

**ICSE Board
Chemistry
Sample Paper – 3**

Time: 2 hrs

Total Marks: 75

General Instructions:

1. *All questions are **compulsory**.*
2. *Questions 1 to 15 carry one mark each.*
3. *Questions in 2A and 2B carry one mark each.*
4. *Questions 3A and 3B carry five marks each.*
5. *Questions 4A and 4B carry 5 marks each.*
6. *Questions in 5A and 5B carry one mark each.*
7. *Questions in 6A and 6B carry one mark each.*
8. *Questions 7A and 7B carry five marks each.*

Question 1

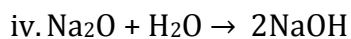
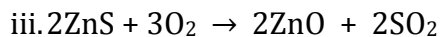
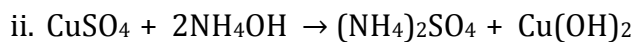
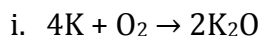
Choose the correct answer out of the four available choices given under each question. [15]

1. The following diagram shows the various shells of electrons. The maximum number of electrons which can be accommodated in the M shell is _____.



- (a) 2
 - (b) 8
 - (c) 18
 - (d) 32
2. Which of the following is incorrect about a heterogeneous mixture?
 - (a) Constituents can be distinctly seen.
 - (b) Constituents are uniformly mixed.
 - (c) Different composition throughout.
 - (d) Sand in Water is an example of heterogeneous mixture.

3. Which of the following are combination reactions?



(a) Reactions (i) and (ii)

(b) Reactions (ii) and (iii)

(c) Reactions (ii) and (iv)

(d) Reactions (i) and (iv)

4. The following table gives the steps we use in writing the formulae of compounds. What is the correct formula of aluminium chloride?

	Aluminium	Chlorine
Symbols	Al	Cl
Valency	3+	1-
Interchanging Valency	1	3

(a) $AlCl_3$

(b) Al_3Cl

(c) Al Cl

(d) Cl_3Al

5. Given the symbol A_ZC , what are the values of A and Z for carbon?

(a) $A = 12, Z = 6$

(b) $A = 8, Z = 4$

(c) $A = 6, Z = 6$

(d) $A = 10, Z = 2$

6. Element _____ has symbol derived from its Latin name 'plumbum'.

(a) Calcium

(b) Lead

(c) Carbon

(d) Hydrogen

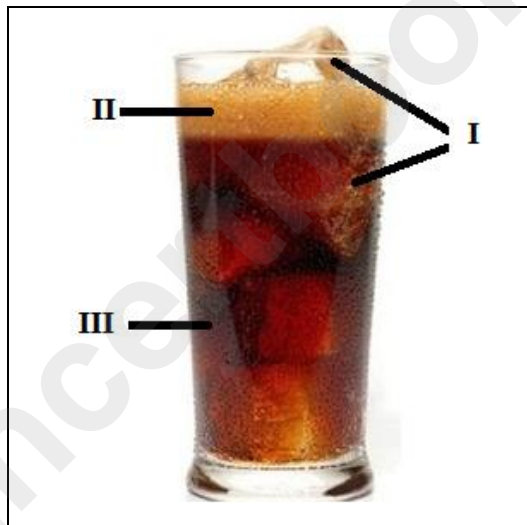
7. Valency of iron in FeO is ____ of chlorine in CaCl₂ is ____ .

- (a) 1+,2-
- (b) 2+, 1-
- (c) 2+,2-
- (d) 1+,1-

8. Melting of ice is

- (a) Irreversible change
- (b) Periodic change
- (c) Chemical change
- (d) Reversible change

9. Which is the correct answer about the states of substances I, II and III with reference to the following picture?

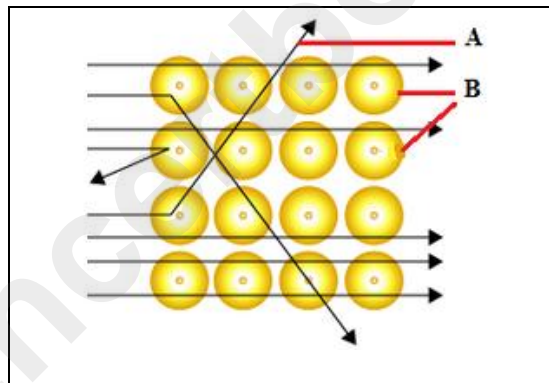


- (a) I - Solid, II - Liquid, III - Gas
- (b) I - Liquid, II - Gas, III - Solid
- (c) I - Solid, II - Gas, III - Liquid
- (d) I - Gas, II - Solid, III - Liquid

