ICSE 2025 EXAMINATION

Sample Question Paper - 14

Chemistry

Time: 2 hours. **Total Marks: 80**

Maximum Marks: 80
Time allowed: Two hours
Answers to this paper must be written on the paper provided separately.
You will not be allowed to write during 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) Dilute sulphuric acid will produce a white precipitate when added to a solution of:
- (a) Copper nitrate
- (b) Zinc nitrate
- (c) Lead nitrate
- (d) Sodium nitrate

(ii) Rusting of iron is an example of:
- (a) High melting point
- (b) Conducts electricity when it is in the molten state
- (c) Redox reaction
- (d) Always soluble in water.

(iii) The drying agent used for purifying hydrogen chloride gas:
- (a) Conc. nitric acid
- (b) Conc. sulphuric acid
- (c) Conc. hydrochloric acid
- (d) Conc. sodium hydroxide

(iv) Nitrogen oxide is a:
- (a) Greenish yellow gas
- (b) Colourless and odourless gas
- (c) White fumes
- (d) Reddish brown coloured gas

(v) **Assertion (A)**: The reaction between manganese dioxide and hydrochloric acid is a redox reaction.

Reason (R): Manganese dioxide gets reduced to manganese chloride by the action of hydrochloric acid.

(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 R is true.

(vi) Which of the following solutions of the compound gives a dirty green precipitate with sodium hydroxide and which is insoluble in excess of ammonium hydroxide?

(a) Ferrous sulphates
(b) Ammonium sulphates
(c) Copper nitrates
(d) Lead carbonates

(vii) The homogenous mixture of two or more metals or metal and a non-metal is called an:

(a) Mineral
(b) Alloy
(c) Ore
(d) Both alloy and ore

(viii) Elements are called as halogens form the group:

(a) 15
(b) 16
(c) 17
(d) 18

(ix) The metal oxide which can react with acid, as well as alkali, is:

(a) Aluminium oxide
(b) Silver oxide
(c) Copper(II)oxide
(d) Calcium oxide

(x) As per Gay-Lussac's law, the volumes of solids and liquids are considered to be:

(a) zero
(b) one
(c) two
(d) infinity

(xi) **Assertion (A)**: Mercury is generally stored in iron bottles.
Reason (R): Mercury does not form an amalgam with aluminium.
(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 R is true.

(xii) Name the reddish brown gas released at the cathode when molten lead bromide is electrolysed:
(a) Oxygen
(b) Hydrogen
(c) Bromine
(d) Lead oxide

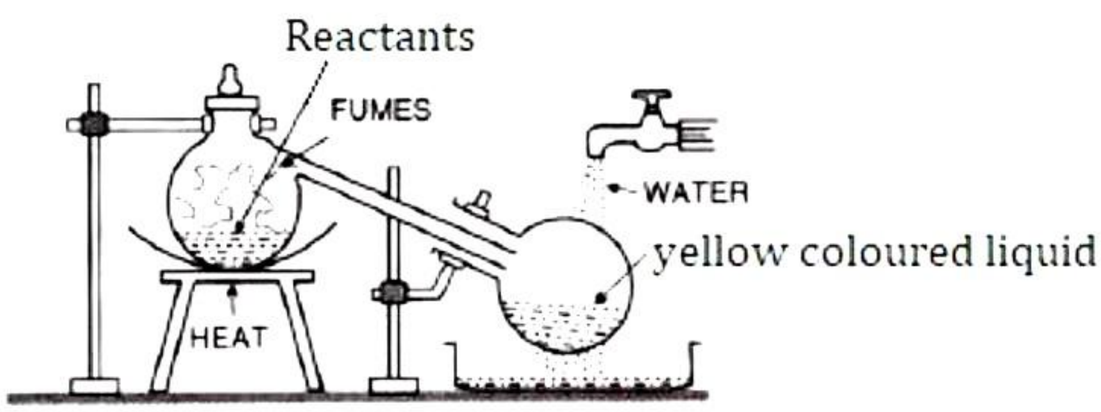
(xiii) The hydrocarbons which are also termed as paraffins are:
(a) Aldehydes
(b) Alkynes
(c) Alkanes
(d) Alkenes

