ICSE 2025 EXAMINATION

Sample Question Paper - 8

Chemistry

Time: 2 hrs. | | **Total Marks: 80**

SECTION-A

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

Question 1

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

(i) Ekta placed electrolysis circuit in copper sulphate solution and observed that the colour of copper sulphate remained unchanged. Which of the following electrodes she might have used?

X – anode: copper, cathode: copper

Y – anode: copper, cathode: platinum

Z – anode: platinum, cathode: copper

(a) Only Z

(b) Only Y

(c) Only X

(d) Both Y and Z

(ii) Common characteristic of a covalent compound is:

(a) High melting point

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

(c) Consists of molecules

(d) Always soluble in water.

(iii) Drying agent for ammonia is:

(a) Slaked lime

(b) Quicklime

(c) Baking soda

(d) Washing Soda

(iv) 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) $FeCl_3$

(v) **Assertion (A)**: Lead hydroxide reacts with caustic potash to form colourless solution.
  Reason (R): Potassium plumbite forms a colourless solution.
  (a) Both A and R are true and R is the correct explanation of A.
  (b) Both A and R are true but R is not the correct explanation of A.
  (c) A is true but R is false.
  (d) A is false but A is true.

(vi) Two volumes of carbon dioxide on combustion with one volume of oxygen gives two volumes of carbon dioxide at the same temperature and pressure. The ratio is:
  (a) 2:1:2
  (b) 1:2:1
  (c) 2:1:1
  (d) 1:2:2

(vii) During the electrolysis of acidified water which of the following takes place:
  (a) Oxygen is released at cathode
  (b) Oxygen is released at anode
  (c) Hydrogen is released at anode
  (d) Sulphur dioxide is released at anode

(viii) The no. of valence electrons in group 18 elements is:
  (a) 4
  (b) 6
  (c) 8
  (d) 2

(ix) Duralumin is an alloy of:
  (a) Al and Cu
  (b) Cu and Sn
  (c) Al and Ag
  (d) Al and Fe

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

(xi) **Assertion (A)**: Sodium chloride will conduct electricity only in the fused or aqueous solution state.
Reason (R): Ions are mobile in solid state.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but A is true.

(xii) Formation of chloroform from methane and chlorine is an example of:
(a) Addition
(b) Dehydration
(c) Substitution
(d) Elimination

(xiii) An insoluble salt obtained when Sulphur dioxide is passed through lime water is:
(a) Calcium Hydroxide
(b) Calcium Sulphate
(c) Calcium Sulphite
(d) Calcium Sulphide

(xiv) Due to great affinity towards oxygen, coating of metal oxide is formed, which does not allow any further reaction with acid. This metal is:
(a) Potassium
(b) Chromium
(c) Lead
(d) Aluminium

(xv) The element with the highest ionization potential in the periodic table is:
(a) He
(b) Ne
(c) Ar
(d) Xe

Question 2

(i) The diagram shows an experiment set up for the laboratory preparation of a pungent choking gas. [5]
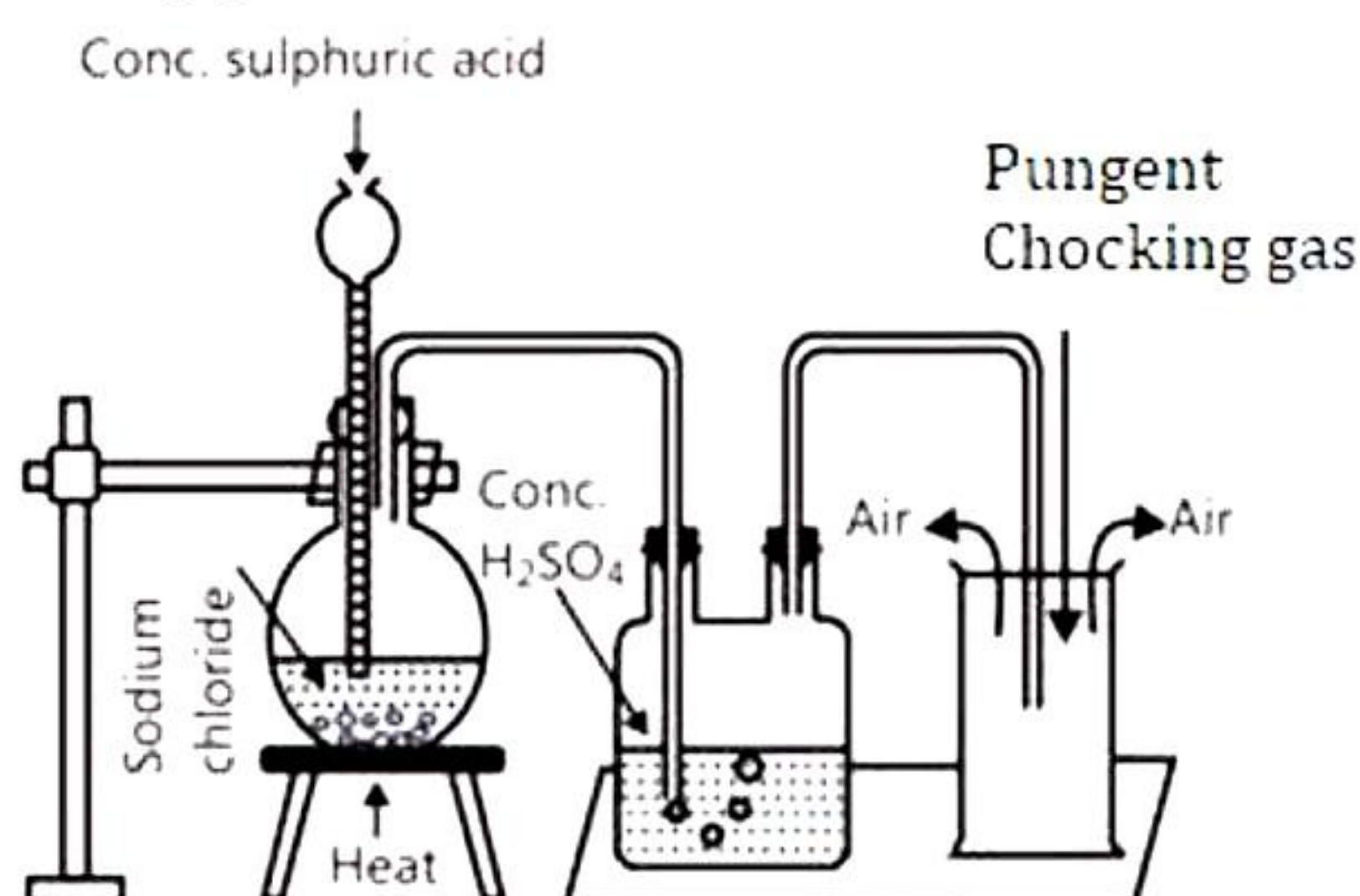
(a) Name the gas collected in the gas jar.
(b) Write a balanced chemical equation for the above preparation.
(c) How the gas being collected?
(d) Name the drying agent in this experiment?
(e) How will you find that the gas jar is full of gas?

