

Elements, Compounds, Symbols And Formulae

POINTS TO REMEMBER

1. **Pure substances** : "A single substance of definite composition." Pure substances are homogeneous. They are made up of only one kind of atoms and compounds or made up of only one kind of molecules.
2. **Elements** : An element is defined as a pure substance made up of only one kind of atoms that cannot be converted into anything simpler than itself by any physical or chemical process.
3. **Metals** : Most of the elements known to us are metals. Example: Sodium potassium, iron, gold, silver are elements. Metals are lustrous, hard, ductile and malleable, good conductor of electricity. Mercury (liquid) have High M.P. and High B.P. but exceptions are there.
4. **Non-metals** : Carbon, phosphorous, sulphur all solids, Bromine (liquid) iodine(s) and rest are gases, dull, do not shine. Cannot be drawn into wires, non malleable, have low M.P. and B.P. do not produce sound when struck, do not conduct electricity. Exceptions are there.
5. Boron, silicon, arsenic, antimony resemble both metals and non-metals and are called metalloids.
6. Unreactive gases, also called noble gases are gases which are very unreactive i.e. He, Ne Ar, Kr, xenon and radon.
7. Symbols are abbreviations that are used to denote a chemical element which is usually first letter of its name in English or Latin.
8. O is the symbol of element oxygen.
C is symbol of element carbon.
Cu is symbol of element copper (taken from Latin name Cuprum)
9. Compound is formed by the chemical combination of two or more elements in definite ratio (by mass).
10. Molecule is the smallest unit of a compound.
11. Elements are the basic substances from which all other substances are made.
12. **Compound** : Consist of two or more elements combined in definite proportion, pure and homogeneous, physical and chemical properties are entirely new and different from its constituent elements, energy is either needed or produced when a compound is formed.
13. **Atoms** : Atom is the smallest unit of an element which cannot be further broken into simpler parts, may or may not have independent existence.
14. **Molecule of element** : When two or more atoms of the same element combine it forms a molecule of an atom. e.g. N_2, O_2
15. **Molecule of compounds** : When atoms of two or more element combine, they form a molecule of a compound. $H_2O, HCl, CuSO_4$.

EXERCISE-I

Question 1.

Classify the following substances into elements and compounds.

Answer:

Mercury, sulphur, sugar, water, sand, gold, coal, oxygen, alcohol.

Ans. **Element:** Mercury, sulphur, gold, coal, oxygen.

Compound : Sugar, water, sand, alcohol.

Question 2.

Give the symbols of: Carbon, calcium, copper, chlorine, cobalt, argon.

Answer:

Carbon is C Chlorine is Cl

Calcium is Ca Cobalt is Co

Copper is Cu Argon is Ar

Question 3.

Define a pure substance. How many types of pure substances do you know ?

Answer:

Pure substances : "A substance of a definite composition which has consistent properties throughout, is called a pure substance"

Types of pure substances: Pure substances are of two

types **(i) Elements, (ii) Compounds.**

Question 4.

Define : (a) Elements (b) Compounds.

Name the particles from which elements and compounds are made of.

Answer:

(a) Elements : An element is defined as a pure substance made up of only one kind of atoms that cannot be converted into anything simpler than itself by any physical or chemical process.

(b) Compounds : Compounds are pure substances composed of two or more elements in definite proportion by mass and has a definite set of properties. Compound is made up of only one kind of molecules.

Question 5.

Give two examples for each of the following :

(a) Metals

(b) Non-metals

(c) Metalloids

(d) Noble gases

Answer:

(a) Metals : Iron, silver, gold.

(b) Non-metals : Carbon, sulphur, oxygen.

(c) Metalloids : Antimony, silicon, boron.

(d) Noble gases : Helium, argon, neon.

Question 6.

Name the elements which form water. How will you justify that water is a compound ?

Answer:

The elements which form water are (i) Hydrogen and oxygen.

Justification : Water has entirely different properties (i.e. is a liquid, extinguishes fire) from the elements it is made up of i.e. Hydrogen a gas catches fire oxygen a gas supporter of combustion.

1. Energy is needed to form water on combining O_2 with H_2 .
2. We can not separate the constituents of water by simple physical means.

Question 7.

Give three differences between metals and non-metals.

Answer:

Metals

1. Metals are ductile i.e. can be drawn into wires.
2. Metals are malleable i.e. can be beaten to form sheets.
3. They are sonorous.

Non-metals

1. Non-metals are mostly soft solids cannot be drawn into wires.
2. They are mostly gases and are not malleable.
3. They do not produce sound when struck.

Question 8.

How is sodium chloride different from its constituent elements, sodium and chlorine ?

Answer:

Sodium is a metal that is stored in kerosene oil as it reacts very fast with air and water. Chlorine is a reactive greenish yellow gas which is poisonous. When these two elements combine chemically they form common salt sodium chloride which is non poisonous colourless solid substance that we use in our food to add taste and to obtain some nutrition.

Question 9.

State four important characteristics of compounds.

Answer:

1. When compound is formed energy like heat, light or electricity is either needed or produced.
2. A compound has properties entirely different from the properties of its constituents.
3. Change in weight takes place.
4. It cannot be separated into its constituents by simple physical means.