(xiv) A green-coloured compound formed when an orange compound is heated is:
(a) Potassium dichromate
(b) Chromium nitrate
(c) Lead chromate
(d) Chromium oxide

(xv) The pair which have both members from the same group of the periodic table:
(a) Mg, Ca
(b) Mg, Na
(c) Zn, Cu
(d) Mg, Fe

Question 2

(i) The diagram shows an experiment set up for the laboratory preparation of a yellow-coloured liquid which is sour in taste. [5M]



(a) Name of the liquid collected in the round bottom flask.
(b) Write a balanced chemical equation for the above preparation.
(c) What is the colour of the fumes?
(d) Why the collected liquid is yellow in colour?
(e) How the yellow liquid is made colourless?

(ii) Match the following: [5]

Statement	**Atomic number**
(1) A solid non-metal belonging to the third period	10
(2) A metal of valency 1.	20
(3) A gaseous element with valency 2.	3
(4) An element belonging to Group 2.	16
(5) A rare gas.	8

(iii) X is an element in the form of a powder. X burns in oxygen and the product is soluble in water. The solution is tested with litmus. Write down the only word which will correctly complete each of the following sentences: [5]

(a) If X is a metal, then litmus will turn _____.
(b) If X is a non-metal, then litmus will turn _____.
(c) If X is a reactive metal, then _____ will be evolved when X reacts with dilute sulphuric acid.
(d) If X is a metal, then it will form _____ oxide which will form _____ solution with water.
(e) If X is a non-metal, then it will not conduct electricity unless it is carbon in the form of _____.

(iv) Copy and complete the following table: [5]

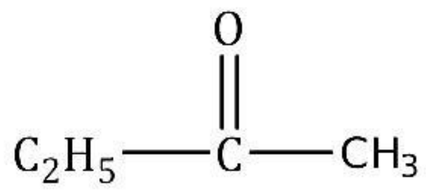
	Anode	Cathode	Electrolyte
Purification of copper	----------	----------	----------
Silver plating of spoon	----------	----------	Potassium argentocynide solution

(v) [5]

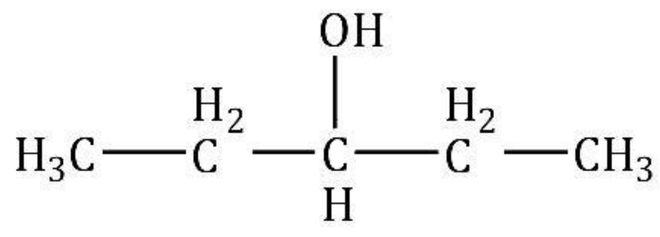
(a) Draw the structural formula for the following:
1. Isopentane
2. Butanoic acid
3. Acetylene

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

1.



2.



SECTION-B

(Attempt any four questions)

Question 3

(i) 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

(ii) Name the metal which is a constituent of: [2]

(a) Blood pigment

(b) Plant pigment

(iii) [3]

(a) What is the difference between:
Ionic compounds and polar covalent compounds

(b) Write whether below given statements are True or False:

1. An ion that has both, slight positive and slight negative charge is called a Dipole molecule.
2. To attain the electronic configuration of the nearest noble gas, nitrogen needs one electrons and hydrogen needs one electron.

(iv) The following questions pertain to the laboratory preparation of ammonia gas: [3]

(a) Write the balanced chemical equation to prepare ammonia gas in the laboratory by using an alkali.

(b) State why concentrated sulphuric acid is not used for drying ammonia gas.

(c) Why is ammonia gas not collected over water?

Question 4

(i) Give reason for the following: [2]

(a) Sodium hydrogen sulphate is not an acid but it dissolves in water to give hydrogen ions, according to the equation.

$$NaHSO_4 \rightleftharpoons H^+ + Na^+ + SO_4^{-2}$$

(b) Anhydrous calcium chloride is used in desiccators?