(ii) Match the following Column A with Column B. [5]

Column A	Column B
(a) Duralumin	1. Shells of ammunition rounds
(b) Brass	2. Scientific Instruments
(c) Bronze	3. Joining electrical circuits
(d) Solder	4. Aircraft frames
(e) Magnalium	5. Coins

(iii) Complete the following by choosing the correct answers from the bracket: [5]
(a) As we move across a period _____ increases. (Atomic size, electron affinity)
(b) As we move down the group _____ decreases. (Metallic character, ionization potential)
(c) Inert gases have complete _____. (Octet, triplet)
(d) Ionization potential is the energy _____ (required/released)
(e) The vertical column in periodic table is called _____ (group/period)

(iv) Name the following: [5]
(a) Process of coating of iron with zinc.
(b) Alloy of lead and tin which is used in electrical circuits.
(c) Heating concentrated ore to high temperature in the presence of air
(d) Metal oxide which can be reduced by hydrogen.
(e) Substance added to the charge in the furnace to remove gangue.

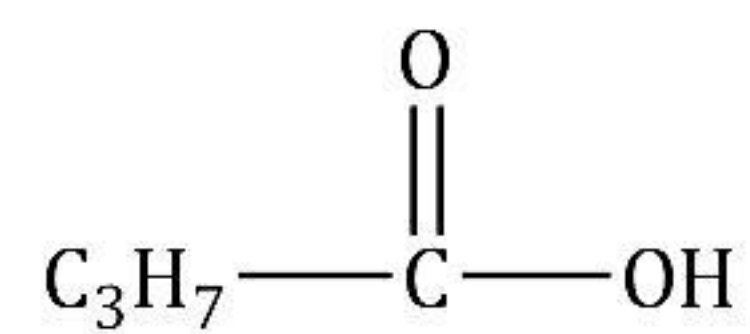(v)   [5]

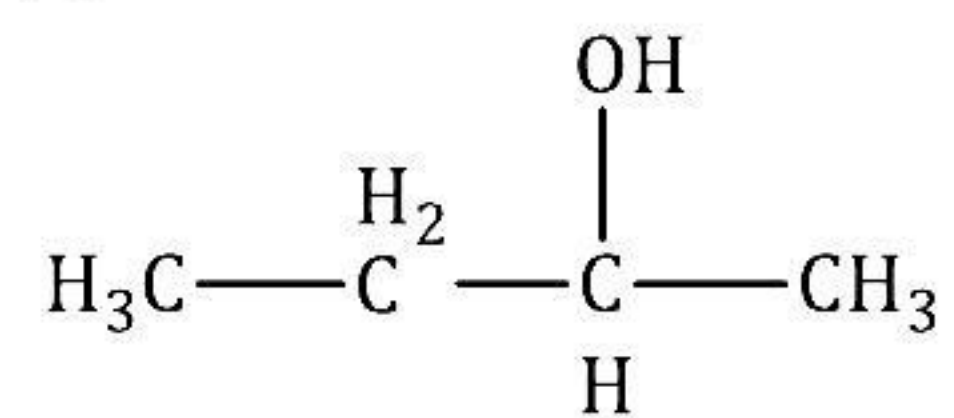   (a) Draw the structural formula for the following:

        1. Isobutane

        2. Pentanal

        3. Methanol

    (b) Name the following organic compounds in IUPAC system:

        1.

$$C_3H_7 \!-\! \overset{\overset{\textstyle O}{\|}}{C} \!-\! OH$$

        2.

$$H_3C \!-\! \overset{H_2}{C} \!-\! \overset{\overset{\textstyle OH}{|}}{\underset{\underset{\textstyle H}{|}}{C}} \!-\! CH_3$$

SECTION-B

(Attempt any four questions)

Question 3

(i) State whether the following statements are True or False. [2]
  (a) Carbon dioxide is a neutral oxide.
  (b) Acetic acid is a tribasic acid.

(ii) [2]
  (a) Define isomerism.
  (b) Give the IUPAC name of the isomer C_4H_{10} which has a branched chain.

