

Name _____

#6 Chemical Reactions

Quantitative Chemistry

Student Learning Map

Unit EQ: How are reactants and products portrayed in a chemical reaction?

Key Learning: The Law of Conservation of Mass dictates the need to write and balance chemical equations.

UNIT CONCEPT:

1. Balancing Chemical Equations	2. Word Problems	3. Classification of Chemical Reactions
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LESSON ESSENTIAL QUESTIONS:

a. Why do I need to balance chemical equations? b. How do I balance chemical equations?	How do I combine nomenclature with chemical reactions?	a. How do we classify chemical reactions? b. How do I use classification to predict products of simple reactions?
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LESSON ESSENTIAL VOCABULARY:

Reactants Products Coefficient Law of Conservation of Mass Aqueous	Diatomic Molecule	Combustion Synthesis Decomposition Single Displacement Double Displacement Neutralization
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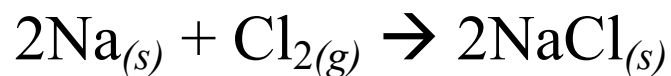
1a. Introduction to Chemical Equations

EQ: Why do I need to balance chemical equations?

Indicators of a Chemical Reaction:

1. Formation of a _____.
2. Production of _____.
3. Production (or absorption) of _____.

Parts of a Chemical Equation:



(s) =

(l) =

(g) =

(aq) =

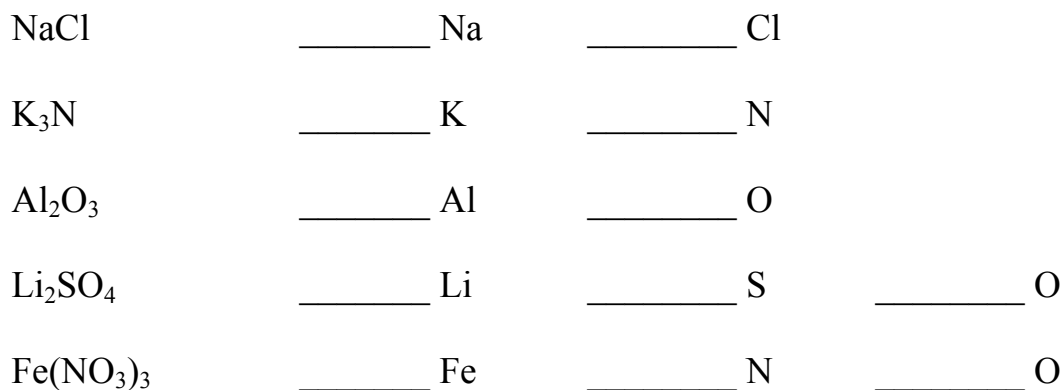
Arrows:

Why do we need to balance chemical equations?

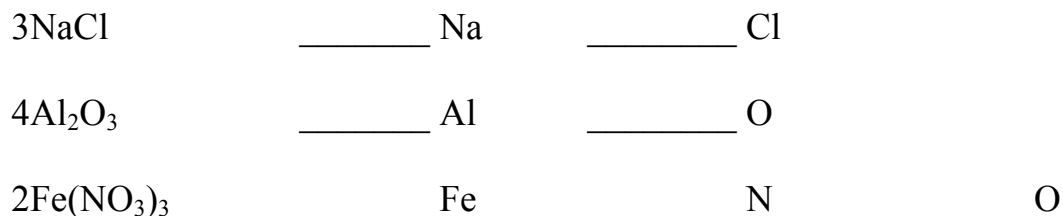
1b. Balancing Chemical Equations

EQ: How do I balance chemical equations?

Review: Determine the number of atoms in each of the following compounds:



Coefficients: Examine the coefficients in front of each compound. How many atoms are represented NOW?

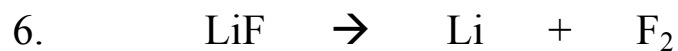
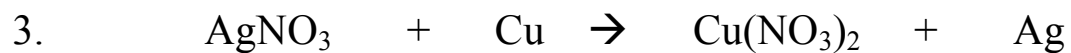
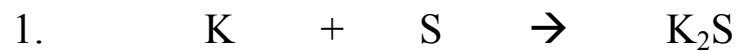


Rules for Balancing: *You can only add coefficients, NOT subscripts!*

1. Start with the most _____ element or compound.
2. Balance _____ last.
3. Balance _____ second to last.
4. If stuck on oxygen, _____ everything except O₂, then balance.
5. Double-check.

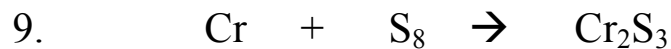
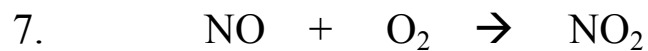
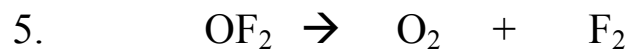
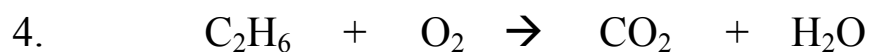
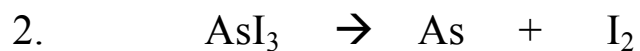
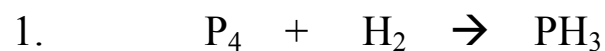
1b. Balancing Chemical Equations (cont.)

Balance the equations below. Be sure to double-check your work!



1b. Balancing Chemical Equations (cont.)

Balance the equations below. Be sure to double-check your work!



2. Word Equations

EQ: How do I combine nomenclature with chemical reactions?

