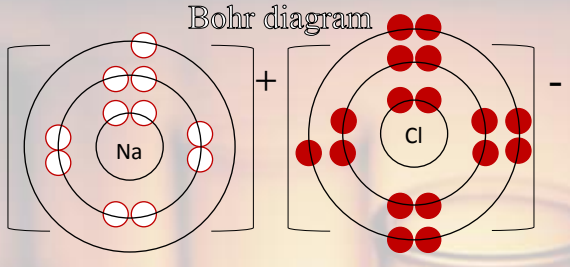
Chemical Names and Formulas of Compounds

PowerPoint 4.2

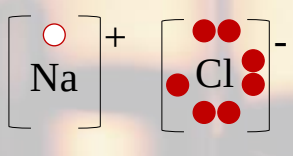
Reminder of Information in PowerPoint 4.1 and in PowerPoint 4.2

You should feel comfortable writing chemical names, determining chemical formulas, and utilizing both Bohr diagrams and Lewis diagrams.

Bohr diagram



Lewis diagram



Chemical name
Sodium chloride

Chemical formula
NaCl

Chemical equation
$Na^+ + Cl^- \rightarrow NaCl$

Chemical Equations

Chemical equations represent ***chemical reactions***

One or more ***chemical changes*** occurring simultaneously.

Symbolic equation, $2NO_{(g)} + O_{2(g)} \leftrightarrow 2NO_{2(g)}$

Coefficient

State of matter

Reactants

Products

Word equation, Copper (I) + oxygen ↔ Copper (I) oxide

Law of Conservation of Mass

- The total mass of the products is always equal to the total mass of the reactants in a chemical reaction
- Atoms are neither created nor destroyed during a chemical reaction.

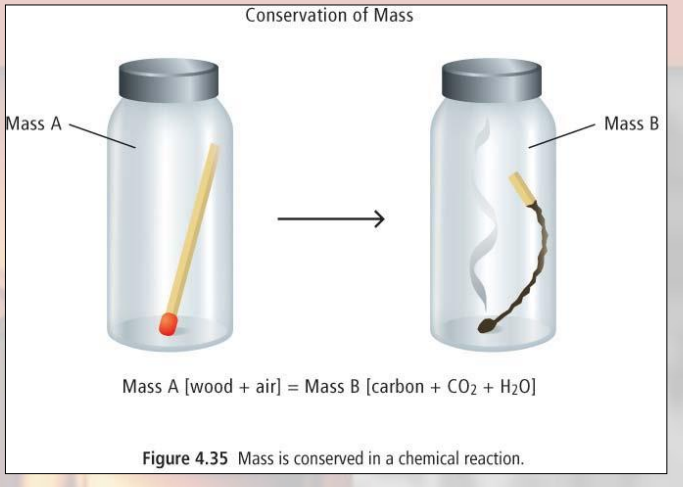


Figure 4.35 Mass is conserved in a chemical reaction.

Various Forms of Chemical Equations

A ***word equation*** shows only the names for the reactants and products,

Methane + oxygen → water + carbon dioxide

A ***skeleton equation*** shows only the formulas for the reactants and products,

$$CH_{4(g)} + O_{2(g)} \leftrightarrow H_2O_{(g)} + CO_{2(g)}$$

A ***balanced equation*** shows the identities of each pure substance involved as well as the matching number of each element on both sides of the chemical equation.

$$CH_{4(g)} + 2O_{2(g)} \leftrightarrow 2H_2O_{(g)} + CO_{2(g)}$$

How to transform a ***Word equation*** into a ***skeleton equation***

Word: Methane + oxygen → water + carbon dioxide

CH_4 O_2 H_2O CO_2

Naming binary covalent compounds

Names of these compounds must be memorized,

H_2O	Water
CH_4	Methane
NH_3	Ammonia

HOFNBrICl

Naturally diatomic molecule (H_2, N_2, O_2, S_2, F_2, Cl_2, Br_2, I_2)

skeleton: $CH_4 + O_2 \rightarrow H_2O + CO_2$

Try transforming the following ***Word equation*** into a ***skeleton equation***

Word: Hydrogen + nitrogen → ammonia

H_2 N_2 NH_3

Naturally diatomic molecule
(H_2, N_2, O_2, S_2, F_2, Cl_2, Br_2, I_2)

skeleton: $H_2 + N_2 \rightarrow NH_3$

How to Transform a ***Skeleton Equation*** to a ***Balanced Equation***

$$CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$$

Hints,

- Count the total number of atoms on each side of the arrow
- Recount as coefficients are added
- Balance compounds first
- Balance single elements last
- Balance O and H last if on both sides
- Polyatomic ions can often be counted as one unit instead of counting each element separately.
- Utilize fractions to balance diatomic elements.

1 ~~1~~ C ~~1~~ 1

4 ~~4~~ H ~~2~~ 4

4 ~~2~~ O ~~3~~ 4

Try to Transform the Following ***Skeleton Equation*** into a ***Balanced Equation***

$$\left[2\ C_2H_6 + 3\tfrac{1}{2}\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O\right] \times 2$$

2	~~2~~	C	1	~~2~~	2
6	~~6~~	H	2	~~2~~	6
7	~~2~~	O	3	~~5~~	7

Summary

Reactants Products

Word equation Methane + oxygen → water + carbon dioxide

Skeleton equation $CH_{4(g)} + O_{2(g)} \rightarrow H_2O_{(g)} + CO_{2(g)}$

Balanced equation ⇨ Following the ***Law of conservation of mass***

$$CH_{4(g)} + 2O_{2(g)} \rightarrow 2H_2O_{(g)} + CO_{2(g)}$$