(iii) What is the difference between [3]
  (i) Ionic compounds and polar covalent compounds
  (ii) Ionic compounds and covalent compounds
  (iii) Polar covalent compounds and non-polar covalent compounds

(iv) The teacher informed Kasturi that in Period 3 of the periodic table, an element B is placed to the left of an element A. Based on this information, she was asked to choose the correct word from the brackets to complete the following statements: [3]
  (a) Element B would have (lower/higher) metallic character than Element A.
  (b) Element A would probably have (lesser/higher) electron affinity than Element B.
  (c) Element A would have (greater/smaller) atomic size than Element B.

Question 4

(i) Complete the reaction with the balanced equation. [2]
   (i) $CaCO_3 + HCl \rightarrow$
   (ii) $Pb(NO_3)_2 + H_2SO_4 \rightarrow$

(ii) Give the preparation of the following salt. [2]
   (a) Ferric sulphate
   (b) Sodium sulphate

(iii) A gaseous hydrocarbon contains 82.76% of carbon. Given that its vapour density is 29, find its molecular formula. $[C = 12, H = 11]$ [3]

(iv) Identify the cations in each of the following three cases: [3]
   (a) Meenal added NaOH solution to Solution (A) which gave a reddish brown precipitate.
   (b) Sahil added NH_4OH solution to Solution (B) that gave a white ppt. which does not dissolve in excess.
   (c) Faiz added NaOH solution to Solution (C) that gave a white ppt. which is insoluble in excess.

Question 5

(i) Name the main component of the following alloys: [2]
   (a) Brass
   (b) Duralumin

(ii) Select the ion which would get selectively discharged from the aqueous mixture of the ions listed below: [2]
   (a) SO_4^{2-}, NO_3^- and OH^-
   (b) Pb^{2+}, Ag^+ and Cu^{2+}

(iii) Give reasons why [3]
   (a) Sodium chloride will conduct electricity only in the fused or aqueous solution state.
   (b) In electroplating an article with silver, the electrolyte sodium argentocyanide solution is preferred over silver nitrate solution.
   (c) Although copper is a good conductor of electricity, it is a non-electrolyte.

(iv) [3]
   (a) Name the most common ore of the metal aluminium from which the metal is extracted. Write the chemical formula of the ore.
   (b) Name the process by which impure ore of aluminium gets purified by using a concentrated solution of an alkali.

Question 6

(i) State your observations when ammonium hydroxide solution is added drop by drop and in excess to each of the following solutions: [2]

   (a) Copper sulphate solution

   (b) Zinc sulphate solution

(ii) Three solutions P, Q and R have a pH value of 3.5, 5.2 and 12.2, respectively. Which one of these is a [2]

   (a) Weak acid

   (b) Strong alkali

(iii) Study the figure given below and answer the questions which follow: [3]
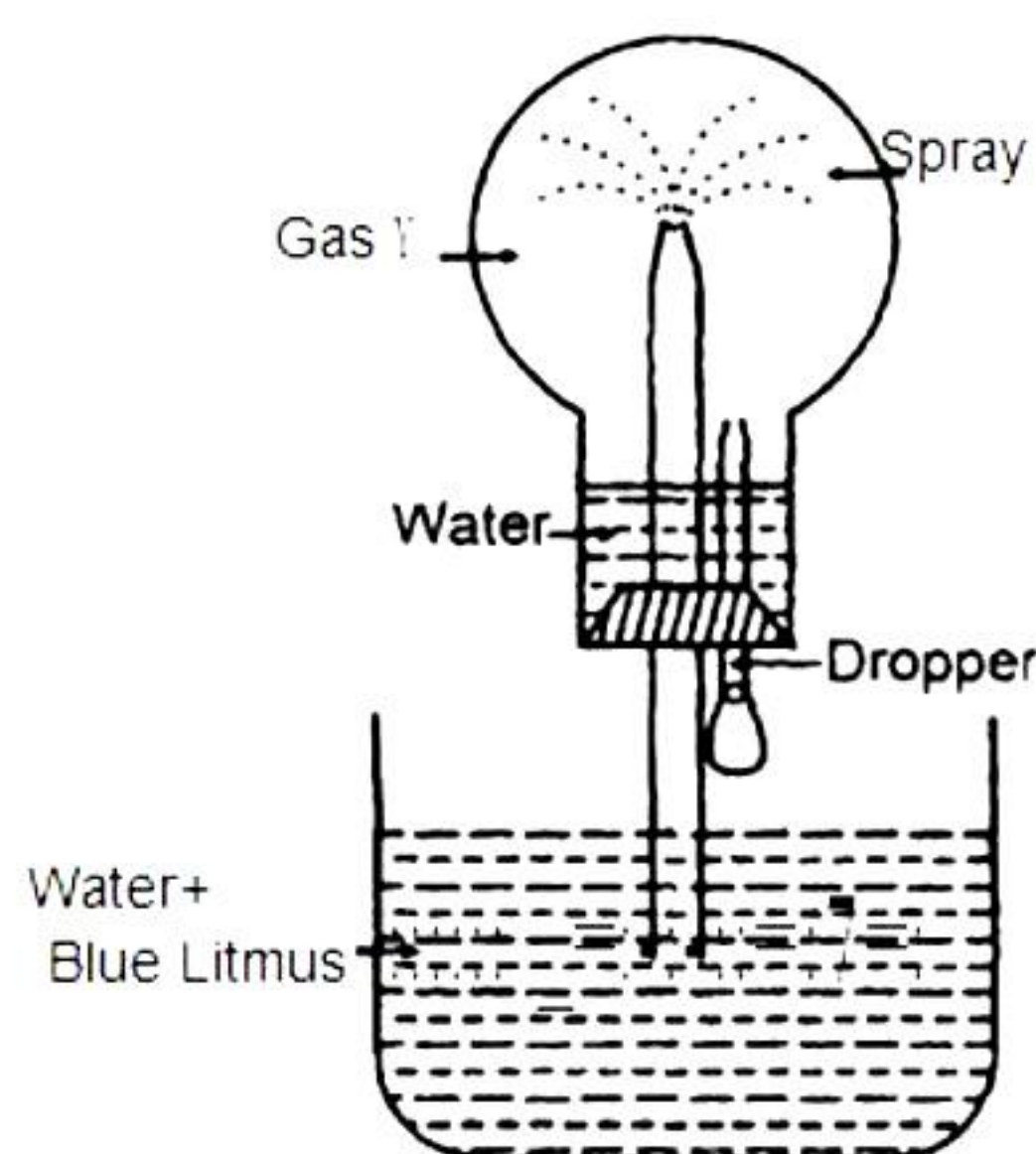
   i. Identify gas Y.

