

# CHEMICAL FORMULA

A chemical formula is a notation used by scientists to show the number and types of atoms present in a molecule, using the atomic symbols and numerical subscripts.

A chemical formula is a simple representation, in writing, of a three dimensional molecule that exists. A chemical formula describes a substance, down to the exact atoms which make it up. There are three basic types of chemical formula :-

- ★ The Empirical Formula.
- ★ The Molecular Formula.
- ★ The Structural Formula.

Each one of these chemical formula provide slightly different information about the makeup of a substance, and clues to its three dimensional shape and how it will interact with other molecules, atoms and ions. In a chemical formula, the letters represents the atomic symbol of each atom.

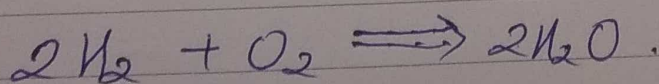


The subscript (lower) represent the number of each atom, while the superscript (higher) represents the charge on a given atom. A coefficient before a chemical formula represent that many units of the molecule. Each of the different types of chemical formula is read a little differently.

## WHAT INFORMATION CONVEYED BY THE FORMULA $H_2O$ .

The actual formula tells you that two atoms of hydrogen combine with one of oxygen to form water. The way in which they combine, the untold story, is also present in the formula.

Three kinds of information conveyed by the formula  $H_2O$ .



## Information conveyed :-

- ★ There are 2 atoms of hydrogen and 1 atoms of oxygen.
- ★ There are 2 volume of hydrogen and 1 volume of oxygen.
- ★ Two moles of hydrogen react with one mole of oxygen to give two moles of water.

## WHAT DO YOU UNDERST- AND BY TERM VALENCY.

Valency :- Number of electron used to complete octet of any element is called valency.

Ex :- Carbon , Atomic no. = 6  
Electronic configuration = 2, 4.

No. of electron ~~used~~<sup>need</sup> to complete octet = 4

So valency = +4 or -4.



# WHY DO CERTAIN ELEMENT EXHIBIT VARIABLE VALENCY.

Sometimes, some elements may exhibit one valency in one compound and another valency in other compound. This property is called as variable valency.

Some elements show variable valency because of the different electronic configuration.

In atoms of an element, sometimes lose more electrons than are present in its valence shell i.e. loss of from the penultimate shell and hence exhibit more than 1 or variable valency.

Giving at least two examples explain how the ions of the elements having variable valency are named?

If the elements exhibit 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.

Example :-

| Elements      | Lower Valency                | Higher Valency              |
|---------------|------------------------------|-----------------------------|
| Ferrum (Iron) | Ferrous ( $\text{Fe}^{+2}$ ) | Ferric ( $\text{Fe}^{3+}$ ) |

State the valency and formula of the following radicals/ions :-

- (a) Ammonium, (b) Calcium, (c) Ferric, (d) Nitride  
(e) Potassium, (f) Aluminium.

|                 | Valency | Formula          |
|-----------------|---------|------------------|
| a) Ammonium ion | +1      | $\text{NH}_4^+$  |
| b) Calcium      | +2      | $\text{Ca}^{2+}$ |
| c) Ferric       | +3      | $\text{Fe}^{3+}$ |
| d) Nitride      | +1      | $\text{NO}_2$    |



|              |    |     |
|--------------|----|-----|
| e) Potassium | 1  | K   |
| f) Aluminium | +3 | Al. |

Write the formula of the following salts.

|                       |   |                                        |
|-----------------------|---|----------------------------------------|
| a) Zinc carbonate     | — | $\text{CO}_3\text{Zn}$ .               |
| b) Lead hydroxide     | — | $\text{Pb}(\text{OH})_2$ .             |
| c) Sodium nitrate     | — | $\text{NaNO}_3$ .                      |
| d) Potassium Zincates | — | $\text{K}_2\text{ZnO}_4$ <sup>+2</sup> |
| e) Magnesium nitride  | — | $\text{Mg}_3\text{N}_2$ .              |
| f) Ammonium Sulphate  | — | $(\text{NH}_4)_2\text{SO}_4$           |

$\text{MCl}$  is the formula of a chloride of metal  $\text{M}$ . What is the formula of its sulphate and hydroxide.

The formula of its sulphate is  $\text{M}_2\text{SO}_4$ .

The formula of its hydroxide is  $\text{MOH}$ .

Balance Each of the following :-