Question 10.

Give two examples for each of the following :

- (a) Non-metals which are solids
- (b) Metals which are soft
- (c) Non-metals which are lustrous
- (d) Elements which are liquids.
- (e) Inert gases
- (f) Metalloids

Answer:

- (a) Phosphorus, Sulphur
- (b) Lead and Sodium
- (c) Radium, Graphite
- (d) Mercury, Bromine
- (e) Helium, Neon
- (f) Antimony, Arsenic

Question 11.

Name the elements present

- (a) Sugar**
- (b) Ammonia**
- (c) Marble**
- (d) Washing soda**

Answer:

Compounds

- (a) Sugar
- (b) Ammonia
- (c) Marble
- (d) Washing soda

Elements present

- (a) Carbon, hydrogen & oxygen
- (b) Nitrogen and hydrogen
- (c) Calcium, carbon & oxygen
- (d) Sodium, carbon & oxygen

Question 12.

What is the proportion of elements present in the following compounds?

- (a) H₂O**

- (b) CO_2
- (c) CaO
- (d) NO_2

Answer:

Compounds	Elements	Proportion of elements
(a) H_2O	H : O	1 : 8
(b) CO_2	C : O	3 : 8
(c) CaO	Ca : O	5 : 2
(d) NO_2	N : O	7 : 16

Question 13.

Name two compounds which dissolve in water.

Answer:

Two compounds which dissolve in water are sugar, table salt.

EXERCISE-II

(ATOMS & MOLECULES)

Question 1.

Define:

- (a) Atom
- (b) Molecule
- (c) Atomicity
- (d) Formula

Answer:

(a) Atom : An atom is the smallest indivisible unit of an element which exhibits all the properties of that element and may or may not have independent existence.

(b) Molecule : A molecule can be defined as the smallest unit of an element or a compound which exhibits all the properties of that element or compound and has independent existence. They are divisible into atoms.

(c) Atomicity : The number of atoms in a molecule of an element is called its atomicity.

(d) Formula : Formula is a short way of representing the molecule of an element or a compound.

Question 2.

Why are symbols and formulae of substances important?

Answer:

Importance of symbols and Formulae :

Symbols and formulae of substance gives a lot of information like.

1. Types of elements present in the compound. E.g. (H_2O is made of two elements hydrogen and oxygen).
2. Number of each kind of atoms in one molecule. E.g. (water has 2 atoms of hydrogen combined with 1 atom of oxygen.)
3. Mass of one molecule of the compound. E.g. [H_2O has mass $(1 \times 2) + 16 = 18 \text{ g}$].

Question 3.

Mention three gaseous elements and write their molecular formulae.

Answer:

Three gaseous elements	molecular formula	Atoms in one molecule
Hydrogen	H_2	2
Oxygen	O_2	2
Chlorine	Cl_2	2

Question 4.

State the informations obtained from the formula of a compound.

Answer:

A formula gives us the following information about a compound.

1. Types of elements present in the compound.
2. Number of each kind of atoms in one molecule of the compound.
3. Mass of one molecule of the compound.

Example:

A molecule of carbon dioxide gas is represented by CO_2 . It indicates that a carbon dioxide molecule is formed by the combination of two elements i.e. carbon and oxygen. The number of carbon atom is one and that of oxygen atom is two. The mass of one molecule of carbon dioxide can be calculated by adding the mass of one atom of carbon and two atoms of oxygen.

Question 5.

What is meant by

(a) 2H and H_2

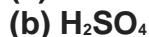
(b) H_2O and $3\text{H}_2\text{O}$?

Answer:

- (a) 2H is two atoms of hydrogen. H_2 is one molecule of hydrogen gas.
(b) H_2O represents one molecule of water. $3\text{H}_2\text{O}$ represents 3 molecules of water.

Question 6.

State the number of atoms of each kind, present in



Also name these compounds.

Answer:

(a) $\text{C}_6\text{H}_{12}\text{O}_6$ has atoms of

Carbon 6 atoms in number

Hydrogen 12 atoms in number

Oxygen 6 atoms in number

The name of the compound is Glucose.

(b) H_2SO_4

Hydrogen 2 atoms in number

Sulphur 1 atom in number

Oxygen 4 atoms in number

The name of the compound is Sulphuric acid.

(c) HNO_3

Hydrogen 1 atom in number

Nitrogen 1 atom in number

Oxygen 3 atoms in number

The name of the compound is Nitric acid.

(d) CaCO_3

Calcium 1 atom in number

Carbon 1 atom in number

Oxygen 3 atoms in number

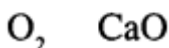
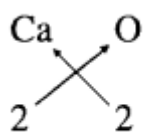
The name of the compound is Calcium Carbonate.

Question 7.

Write the molecular formulae of compounds calcium oxide, hydrogen sulphide, carbon monoxide and lead sulphide.

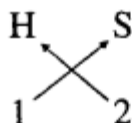
Answer:

Compound Calcium oxide is formed of elements calcium (Ca) and oxygen (O)



Symbols combining power Here subscript number is same Ca_2 Formula of calcium oxide is CaO Compounds Hydrogen sulphide is formed of elements hydrogen (H), sulphide (S)

Symbols combining power

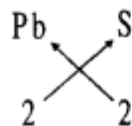


Formula is H_2S

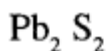
Compound **Carbon monoxide** is compound of elements carbon (C) and oxygen (O)

Formula of carbon monoxide is CO

Formula of **lead sulphide** is PbS



Symbols combining power



Here the subscript numbers is same.

