

Chapter 5 – Language of Chemistry

ACTIVITY 1

Write the names and symbols of the first twenty elements that you have studied in class VI & VII.

Answer:

Name of the elements	Symbol	Valency
1. Hydrogen	H	1
2. Helium	He	0
3. Lithium	Li	1
4. Beryllium	Be	2
5. Boron	B	3
6. Carbon	C	4
7. Nitrogen	N	3
8. Oxygen	O	2
9. Fluorine	F	1
10. Neon	Ne	0
11. Sodium	Na	1
12. Magnesium	Mg	2
13. Aluminium	Al	3
14. Silicon	Si	4
15. Phosphorus	P	3
16. Sulphur	S	2
17. Chlorine	Cl	1
18. Argon	Ar	0
19. Potassium	K	1
20. Calcium	Ca	2

ACTIVITY 2

Write the molecular formulae of:

1. Copper oxide

Answer: CuO

2. Iron (III) chloride

Answer: $FeCl_3$

3. Sodium hydroxide

Answer: NaOH

4. Iron (II) sulphide

Answer: FeS

5. Lead (II) oxide

Answer: PbO

6. Hydrogen nitrate (nitric acid)

Answer: HNO_3

7. Hydrogen sulphate (sulphuric acid)

Answer: H_2SO_4

8. Calcium hydroxide

Answer: $Ca(OH)_2$

9. Magnesium carbonate

Answer: $MgCO_3$

10. Ammonium carbonate

Answer: $(NH_4)_2CO_3$

ACTIVITY 3

Write the molecular formula for each of the following compounds:

1. Sulphur trioxide

2. Iron (II) sulphide

3. Ammonia

Find the number and names of elements present in them and calculate their molecular masses.

Answer:

1. Sulphur trioxide

1. The molecular formula of sulphur trioxide is SO_3 .
2. The elements present in it are sulphur dioxide and oxygen.
3. One molecule of sulphur trioxide has one atom of sulphur and three atoms of oxygen.
4. Molecular mass of sulphur trioxide (SO_3)
 $= 32 + 3 \times 16$
 $= 32 + 48 = 80 \text{ amu}$.

2. Iron (II) sulphide

1. The molecular formula of iron (II) sulphide is FeS.
2. The elements present in it are iron and sulphur.
3. One molecule of iron (II) sulphide has one atom of iron and one atom of sulphur.
4. Molecular mass of iron (II) sulphide (FeS)
 $= 55.5 + 32$
 $= 87.5 \text{ amu}$

3. Ammonia

1. The molecular formula of ammonia is NH_3 .
2. The elements present in it are nitrogen and hydrogen.
3. One molecule of ammonia has one atom of nitrogen and three atoms of hydrogen.
4. Molecular mass of ammonia (NH_3)
 $= 14 + 3 \times 1$
 $= 14 + 3$
 $= 17 \text{ amu}$.

Question 1

Define:

- (a) Radical
- (b) Valency
- (c) Molecular formula

Solution:

- (a) Radical: An atom of an element or a group of atoms of different elements that behaves as a single with a positive or negative charge on it is called radical.
- (b) Valency: The number of electrons donated or accepted by the valence shell of an atom during chemical combination is called as valency.
- (c) Molecular formula: Molecular formula is a symbolic representation of a molecule. It represents the number of atoms of each element present. These atoms combine in the whole to form the molecule.

Question 2.

Give the symbols and valencies of following radicals:

- (a) Hydroxide
 (b) Chloride
 (c) Carbonate
 (d) Ammonium
 (e) Nitrate

Solution:

Element	Symbol	Valencies
(a) Hydroxide	OH^-	1
(b) Chloride	Cl^-	1
(c) Carbonate	CO_3^{2-}	2
(d) Ammonium	NH_4^+	1
(e) Nitrate	NO_3^-	1

Question 3.

Write the molecular formula for the oxide and sulphide of following elements.

(a) Sodium

Solution:

(a) Sodium oxide Na_2O

Sodium sulphide Na_2S

(b) Calcium

Solution:

(b) Calcium oxide CaO

Calcium sulphide CaS

(c) Hydrogen

Solution:

(c) Hydrogen oxide H_2O

Hydrogen sulphide H_2S

Question 4.

Write the molecular formulae for the following compounds and name the elements present.

(a) Baking soda

Solution:

(a) Baking soda- NaHCO_3

Elements present in Baking soda are sodium, hydrogen, oxygen and carbon.

(b) Common salt

Solution:

(b) Common salt - NaCl

Elements present in common salt are: Sodium and chlorine.

(c) Sulphuric acid

Solution:

(c) Sulphuric acid – H_2SO_4

Elements present in Sulphuric acid are Hydrogen, sulphur and oxygen.

(d) Nitric acid

Solution:

(d) Nitric acid – HNO_3

Elements present in Nitric acid are: Hydrogen, nitrogen and oxygen.

Question 5.

The valency of aluminium is 3. Write the valency of other radicals present in the following compounds.

(a) Aluminium chloride

Solution:

(a) The molecular formula of Aluminium chloride- ($AlCl_3$)

Valency of Al is 3.

Another radical present is chloride (Cl^-) and its valency is 1.

(b) Aluminium oxide

Solution:

(b) Molecular formula of Aluminium oxide –(Al_2O_3)

Valency of Al is 3

Another radical present is oxide (O^{2-}) and its valency is 2.

(c) Aluminium nitride

Solution:

(c) The molecular formula of Aluminium nitride –(AlN)

Valency of aluminium is 3

Another radical present is Nitride (N^{3-}) and its valency is 3

(d) Aluminium sulphate

Solution:

(d) The molecular formula of aluminium sulphate - $Al_2(SO_4)_3$

Valency of aluminium is 3

Another radical present is sulphate (SO_4^{2-}) and its valency is 2.

Question 6.

What is variable valency? Give two examples of elements showing variable valency.

Solution:

Some elements have multiple valencies that means they show variable valency.

Ferrous is written as Iron (II), and Ferric is written as Iron (III).

Metal	Radicals	Valency
Iron	Ferrous [iron (II)]	2
	Ferric [iron (III)]	3
Copper	Cuprous [copper (I)]	1
	Cupric [copper (II)]	2

Question 7

(a) What is the chemical equation?

Solution:

(a) Chemical Equation- The symbolic representation of a chemical reaction using the symbols and the formulae of the substances involved in the reaction is called as a chemical equation.

(b) Why is it necessary to balance a chemical equation?

Solution:

(b) The chemical equation needs to be balanced to make the number of the atoms of the reactants equal to the number of the atoms of the products

(c) What are the limitations of a chemical equation?

Solution:

1. It does not state anything about the physical states of the product and the reactants, i.e. whether they are solids, liquids and gases.
2. It does not say anything about the concentration of reactants and products.
3. It does not inform about the time taken for the completion of the reaction.
4. It does not inform about the rate at which a reaction proceeds.
5. It does not inform about the heat changes during the reaction, i.e. whether the heat is given out of absorbed.
6. It does not inform about the conditions such as temperature, pressure, catalyst etc. which affect the reaction.
7. It does not inform about the nature of the reaction, i.e. whether it is reversible or irreversible.