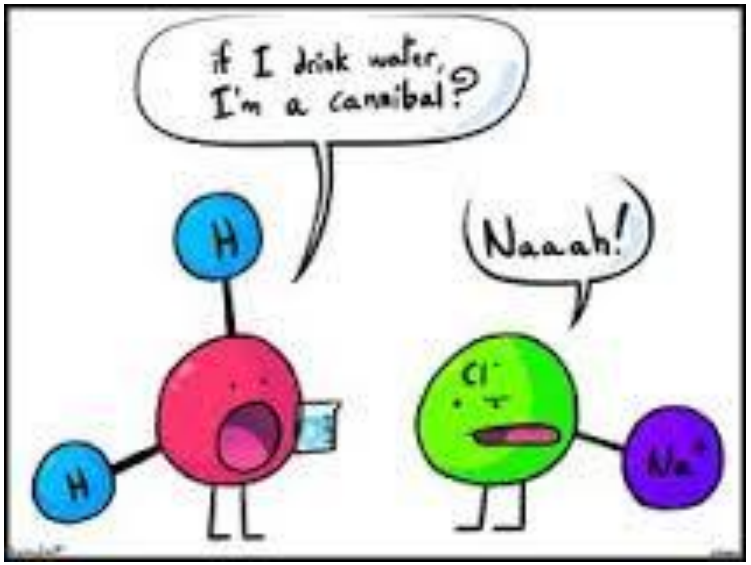
Molecules, Molecular Models, and the Signs of Chemical Reactions



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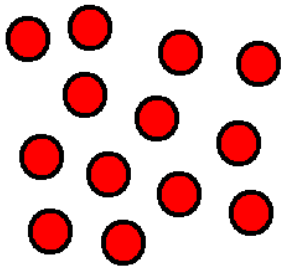
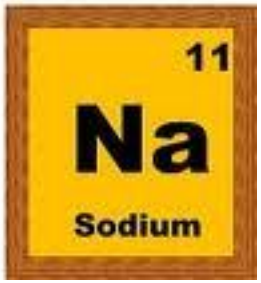
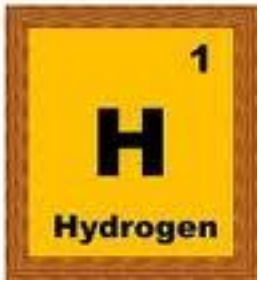
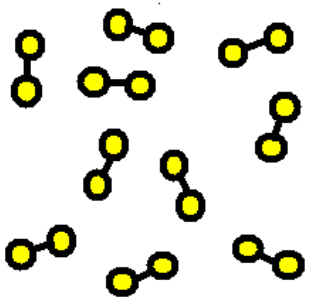
Review: Elements

- Pure substance made up of **one type** of atom
- Found on the Periodic Table
  - Examples: aluminum, helium, hydrogen, potassium, etc.









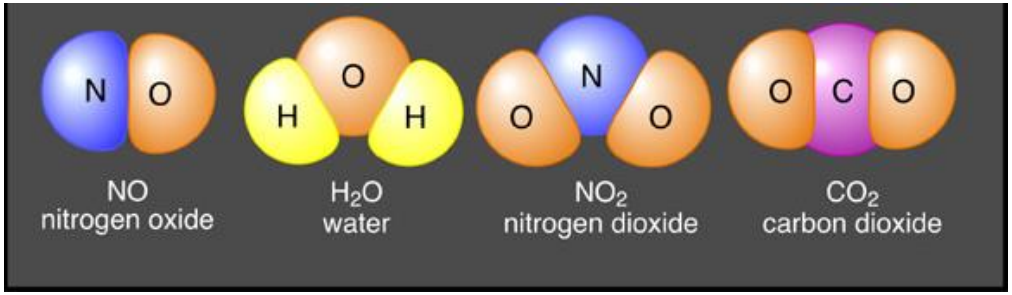
Review: Compounds and Molecules

Compounds: Molecules with **<u>two or more different elements</u>** chemically bonded in fixed proportions (ex. NaCl, H_20, CH_4)

