

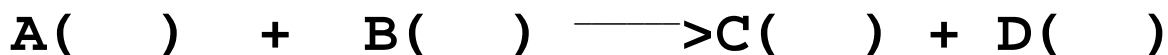
Chapter 6 - Chemical Equations

Evidence of a Chemical Reaction

- 1.
- 2.
- 3.
- 4.

Rather than writing each reaction in words we use the correct chemical formulas for the reactants and products. We then change the coefficients in order to have the same number of each element on each side of the equation. This follows the Law of Conservation of Matter.

Reactants \longrightarrow Products



States are indicated
by: _____, _____, _____, _____

Conditions are written above or below the arrow.

Carbon and oxygen produce carbon dioxide when heated

Methane and oxygen when subjected to a spark produce carbon dioxide and water vapor.

In any ordinary chemical reaction, matter is neither created nor destroyed.

Therefore we must have the same number of atoms on each side of the equation

CHANGE ONLY COEFFICIENTS
once you have the correct
formulas for all reactant and
products
NEVER CHANGE A SUBSCRIPT

Mercuric oxide when heated yields
mercury + oxygen

Zinc + Hydrochloric acid \longrightarrow zinc
chloride + hydrogen

STEPS TO BALANCE AN EQUATION

1. Write correct formulas for
all reactants and products.

2. Balance by changing
coefficients only so that the
Law of Conservation is
followed.

HINTS FOR BALANCING EQUATIONS

1. If an element appears in more
than one place on one side of the
equation, balance it last.

propane + oxygen \longrightarrow carbon dioxide
+ water

2. If a fraction will balance the
equation, multiply the whole
equation to eliminate the
fraction

Sodium + water \longrightarrow sodium hydroxide
+ hydrogen

3. If all coefficients are divisible

by a small whole number, divide to get the simplest equation.



4. If polyatomic ions are not changed between reactants and products, you should balance them as a group.

Aluminum sulfate + Magnesium hydroxide \longrightarrow

Sulfuric acid + Sodium hydroxide \longrightarrow

5. If an odd number of atoms appear on one side of the equation, multiply the odd number by 2 and continue.

Potassium chlorate \longrightarrow potassium
chloride + oxygen

Complete the following:

Calcium carbonate + Sulfuric acid \rightarrow Calcium sulfate + carbon dioxide + water

Sodium chloride + Ammonia gas + Water + Carbon dioxide \rightarrow Ammonium Chloride + Sodium bicarbonate

Magnesium + Water \rightarrow Magnesium hydroxide + Hydrogen

HW 11 pp

Quiz 11-Balancing Chemical Equations

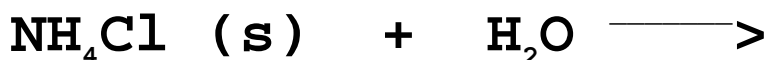
- Reactions in Aqueous Solutions

Driving forces in chemical reactions

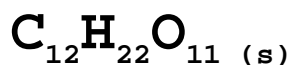
- 1.
- 2.
- 3.
- 4.

I. Precipitation Reactions - Solid is produced

When an ionic substance dissolves in water ions are produced



Electrolyte - compound which when dissolved in water produces ions and therefore carries an electrical current



Solubility of Common Ionic Compounds	
Soluble Compounds	Exceptions
Sodium, potassium, and ammonium compounds Acetates, nitrates, chlorates, and perchlorates Halides (chlorides, bromides, and iodides) Sulfates	 Lead (II), silver, and mercury (I) halides are insoluble Calcium, strontium, barium, and lead(II) sulfates are insoluble
Insoluble Compounds	Exceptions
Carbonates and Phosphates and Chromates Hydroxides Sulfides and Oxides	Sodium, potassium, and ammonium compounds are soluble Sodium, potassium, calcium, strontium, and barium compounds are soluble Sodium, potassium, ammonium, and calcium compounds are soluble

Predict whether the following are soluble ?



In Double Displacement reactions, the ions exchange positions



Write the balanced equation for the following Double Displacement (Metathesis) reactions:



In order to determine whether a precipitate reaction has occurred you must look at _____

II Formation of a Gas (bubbles)

If H_2S is a product, it is a gas

If H_2CO_3	are products
H_2SO_3	they will
NH_4OH	produce gases

Calcium Carbonate + Sodium hydroxide \longrightarrow

Ammonium Sulfate + Sodium hydroxide \longrightarrow

Potassium sulfide + Nitric acid \longrightarrow

Sodium sulfite + Hydrochloric acid \longrightarrow

III Reactions that produce heat

Neutralization reactions _____ are accompanied by the release of heat

Acids - contain or produce H^{+1} ion in aqueous soln.

taste sour

strong electrolyte - 100% ionized if strong

HCl

HNO₃

H₂SO₄

Bases - “alkalis” -

bitter taste

contain OH^{-1}

slippery

strong bases are 100% ionized

NaOH

KOH

Sodium hydroxide + Hydrochloric acid —————>

Sulfuric acid + potassium hydroxide —————>

7.3 Describing reactions in aqueous solution

Molecular equation - complete balanced equation(including states)