   ii. What property of gas Y does this experiment demonstrate?

   iii. Name another gas which has the same property and can be demonstrated through this experiment.

(iv) Calculate the percentage of the following: [3]

   (a) Oxygen in Nitric oxide (NO)

   (b) Carbon in ethane (C_2H_6)

   (c) Nitrogen in Urea [$(NH_2)_2CO$]

Question 7

(i) Calculate the volume of unused oxygen and the volume of carbon dioxide formed when 1250 cc of oxygen was burnt with 300 cc of ethane [C_2H_6]. [2]

$$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$$

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

   (a) Which of the following elements will form ions most readily and why?

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

(iii) The chemical reaction between concentrated nitric acid and phosphorous to produce phosphoric acid is an oxidation reaction which is represented by the following balanced chemical equation:

$P + 5HNO_3 \rightarrow H_3PO_4 + 5NO_2 + H_2O$

If 6.2 g of phosphorous was used in the reaction, calculate: [4]

(a) Number of moles of phosphorous taken and mass of phosphoric acid formed.

(b) Mass of nitric acid consumed at the same time if measured at 760 mm Hg pressure and 273 °C.

(c) The volume of steam produced at the same time if measured at 760 mm Hg pressure and 273 °C.

Question 8

(i) Draw the electron dot structure for the formation of ammonium ion. [2]

(ii) [2]

(a) Give reason: Sodium chloride will conduct electricity only in the fused or aqueous solution state.

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

(iii) Calculate the percentage of the following: [3]

(a) Oxygen in Nitric oxide (NO)

(b) Carbon in ethane (C_2H_6)

(c) Nitrogen in Urea [$(NH_2)_2CO$]

(iv) An element Y has atomic number 17. Answer the following questions. [3]

(a) State the period & group to which it belongs:

(b) Is it a metal or Non Metal?

(c) Write the formula between Y and any alkali metal.

Solution

SECTION A

Solution 1

(i)   (c)

(ii)   (c)

(iii)   (b)

(iv)   (d)

(v)   (a)

(vi)   (a)

(vii)   (b)

(viii)   (c)

(ix)   (a)

(x)   (a)

(xi)   (c)

(xii)   (c)

(xiii)   (c)

(xiv)   (d)

(xv)   (a)

Solution 2

(i)

    (a) HCl (Hydrogen chloride gas)

    (b) $2NaCl + H_2SO_4 \xrightarrow{<200^{\circ}C} Na_2SO_4 + HCl\uparrow$

    (c) The HCl gas is collected by upward displacement of air as it is 1.28 times heavier than air.

    (d) Conc. H_2SO_4.

    (e) When the jar is completely filled with hydrogen chloride, fumes appear above the jar's mouth. White fumes appear on exposing hydrogen chloride gas to air since it forms hydrochloric acid with atmospheric water vapour. This jar when brought near a rod dipped in ammonium hydroxide gives dense white fumes, which indicate the formation of ammonium chloride, as per the reaction given below.

    $HCl + NH_4OH \rightarrow NH_4Cl + H_2O$

(ii)

Column A	Solutions from Column B
(a) Duralumin	4. Aircraft frames
(b) Brass	1. Shells of ammunition rounds
(c) Bronze	5.Coins
(d) Solder	3. Joining electrical circuits
(e) Magnalium	2. Scientific Instruments

(iii)

(a) Electron affinity
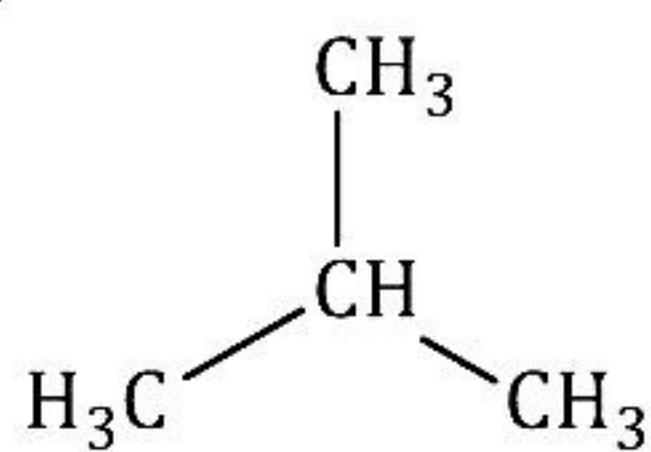(b) Metallic character
(c) Octet
(d) Required
(e) Group

(iv)

(a) Electroplating
(b) Solder
(c) Roasting
(d) PbO or CuO
(e) Flux

(v)

(a)

1.