(ii) Arya was instructed to perform tests on two salts viz. P and Q in her practical examination. She noted down the observations as given below. Could you help her to identify the salts P and Q from these observations?

(a) On performing the flame test, salt P produces a lilac coloured flame and its solution gives a white precipitate with silver nitrate solution, which is soluble in ammonium hydroxide solution.

(b) When dilute HCl is added to a salt Q, a brisk effervescence is produced and the gas turns limewater milky.
When NH_4OH solution is added to the above mixture (after adding dilute HCl), it produces a white precipitate which is soluble in excess NH_4OH solution.

(iii) Define: [3]

a) Chemical bond
b) Electrovalent bond
c) Covalent bond

(iv) Give balanced *chemical equations* for the following *conversions*: [3]

(a) Complete combustion of ethane
(b) Ethane from ethene
(c) Acetylene with iodine gas.

Question 5

(i) 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.

(ii) Element X is a metal with a valency 2, and element Y is a non-metal with a valency 3.[2]

(a) Write an equation to show how Y forms an ion.

(b) If Y is a diatomic gas, then write an equation for the direct combination of X and Y to form a compound.

(iii) Name the metal hydroxides which are: [3]

(a) Sparingly soluble,

(b) Insoluble,

(c) Soluble, in caustic soda solution.

(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) 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+}

(ii) Name the product formed when: [2]

(a) Carbon and conc. Nitric acid is heated

(b) Dilute HNO_3 is added to copper.

(iii) A compound X has the following percentage composition by mass. [3]

Carbon = 26.7%, Oxygen = 71.1%, Hydrogen = 2.2%

Calculate the empirical and molecular formula of X if the relative molecular mass of the compound is 90.04 grams.

(iv) Give the principles of : [3]

(a) Hydraulic washing

(b) Forth floatation

(c) Electromagnetic separation

Question 7

(i) Find the empirical formula of the compounds with the following percentage composition [3]

Pb = 62.5%, N = 8.5%, O = 29.0%

(ii) Answer the following questions: [3]

(a) Here is an electrode reaction:

$Cu \longrightarrow Cu^{+2} + 2e^{-}$

At which electrode (anode or cathode) would such a reaction take place? Is this an example of oxidation or reduction?

(b) A solution contains magnesium ions (Mg^{+2}), iron (II) ions (Fe^{+2}) and copper ions (Cu^{+2}). On passing an electric current through this solution, which ions will be first to be discharged at the cathode? Write the equation for the cathode reaction.

(c) Why is carbon tetrachloride, which is a liquid a non-electrolyte?

(iii) A gas at a pressure of 800 mm of Hg and a temperature of 67 °C occupies 800 mL. If at S. T. P. the mass of the gas is 2.0 g, find the vapour density and the molecular mass of the gas (1 L of H_2 at S. T. P. weigh 0.09 g). [4]

Question 8

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

(a) Formation of CaO

(b) Formation of CH_4

(ii) Comment, sulphuric acid is referred to as: [2]

(a) King of chemicals

(b) Oil of vitriol

(iii) [3]

(a) The percentage composition of a gas is Nitrogen 82.35% and Hydrogen 17.64%. Find the empirical formula of the gas. [N = 14, H = 1]

(b) Define empirical formula of a compound.

(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 alkaline earth metal.

Solution

SECTION A

Solution 1 [1 each]

(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) Nitric acid [1]

(b) $KNO_3 + H_2SO_4 \xrightarrow{<200°C} KHSO_4 + HNO_3$ [1]

(c) Brown fumes of nitric acid vapour. [1]

(d) The collected liquid is yellow in colour due to the dissolution of reddish-brown nitrogen dioxide gas in the acid. This gas is produced due to the thermal decomposition of a portion of nitric acid.

