Chemical Reactions

Learning Targets:

- I can describe evidence of a *chemical* reaction from experimental observations.
- I can balance chemical equations to fulfill the Law of Conservation of Mass
- I can interpret changes in matter and energy from complete chemical equations
- I can write chemical reactions by interpreting word equations
- I can classify reaction types (synthesis, decomposition, single replacement, double replacement, combustion)
- **I can predict the products of chemical reactions in writing complete chemical equations** (synthesis, decomposition, single replacement, double replacement, and combustion)

Chemical Reactions

- **Chemical Reaction**: *a process in which one or more substances are converted into new substances with different chemical and physical properties*
  - **Reactants → Products**
  - → means "_____"
  - chemical equation example: $Fe(s) + O_2(g) \rightarrow Fe_2O_3(s)$

- **Balanced Equations** – both sides of the equation must have the same _____ for each element
  - Law of Conservation of Mass
  - only _____ may be adjusted to balance an equation
  - NEVER change the _____ which identify the substance (ex: H_2O_2 vs. H_2O)
  - example:

$$\_\_\ C(s) + \_\_\ O_2(g) \rightarrow \_\_\ CO_2(g)$$

$$\_\_\ H_2(g) + \_\_\ O_2(g) \rightarrow \_\_\ H_2O\ (l)$$

- Word Equations *use the name of the chemical to describe what is happening in the reaction*
  - example: Iron and oxygen react to produce iron (III) oxide

Basic Types of Reactions *examples:*

- **Synthesis/ Combination** $2\ Mg + O_2 \rightarrow 2\ MgO$
- **Decomposition** $CaCO_3 \rightarrow CaO + CO_2$
- **Single Replacement** $2\ K + 2\ H_2O \rightarrow 2\ KOH + H_2$
- **Double Replacement** $K_2CO_3 + BaCl_2 \rightarrow 2\ KCl + BaCO_3$
- **Combustion** $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$

5 signs/evidence of chemical reactions:

1. _____
2. _____
3. _____
4. _____
5. _____

Types of Chemical Reactions

To help make sense of all the different chemical reactions that exist, we classify reactions into several types. There are five basic types of reactions.

Types	Pattern	Example
Synthesis	$X + Y \rightarrow XY$	$2H_2 + O_2 \rightarrow 2H_2O$
Decomposition	$AB \rightarrow A + B$	$H_2CO_3 \rightarrow H_2O + CO_2$
Single **R**eplacement	$XY + A \rightarrow AY + X$	$Zn + 2HCl \rightarrow H_2 + ZnCl_2$
Double **R**eplacement	$XY + AB \rightarrow XB + AY$	$2AgNO_3 + K_2CrO_4 \rightarrow Ag_2CrO_4 + 2KNO_3$
Combustion	$C_xH_y + O_2 \rightarrow CO_2 + H_2O$	$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

Classify each of the following reactions as **S**, **D, SR, DR,** or **C** and then balance the equation.