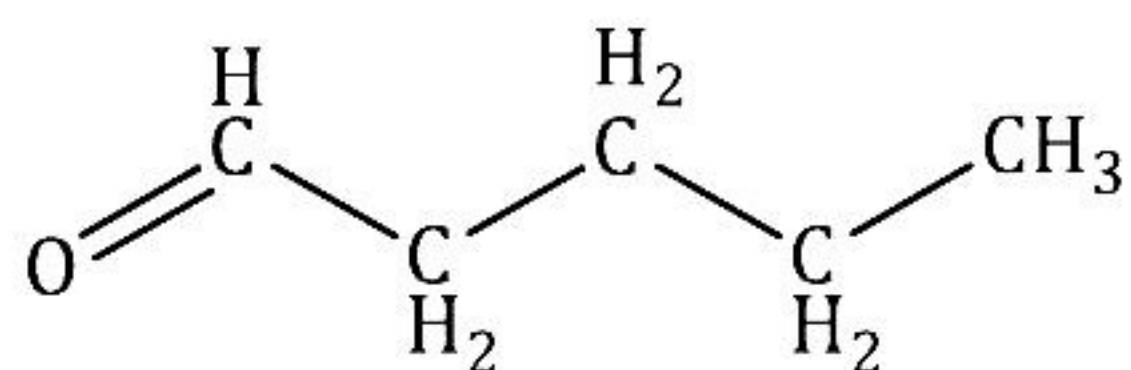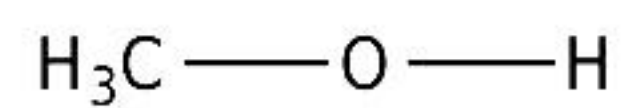Isobutane

2.

Pentanal

3.

Methanol

(b)

1.

$$C_3H_7 \overset{\displaystyle O}{\underset{}{\overset{\|}{-C}}} -OH$$

Butanoic acid

2.

$$H_3C - \overset{H_2}{C} - \overset{OH}{\underset{H}{C}} - CH_3$$
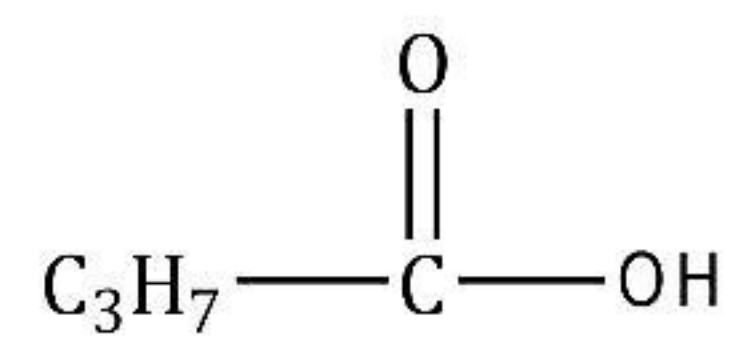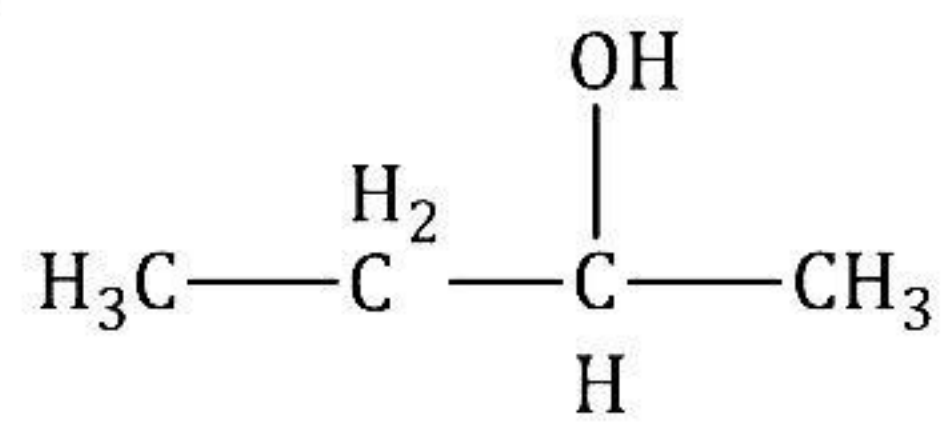
butan-2-ol

SECTION-B

(Attempt any four questions)

Solution 3

(i)

    (a) False:

       Carbon dioxide is an acidic oxide.
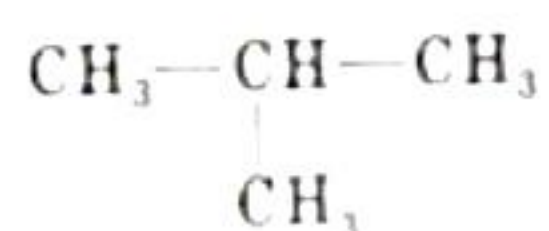
    (b) False

       Acetic acid is monobasic acid.

(ii)

    (a) The compounds having same molecular formula but different structural formula are called as isomers and the phenomenon is called isomerism.

    (b) 2-Methylpropane

2-Methylpropane

(iii)

    (a) Ionic compounds are formed as a result of the transfer of one or more electrons from the atom of a metallic electropositive element to an atom of a non-metallic electronegative element.