EXERCISE-III

Question 1.

Name:

- Three different forms of carbon.
- A form of carbon used as a gem.
- Two substances used to make electric wires.
- Two substances used to make jewellery.
- A substances used as an insulator.

Answer:

(a)

- Diamond
- Graphite
- Coal

(b) Diamond is used as gem.

(c)

1. Copper.
2. Aluminium as these are good conductors of electricity.

(d)

1. Gold.
2. Silver as these are shining, lustrous, and ductile.

(e) Plastic is used as insulator as it is bad conductor of electricity.

Question 2.

Give one use of each of the following substances :

(a) Iron

(b) Brass

(c) Coal

Answer:

(a) Iron : To make machines tools and building material.

(b) Brass : To make water taps and utensils.

(c) Coal: Coal is used as fuel also used in thermal power plant to produce electricity.

Question 3.

Give reason:

(a) A frying pan is made up of steel but its handle is made up of wood.

(b) Graphite is used to make lead of the pencils.

(c) Argon is filled in electric bulbs.

Answer:

(a) Steel is good conductor of heat to cook food, pan is made of steel where as wood is insulator of heat and to hold, handle is made up of wood.

(b) Graphite leaves mark on the paper and makes it black.

(c) Argon is inert gas and protects the element of bulb from oxidation and burning. Hence increases bulb's life.

Question 4.

Answer the following questions:

- (a) Why are copper and aluminium used to make electric wires?
 (b) What do you understand by the statement: 'metals are ductile and malleable'?
 (c) Give the advantages of using symbols instead of names of elements or compounds.
 (d) When iron is mixed with sulphur at room temperature, it does not form a compound. Why?
 (e) Find the atomicity of the Following molecules:

1. calcium chloride
2. aluminium sulphide
3. acetic acid
4. dinitrogen oxide
5. carbon monoxide

Answer:

(a) Copper and aluminium are good conductors of heat and electricity. They can be drawn into wires and beaten into sheets. Therefore, they are used to make electric wires.

(b) Metals are ductile, i.e., they can be drawn or stretched into thin wires. They are malleable, i.e., they can be beaten into thin sheets.

(c)

1. Symbols increases scientific communication across the world.
2. Symbols helps to make equations and data shorter and concise.
3. Symbols are helpful for Scientists as it would take time and paper to do their job. They had to write out the full name of every element instead of its symbol.

(d) When iron is mixed with sulphur at room temperature, it does not form a compound because the mixture of iron and sulphur requires heat to form a compound i.e. iron sulphide.

(e) Atomicity of

(i) Calcium chloride – CaCl_2

$$= (1 \times 1) + (2 \times 1) = 1 + 2 = 3$$

(ii) Ammonium sulphide – $(\text{NH}_4)_2\text{S}$

$$= (1 + 4) \times 2 + 1 \times 1 = 2 + 8 + 1 = 11$$

(iii) Acetic acid – CH_3COOH

$$= 1 + 1 \times 3 + 1 + 1 + 1 + 1 = 5 + 3 = 8$$

(iv) Dinitrogen oxide – N_2O

$$= 1 \times 2 + 1 = 2 + 1 = 3$$

(v) Carbon monoxide – CO

$$= 1 \times 1 + 1 \times 1 = 1 + 1 = 2$$

OBJECTIVE TYPE QUESTIONS

1. Fill in the blanks

- (a) **Atomicity** refers to the number of atoms in the molecule of an element.
(b) The most abundant element in the earth's crust is **oxygen**.
(c) A metal which is a liquid at room temperature is **mercury**.
(d) The most abundant element in the atmosphere is **nitrogen**.
(e) A metal which is a poor conductor of electricity is **tungsten**.
(f) A diatomic gaseous element is **oxygen**.
(g) A liquid non-metal is **bromine**.

2. Match the columns

	Column A	Column B
	(a) Metals	(i) Non-reactive
	(b) Molecules	(ii) Brittle
	(c) Non-metals	(iii) Lustrous
	(d) Noble gases	(iv) Smallest unit of compound
Ans.	Column A	Column B
	(a) Metals	(iii) Lustrous
	(b) Molecules	(iv) Smallest unit of compound
	(c) Non-metals	(ii) Brittle
	(d) Noble gases	(i) Non-reactive

3. Indicate whether the following statements are true or false.

(a) A compound is made up of just one kind of atom.

Answer. True False

Correct : A compound is made up of two or more elements in a fixed proportion by mass.

(b) Metals reflect light and are good conductors of electricity.

Answer. True

(c) Metals can be polished.

Answer. True

(d) Elements are made up of compounds.

Answer. False

Correct : Elements are made up of atoms.

(e) All elements are artificially prepared.

Answer. False

Correct: All elements are made up of a limited number of basic substances.

(f) Molecules can exist independently.

Answer. True

(g) Molecules combine to form atoms.

Answer. False

Correct : Atoms combine to form molecule.

(h) Noble gases are higt reactive.

Answer. False

Correct: Noble gases are non-reactive.

(i) Ozone is a triatomic molecule.

Answer. True

MULTIPLE CHOICE QUESTIONS

Tick (✓) the correct alternative from the choice given for the following statements :

1. All pure substances have

1. the same physical state .
2. the same colour
3. the same composition
4. **a definite set of properties**

2. Sugar is a compound which consists of the elements

1. carbon and hydrogen
2. hydrogen and oxygen
3. **carbon, hydrogen and oxygen**
4. hydrogen, carbon and sulphur

3. Atoms of different kinds combine to form molecules of

1. an element
2. **a compound**
3. a mixture

4. all of the above

4. Sulphur and carbon are

1. metals
2. **non-metals**
3. metalloids
4. noble gases

5. Gold is used to make jewellery because

1. it is dull
2. **lustrous and attractive**
3. highly reactive
4. very cheap

6. The most abundant elements in the universe are

1. neon and argon
2. **hydrogen and helium**
3. aluminium and copper
4. oxygen and nitrogen

7. The compound used as common salt is

1. **sodium chloride**
2. calcium chloride
3. sodium oxide
4. hydrogen chloride

8. Brass and bronze are

1. elements
2. **mixtures**
3. compounds
4. all of the above

9. Sand is a compound of

1. silicon and nitrogen
2. **silicon and oxygen**
3. oxygen and sulphur
4. none of the above

10. From the list given below select the correct substance which is most suitable to the statements given : (oxygen, diamond, zinc, graphite, gold)

1. A metal which is brittle.
2. A non-metal which is a good conductor of electricity.
3. The hardest naturally occurring substance.
4. The most ductile metal.
5. A gaseous non-metal.

Answer.

- (a) Zinc
- (b) Graphite
- (c) Diamond
- (e) Oxygen

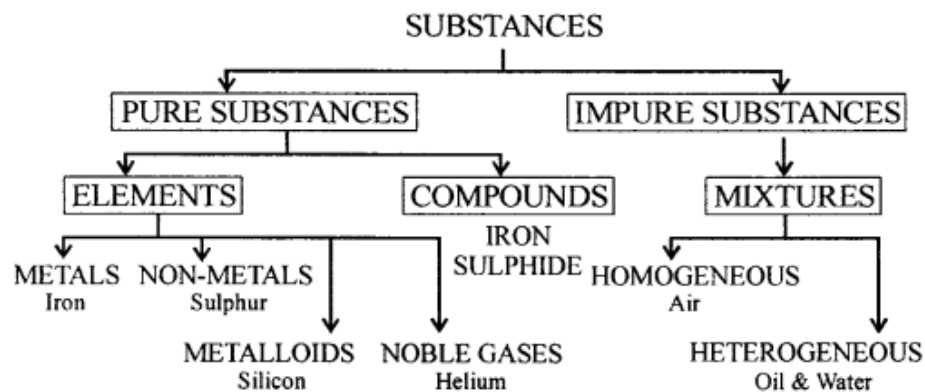
ADDITIONAL QUESTIONS FOR PRACTICE Exercise

Elements and Compounds

Question 1.

Classify substances into pure and impure substances in the form of a chart or tabulation.

Answer:



Question 2.

Differentiate between the terms – elements, compounds & mixtures.

Answer:

Element is a pure substance.

1. It is the basic unit of matter and cannot be broken down into two or more simpler substances by any means.
2. It is mainly classified into metals, non-metals, metalloids and noble gases.

Compound is a pure substance.

1. It is formed by combination of two or more elements.
2. The elements are combined together in a fixed ratio.
3. It can be broken down into its elements by chemical means.

Mixture is an impure substance.

1. It is formed by combination of two or more elements, compounds or both.
2. The substances are mechanically mixed together in any ratio.

Question 3.

The important physical properties of substances are colour, odour, nature, density & solubility in water. Name –

- (a) two coloured gases (with their colours)
- (b) a gas with a pungent, choking odour which is lighter than air
- (c) a poisonous gas almost as heavy as air.

Answer:

- (a) (i) Chlorine – greenish yellow ,(ii) Nitrogen dioxide – reddish brown.
- (b) Ammonia.
- (c) Carbon monoxide

Question 4.

Complete the statement – an element is a pure substance made up of (identical/different) atoms.

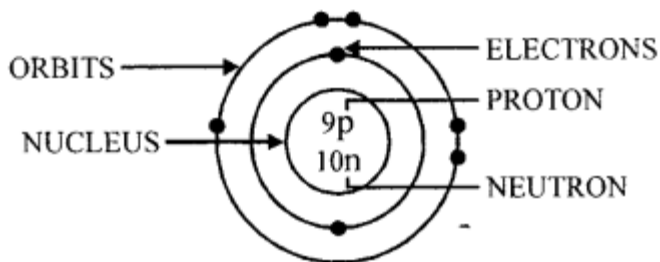
Answer:

An element is a pure substance made up of **identical** atoms.

Question 5.

Draw a labelled diagram of an atom including its nucleus, orbits & their contents.

Answer:



Question 6.

Elements are classified into – Metals – Non-metals – Metalloids – Noble gases.
State which of A, B, C, D is a –

1. **Metallic element**
2. **Non-metallic element**
3. **Metalloid**
4. **Noble gas.**

A : Is non-malleable, non-ductile & a poor conductor of electricity

B : Has lustre, is malleable and ductile & a good conductor of heat

C : Is unreactive and inert and present in traces in air

D : Shows properties of both metals and non-metals.

Answer:

A : Is non-malleable, non-ductile & a poor conductor of electricity **Non-metallic element**

B : Has lustre, is malleable and ductile & a good conductor of heat **Metallic element**

C : Is unreactive and inert and present in traces in air **Noble gas.**

D : Shows properties of both metals and non-metals **Metalloid**

Question 7.

An atom of an element is denoted by a “symbol” Explain the meaning of the term ‘symbol’. State a reason for representing the following elements by their symbols.

(a) **Hydrogen by ‘H’**

(b) **Helium by ‘He’,**

(c) **Copper by ‘Cu’ .**

Answer:

Symbols : The short form or abbreviated name of the element (or radicals)

The reason for representing the following elements by their symbols are as follow :

(a) **Hydrogen by ‘H’** – First letter of the name of element

(b) **Helium by He** – First two letters of the name of Noble gases.

(c) **Copper by ‘Cu’** – Deriving symbols from their Latin names

Question 8.

Match the metallic elements – with their correct symbols Metallic elements

(a) Potassium (b) Sodium (c) Calcium (d) Magnesium (e) Zinc (f) Aluminium (g) Iron (h) Lead (i) Copper (j)Mercury (k) Silver (l) Platinum (m) Gold

Symbols : (1) Ca ; (2) Zn ; (3) Pb ; (4) Hg ; (5) Cu ; (6) Au ; (7) K ; (8) Fe ; (9) Al

; (10) Na ; (11) Mg ; (12) Pt ; (13) Ag

Answer:

Metallic	Symbol	Metallic	Symbol
a. Potassium	K	b. Sodium	Na
c. Calcium	Ca	d. Magnesium	Mg
e. Zinc	Zn	f. Aluminium	Al
g. Iron	Fe	h. Lead	Pb
i. Copper	Cu	j. Mercury	Hg
k. Silver	Ag	l. Platinum	Pt
m. Gold	Au		

Question 9.

Match the non-metallic elements – with their correct symbols.

Non-metallic elements :

(a) Carbon (b) Chlorine (c) Oxygen (d) Phosphorus (e) Hydrogen (f) Nitrogen (g) Iodine (h) Bromine (i) Fluorine (j) Silicon (k) Sulphur

Symbols : (1) O (2) I (3) Si (4) C (5) Cl (6) P (7) F (8) H (9) S (10) Br (11) N

Answer:

Non-Metallic	Symbol	Non-Metallic	Symbol
a. Carbon	C	b. Chlorine	Cl
c. Oxygen	O	d. Phosphorus	P
e. Hydrogen	H	f. Nitrogen	N
g. Iodine	I	h. Bromine	Br
i. Fluorine	F	j. Silicon	Si
k. Sulphur	S		

Question 10.

Match the noble gases – with their correct symbols

Noble gases : (a) Helium (b) Neon (c) Argon (d) Krypton (e) Xenon (f) Radon

Symbols : (1) Ar (2) Xe (3) Rn (4) He (5) Kr (6) Ne

Answer:

Noble gas	Symbols	Noble gas	Symbols
(a) Helium	- He	(b) Neon	- Ne
(c) Argon	- Ar	(d) Krypton	- Kr
(e) Xenon	- Xe	(f) Radon	- Rn

Question 11.

Give a reason why elements are tabulated in a table called the 'Periodic table'.

Answer:

For arranging all the elements in a systematic and simple manner. The arrangement of elements was done in the form of a table called Periodic Table in which elements are arranged in increasing order of their atomic numbers. Elements in the Periodic Table are arranged in Horizontal rows called Periods and vertical columns called Groups. Metallic elements are placed on the left non-metallic on the right and noble gases on the extreme right of the Periodic table.

Question 12.

Give the names and symbols of the first twenty elements of the periodic table. Differentiate them into metals, non-metals, metalloids and noble gases.

Answer:

Metals	Metalloids	Non-metals	Noble gases
Lithium-Li	Boron B	Carbon-C	Helium-He
Beryllium-Be	Silicon Si	Nitrogen-N	Neon-Ne
Sodium-Na		Oxygen-O	Argon-Ar
Magnesium-Mg		Fluorine-F	
Aluminium-Al		Phosphorus-P	
Potassium-K		Sulphur-S	
Calcium-Ca		Chlorine-Cl	
Scandium-Sc			
Titanium-Ti			

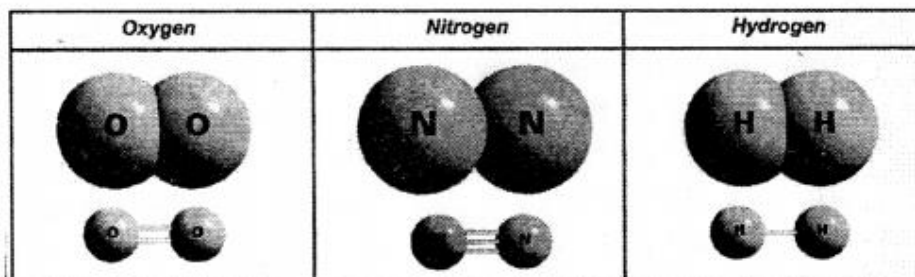
Question 13.

Explain the term – molecules. Give three examples of atoms of the same element forming a molecule. State the atomicity of the same.

Answer:

Atoms of the same element or different elements combine to form a molecule.

Atoms of the same element forming a molecule **1. Oxygen 2. Nitrogen 3. Hydrogen.**



Atomicity is the number of atoms present in one molecule of the element.

Element :

Hydrogen H

Nitrogen N

Oxygen O

Molecule :

H₂

N₂

O₂

Atomicity :

2

2

2

Question 14.

Give one example of **(a)** a triatomic molecule **(b)** a polyatomic molecule.

Answer:

(a) A Triatomic molecule

Element : Ozone O

Molecule : O₃

Atomicity : 3

(b) A polyatomic molecule

Element : Phosphorus P

Molecule : P₄

Atomicity : 4

Question 15.

Explain the term compounds. Give the example of a compound containing

(a) hydrogen and oxygen

(b) carbon and oxygen

(c) nitrogen and oxygen

(d) calcium and oxygen.

Answer:

A compound is a pure substance made up of two or more different elements combined

chemically in a fixed proportion.

Example of Atoms of different elements forming a compound

(a) 2 Atom of H and 1 atom of O = H_2O

(b) Carbon dioxide, 1 atom of carbon and 2 atom of O = CO_2

(c) Nitrogen dioxide, 1 atom of nitrogen 2 atom of O = NO_2

(d) Calcium oxide, 1 atom of calcium 1 atom of O = CaO

Question 16.

State two characteristics of water which prove that it is a – compound.

Answer:

Characteristics of compounds

1. **Elements** in a compound are present in a definite proportion.
Example 2 atoms of hydrogen combine with 1 atom of oxygen to give 1 molecule of water (compound) $H_2 + O = H_2O$ (water)
2. **Compounds** have a definite set of properties example :
The properties of the compound water are different from the properties of the elements hydrogen and oxygen in water.

Question 17.

Explain the terms 'chemical formula'. State what a chemical formula denotes.

Answer:

Chemical formula is a representation of a substance either element or compound by means of symbols.

Chemical formula denotes the number of atoms of each element present in a compound.

Question 18.

Give the symbols and the number of atoms of each element present in

(a) sodium chloride

(b) water

(c) carbon dioxide

(d) zinc chloride.

Answer:

(a) Sodium chloride

Elements	Symbols
(Sodium)	Na
[chlorine (Chloride)]	Cl

No. of atoms of each element present

1 atom of - Na, 1 atom of - Cl

(b) Water (H₂O)

Elements	Symbols
(Hydrogen)	H
[Oxygen (oxide)]	O

No. of atoms of each element present

2 atoms of - H, 1 atom of - O

(c) carbon dioxide CO₂

Elements	Symbols
(Carbon)	C
[Oxygen (oxide)]	O

No. of atoms of each element present

1 atom of - C, 2 atoms of - O

(d) zinc chloride ZnCl₂

Elements	Symbols
(Zinc)	Zn
[Chlorine (chloride)]	Cl

No. of atoms of each element present

1 atom of - Zn, 2 atoms of - Cl

Question 19.

For writing a chemical formula – ‘symbols’ and combining capacity of an element with hydrogen i.e. ‘valency’ should be known. Explain the term – combining capacity of an element i.e. valency.

Answer:

The combining power of an element especially as measured by the number of hydrogen atoms can combine or displace with the element.

Question 20.

State what are radicals. Give the names of the radicals –

(a) No₃

(b) OH

- (c) SO_4
- (d) CO_3

Answer:

A radical is an atom or group of atom of same or different elements that behaves in the manner of positive or negative ions.

- (a) NO_3 – nitrate
- (b) OH – hydroxide
- (c) SO_4 – sulphate
- (d) CO_3 – carbonate

Question 21.

Match the symbols of metallic elements – with their correct combining power or capacity.

- (a) K
- (b) Zn
- (c) Al
- (d) Na
- (e) Ca

Combining power or capacity – A : 3 ; B : 2 ; C : 1.
(positive valencies)

Answer:

- (a) K — Valency-1 (C)
- (b) Zn — Valency-2 (B)
- (c) Al — Valency-3 (A)
- (d) Na — Valency-1 (C)
- (e) Ca — Valency-2 (B)

Question 22.

Match the symbols of non-metallic elements with their correct combining power or capacity.

- (a) O
- (b) S
- (c) Cl

Combining power or capacity A : 3; B : 2; C : 1. (negative valencies)

Answer:

- (a) O — Valency-2 (B)
- (b) S — Valency-2 (B)
- (c) Cl — Valency-1 (C)

Question 23.

Match the symbols of – radicals – with their correct combining power or capacity, (valency).

- (a) OH
- (b) So_4
- (c) No_3
- (d) Co_3

Combining power or capacity – A : 3; B : 2; C : 1. (negative valencies)

Answer:

- (a) OH— Valency- 1 (C)
- (b) So_4 — Valency- 2 (B)
- (c) No_3 — Valency- 1 (C)
- (d) Co_3 — Valency- 2 (B)

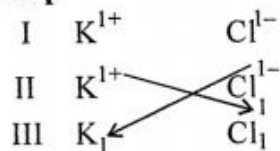
Question 24.

Write the formula of the compound formed – given symbols and combining power or capacity (valency) of each element in the compound.

- (a) $\text{K}^{1+} \text{Cl}^{1-}$
- (b) $\text{Na}^{1+} \text{Cl}^{1-}$
- (c) $\text{Ca}^{2+} \text{No}_3^{1-}$

Answer:

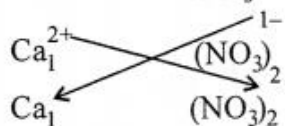
(a) $K^{1+} Cl^{1-}$ **Step** Formula = KCl



(b) $Na^{1+} Cl^{1-}$ Na^{1+} Cl^{1-} Formula NaCl



(c) $Ca^{2+} NO_3^{1-}$ Ca^{2+} NO_3^{1-} Formula = $Ca(NO_3)_2$



Question 25.

Match the formulas of the following – gases – with their correct names :

Gases- (a) H_2 (b) N_2 (c) O_2 (d) Cl_2 (e) HCl (f) NH_3 (g) CO (h) CO_2 (i) SO_2 (j) NO (k) NO_2

Names :

- | | |
|------------------------|-----------------------|
| (1) Ammonia | (2) Nitrogen dioxide |
| (3) Oxygen | (4) Hydrogen |
| (5) Nitrogen | (6) Chlorine |
| (7) Carbon monoxide | (8) Sulphur dioxide |
| (9) Nitrogen monoxide | (10) Carbon dioxide ; |
| (11) Hydrogen chloride | |

Answer:

- | | |
|------------|------------------------|
| (a) H_2 | (4) Hydrogen |
| (b) N_2 | (5) Nitrogen |
| (c) O_2 | (3) Oxygen |
| (d) Cl_2 | (6) Chlorine |
| (e) HCl | (11) Hydrogen chloride |

- | | |
|-------------------|-----------------------|
| (f) NH_3 | (1) Ammonia |
| (g) CO | (7) Carbon monoxide |
| (h) CO_2 | (10) Carbon dioxide |
| (i) SO_2 | (8) Sulphur dioxide |
| (j) NO | (9) Nitrogen monoxide |
| (k) NO_2 | (2) Nitrogen dioxide |

Question 26.

Match the formulas of the following – acids – with their correct names

Acids –

- (a) HCl
- (b) HNO_3
- (c) H_2SO_4
- (d) H_2CO_3

Names –

- (1) Carbonic acid
- (2) Sulphuric acid
- (3) Hydrochloric acid
- (4) Nitric acid

Answer:

- | | |
|-----------------------|-----------------------------|
| (1) Carbonic acid | (d) H_2CO_3 |
| (2) Sulphuric acid | (c) H_2SO_4 |
| (3) Hydrochloric acid | (a) HCl |
| (4) Nitric acid | (b) HNO_3 |

Question 27.

Match the formulas of the following – bases – with their correct names.

Bases –

- (a) NaOH
- (b) KOH
- (c) $\text{Ca}(\text{OH})_2$
- (d) $\text{Zn}(\text{OH})_2$

Names –

- (1) Potassium hydroxide
- (2) Zinc hydroxide
- (3) Aluminium hydroxide
- (4) Calcium hydroxide
- (5) Sodium hydroxide

Answer:

- (1) Potassium hydroxide – **(b)** KOH
- (2) Zinc hydroxide – **(d)** $\text{Zn}(\text{OH})_2$
- (3) Calcium hydroxide – **(c)** $\text{Ca}(\text{OH})_2$
- (4) Sodium hydroxide – **(a)** NaOH

Question 28.

Complete the statements with the correct words.

Answer:

- (a) Acids** – are chemicals which are **sour** in taste and derived from plants and **minerals**.
- (b) Bases** – are chemicals which are hydroxide (or oxides) of **metals** eg. sodium hydroxide.
- (c) Salts** – are chemicals formed on reaction of a base with an **acid** giving salt and water.

Question 29.

In the chemical word equation – Zinc + Sulphuric acid ® Zinc sulphate + Hydrogen

- (a)** State the reactants and products of the above reaction. What does the arrow indicate.

Answer:

Question

- (b)** The molecular equation is :

$\text{Zn} + \text{H}_2\text{SO}_4 \text{ ® } \text{ZnSO}_4 + \text{H}_2[\text{g}]$. State what [g] represents.

Answer:

[g] represents gas.

Objective Type Questions

Elements and Compounds

Q.I. Complete the statements given below by filling in the blank with the correct word/s.

1. An element is a pure substance which cannot be broken down by physical or **chemical** methods.
2. The basic unit of an element is an **atom**.
3. Atom contains **nucleus**, with positively charged **protons**.
4. Element **silver** has the symbol derived from its Latin name 'argentum'.
5. From the elements – He, Br, Pt and O ; the element which is metallic is **Pt**, an inert element is **He**, forms a triatomic molecule is O, is liquid at room temperature is **Br**.
6. From the elements nitrogen, chlorine, bromine, the element present in the atmosphere is **nitrogen**.

Q.2. Match the statements in List I – 1 correct answers in List II – A to J.

List I	List II
1. Fluorine and chlorine	A : Nitrogen
2. A diatomic molecule	B : Boron
3. A molecule containing the elements hydrogen and oxygen	C : Reactants
4. A metalloid - showing properties of both metals and non-metals	D : Chemical formula
5. The term used for the substances which take part in the chemical reaction	E : Halogens
6. The term which represents a substance by means of symbols	F : Water
7. The term used for substances formed as a result of a chemical reaction	G : Nitric oxide
8. A compound containing one atom of zinc and two atoms of chlorine	H : Products
9. The chemical name for nitrogen monoxide	I : Phosphorus
10. A polyatomic molecule	J : Zinc chloride

Answer:

- | | |
|--|----------------------|
| 1. Fluorine and chlorine | E : Halogens |
| 2. A diatomic molecule | A : Nitrogen |
| 3. A molecule containing the elements hydrogen and oxygen | F : Water |
| 4. A metalloid - showing properties of both metals and non-metals | B : Boron |
| 5. The term used for the substances which take part in the chemical reaction | C : Reactants |
| 6. The term which represents a substance by means of symbols | D : Chemical formula |
| 7. The term used for substances formed as a result of a chemical reaction | H : Products |
| 8. A compound containing one atom of zinc and two atoms of chlorine | J : Zinc chloride |
| 9. The chemical name for nitrogen monoxide | G : Nitric oxide |
| 10. A polyatomic molecule | I : Phosphorus |

Q.3. Select the correct answer from the choice in brackets.

Question 1.

The symbol of – mercury [Mg / Hg / Ag]

Answer:

Hg

Question 2.

The type of element-phosphorus [metallic / non-metallic / noble gas]

Answer:

non-metallic

Question 3.

The type of molecule- bromine [monoatomic / diatomic / triatomic]

Answer:

diatomic

Question 4.

A compound [nitrogen / ozone/ zinc chloride]

Answer:

zinc chloride

Question 5.

The unreactive non-metallic element [chlorine / argon / sulphur]

Answer:

argon

Question 6.

The negatively charged particles in an atom [protons / neutrons / electrons]

Answer:

electrons

Question 7.

The element which is malleable [sulphur / carbon / iron]

Answer:

iron

Question 8.

An impure substance [element / mixture / compound]

Answer:

mixture

Question 9.

An element which is a poor conductor of heat [copper / carbon / aluminum]

Answer:

carbon

Question 10.

A group of atoms of elements [ion / radical / combining power]

Answer:

radical

Q.4 Match the compounds in List I – 1 to 20 with their correct formulas from in List II – A to T.

- | | |
|--------------------------------|-------------------------------|
| 1. Hydrochloric acid | 2. Potassium hydroxide |
| 3. Sulphuric acid | 4. Zinc hydroxide |
| 5. Sodium chloride | 6. Nitric acid |
| 7. Calcium hydroxide | 8. Carbonic acid |
| 9. Sodium hydroxide | 10. Copper sulphate |
| 11. Potassium chloride | 12. Calcium carbonate |
| 13. Magnesium sulphide | 14. Zinc sulphate |
| 15. Aluminium hydroxide | 16. Sodium carbonate |
| 17. Calcium sulphide | 18. Magnesium oxide |
| 19. Zinc oxide | 20. Ammonium chloride. |

- | | | | | |
|---------------------------------------|------------------------------|---------------------------------------|--|---------------|
| A. NaCl | B. NaOH | C. KCl | D. Ca(OH)₂ | |
| E. CaS | F. CuSO₄ | G. CaCO₃ | H. NH₄Cl | I. HCl |
| J. ZnO | K. HNO₃ | L. H₂CO₃ | M. MgS | |
| N. MgO | O. KOH | P. ZnSO₄ | Q. Na₂CO₃ | |
| R. H₂SO₄ | S. Al(OH)₃ | T. Zn(OH)₂ | | |

Ans.1. Hydrochloric acid (I) HCl

2. Potassium hydroxide (O) KOH
3. Sulphuric acid (R) H₂SO₄
4. Zinc hydroxide (T) Zn(OH)₂
5. Sodium chloride (A) NaCl
6. Nitric acid (K) HNO₃
7. Calcium hydroxide (D) Ca(OH)₂
8. Carbonic acid (L) H₂CO₃
9. Sodium hydroxide (B) NaOH
10. Copper sulphate (F) CuSO₄
11. Potassium chloride (C) KCl
12. Calcium carbonate (G) CaCO₃
13. Magnesium sulphide (M) MgS
14. Zinc sulphate (P) ZnSO₄
15. Aluminium hydroxide (S) Al(OH)₃
16. Sodium carbonate (Q) Na₂CO₃
17. Zinc sulphide (E) ZnS
18. Magnesium oxide (N) MgO
19. Zinc oxide (J) ZnO
20. Ammonium chloride (H) NH₄Cl