$4HNO_3 \rightarrow 2H_2O + 4NO_2 + O_2$ [1]

(e) Dry air or CO_2 is bubbled through the acid. The acid turns colourless because dry air or CO_2 drives out NO_2 from warm acid which is further oxidized to nitric acid. [1]

(ii)

Statement	Atomic number
(1) A solid non-metal belonging to the third period	16
(2) A metal of valency 1	3
(3) A gaseous element with valency 2	8
(4) An element belonging to Group 2	20
(5) A rare gas	10

(iii)

(a) If X is a metal, then litmus will turn blue. [1]

(b) If X is a non-metal, then litmus will turn red. [1]

(c) If X is a reactive metal, then hydrogen will evolve when X reacts with dilute sulphuric acid. [1]

(d) If X is a metal, then it will form a basic oxide which will form an alkaline solution with water. [1]

(e) If X is a non-metal, then it will not conduct electricity unless it is carbon in the form of graphite. [1]

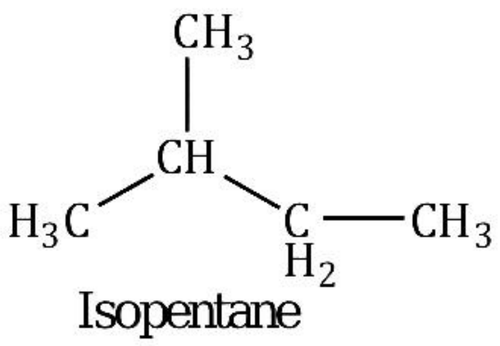
(iv) [5]

	Anode	Cathode	Electrolyte
Purification of copper	Impure copper	Pure copper	Acidified copper sulphate solution
Silver plating of spoon	Pure silver	Spoon	Potassium argentocynide solution

(v)

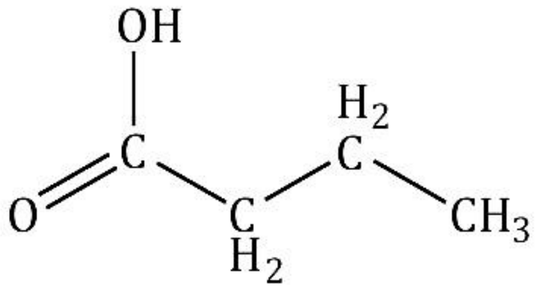
(a) [1]

1.



Isopentane

2. [1]



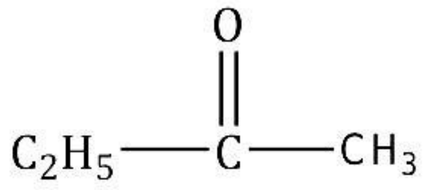
Butanoic acid

3. [1]

Acetylene

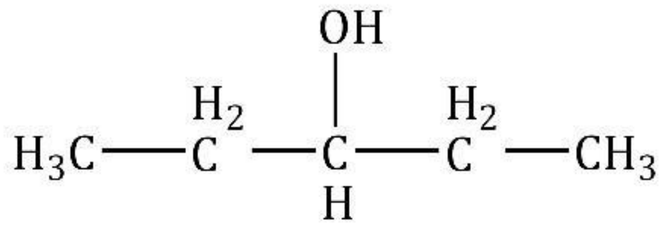
(b)

1. [1]



Butanone

2. [1]



Pentan-3-ol

SECTION-B

(Attempt any four questions)

Solution 3

(i)

(a) Solution Q is a weak acid.

(b) Solution R is a strong alkali.

(ii)

(a) The metal which is a constituent of blood pigment is Iron (Fe)

(b) The metal which is a constituent of plant pigment is Magnesium (Mg).

(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)

1. False

   The correct statement is as follows:

   A molecule that has both, slight positive and slight negative charge is called a Dipole molecule.

2. False

   The Correct statement is as follows:

   To attain electronic configuration of nearest noble gas, nitrogen needs three electrons and hydrogen needs one electron.

(iv)

(a) The balanced chemical equation to prepare ammonia gas in the laboratory by using an alkali:

$2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O + 2NH_3$

(b) Ammonia is basic in nature. If we use sulphuric acid as a drying agent, then it reacts with acid to give water and salt.

(c) Ammonia gas is not collected over water because it is highly soluble in water and dissolves to form ammonium hydroxide.

Solution 4

(i)

(a) Sodium hydrogen sulphate is not an acid but undergoes partial replacement of the ionisable hydrogen atom and behaves as an acidic salt to give H^+ ions.