10. When the temperature of water increases above 0°C up to 4°C, its density _____.

- (a) decreases
- (b) increases
- (c) becomes zero
- (d) remains unchanged

11. When an electric current is passed through acidulated water, _____ volume of hydrogen is formed at the cathode and _____ volume of oxygen is formed at the anode.
- one, two
 - three, one
 - one, three
 - two, one
12. A soluble solid is separated from insoluble solid by _____
- Fractional crystallisation
 - Solvent extraction
 - sublimation
 - Magnetic separation
13. The following picture represents Rutherford's gold foil experiment. The parts labelled A and B in the diagram represent _____ and _____, respectively.



- light rays, electrons
 - X-rays, nuclei of gold atoms
 - alpha rays, electrons
 - alpha rays, gold atoms
14. Anthracite is
- An inferior type of coal
 - A superior type of coal
 - A cheapest form of coal
 - None of above
15. Hydrogen is
- Combustible
 - Non-combustible
 - Supporter of combustion
 - Non-supporter of combustion

Question 2

(A) State the electronic configuration of the following atoms? [5]

1. Atom 'A' (Atomic Number = 8)
2. Atom 'B' (Atomic Number = 18)
3. Atom 'C' (Atomic Number = 11)
4. Atom 'D' (Atomic Number = 20)
5. Atom 'E' (Atomic Number = 3)

(B) Fill in the blanks and rewrite the sentences: [5]

1. Water reacts with metals to liberate _____ gas.
2. The process of change from the _____ state to the _____ state at a particular temperature is called liquefaction.
3. Atoms of the same elements differing in the number of _____ in their nuclei are known as isotopes.
4. The gas which has now replaced hydrogen in air balloons is _____
5. The crystal of _____ is opaque to light and is good conductor of heat

Question 3

(A) State whether the following statements are true or false. Rewrite the false statement. [5]

1. When potassium chlorate is heated strongly, potassium chloride is formed with evolution of carbon dioxide gas.
2. The maximum number of electrons which can be accommodated in the K shell is 8.
3. Mercuric oxide when heated gives mercury and oxygen. This is a displacement reaction.
4. Balanced chemical equation shows both the number of molecules and the number of atoms involved in the reaction.
5. The positive charge radicals are called as anions..

(B) State a method to separate the following mixtures: [5]

1. Two solid mixtures, one of which sublimes.
2. A solid-liquid mixture containing an insoluble solid in a liquid component.
3. To separate the mixture of an insoluble solid and a soluble solid.
4. To separate the mixture of different solid constituents in a liquid component.
5. To separate the mixture of a soluble solid from a liquid component.

Question 4

(A) Describe the formation of coal. What are its four types? [5]

(B) Define the following terms: [5]

1. Crystallisation
2. Water of crystallisation
3. Hydrated crystal
4. Anhydrous crystal
5. Crystal

Question 5

(A) What is atom? State the main postulates of Dalton's atomic theory. [5]

(B) What is meant by the metal activity series? What are its important features? [5]

Question 6

(A) Draw a diagram representing the atomic structures of the following: [5]

1. Hydrogen
2. Helium
3. Lithium
4. Carbon
5. Nitrogen

(B) Define the following terms: [5]

1. Atomic number
2. valency
3. Atomic mass number
4. Valence shell
5. Periodic table

Question 7

(A) 1. Write the balanced chemical equations [3]

a. Lead + Carbon \rightarrow Lead + Carbon dioxide

b. Calcium oxide + Water \rightarrow Calcium hydroxide

c. Hydrogen + Chlorine \rightarrow Hydrochloric acid

2. State the formula of the following compounds: [2]

a. Calcium nitrate

b. Sodium chloride

(B)

1. What are the types of mixtures? [2]

2. Differentiate between a compound and mixture. [3]

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Solution

Question 1

1. (c) 18
2. (b) Constituents are uniformly mixed.
3. (d) Reactions (i) and (iv)
4. (a) AlCl_3
5. (a) $A = 12, Z = 6$
6. (b) Lead
7. (b) $2+, 1-$
8. (d) reversible change
9. (c) I - Solid, II - Gas, III - Liquid
10. (b) increases
11. (d) two, one
12. (b) solvent extraction
13. (d) alpha rays, gold atoms
14. (b) superior type of coal
15. (a) combustible

Question 2

(A)