       A polar covalent compound is one in which there is an unequal distribution of electrons between the two atoms.

    (b) Ionic compounds, made of ions, are usually crystalline solids with high melting and boiling points.

       They are soluble in water and good conductors of electricity in the aqueous solution and molten state.

       Covalent compounds, made of molecules, can exist as soft solids or liquids or gases with low melting and boiling points. They are usually insoluble in water and poor conductors of electricity.

    (c) Polar covalent compounds are formed between 2 non-metal atoms which have different electronegativities and therefore have unequal sharing of the bonded electron pair.

       Non-polar compounds are formed when two identical non-metals equally share electrons between them.
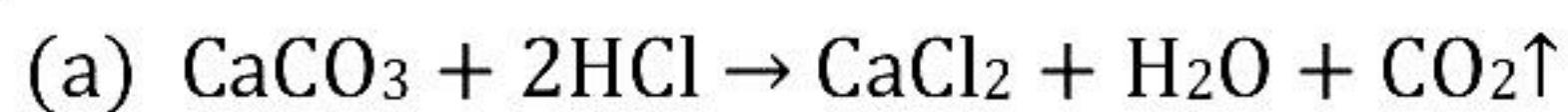
(iv)

    (a) Element B would have <u>lower</u> metallic character than Element A.

    (b) Element A would probably have <u>higher</u> electron affinity than Element B.

    (c) Element A would have <u>smaller</u> atomic size than Element B.

Solution 4

(i)

    (a) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2\uparrow$

    (b) $Pb(NO_3)_2 + H_2SO_4 \rightarrow PbSO_4 + 2HNO_3$

(ii)

    (a) Ferric sulphate - Oxidation

    (b) Sodium sulphate – Neutralisation

(iii) Vapour density = 29

Element	Percentage	At. mass	Gram atom	Ration	
Carbon	82.76	12	$82.76/12 = 6.9$	$6.9/6.9 = 1$	2
Hydrogen	17.24	1	$17.24/1 = 17.24$	$17.24/6.9 = 2.5$	5

Empirical formula is C_2H_5.

Molecular weight = 2 × Vapour density
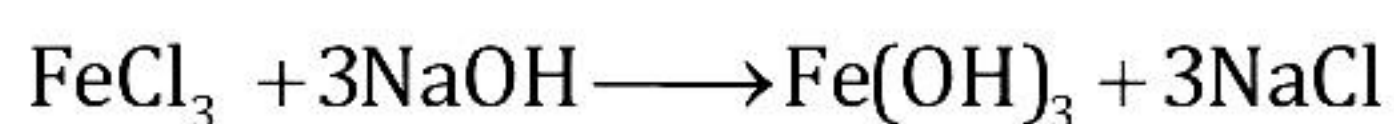
Molecular weight = n × (Empirical formula weight)

$58 = n \times (12 \times 2 + 1 \times 5)$

$n = 2$

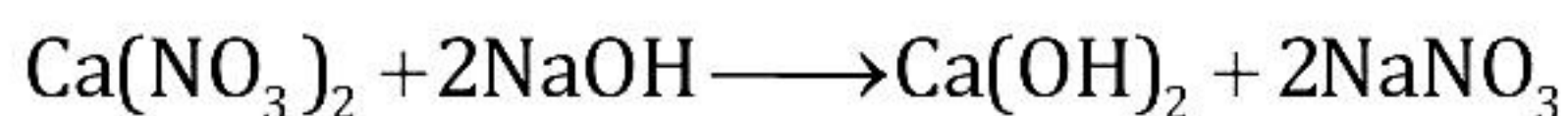So, molecular formula = C_4H_{10}

(iv)

    (a) Fe^{3+} ion

$$FeCl_3 + 3NaOH \longrightarrow Fe(OH)_3 + 3NaCl$$

                        (Reddish brown ppt.)

    (b) Pb^{2+} ion

$$Pb(NO_3)_2 + 2NH_4OH \longrightarrow Pb(OH)_2 + 2NH_4NO_3$$

                        (chalky white ppt. insoluble in excess)

    (c) Ca^{2+} ion

$$Ca(NO_3)_2 + 2NaOH \longrightarrow Ca(OH)_2 + 2NaNO_3$$

                        (White ppt. sparingly soluble)

Solution 5

(i)   The main component of the following alloys:

Name	Composition	Uses
(a) Brass	Cu = 60–80% Zn = 20–40%	For making utensils, cartridges
(b) Duralumin	Al = 95%, Cu = 4% Mn = 0·5%, Mg = 0·5%	For making bodies of aircraft

(ii)

   (a) OH^-

   (b) Ag^+

(iii)

   (a) Electrostatic forces of attraction between ions in the solid state are very strong. These forces weaken in the fused state or in the solution state. Hence, ions become mobile.

   (b) If silver nitrate solution is used directly instead of double cyanide of silver and sodium, then the deposition of silver will be very fast and hence not very smooth and uniform.

   (c) Copper has no mobile electrons in the solid state, and an electrolyte should dissociate into oppositely charged ions to conduct electricity.
   Hence, copper is a non-electrolyte.