___ 1. $\_\_ZnS + \_\_HCl \rightarrow \_\_ZnCl_2 + \_\_H_2S$

___ 2. $\_\_H_2CO_3 \rightarrow \_\_H_2O + \_\_CO_2$

___ 3. $\_\_Al + \_\_Fe_3O_4 \rightarrow \_\_Al_2O_3 + \_\_Fe$

___ 4. $\_\_H_2 + \_\_Br_2 \rightarrow \_\_HBr$

___ 5. $\_\_NaCl + \_\_I_2 \rightarrow \_\_NaI + \_\_Cl_2$

___ 6. $\_\_AlCl_3 + \_\_Na_2CO_3 \rightarrow \_\_Al_2(CO_3)_3 + \_\_NaCl$

___ 7. $\_\_H_2O \rightarrow \_\_H_2 + \_\_O_2$

___ 8. $\_\_Ca(OH)_2 + \_\_H_3PO_4 \rightarrow \_\_Ca_3(PO_4)_2 + \_\_H_2O$

___ 9. $\_\_NH_4OH \rightarrow \_\_H_2O + \_\_NH_3$

___ 10. $\_\_NaOH + \_\_(NH_4)_2SO_4 \rightarrow \_\_Na_2SO_4 + \_\_H_2O + \_\_NH_3$

___ 11. $\_\_C_4H_{10} + \_\_O_2 \rightarrow \_\_CO_2 + \_\_H_2O$

___ 12. $\_\_C_7H_6O_2 + \_\_O_2 \rightarrow \_\_CO_2 + \_\_H_2O$

___ 13. $\_\_P_4O_{10} + \_\_H_2O \rightarrow \_\_H_3PO_4$

___ 14. $\_\_Fe + \_\_HCl \rightarrow \_\_H_2 + \_\_FeCl_2$

___ 15. $\_\_H_2O_2 \rightarrow \_\_H_2O + \_\_O_2$

___ 16. $\_\_Fe_2O_3 + \_\_H_2SO_4 \rightarrow \_\_Fe_2(SO_4)_3 + \_\_H_2O$

___ 17. $\_\_Zn + \_\_HCl \rightarrow \_\_H_2 + \_\_ZnCl_2$

___ 18. $\_\_Fe + \_\_CuSO_4 \rightarrow \_\_FeSO_4 + \_\_Cu$

Evidence of Learning:
Complete any 15 problems (page 2, 3, or 4) to practice balancing equations and check your progress

Balance the equation and classify each reaction as **synthesis**, **decomposition**, **single-replacement**, or **double-replacement**.

Balance the equation…	**…and classify it.**
1. ____ Sb + ____ Cl_2 → ____$SbCl_3$	_____
2. ____ Mg + ____O_2 → ____MgO	_____
3. ____ $CaCl_2$ → ____ Ca + ____ Cl_2	_____
4. ____ $NaClO_3$ → ____ NaCl + ____ O_2	_____
5. ____ Fe + ____ HCl → ____ $FeCl_2$ + ____ H_2	_____
6. ____ CuO + ____ H_2 → ____ Cu + ____ H_2O	_____
7. ____ Al + ____ H_2SO_4 → ____ $Al_2(SO_4)_3$ + ____ H_2	_____
8. ____ $MgBr_2$ + ____ Cl_2 → ____ $MgCl_2$ + ____ Br_2	_____
9. ____ SnO_2 + ____ C → ____ Sn + ____ CO	_____
10. ____ $Pb(NO_3)_2$ + ____ H_2S → ____ PbS + ____ HNO_3	_____
11. ____ HgO → ____ Hg + ____ O_2	_____
12. ____ $KClO_3$ → ____ KCl + ____ O_2	_____
13. ____ N_2 + ____ H_2 → ____ NH_3	_____
14. ____ NaBr + ____ Cl_2 → ____ NaCl + ____ Br_2	_____
15. ____ Zn + ____ $AgNO_3$ → ____ $Zn(NO_3)_2$ + ____ Ag	_____
16. ____ Sn + ____ Cl_2 → ____ $SnCl_4$	_____

Balance the equation… **…and classify it.**

17. ____ $Ba(OH)_2$ → ____ BaO + ____ H_2O _____

18. ____ $Mg(OH)_2$ + ____ HCl → ____ $MgCl_2$ + ____ H_2O _____

19. ____ Na_2CO_3 + ____ HCl → ____ NaCl + ____ H_2CO_3 _____

20. ____ NH_4NO_2 → ____ N_2 + ____ H_2O _____

21. ____ N_2 + ____ O_2 → ____ N_2O_5 _____

22. ____ $MgCO_3$ → ____ MgO + ____ CO_2 _____

23. ____ KBr + ____ Cl_2 → ____ KCl + ____ Br_2 _____

24. ____ Zn + ____ $CuSO_4$ → ____ Cu + ____ $ZnSO_4$ _____

25. ____ P + ____ O_2 → ____ P_4O_6 _____

26. ____ K + ____ H_2O → ____ KOH + ____ H_2 _____

27. ____ Al + ____ $Pb(NO_3)_2$ → ____ $Al(NO_3)_3$ + ____ Pb _____

28. ____ Fe + ____ O_2 → ____ Fe_3O_4 _____

29. ____ Li + ____ O_2 → ____ Li_2O _____

30. ____ $ZnCl_2$ + ____ KOH → ____ $Zn(OH)_2$ + ____ KCl _____

31. ____ Fe_3O_4 + ____ H_2 → ____ Fe + ____ H_2O _____

32. ____ $Pb(NO_3)_2$ → ____ Pb + ____ NO_2 + ____ O_2 _____

33. ____ H_2O → ____ H_2 + ____ O_2 _____

Writing Word Equations

Evidence of Learning:

Complete any 4 problems to practice writing word equations and check your progress

Ionic Formulas	Covalent Formulas
metal + nonmetal balance the charges example: aluminum oxide Al^{+3} O^{-2} Al_2O_3	nonmetal + nonmetal covalent prefix system example: nitrogen dioxide NO_2

key words:

yields or produces or forms →
combines or combines **+**
decomposes → (for decomposition reactions)

- look out for "**HONClBrIF**" elements! They are ***diatomic*** in their **pure** form.
- pure forms of sulfur and phosphorus are S_8 and P_4, respectively.

Write the formulas for the chemical reaction, balance, and classify the reaction type:

1. Sulfur dioxide gas combines with oxygen gas to produce sulfur trioxide.

2. When heated, calcium carbonate decomposes to form calcium oxide and carbon dioxide.

3. Barium oxide reacts with water to form barium hydroxide.

4. When heated, calcium sulfite decomposes to form calcium oxide and sulfur dioxide.

5. Iron reacts with sulfuric acid (H_2SO_4) to form Iron (III) sulfate and hydrogen gas.

6. Dinitrogen pentoxide reacts with water to produce nitric acid (HNO_3).

7. Carbon reacts with zinc oxide to produce zinc and carbon dioxide

8. Bromine reacts with sodium iodide to form sodium bromide and iodine.

Reaction Type Demos

Chemical reactions are often classified in order to predict the products of a chemical reaction. Most chemical reactions fall into one of five general reaction types:

- **Synthesis (also called Combination)**
- **Decomposition**
- **Single Replacement**
- **Double Displacement**
- **Combustion**

Task: You and your group will teach the class and perform a demo of one of the general reaction types.

Guidelines for your lesson:

- describe the general reaction
  - you may want to use the the ipad, Smartboard, or Elmo to enhance your lesson presentation
- describe "how to" predict the products
- demonstrate how to solve 2-3 example problems of predicting reaction products (see pages 10-13)
- perform an experimental demonstration of your reaction type
  - please discuss chemicals with Ms. V and write/ type a procedure and safety protocols for your demo

Group Sizes: *Group sizes vary based on the complexity of product prediction:*

	Per 2 (12 students)	Per 3 (19 students)
Synthesis*	2	3-4
Decomposition*	2	3-4
Single Replacement ✒	3	4
Double Replacement ✒	3	4
Combustion	2	3-4

* Synthesis & Decomposition groups may work together

✒ Predicting the products of single and double replacement reactions are more complex (hence a larger group)

***You will likely want to research your reaction type online and can also reference the following textbook* pages:**

Combination (Synthesis)	page 326
Decomposition	page 327
Single Replacement	page 327-328
Double Replacement	page 329-330
Combustion	page 325

Demonstration Possibilities (<u>you may also research and suggest your own demo</u>):

Synthesis Reactions

Copper burning in Oxygen, Magnesium burning in Oxygen

Decomposition Reactions

Heating of Copper(II) Carbonate, Heating of Potassium Chlorate (Gummy Bear)
"Elephant's Toothpaste" demo
Carbon Snake (sugar and sulfuric acid)

Single Replacement Reactions

Iron in Copper(II) Chloride solution, Zinc in Copper(II) Chloride solution
Copper in Silver Nitrate solution {tree}