1. Electronic configuration of atom 'A' = 2, 6
2. Electronic configuration of atom 'B' = 2, 8, 8
3. Electronic configuration of atom 'C' = 2, 8, 1
4. Electronic configuration of atom 'D' = 2, 8, 8, 2
5. Electronic configuration of atom 'E' = 2, 1

(B)

1. Water reacts with metals to liberate hydrogen gas.
2. The process of change from the gaseous state to the liquid state at a particular temperature is called liquefaction.
3. Atoms of the same elements differing in the number of neutrons in their nuclei are known as isotopes.
4. The gas which has now replaced hydrogen in air balloons is Helium.
5. The crystal of graphite is opaque to light and is good conductor of heat

Question 3

(A)

1. False. When potassium chlorate is heated strongly, it breaks to produce oxygen along with potassium chloride.
2. False. The maximum number of electrons which can be accommodated in the K shell is 2.
3. False. A reaction in which a compound breaks up into two or more simple substances due to the application of heat is called a decomposition reaction. Mercuric oxide when heated decomposes to form two elements—mercury and oxygen
4. True
5. False. The positive charge radicals are called as cations. The negative charge radicals are called as anions.

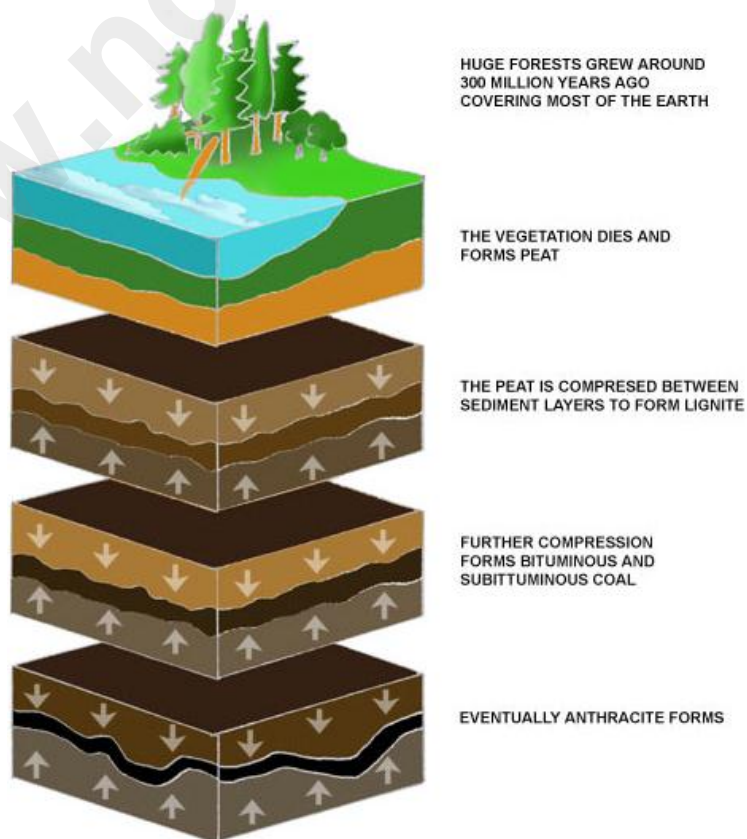
(B)

1. Sublimation
2. Filtration
3. Solvent extraction
4. Chromatography
5. Distillation

Question 4

(A)

1. Formation of Coal:



Formation of Coal

- a. Coal was formed about 200 to 300 million years ago from the remains of plants such as ferns, mosses and trees which existed in swampy forests.
- b. As plants and trees died, their remains sank to the bottom of swampy areas.
- c. These dead plants and trees got covered with a layer of mud, water, rocks and soil by accumulating layer upon layer over a period of time. This eventually formed a soggy and dense material called peat.
- d. As more matter piled up on them, the bottom layers got compressed.
- e. Increasing heat and pressure from the top layers along with bacterial action gradually changed the material to coal.
- f. With the formation of each successive layer of coal, the amount of carbon present in the deposit increased and the level of impurities decreased.
- g. This gradual process of conversion of vegetable matter into coal under high temperature and pressure is called carbonisation.