(iv)

   (a)

Ore of Al	Chemical name	Formula
Bauxite	Hydrated aluminium oxide	$Al_2O_3.2H_2O$
Cryolite	Sodium aluminium fluoride	Na_3AlF_6
Corundum	Anhydrous aluminium oxide	Al_2O_3

   (b) The process by which the impure ore of aluminium gets purified by using a concentrated solution of an alkali is the **Bayer process.**
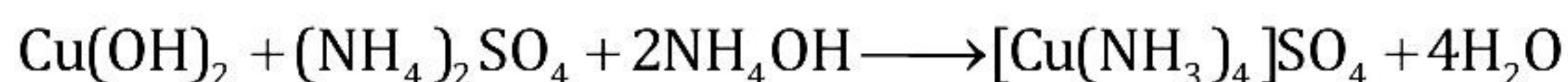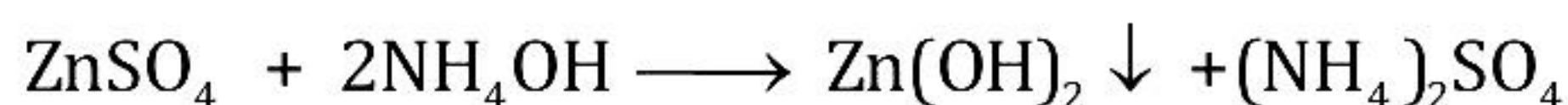
Solution 6

(i)

   (a) When NH_4OH is added to copper sulphate solution drop-wise, a pale blue ppt. is obtained.
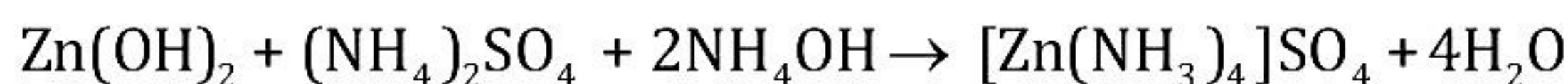
   $$CuSO_4 + 2NH_4OH \longrightarrow Cu(OH)_2 + (NH_4)_2SO_4$$
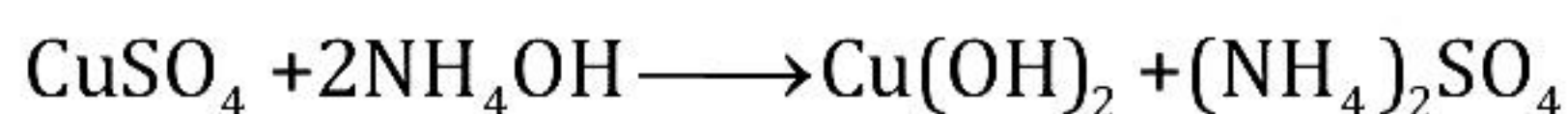
   With excess of NH_4OH, the ppt. dissolves to give a deep blue solution of tetrammine copper(II)sulphate.

   $$Cu(OH)_2 + (NH_4)_2SO_4 + 2NH_4OH \longrightarrow [Cu(NH_3)_4]SO_4 + 4H_2O$$

(b) When NH₄OH is added to zinc sulphate solution drop-wise, a white, gelatinous ppt. is obtained.

$$ZnSO_4 + 2NH_4OH \longrightarrow Zn(OH)_2 \downarrow + (NH_4)_2SO_4$$

With excess of NH_4OH, gelatinous white ppt. dissolves.

$$Zn(OH)_2 + (NH_4)_2SO_4 + 2NH_4OH \rightarrow [Zn(NH_3)_4]SO_4 + 4H_2O$$

OR

$$Zn(OH)_2 + 4NH_4OH \rightarrow [Zn(NH_3)_4](OH)2 + 4H_2O$$
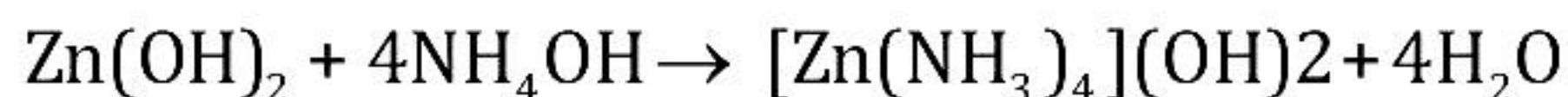
(ii)

(a) Solution Q is a weak acid.

(b) Solution R is a strong alkali.

(iii)

(a) The gas is HCl (hydrogen chloride).

(b) The extreme solubility of hydrogen chloride gas is demonstrated by the fountain experiment.

(c) Another gas which has the same property and can be demonstrated through this experiment is ammonia gas.

(iv)

(a) Oxygen in Nitric oxide (NO)

Relative molecular mass = 14 + 16 = 30 a.m.u.

$$\% \text{ Oxygen} = \frac{16}{30} \times 100 = 55.33\%$$

(b) Carbon in ethane (C_2H_6)
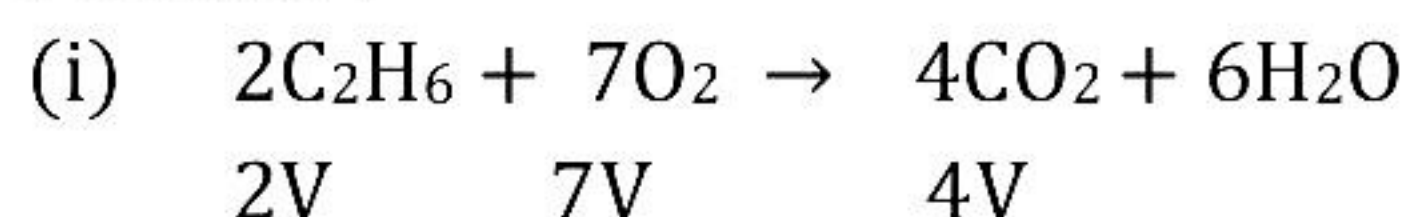
Relative molecular mass = 24 + 6 = 30 a.m.u.

$$\% \quad \text{Carbon} = \frac{24}{30} \times 100 = 80\%$$

(c) Nitrogen in Urea [(NH₂)₂CO]

Relative molecular mass = 28 + 4 + 12 + 16 = 60 a.m.u.

$$\% \text{ Nitrogen} = \frac{28}{60} \times 100 = 46.66\%$$

Solution 7

(i) $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

2V   7V   4V

From the equation, 2V of ethane reacts with 7V oxygen.