- Have chemical formulas

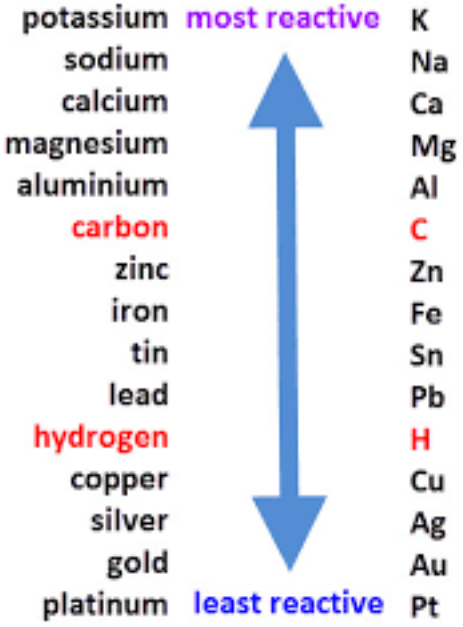
Molecules: <u>Two or more atoms</u> chemically bonded together (ex. H_2, $MgCl_2$, O_2, N_2)

- All compounds are molecules, but not all molecules are compounds



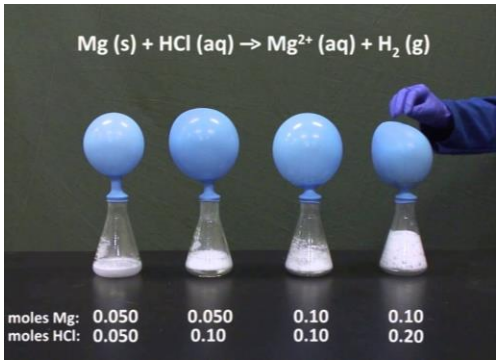
Review: Reactivity

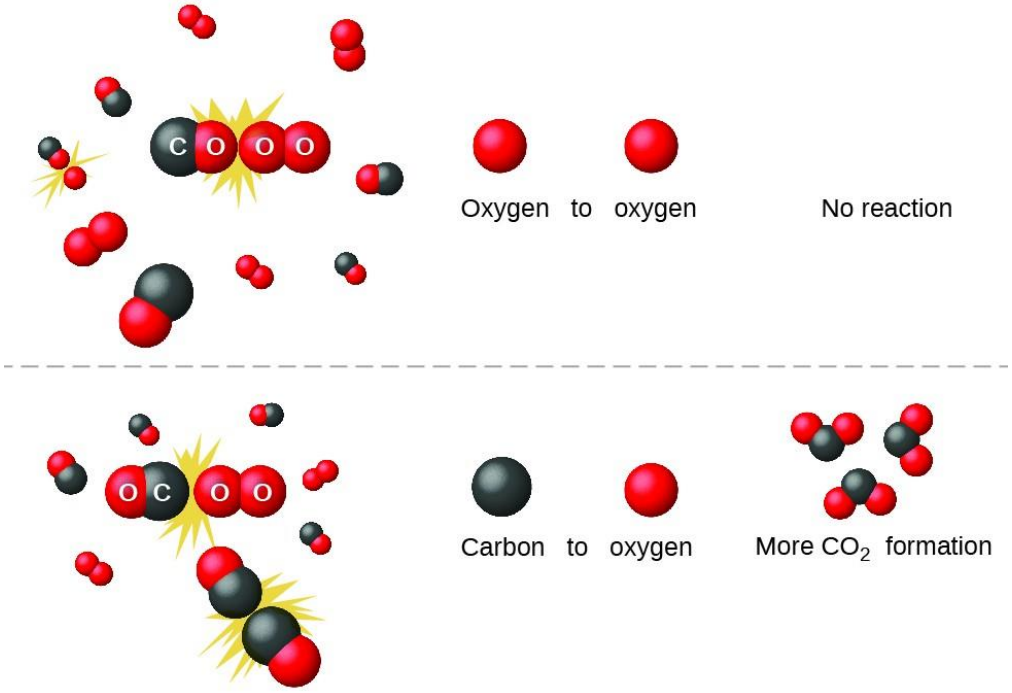
- **Chemical** property of elements and molecules
- The ability for a substance to **combine** chemically with other substances



Review: Molecules and Chemical Reactions

Chemical Reaction: <u>Chemical</u> process in which atoms **<u>split</u>**, **<u>rearrange</u>**, and **<u>recombine</u>** to form new substances





How can you know if a Chemical Reaction has taken place?

- Evidence that a **chemical change** has occurred might include:
  - A color change
  - An odor change
  - Formation of a precipitate (mixing two liquids makes a solid)
  - Gas is formed (bubbles)
  - Changes in physical properties.
  - Energy released as sound, light and/or heat
  - Temperature change

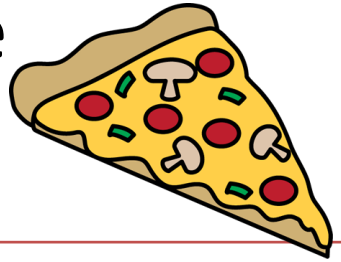
Evidence of Chemical Reactions

- **F**izzing/Bubbles
  - Formation of gas
- **A**roma
- **R**eplacement
- **T**emperature
- New **S**ubstance(s)
- Sound
- Light
- Color Change

and

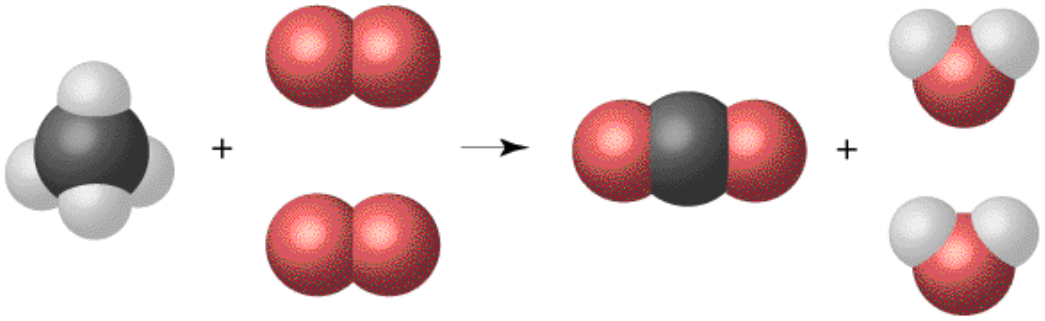
Fireworks!

F.A.R.T.S?!?!?!?!

When You Eat a Slice of Pizza	
Substances at Beginning of Digestion	A Substance at End of Digestion
Bread Cheese Toppings of Choice Tomato Sauce 	Fart: • 59% Nitrogen • 21% Hydrogen • 9% Carbon dioxide • 7% Methane • 4% Oxygen • 1% Hydrogen sulfide gas 

Chemical Equations

- **Chemical Equations:** used to show chemical reactions and **how much of each** reactant and product are needed
  - **Reactants**: substance(s) at the **beginning** of the reaction (left side of arrow)
  - **Products**: substance(s) at the **end** of the reaction (right side of arrow)



One methane molecule + Two oxygen molecules → One carbon dioxide molecule + Two water molecules

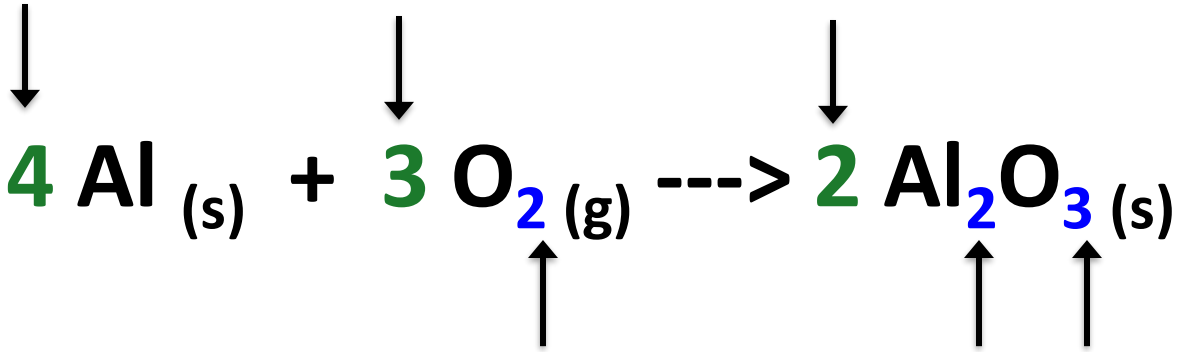
$$CH_{4(g)} + 2\,O_{2(g)} \longrightarrow CO_{2(g)} + 2\,H_2O_{(g)}$$

reactants → Compounds on left side of arrow

products → Compounds on right side of arrow

Coefficients and Subscripts

Coefficients: numbers in **front** of the reactants and products that tell **how many of those molecules are needed for the reaction**



Subscripts: numbers written **below** and **after** the elements that tell **how many atoms there are**

Symbols Used in Chemical Equations

Symbol	Purpose
$2H_2O$	Example of a *chemical formula*; identifies atoms or molecules in the reaction; and the amount needed for reaction to occur
+	Separates more than one reactant or product; say *plus*
→	Separates reactants from products; indicates direction of reaction; say *yields (makes)*
(s)	Identifies a *solid* state
(aq)	Identifies a substance that is dissolved in water; *aqueous* solution
(l)	Identifies *liquid* state
(g)	Identifies *gas* state