2. Types of Coal:

a. Peat:

- The heat and pressure from the top layers converted dead plants into a spongy brown material called peat. Peat is the first stage in the formation of coal.
- It is light brown and contains only about 50–60% carbon. Therefore, it is the most inferior form of coal.

b. Lignite:

- It is the second stage in the formation of coal. The peat is compressed between sediment layers to form lignite.
- Lignite contains 60–70% carbon.
- It is also brown, but it is harder than peat.

c. Bituminous:

- It is the third stage in the formation of coal. It contains 80–90% carbon.
- There are high, medium and low varieties of bituminous coal with corresponding carbon content being 90%, 80% and 70–75%.
- Bituminous coal is the most common variety of coal and is also known as household coal. It is black and hard. On heating it, both volatile and non-volatile materials are given out.

d. Anthracite:

- It is the purest variety of coal. It is the oldest stage in the formation of coal. Its carbon content varies between 92% and 98%.
- It is hard, dense and black. It is difficult to ignite, but when ignited, it burns with a lot of heat and for a very long time.
- It is found in very few places in the world. Anthracite does not produce any ash and is considered the best quality coal.

(B)

1. **Crystallisation:** The process of separation or deposition of crystals from a hot saturated solution on gentle cooling of the solution.
2. **Water of crystallisation:** When a crystal is separated or deposited from a hot saturated solution on gentle cooling of solution. It generally unites with a definite number of water molecules and enters into a loose chemical combination with them. This definite number of water of molecules is called water of crystallisation.
3. **Hydrated crystals:** Hydrated crystal contain definite number of water molecule in loose chemical combination with the crystals.
4. **Anhydrous crystals:** Anhydrous crystals do not contain any definite number of water molecules in loose chemical combination with the crystal
5. **Crystal:** Crystals are solids having definite regular shape, symmetrical arrangements and shape edges.

Question 5

(A) Atom: Atom is smallest fundamental particle of the matter.

The postulates of Dalton's atomic theory

- All matter is made up of very tiny, indivisible and indestructible particles called atoms.
- Atoms can neither be created nor be destroyed.
- Atoms of a given element are identical in mass and chemical properties.
- Atoms of different elements have different masses and chemical properties.
- Atoms combine in the ratio of small whole numbers to form compounds.
- The number and kinds of atoms in a given compound are fixed.
- The atom is the smallest particle of matter which can take part in a chemical reaction.

(B) Metal activity series

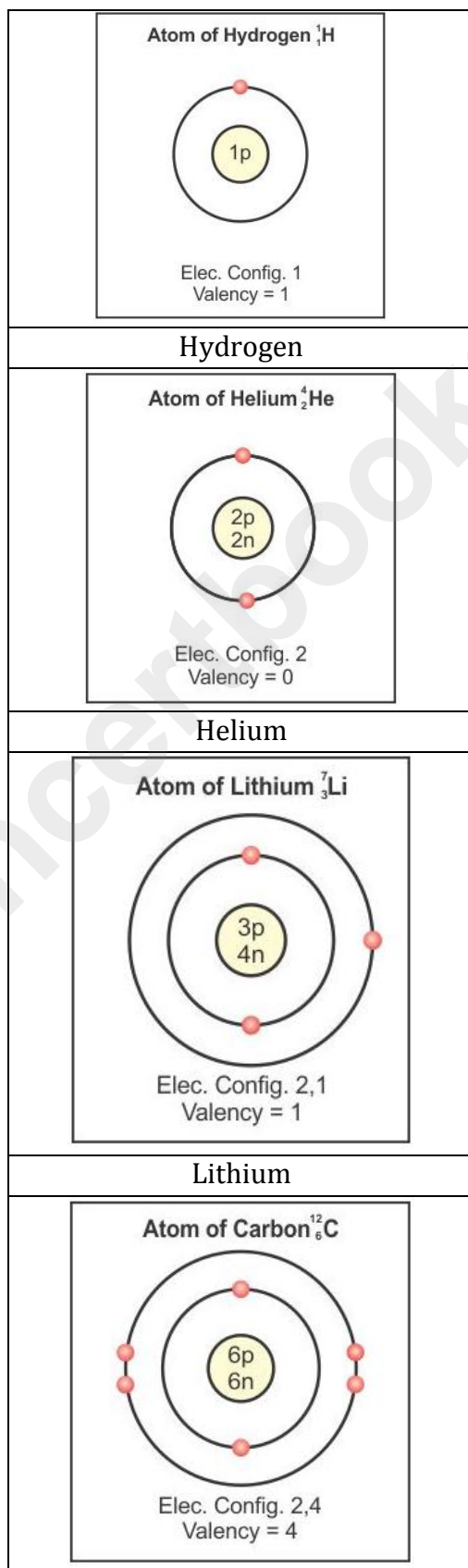
A list in which metals are arranged in the decreasing order of their chemical reactivity is called the metal reactivity series.

