combustion reactions can be represented as: [2]

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$$

$$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(g)$$

Ans. (a) Volume of CO_2 added by propane :

$$C_3H_8(g) + 5O_2(g) \longrightarrow 3CO_2(g) + 4H_2O(g)$$

By Gay Lussac's law: 1 Vol. | 5 Vol. | 3 Vol. | 4 Vol.

6 Lt | $3 \times 6 = 18$ Lt.

(b) Volume of CO_2 added by butane.

$$2C_4H_{10}(g) + 13O_2(g) \longrightarrow 8CO_2(g) + 10H_2O(g)$$

By Gay Lussac's law: 2 Vol → 8 Vol; 1 Vol → 4 Vol; 4 Lt → 4 × 4 = 16 Lt.

∴ Total volume of carbon dioxide added = (18 + 16) = 34 Lt.

(iii) Some properties of sulphuric acid are listed below. Choose the property A, B, C, or D which is responsible for the reactions (a) to (c). [3]

A : Acid B : Dehydrating agent C : Non-volatile acid D : Oxidizing agent

(a) $S + 2H_2SO_4 \longrightarrow 3SO_2 + 2H_2O$

(b) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$

(c) $CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$

Ans. (a) $S + 2H_2SO_4 \longrightarrow 3SO_2 + 2H_2O$ [D] Oxidizing agent

(b) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$ [C] Non-volatile acid

(c) $CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$ [A] Acid

(iv) Identify **the acid** which matches the following description (a) to (c) : [3]

(a) The acid which produces sugar charcoal from sugar.

(b) The acid which is prepared by catalytic oxidation of ammonia.

(c) The acid on mixing with lead nitrate solution produces a white precipitate which is insoluble even on heating.

Ans. (a) Concentrated sulphuric acid. (b) Nitric acid (c) Dilute sulphuric acid.

Question 7

(i) A gaseous hydrocarbon of vapour density 29, contains 82.76% of carbon. Calculate its empirical formula and molecular formula. [C = 12, H = 1] [2]

Ans. % age of carbon = 82.76%.

∴ % age of hydrogen = (100 – 82.76) = 17.24%

Elements	% age weight	At. wt.	Relative number of moles	Simple ratio of atoms
C	82.76	12	82.76 ÷ 12 = 6.89	6.89 ÷ 6.89 = 1 or 2
H	17.24	1	17.24 ÷ 1 = 17.24	17.24 ÷ 6.89 = 2.5 or 5

∴ Empirical formula of hydrocarbon is $\mathbf{C_2H_5}$.

∴ Empirical formula mass of hydrocarbon = 2(12) + 5(1) = 29

Vapour density of hydrocarbon = 29

∴ Molecular mass of hydrocarbon = 2 × V.D. = 2 × 29 = 58

Now, n × Empirical formula mass = Molecular mass

$n \times 29 = 58$

$n = 2$

∴ Molecular formula of hydrocarbon = n × Empirical formula = 2 × C_2H_5 = $\mathbf{C_4H_{10}}$.

(ii) Name the functional group present in [2]

(a) CH_3COCH_3 (b) CH_3CHO

Ans. (a) $\rangle C = O$ (Ketonic group) (b) $-CHO$ (Aldehydic group)

(iii) A metal article is to be electroplated with silver. The electrolyte selected is sodium argentocyanide. [3]

(a) State one condition to ensure that the deposit is smooth, firm and long lasting.

(b) Write the reaction taking place at the cathode.

(c) Write the reaction taking place at the anode.

Ans. (a) The metal to be electroplated should be absolutely free from oxides of metals, grease, etc., and low current density should be used.

(b) $Ag^+ + e^- \longrightarrow Ag$ [at cathode]

(c) $Ag - e^- \longrightarrow Ag^+$ [at anode]

(iv) (a) Give two examples of weak acids. [3]

(b) Give two examples of bases which are not soluble in water.

(c) The pH of a solution is 5. To this solution is added a liquid when the pH decreases to 3. What is nature of liquid added to the solution?

Ans. (a) (1) Carbonic acid (H_2CO_3) (2) Sulphurous acid (H_2SO_3).

(b) (1) Copper hydroxide [$Cu(OH)_2$] (2) Iron (II) hydroxide [$Fe(OH)_2$]

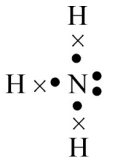
(c) Liquid is acidic in nature and has pH less than 3.

Question 8

(i) Give the electron dot structure of the following : [2]

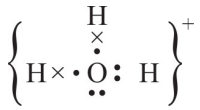
(a) NH_3 (b) H_3O^+

Ans. (a)



Ammonia (NH_3)

(b)



Hydronium ion (H_3O^+)

(ii) Answer the following questions: [2]

(a) How will you distinguish between Ammonium hydroxide and Sodium hydroxide using copper sulphate solution?

(b) How will you distinguish between dilute hydrochloric acid and dilute sulphuric acid using lead nitrate solution?

Ans. (a) Sodium hydroxide forms a pale blue precipitate which is insoluble in excess of sodium hydroxide.

Ammonium hydroxide forms a pale blue precipitate which dissolves in excess of ammonium hydroxide to form deep blue coloration.

(b) Hydrochloric acid forms a white precipitate with lead nitrate solution. This precipitate dissolves on warming the reaction mixture so as to form clear solution. Sulphuric acid forms a white precipitate with lead nitrate solution. This precipitate does not dissolve on warming the reaction mixture.

(iii) Name the particles present in : [3]

(a) Strong electrolyte (b) Non-electrolyte (c) Weak electrolyte

Ans. (a) Mainly ions (b) Only molecules (c) Ions and Molecules

(iv) The metals of Group 2 from top to bottom are Be, Mg, Ca, Sr, and Ba. [3]

(a) Which one of these elements will form ions most readily and why?

(b) State the common feature in the electronic configuration of all these elements.

Ans. (a) Barium will ionise most readily because the 2 electrons in its valence shell are far away from the nucleus. Thus, barium can easily donate these electrons and ionises readily.

(b) All the elements in the list have two valence electrons.

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