(b) As calcium chloride absorbs moisture and keeps the compound dry, so it is used in desiccators as a drying agent.

(ii)

(a) KCl

(b) $ZnCO_3$

(iii)

(a) A chemical bond may be defined as the force of attraction between any two atoms, in a molecule, to maintain stability.

(b) The chemical bond formed between two atoms by transfer of one or more electrons from the atom of a metallic electropositive element to an atom of a non-metallic electronegative element.

(c) The chemical bond formed due to mutual sharing of electrons between the given pairs of atoms of non-metallic elements.

(iv)

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

(b) $CH_2{=}CH_2 + H_2 \xrightarrow{200^\circ C, Ni} CH_3 - CH_3$

(c) $HC \equiv CH + I_2 \longrightarrow ICH = CHI$

(1,2 – di – iodoethane)

Solution 5

(i)

(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.

(ii)

(a) Y will form an anion by gaining 3 electrons.

The equation is $Y + 3e^- \rightarrow Y^{3-}$

(b) The equation for the direct combination of X and Y to form a compound is

$3X + Y_2 \rightarrow X_3Y_2$

(iii)

(a) $Ca(OH)_2$

(b) $Fe(OH)_2$ and $Cu(OH)_2$

(c) $Zn(OH)_2$ and $Pb(OH)_2$

(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) OH^-

(b) Ag^+

(ii)

(a) When carbon and conc. Nitric acid is heated the products formed are Carbon dioxide, Nitrogen dioxide and water.

$C + 4HNO_3 \rightarrow CO_2 + 2H_2O + 4NO_2$

(b) Copper when reacts with dilute HNO_3 forms Copper nitrate, Nitric oxide and water.

$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 4H_2O + 2NO$

(iii)

	C	0	H	
%	26.7	71.1	2.2	
At. mass	12	16	1	

$$\frac{\%}{\text{At.wt}} \quad \frac{26.7}{12} \quad \frac{71.1}{16} \quad \frac{2.2}{1}$$

Ratio by atoms 1 2 1

Empirical formula: CHO_2

Relative molecular mass = 90

Empirical formula mass = 12 + 1 + 32 = 45

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}} = \frac{90}{45} = 2$$

Molecular formula = 2 (CHO_2) = $C_2H_2O_4$

(iv)

(a) Hydraulic washing: The difference in the densities of the ore and the gangue is the main criterion.

(b) Froth floatation: This process depends on the preferential wettability of the ore with oil and the gangue particles by water.

(c) Electromagnetic separation: Magnetic properties of the ores.

Solution 7

(i)

Element	%	Atomic mass	Atomic ratio	Simple ratio
Pb	62.5	207	$\frac{62.5}{207} = 0.3019$	1
N	8.5	14	$\frac{8.5}{14} = 0.6071$	2
O	29.0	16	$\frac{29.0}{16} = 1.81$	6

So, $Pb(NO_3)_2$ is the empirical formula.

(ii)

(a) The reaction takes place at anode. This is an example of oxidation.

(b) Cu^{+2} will discharge easily at cathode.

Reaction at cathode:

$Cu^{+2} + 2e^- \rightarrow Cu$

(c) Carbon tetrachloride is a non-electrolyte because it is a covalent compound. It does not ionize and hence do not conduct electricity.

(iii)

P_1 = 800 mm of Hg

P_2 = 760 mm of Hg

V_1 = 800 mL

V_2 = x mL

T_1 = 67 + 273 = 340 K

T_2 = 273 K

By Gas Equation:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$\frac{800\times800}{340} = \frac{760\times V_2}{273}$$

$$\therefore V_2 = \frac{800\times800\times273}{760\times340}$$

$$= 676.16\,\text{mL}$$

676.16 mL of the gas weighs 2.0 g.