So, 300 cc of ethane reacts with

$300 \times 7 / 2 = 1050$ cc

Hence, unused $O_2 = 1250 - 1050 = 200$ cc

From 2V of ethane, 4V of CO_2 is produced.

So, 300 cc of ethane will produce $300 \times 4 / 2 = 600$ cc of CO_2.

(ii)

   (a) Ba metal will form ions readily because the ionisation energy decreases down the group as the size increases.

   (b) On moving down the group, the number of electrons in the outermost shell, i.e. the valence electrons remain the same. So, the valency in a group remains the same, i.e. 2.

(iii)

   (a) 1 mole of phosphorous atom = 31 g of phosphorous

      31 g of P = 1 mole of P

      $6.2\,g\,of\,P = \dfrac{6.2 \times 1}{31} = 0.2\,mole\,of\,P$

   (b) 31 g of P reacts with $HNO_3 = 315$ g

      So, 6.2 g P will reacts with $HNO_3 = 315 \times 6.2/31 = 63$ g

   (c) Moles of steam formed from 31 g phosphorous = 18 g / 18 g = 1 mol

      Moles of steam formed from 6.2 g phosphorous = 1 mol × 6.2 g/31 g = 0.2 mol

      Volume of steam produced at STP = 0.2 mol × 22.4 L / mol = 4.48 L

      Since, the pressure (760 mm) remains constant, but the temperature (273 + 273) = 546 is double, the volume of the steam also gets doubled.

      So, volume of steam produced at 760 mm Hg and 273 °C = 4.48 × 2 = 8.96 L

Solution 8

(i) Electron dot structure of formation of ammonium ion:
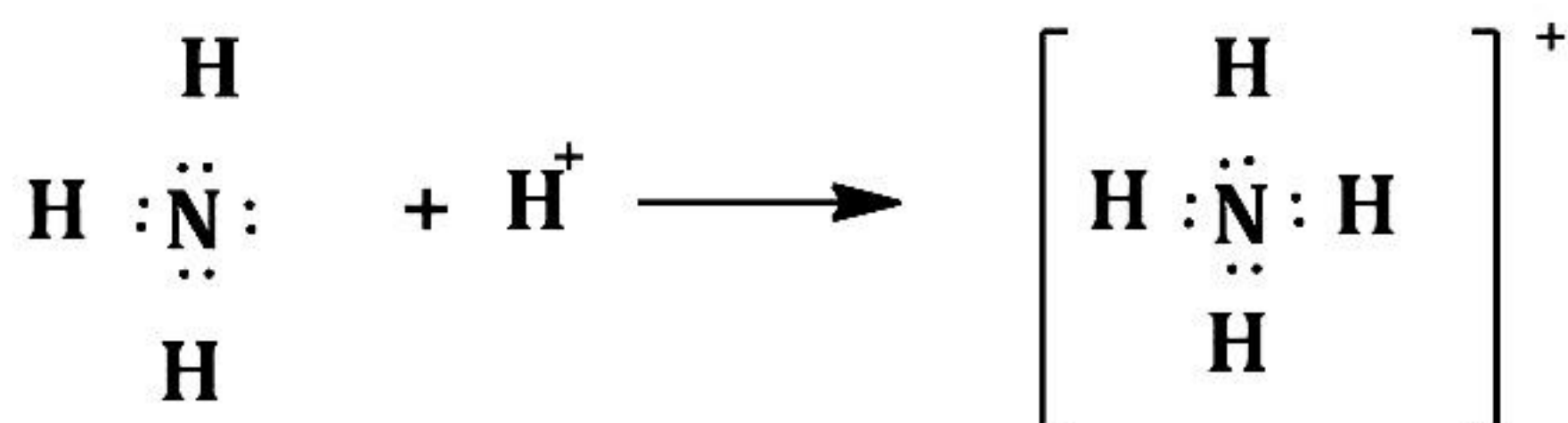
(ii)

   (a) Electrostatic forces of attraction between ions in the solid state are very strong. These forces weaken in the fused state or in the solution state. Hence, ions become mobile.

(b) The anode is the oxidising electrode. An anode is a positively charged electrode, and oxidation means loss of electrons. Thus, electrons lost during oxidation get deposited at the anode. So, the anode is the site of oxidation.

(iii)

(a) Oxygen in Nitric oxide (NO)

Relative molecular mass $= 14 + 16 = 30$ a.m.u.

% Oxygen $= \dfrac{16}{30} \times 100 = 55.33\%$

(b) Carbon in ethane (C_2H_6)

Relative molecular mass $= 24 + 6 = 30$ a.m.u.

% Carbon $= \dfrac{24}{30} \times 100 = 80\%$

(c) Nitrogen in Urea [$(NH_2)_2CO$]

Relative molecular mass $= 28 + 4 + 12 + 16 = 60$ a.m.u.

% Nitrogen $= \dfrac{28}{60} \times 100 = 46.66\%$

(iv)

(a) The element with atomic number 17 is nothing but Chlorine.

Period $= 3$

Group $= 17$

(b) It is Non-metal.

(c) NaCl