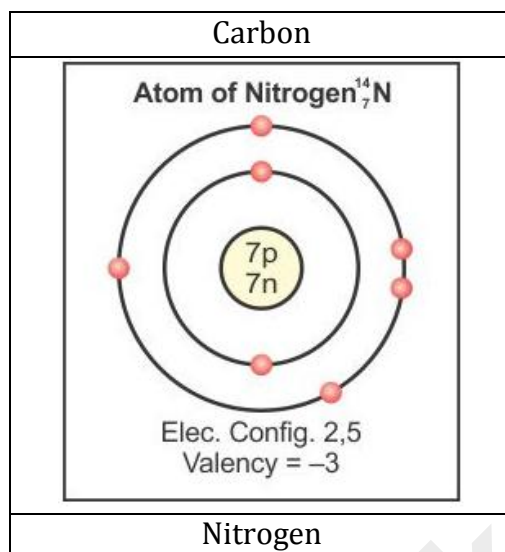
The most active metal (potassium) is placed at the top of the list and the least active metal (platinum) is placed at the bottom of the list.

Features of the activity series:

- The ease with which a metal in solution loses electron/s and forms a positive ion decreases down the series, from potassium to gold.
- Hydrogen is included in the activity series because hydrogen, like metals, also loses an electron and becomes positively charged (H^+) in most chemical reactions.
- The series facilitates the comparative study of metals in terms of the degree of their reactivity.
- Compounds of metals (oxides, carbonates, nitrates, hydroxides) can also be easily compared.

Question 6
(A)





(B)

1. **Atomic number:** It is the number of protons or number of electrons in the atom of an element. It is denoted as 'Z'.

$$\text{Atomic no. (Z)} = \text{Number of protons (p)} = \text{Number of electrons (e)}$$

2. **Valency:** It is the number of electrons donated or accepted by an atom, so as to achieve stable electronic configuration of the nearest noble gas..
3. **Atomic Mass:** The atomic mass number is defined as the sum of the number of protons and neutrons contained in the nucleus of an atom of that element. It is denoted by the symbol A.

$$\text{Atomic mass number (A)} = \text{Number of protons (p)} + \text{Number of neutrons (n)}$$

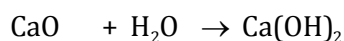
4. **Valence shell:** The outermost shell of an atom of an element is called as valence shell
5. **Isotope:** These are the atoms of same element having the same atomic number but different mass numbers

Question 7

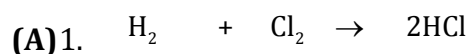
a. Lead monoxide + Carbon → Lead + Carbon dioxide



b. Calcium oxide + Water → Calcium hydroxide

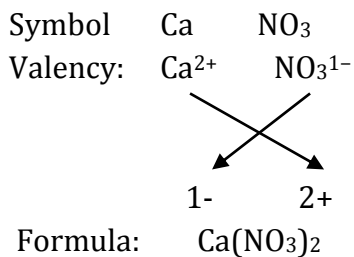


c. Hydrogen + Chlorine → Hydrochloric acid

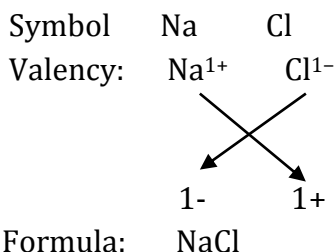


2.

a. Calcium nitrate



b. Sodium chloride



(B)

1.

- There are two types of mixtures—homogeneous mixtures and heterogeneous mixtures.
- Homogeneous mixture:** A mixture which has uniform composition and properties throughout its mass is called a homogeneous mixture. Examples: Sugar solution, salt solution
- Heterogeneous mixture:** A mixture which has different composition and properties in different parts of its mass is called a heterogeneous mixture. Examples: Sand mixed with salt, sugar in oil

2.

Compound	Mixture
a. It is obtained by the chemical combination of more than one element.	a. It is obtained by the physical combination of either elements or compounds or both.
b. The composition of elements present in a compound is fixed.	b. The composition of elements present in a mixture is not fixed.
c. The properties of a compound are different from those of its elements.	c. It shows the properties of all its constituent elements.

d. Its constituents are separated by using only chemical and electrochemical methods.	d. Its constituents are separated using physical methods.
e. A compound is homogeneous in nature.	e. The mixtures are homogeneous or heterogeneous.