Double Displacement Reactions

Lead(II) Nitrate and Potassium Iodide, Potassium Chloride and Silver Nitrate

Combustion

Dollar burning in Alcohol

	Exemplary 5	Accomplished 4	Developing 3	Needs Improvement 2
General Overview	Students accurately describe a general overview of the reaction type using illustrations AND modeling or an analogy to practically explain what occurs during the reaction.	Students accurately describe a general overview of the reaction that includes a visual OR a model or analogy to practically represent what occurs during the reaction.	Students describe a general overview of the reaction, but visuals or an analogy would better support the explanation.	There is a limited overview of the reaction type.
Predicting Products	Students exhibit an advanced understanding of their reaction type and are able to clearly and accurately explain how to predict products with details specific to their reaction type. Students accurately predict *all* products for 3 or more *varied* examples, highlighting a variety of aspects for the particular reaction type.	Students exhibit an overall understanding of their reaction type and are able to clearly explain how to predict the products using notes or visuals to guide the presentation. Students accurately predict *most* products for 2 or more examples, however, the examples could be more diverse to represent greater breadth of reaction prediction.	Students exhibit some understanding of their reaction type and offer a basic explanation on how to predict products. Students accurately predict *some* products for 2 examples, but there may be some misconceptions or details that need clarifying.	Students exhibit a limited understanding of their reaction type and how to predict products. There are many misconceptions and errors in the presentation.
Experimental Demo	Students research and type a step-by-step quantitative procedure, complete with appropriate safety concerns and protocols. Students conference with Ms. V prior to the lesson to discuss and try the demo and are well prepared to present a demo with demo materials being prepared prior to the lesson. The demo engages the class and presenters are able to accurately explain the reactants and products of the demo reaction as an example of the reaction type.	Students research and type a general procedure and list some safety concerns. Students discuss the demo with Ms. V prior to the lesson to prepare materials. Students are prepared to present a demo and are able to explain how the demo relates to their reaction type, but do not discuss the specific reactants or products formed.	Students include a basic procedure, but the procedure needs more specific measurements, steps, or safety considerations. The demo is not prepared in advance and students take time at the start of the lesson to set up the demo. Students present a demo to the class, however, students show a limited understanding in being able to describe and relate their demo to the reaction type.	Students present a demo but do not include a procedure, model safety protocols, or are unable to explain how their demo relates to the reaction type.
Lesson Presentation	The information is organized and presented in a sequential manner for learning and is appropriately challenging for Honors Chemistry students. The lesson is enhanced by a visual presentation and handouts. Presentation roles are shared amongst all group members equally and exemplary presentation skills are exhibited throughout the presentation.	Information is presented in an organized manner with information increasing in complexity as the presentation progresses. The lesson is supplemented with visuals or a handout. Presentation roles are shared amongst all group members and appropriate presentation skills are exhibited during most of the presentation.	Information is presented with notes to guide the presentation, but lacks organization and visuals or handouts have not been prepared in advance to enhance the lesson. The learning of all group members is not equally represented through the presentation and presenters needs to be more aware of their audience when presenting.	Information is not organized and results in an unstructured presentation. There is little evidence that the lesson has been planned or rehearsed in advance, such as no visuals or notes to guide the lesson, a lack of shared group roles, or presentation skills that need improvement to better engage the audience.

CLASSIFICATION OF CHEMICAL REACTIONS

Name _____

Classify the reactions below as synthesis, decomposition, single replacement (cationic or anionic) or double replacement.