∴ 1000 mL of the gas at S.T.P. weighs = 2.96 g

Vapour density =

$$= \frac{\text{Wt. of 1000 mL of the gas at S.T.P.}}{\text{Wt. of 1000 mL of H2 S.T.P.}}$$

$$= \frac{2.96}{0.09} = 32.86$$

$$\therefore \text{Molecular mass} = 2\times \text{V.D.}$$

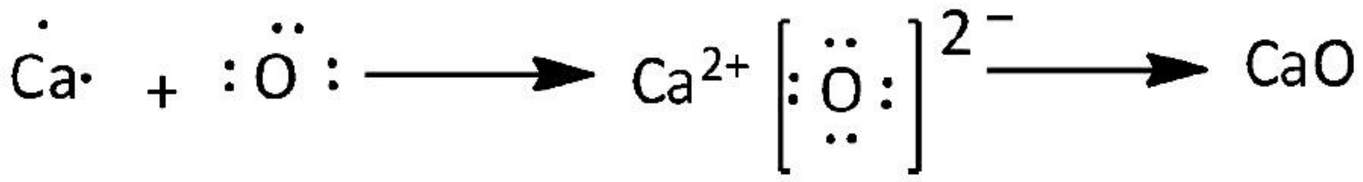
$$= 2\times 32.86$$

$$= 65.73$$

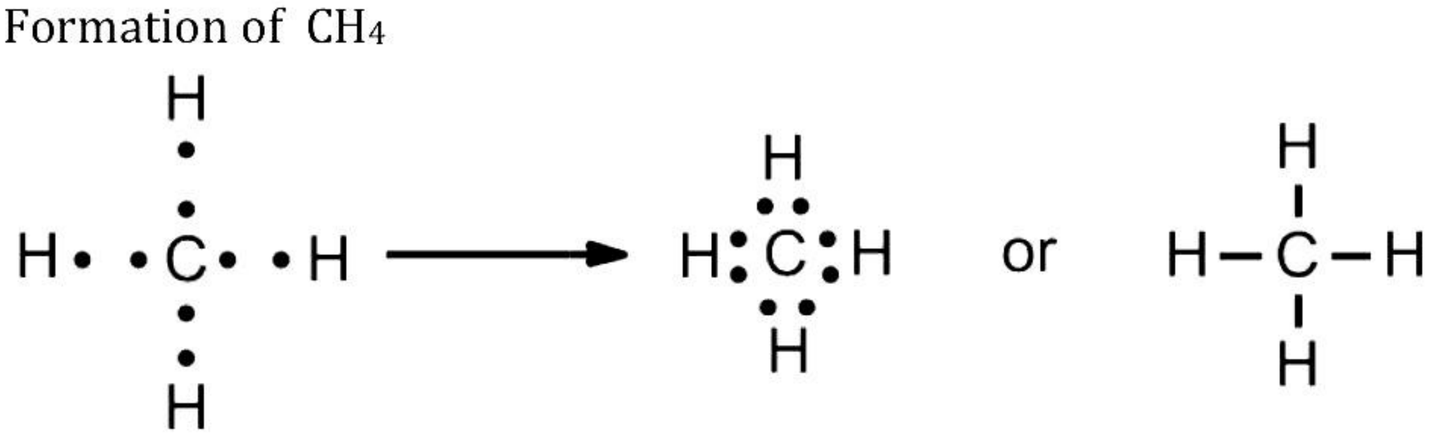
Solution 8

(i)

(a) Formation of CaO



(b) Formation of CH_4



(ii)

(a) Sulphuric acid is called 'King of Chemicals' because there is no other manufactured compound which is used by such a large number of key industries.

(b) Sulphuric acid is referred to as 'Oil of vitriol' as it was obtained as an oily viscous liquid by heating crystals of green vitriol.

(iii)

(a) Given:

N = 82.35%

H =17.64%

Element	% composition	Atomic mass	Atomic ratio	Simplest ratio
H	17.64	1	17.64	3
N	82.35	14	5.8	1

So, the empirical formula is NH_3.

(b) The empirical formula of a compound is the simplest formula, which gives the simplest ratio in whole numbers of atoms of different elements present in one molecule of the compound.

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

(a) Period = 3, Group = 17

(b) It is Non-metal.

(c) $CaCl_2$