DIATOMIC MOLECULES

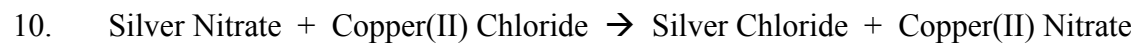
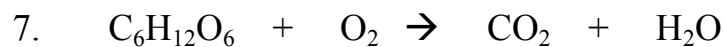
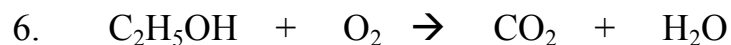
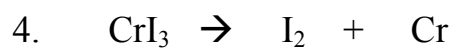
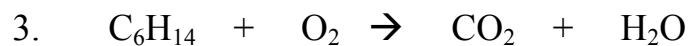
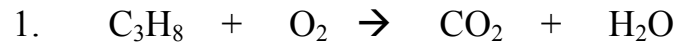


Problems:

1. Chromium + Oxygen \rightarrow Chromium(III) Oxide
2. Aluminum Hydrogen Carbonate \rightarrow Aluminum Carbonate + Carbon Dioxide + Water
3. Chlorine + Potassium Iodide \rightarrow Potassium Chloride + Iodine
4. Silicon Dioxide + Hydrofluoric Acid \rightarrow Silicon Tetrafluoride + Water
5. Hydrogen + Nitrogen \rightarrow Nitrogen Trihydride
6. Copper + Sulfuric Acid \rightarrow Copper(II) Sulfate + Sulfur Dioxide + Water

2. Word Equations (cont.)

Balance the equations below. For the word equations, be sure to write the correct formulas before balancing.



2. Word Equations (cont.)

11. Silicon Tetrachloride + Magnesium \rightarrow Silicon + Magnesium Chloride

12. Diarsenic Trioxide + Potassium Iodide + Hydrochloric Acid \rightarrow
Arsenic Triiodide + Potassium Chloride + Water

Problems:

1. Sodium chloride is produced from the reaction between sodium metal and chlorine gas.
2. Solid iron(III) sulfide reacts with gaseous hydrogen chloride to form solid iron(III) chloride and hydrogen sulfide gas.
3. Calcium acetate reacts with potassium phosphate to produce a white precipitate of calcium phosphate and potassium acetate.
4. Magnesium burns in oxygen to create magnesium oxide.
5. Hydrochloric acid is used to digest food in the stomach. It is also the cause of acid indigestion. To treat this, many antacids contain calcium hydroxide. This compound neutralizes hydrochloric acid, producing calcium chloride and water.
6. Xenon difluoride and water are the products of the reaction between hydrofluoric acid, xenon, and oxygen gas.

2. Word Equations (cont.)

7. The human body uses glucose ($C_6H_{12}O_6$) and oxygen to produce energy. These two compounds react with each other to produce carbon dioxide and water.

8. Sodium sulfate and zinc carbonate are the products of the reaction between zinc sulfate and sodium carbonate.

9. Ammonia (NH_3) has an extremely pungent odor, and it is used in commercial cleaning products. When it reacts with oxygen, it produces water and nitrogen gas.

10. Hydrogen sulfide is a very flammable and poisonous gas. It is responsible for the odor of rotten eggs. When it burns, it combines with oxygen in the air to form sulfur dioxide gas and water vapor.

11. Baking soda (also known as sodium hydrogen carbonate) breaks down in the presence of heat to form sodium carbonate. The byproducts are carbon dioxide and water vapor.

12. Silicon tetrafluoride and water are the products of the reaction between silicon dioxide and hydrofluoric acid.

13. Many metals react with acids to form hydrogen gas. For example, when magnesium is added to hydrochloric acid, it produces hydrogen gas along with magnesium chloride.

14. Water vapor is produced when hydrogen gas burns in oxygen.

Date:

3a. Classifying Reactions

EQ: How do we classify chemical reactions?

Type	Definition	Illustration	Examples

3a. Classifying Reactions (cont.)

Balance and classify the following reactions:

	Reaction	Classification
1	$\text{K}_2\text{SO}_4 + \text{CaCl}_2 \rightarrow \text{KCl} + \text{CaSO}_4$	
2	$\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$	
3	$\text{PBr}_3 \rightarrow \text{P}_4 + \text{Br}_2$	
4	$\text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{Ag}$	
5	$\text{NH}_4\text{OH} + \text{HBr} \rightarrow \text{H}_2\text{O} + \text{NH}_4\text{Br}$	
6	$\text{Pb} + \text{O}_2 \rightarrow \text{PbO}_2$	
7	$\text{SnO} + \text{C} \rightarrow \text{Sn} + \text{CO}_2$	
8	$\text{KOH} + \text{HCl} \rightarrow \text{H}_2\text{O} + \text{KCl}$	

For 9-11, write the balanced equation AND determine the classification.

9. Barium reacts with nitrogen gas to form barium nitride.

10. Pentane (C_5H_{12}) combusts to form carbon dioxide and water.

11. Lead(II) bromide and sodium nitrate are the products of the reaction between lead(II) nitrate and sodium bromide.

3b. Predicting Products

EQ: How do I use classification to predict products of simple reactions?

	Products	Examples
Combustion		$\text{CH}_4 + \text{O}_2 \rightarrow$ $\text{C}_2\text{H}_6 + \text{O}_2 \rightarrow$
Synthesis		$\text{Na} + \text{Cl}_2 \rightarrow$ $\text{Al} + \text{O}_2 \rightarrow$
Decomposition		$\text{LiF} \rightarrow$ $\text{Fe}_2\text{O}_3 \rightarrow$
Single Displacement		$\text{Mg} + \text{CuCl}_2 \rightarrow$ $\text{Cl}_2 + \text{KI} \rightarrow$
Double Displacement		$\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow$ $\text{AgNO}_3 + \text{NaCl} \rightarrow$
Neutralization		$\text{HCl} + \text{KOH} \rightarrow$ $\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow$