

Chapter 1 The Language Of Chemistry

1. What is a symbol? What information does it convey?

Solution:

Short form of an atom of a specific element or the abbreviations used to refer names of the element is known as symbol.

1. It represents a specific element.
2. It represents one atom of an element.
3. A symbol represents how many atoms are present in its one gram (gm) atom.
4. It represents the number of times an atom is heavier than one atomic mass unit (amu) taken as a standard.

2. Why is the symbol S for Sulphur, but Na for Sodium and Si for Silicon?

Solution:

While naming an element first letter of the element is taken and written in capitals(e.g. for sulphur, we use the symbol S). In case if the letter is already adopted. We use a symbol derived from the Latin word of the element name (e.g. for sodium/Natrium, we use the symbol Na). In some cases, we use the initial letter in capital together with a small letter from its name (e.g. for silicon, we use the symbol Si).

3. Write the full form of IUPAC. Name the elements represented by the following Symbols: Au, Pb, Sn, Hg

Solution:

IUPAC stands for The International Union of Pure and Applied Chemistry (IUPAC).

Au- Gold

Pb- Lead

Sn- Tin

Hg- Mercury

4. If the symbol for cobalt, Co were written as CO, What would be wrong with it?

Solution:

If we write CO it means it consists of two non-metals namely Carbon and Oxygen and it would represent Carbon-monoxide but not Cobalt.

5. What do the following symbols stand for?

a) H b) H₂ c) 2H d) 2H₂

Solution:

1. H stands for one atom of Hydrogen
2. H₂ stands for one molecule of Hydrogen
3. 2H stands for 2 atoms of Hydrogen
4. 2H₂ stands for 2 molecules of Hydrogen.

6. What is meant by atomicity? Name a diatomic element.

Solution:

A set of atoms of the same type together forms a molecule of the element. The number of atoms in a molecule of an element is called its atomicity.

Examples of diatomic elements are H_2 – Hydrogen, O_2 – Oxygen, N_2 – Nitrogen

7. a) Explain the terms valency and variable valency

b) How are the elements with variable valency named? Explain with an example.

Solution:

a) Valency is the capacity of an atom to lose, gain or share atoms during a chemical reaction is called its valency. Sometimes atom of an element can lose more electron than they are present which means they lose electron from its penultimate shell. Such an element is said to exhibit variable valency.

b) If an element exhibits two different positive valencies, then

1. For the lower valency, use the suffix -OUS at the end of the name of the metal

2. For the higher valency, use the suffix -IC at the end of the name of the metal.

8. Give the formula and valency of

a) aluminate

b) chromate

c) aluminium

d) cupric

Solution:

Name	Formula	Valency
Aluminate	AlO_2	-2
Chromate	CrO_4	-2
Aluminium	Al	+3
Cupric	Cu	+2

9.a) What is a chemical formula?

b) What is the significance of a formula? Give an illustrate.

Solution:

a) A chemical formula is a symbolic representation of the number of atoms present in a molecule of that substance.

b) Significance of Chemical Formula

A chemical formula is very important in finding information about chemical compounds as it tells us about the elements and the number of atoms in a substance

Example – Salt – NaCl, ethanol C₂H₆O because the molecule of ethanol contains two Carbon, 6 Hydrogen and 1 Oxygen atom.

10. What do you understand by the following terms?

a) Acid radical b) Basic radical

Solution:

1. Negatively charged radical is called as acidic radical.
2. Positively charged radical is called a basic radical.

11. Select the basic radical in the following compounds

- a) MgSO₄
- b) (NH₄)₂
- c) Al₂(SO₄)₃
- d) ZnCO₃
- e) Mg(OH)₂

Solution:

	Acid Radical	Basic radical
a) MgSO ₄	SO ₄ ⁻	Mg ⁺
b) (NH ₄) ₂ SO ₄	SO ₄ ⁻	NH ₄ ⁺
c) Al ₂ (SO ₄) ₃	SO ₄ ⁻	Al ⁺³
d) ZnCO ₃	CO ₃ ⁻	Zn ⁺²
e) Mg(OH) ₂	OH ⁻	Mg ⁺²

12. Write the chemical formulae of sulphates of Aluminium, Ammonium and Zinc.

Solution:

Valencies of aluminium, ammonium and zinc are 3, 1 and 2, respectively. The valency of sulphate is 2. Hence, chemical formulae of the sulphates of aluminium, ammonium and zinc are Al₂(SO₄)₃, (NH₄)₂SO₄, ZnSO₄.

13. The valency of element A is 3 and that of element B is 2. Write the formula of the compound formed by the combination of A and B.

Solution:

The formula of the compound whose valency is 3 and 2 is A₂B₃.

14. Match the following

Compound	Formula
Boric acid	NaOH
Phosphoric acid	SiO ₂
Nitrous acid	Na ₂ CO ₃
Nitric acid	KOH
Sulphurous acid	CaCO ₃
Sulphuric acid	NaHCO ₃
Hydrochloric acid	H ₂ S
Silica (Sand)	H ₂ O
Caustic soda (Sodium Hydroxide)	PH ₃
Caustic potash(potassium hydroxide)	CH ₄
Washing soda(Sodium carbonate)	NH ₃
Baking Soda (Sodium bicarbonate)	HCl
Limestone (calcium carbonate)	H ₂ SO ₃
Water	HNO ₃
Hydrogen Sulphide	HNO ₂
Ammonia	H ₃ BO ₃
Phosphine	H ₃ PO ₄
Methane	H ₂ SO ₄

Solution:

Compound	Formula
Boric acid	H ₃ BO ₃
Phosphoric acid	H ₃ PO ₄
Nitrous acid	HNO ₂
Nitric acid	HNO ₃
Sulphurous acid	H ₂ SO ₃
Sulphuric acid	H ₂ SO ₄
Hydrochloric acid	HCl
Silica (Sand)	SiO ₂

Caustic soda (Sodium Hydroxide)	NaOH
Caustic potash(potassium hydroxide)	KOH
Washing soda(Sodium carbonate)	Na ₂ CO ₃
Baking Soda (Sodium bicarbonate)	NaHCO ₃
Limestone (calcium carbonate)	CaCO ₃
Water	H ₂ O
Hydrogen Sulphide	H ₂ S
Ammonia	NH ₃
Phosphine	PH ₃
Methane	CH ₄

15. write the basic and acidic radicals of the following and then write the chemical formulae of these compounds.

- a) Barium sulphate
- b) Bismuth nitrate
- c) calcium bromide
- d) Ferrous sulphide
- e) Chromium sulphate
- f) Calcium silicate
- g) Stannic oxide
- h) Sodium Zincate
- i) Magnesium phosphate
- j) Sodium thiosulphate
- k) Stannic phosphate
- l) Nickel-bi-sulphate
- m) Potassium manganate
- n) Potassium ferrocyanide

Solution:

Compounds	Acidic radical	Basic radical	Chemical formulae
a) Barium sulphate	SO_4^{-2}	Ba^{+2}	BaSO_4
b) Bismuth nitrate	NO_3^-	Bi^{3+}	$\text{Bi}(\text{NO}_3)_3$
c) calcium bromide	Br^-	Ca^{+2}	CaBr_2
d) Ferrous sulphide	S^{2-}	Fe^{+2}	FeS
e) Chromium sulphate	SO_4^{-2}	Cr^{+3}	$\text{Cr}_2(\text{SO}_4)_3$
f) Calcium silicate	SiO_4^{-2}	CR^{3+}	$\text{Cr}_2(\text{SO}_4)_3$
g) Stannic oxide	O^{-2}	Sn^{+2}	SnO_2
h) Sodium Zincate	ZnO^{-2}	Na^{+1}	Na_2ZnO_2
i) Magnesium phosphate	PO_4^{-3}	Mg^{+2}	$\text{Mg}^3(\text{PO}_4)_2$
j) Sodium thiosulphate	$(\text{S}_2\text{O}_3)^{-2}$	Na^{+1}	$\text{Na}_2\text{S}_2\text{O}_3$
k) Stannic phosphate	$(\text{PO}_4)^{-3}$	Sn^{4+}	$\text{Sn}_3(\text{PO}_4)_4$
l) Nickel-bi-silphate	H_2SO_4^-	Ni^{+3}	$\text{NiH}(\text{SO}_4)_3$
m) Potassium manganate	MnO_4^{-2}	K^{+1}	K_2MnO_4
n) Potassium ferrocynide	$[\text{Fe}(\text{CN})_6]^{4-}$	K^{1+}	$\text{K}_4[\text{Fe}(\text{CN})_6]$

16. Write chemical names of the following compounds

1. $\text{Ca}_3(\text{PO}_4)_2$
2. K_2CO_3
3. K_2MnO_4
4. $\text{Mn}_3(\text{BO}_3)_2$
5. $\text{Mg}(\text{HCO}_3)_2$
6. $\text{Na}_4\text{Fe}(\text{CN})_6$

7. $\text{Ba}(\text{Cl})_3)_2$
8. Ag_2SO_3
9. $(\text{CH}_3\text{COO})_2\text{Pb}$
10. Na_2SiO_3

Solution:

1. Calcium phosphate
2. Potassium carbonate
3. Potassium manganate
4. Manganese(II) Borate
5. Magnesium bicarbonate.
6. Sodium ferrocyanide
7. Barium Chlorate
8. Silver sulfite
9. Lead(II) acetate
10. Sodium silicate

17. Give the names of the following compounds

- a) KClO
- b) KClO_2
- c) KClO_3
- d) KClO_4

Solution:

1. Potassium hypochlorite
2. Potassium chlorite
3. Potassium chlorate
4. Potassium perchlorate

18. Complete the following statements by selecting the correct option.

- a) The formula of a compound represents
 1. an atom

2. a particle
3. a molecule
4. a combination

b) The correct formula of aluminium oxide is

1. AlO_3
2. AlO_2
3. Al_2O_3
4. Al_3O_2

c) The valency of Nitrogen in Nitrogen dioxide(NO_2) is

- i) One
- ii) Two
- iii) Three
- iv) Four

Solution:

- a. The formula of a compound represents a molecule
- b. The correct formula of aluminium oxide is Al_2O_3
- c. The valency of Nitrogen in Nitrogen dioxide(NO_2) is four

19. Give the names of the elements and number of atoms of those elements, present in the following compounds.

- a) Sodium sulphate
- b) Quick lime
- c) Baking soda (NaHCO_3)
- d) Ammonia
- e) Ammonium dichromate

Solution:

a) Sodium sulphate

A chemical formula is Na_2SO_4

Atoms- 2 sodium, one Sulphur and 4 oxygen atoms.

b) Quick lime

The chemical formula is CaO .

Atoms- one Calcium atom and 1 oxygen atom.

c) Baking soda (NaHCO_3)

The chemical formula is NaHCO_3

Atoms- 1 Sodium, 1 hydrogen, 1 carbon and 3 oxygen atoms.

d) Ammonia

A chemical formula is NH_3

Atoms- 3 hydrogens and 1 nitrogen atom.

e) Ammonium dichromate

The chemical formula is $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$.

Atoms- 2 ammonium, 2 chromium and 7 oxygen atoms.

20. The formula of the sulphate of an element M is $\text{M}_2(\text{SO}_4)_3$.

Write the formula of it.

a) Chloride

b) Oxide

c) Phosphate

d) Acetate

Solution:

a) Chloride