

Learning Objectives



- To recognize the components of chemical equations
- To recognize the three types of chemical equations
- To understand the law of conservation of mass

Chemicals and Their Reactions

Chapter 6



Where do we find Chemical Reactions?

- Everywhere!



What is a chemical reaction?



- a reaction between 2 or more elements or compounds to form new substances, with new properties.

Describing Chemical Reactions

- Equations (either word or chemical) are used for reactions
- Equations are balanced



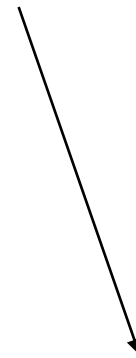
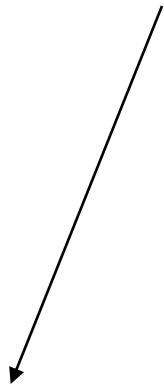
General Chemical Equation



Reactants

yield

Products

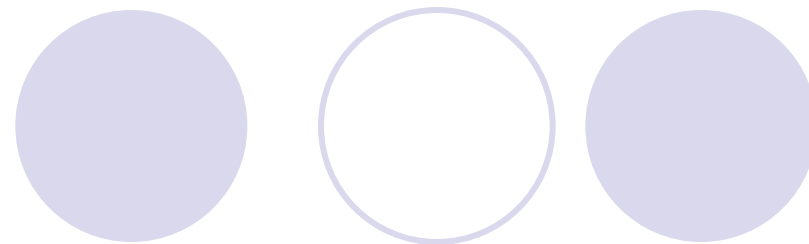


produce

Substances
used up during
the reaction

Substances
produced during
the reaction

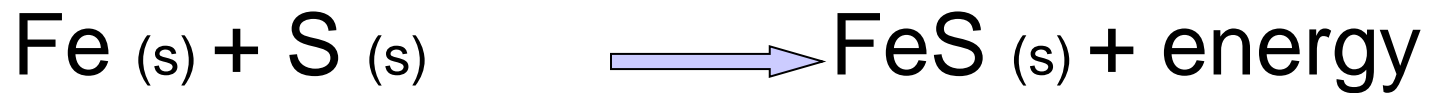
Word Equations



Iron + sulfur \longrightarrow iron (II) sulfide + energy

- The arrow indicates the direction of the reaction
- The '+' sign on reactant side means the substances must be in contact
- The '+' sign on product side means more than one product

Chemical Equations



+



Sulfur Photo from MII, courtesy of the Smithsonian Institution



Word vs Chemical Equations?

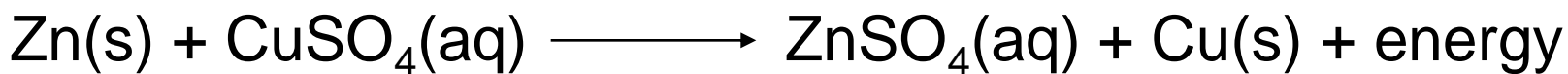
- chemical equations provide more detail such as:
 - Chemical formulas of substances involved
 - The ratio of substances involved
 - State of substances involved



State Symbols for Equations

Symbol	Meaning
(s)	Solid
(l)	Liquid
(g)	Gas
(aq)	Aqueous (dissolved in water)

Example:

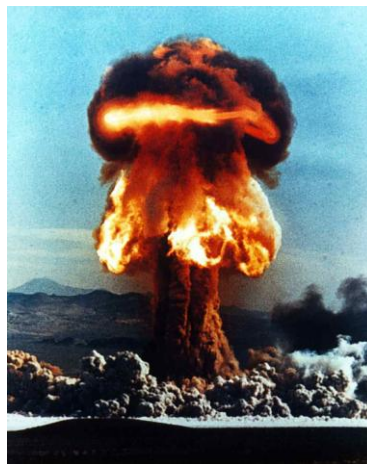


What do the state symbols tell you about what has happened in this reaction?



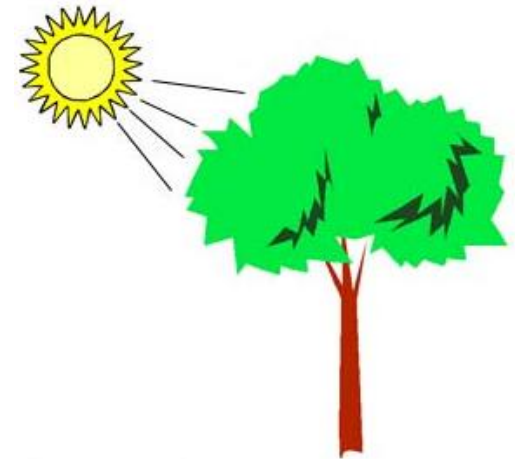
Energy and Reactions

- Exothermic reactions **release** energy
- Energy will be on the product side of the equation
- **Ex**othermic = **exit**
- Examples:



Energy and Reactions

- Endothermic reactions **require** energy in order to occur (absorb/consume energy)
- Energy will be on the reactant side of the equation
- Examples:

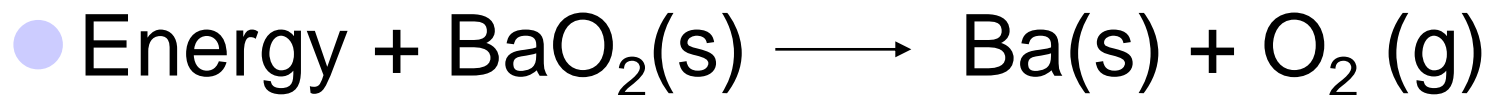


Energy and Reactions

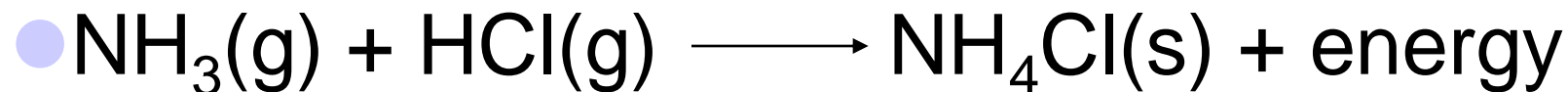


- A reaction is exothermic if **more** energy is **produced** than was put into the reaction
- A reaction is endothermic if **more** energy is **required** to run the reaction than is produced

Exothermic or Endothermic?



Endothermic



Exothermic



Exothermic or Endothermic?



Exothermic (This is cellular respiration)

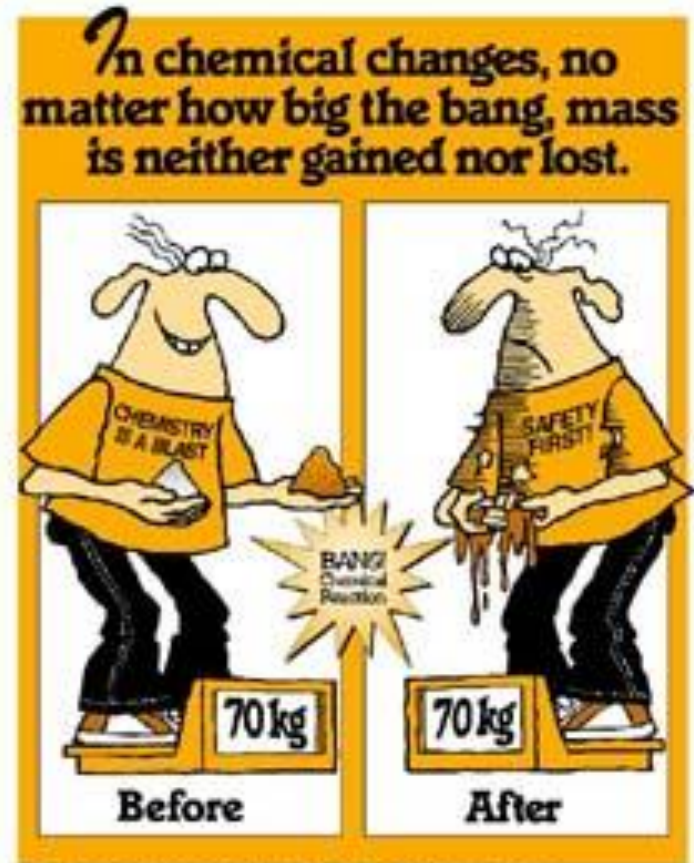


Endothermic (This is photosynthesis)

Conserving Mass in Reactions

Law of Conservation of Mass

- The total mass of the reactants equals the total mass of the products



LAW OF CONSERVATION OF MATTER: Matter cannot be made or destroyed by ordinary chemical means.

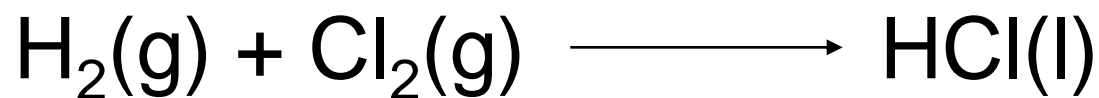
Conserving Mass in Chemical Reactions



1 atom of carbon
2 atoms of oxygen

1 atom of carbon
2 atoms of oxygen

Conserving Mass in Chemical Reactions



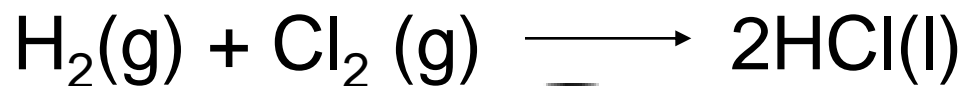
2 atoms of hydrogen

2 atoms of chlorine

1 atom of hydrogen

1 atom of chlorine

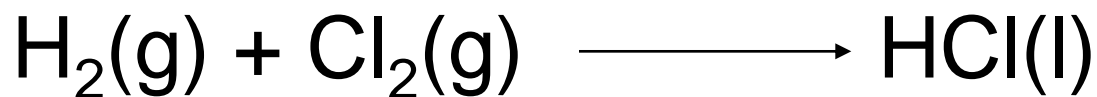
Conserving Mass in Chemical Reactions



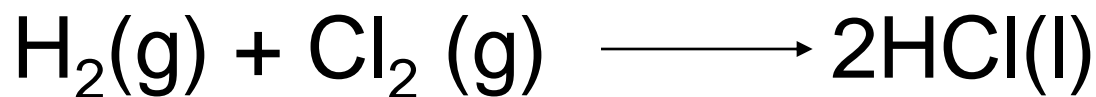
2 atoms of hydrogen
2 atoms of chlorine

2 atoms of hydrogen
2 atoms of chlorine

Conserving Mass in Chemical Reactions



This is called a **skeleton** equation



This is the **balanced** equation

The **coefficient** refers to the entire molecule, **not** just to the adjacent atom

To balance things out....

- Homework
- Page 227 # 2 – 4, 7, 8
- Page 232 # 2 – 4, 6

