

Chemical Reactions



Changes in Matter

- *Physical Changes* – A change in the state or appearance of a substance with no chemical change.
 - Example: H_2O as a solid, liquid, or gas.



Changes in Matter

- Chemical Changes – A change in matter that produces a new substance
 - Example: The same word printed in a different order...

STAMPEDES = MADE + STEPS

Evidence of A Chemical Reaction

- What forms of evidence show that a chemical reaction took place?
 - Color Change.
 - Precipitation.
 - Gas Production.
 - Changes in Temperature.
 - Changes in Properties.

Are They Chemical or Physical Reactions?

- Ice cream melting
- Sugar dissolving in water.
- Gasoline burning.
- Milk turning sour.
- Physical.
- Physical.
- Chemical
- Chemical

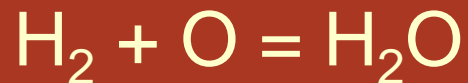
Conservation of Mass

- During a chemical reaction, matter is not created or destroyed.
- But what about burning a piece of wood. Burnt ash does not equal the mass of the log before it was burned?
 - Much of the mass is lost as carbon dioxide.

Describing Chemical Reactions

- Writing Chemical Equations
 - Hydrogen molecules react with Oxygen molecules to form water molecules.

--OR--



Chemical Formulas

- Water = H_2O
- Carbon Dioxide = CO_2
- Carbon Monoxide = CO
- Methane = CH_4
- Propane = C_3H_6
- Table Salt = NaCl

Structure of an Equation

- Reactant + Reactant = Product
- $\text{H}_2 + \text{O}_2 = \text{H}_2\text{O}_2$

Balancing Chemical Equations

- $3 \text{ H}_2\text{O}$
- Multiply 3 by each atom's subscript.
- $3 \times \text{H}_2 = 6 \text{ H's}$
- $3 \times \text{O}_1 = 3 \text{ O's}$

Balancing Chemical Equations

- How many atoms are present in each compound?
 - 2 H₂SO₄
 - 4 Fe₂O₃
 - 6 NaCl
 - NO₂
 - 2 CO₂H (carboxylic acid).

Balancing Equations

Balance the equation



	Reactants	Products
Element	# of Atoms	# of Atoms
H	4	4
O	2	2

Types of Chemical Reactions

- Synthesis
- Decomposition
- Replacement

Synthesis Reactions

- When two or more substances combine to make a more complex substance.
- Example: $2 \text{H}_2 + \text{O}_2 = 2 \text{H}_2\text{O}$.

Decomposition Reactions

- The breaking down of compounds into simpler products.
- Example: $2 \text{H}_2\text{O}_2 = 2 \text{H}_2\text{O} + \text{O}_2$

Replacement Reactions

- One element replaces another.
- Example: $2 \text{CuO} + \text{C} = 2 \text{Cu} + \text{CO}_2$
 - Copper oxide in the presence of charcoal. The carbon of the charcoal takes the place of the copper in the copper oxide.

Reaction Energy

- Exothermic Reactions:
 - A reaction that releases energy.
 - Example: Car engine (combustion).
 - Reactants = products + energy.
- Endothermic Reactions:
 - A reaction that absorbs energy.
 - Example: The formation of ice.
 - Reactants + energy = products

Rates of reactions

- Concentration
- Surface Area
- Temperature
- Catalyst (enzymes)
- Inhibitor