

CHEMISTRY STUDY MATERIALS FOR CLASS 9

(BASED ON CHAPTER 3: ATOMS AND MOLECULES)

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Variable Valency

Sometimes, the same element may exhibit one valency in one compound and another valency in some other compound. This property is called variable valency.

Example

Element	Symbol	Valencies exhibited (variable valencies)	Ions
Copper	Cu	1, 2	Cu^{+1} , Cu^{+2}
Silver	Ag	1, 2	Ag^{+1} , Ag^{+2}
Gold	Au	1, 3	Au^{+1} , Au^{+3}
Iron	Fe	2, 3	Fe^{+2} , Fe^{+3}

Writing Chemical Formulae

Step 1 : Write the symbol of a basic radical (element with a positive valency) on the left hand side and that of the acidic radical (element with a negative valency) on the right hand side.

Step 2 : Write the valency number/charge of each of the respective ions at the bottom of its symbol.

Step 3 : Interchange the valency number. Ignore the (+) and (-) sign.

Step 4 : Write the interchanged number.

Step 5 : Write the compound's formula.

Step 6: Cross the reduced valencies. If 1 appears, ignore it. And if a group of atoms receives a valency number more than 1, enclose it with in brackets.

Formulae of Simple Compounds

Using the valency of ions, we can write the formulae of compounds.

1. Formula of Aluminum chloride

Symbols	Al	←	→	Cl
Valency	3+			1-
Formula	AlCl₃			

2. Formula of Carbon dioxide

Symbols	C	←	→	O
Valency	4+			2-
Formula	$C_2O_4 = \mathbf{CO_2}$			

3. Formula of Sodium phosphate

Symbols	Na			PO ₄
Valency	1+			3-
Formula	Na₃PO₄			

4. Formula of Magnesium sulphate

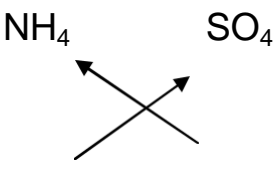
Symbols	Mg			SO ₄
Valency	2+			2-
Formula	$Mg_2(SO_4)_2 = \mathbf{MgSO_4}$			

5. Formula of Ammonium bicarbonate

Symbols	NH ₄			HCO ₃
Valency	1+			1-
Formula	NH₄HCO₃			

6. Formula of Ammonium sulphate

Symbols	NH ₄	SO ₄
Valency	1+	2-
Formula	(NH₄)₂SO₄	



As we know that, if a group of atoms receives a valency number more than 1, we enclose it within brackets. Therefore, the molecular formula of ammonium sulphate is **(NH₄)₂SO₄**.

Significance of Molecular Formula

The molecular formula of a compound has a quantitative significance. It represents the following:

- (1) The name of the substance.
- (2) Both, the molecule and the molecular mass of the compound.
- (3) The respective numbers of different atoms present in one molecule of a compound.
- (4) The ratios of the respective masses of the elements present in the compound.

Let us consider an example of carbon dioxide.

The formula CO₂ means that

- (1) It represents carbon dioxide.
- (2) The molecular formula of carbon dioxide is CO₂.
- (3) Each molecule contains one carbon atom joined by chemical bonds with two oxygen atoms.

The molecular mass of carbon dioxide is 44, given that the atomic mass of carbon is 12 and that of oxygen is 16.