Ionic equation - anything in aqueous solution is shown as ions (include states)

Net Ionic Equation - eliminates spectator ions (include states)

Complete each of the above for the reaction:

Potassium sulfate + Barium chloride \longrightarrow



Sulfuric acid + Potassium hydroxide \longrightarrow

Molecular

Ionic

Net Ionic

Sodium Carbonate + Hydrochloric acid \longrightarrow

Molecular

Ionic

Net Ionic

Potassium nitrate + Sodium sulfate

Molecular

Ionic

Net Ionic

For each of the following reactions indicate any evidence that a chemical reaction has occurred. If no reaction occurs, put “NR”. You do not have to write a balanced equation.

Reaction	Evidence
Calcium carbonate + Sulfuric acid	
Ammonium sulfate + Sodium hydroxide	
Potassium sulfide + Nitric acid	
Sodium sulfite + Hydrochloric acid	

HW 12 pp

Quiz 12 - Molecular, Ionic, and Net Ionic Equations

CLASSIFYING CHEMICAL REACTIONS

I Oxidation-Reduction (Redox)

Transfer of electrons - change in oxidation #

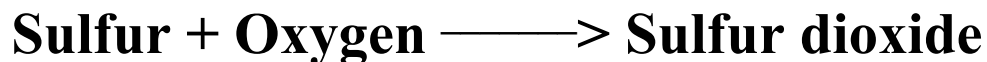
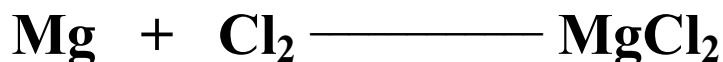
Metal + Nonmetal

Metal _____ electrons, nonmetal _____ electrons

Na

Cl

Change in oxidation number therefore redox



If you have an element on one side of the equation and it is in a compound on the other side, it is a Redox reaction

II Double Displacement (Metathesis)



A. Precipitation



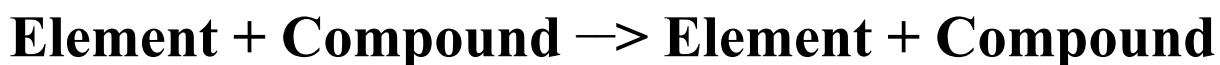
B. Neutralization



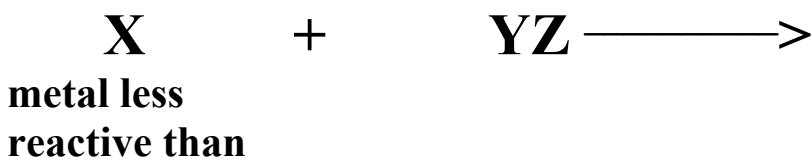
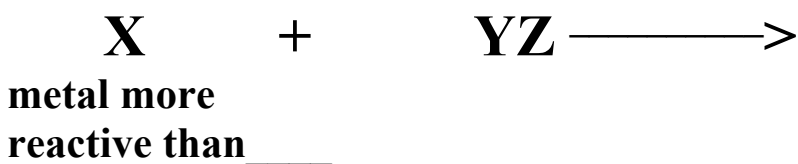
C. Formation of a gas (H_2S , CO_2 , SO_2 , NH_3)



III Single Displacement



nonmetal more
reactive than _____





IV Combustion Reactions - combine with oxygen



V Synthesis - Combination

Element + Element -----> Compound

Element + Compound -----> Compound

Compound + Compound ---> Compound

Hydrogen + Chlorine --->

Uranium + Fluorine --> Uranium(VI) fluoride

**Potassium oxide + Oxygen ---> Potassium
superoxide**

Lead(II) chloride + Chlorine --> Lead(IV) chloride

Sulfur trioxide + water ---> Sulfuric acid

VI Decomposition - Opposite of synthesis

One reactant ---> Two or more products

**Calcium Carbonate ----> Calcium oxide + Carbon
dioxide**

**Sodium bicarbonate ---> Sodium carbonate + water
+ carbon dioxide**

Calcium sulfate pentahydrate --->

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**HW 13** pp 211-214 #41,44,50,53,55,57,58,61(a,c),  
63(a,b),65(a,b),88,89

**Quiz 13 - Types of Chemical Reactions and  
Balancing Equations**

**Practice Equations ---->**

**Magnesium + Sulfur ---->**

**Sodium phosphate + Zinc chloride---->**

**Zinc + Mercuric nitrate ---->**

**Calcium carbonate ---> Calcium oxide + Carbon  
dioxide**

**Aluminum + Oxygen ---->**

**Ferric oxide + Aluminum**

**Sulfuric acid + Potassium hydroxide**

**Plumbic oxide---> Lead + Oxygen**