1. $2H_2 + O_2 \rightarrow 2H_2O$ _____

2. $2H_2O \rightarrow 2H_2 + O_2$ _____

3. $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$ _____

4. $2CO + O_2 \rightarrow 2CO_2$ _____

5. $2HgO \rightarrow 2Hg + O_2$ _____

6. $2KBr + Cl_2 \rightarrow 2KCl + Br_2$ _____

7. $CaO + H_2O \rightarrow Ca(OH)_2$ _____

8. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ _____

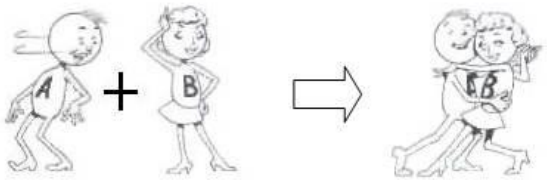
9. $2H_2O_2 \rightarrow 2H_2O + O_2$ _____

10. $Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$ _____

Predicting Reaction Products

For each of the following reactions predict the products and then balance the equation:

Synthesis



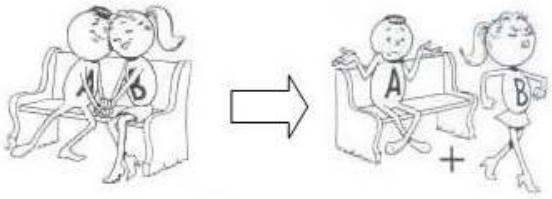
1. $Al + O_2 \rightarrow$

2. $Li + N_2 \rightarrow$

3. Gaseous hydrogen and gaseous chlorine are combined:

4. Magnesium is burned in oxygen:

Decomposition



1. $MgO \xrightarrow{\Delta}$

2. $H_2O \xrightarrow{electricity}$

3. $NaBr \xrightarrow{electricity}$

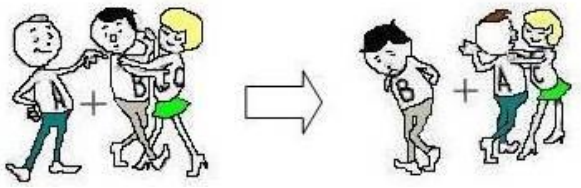
4. Molten aluminum chloride is electrolyzed:

Single Replacement/ Displacement

Use an activity series to verify whether a reaction occurs in each of the following reactions.

If a reaction does occur, predict the products and balance the equation.

If no reaction occurs – write No RXN.



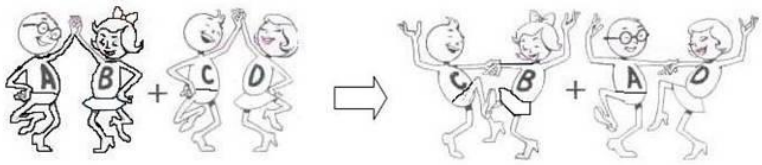
1. Ca + $ZnCl_2(aq)$→
2. Ag + $Cu(NO_3)_2$ →
3. Zn + HCl →
4. Cl_2 + NaBr(aq) →
5. Li + $CuSO_4(aq)$ →
6. Fe + $Cu(NO_3)_2$ →
7. Br_2 + KCl →
8. Li + HCl →
9. Magnesium metal is added to a solution of Iron (III) chloride
10. Copper + aluminum chloride react
11. Magnesium is added to hydrochloric acid

Activity Series**

Most	Metals	Nonmetals	Most
	Li	F_2	
	Rb	Cl_2	
	K	Br_2	
	Cs	I_2	
	Ba		
	Sr		
	Ca		
	Na		
	Mg		
	Al		
	Ti		
	Mn		
	Zn		
	Cr		
	Fe		
	Co		
	Ni		
	Sn		
	Pb		
	$**H_2$		
	Cu		
	Ag		
	Au		
Least			Least

Double Replacement

Two aqueous ionic compounds react if one product is a precipitate (solid), gas, or a molecule (such as water).



Steps to predict the products for double replacement reactions:

$Pb(NO_3)_2 + KI \rightarrow$

1. Break the reactants into ions: Pb^{2+} and NO_3^- K^+ and I^-
2. Switch the partners: Pb^{2+} and I^- K^+ and NO_3^-
3. Write correct formulas: PbI_2 KNO_3
4. Balance it: $Pb(NO_3)_2 + KI \rightarrow PbI_2 + KNO_3$

   $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$
5. Label phases using a solubility chart: $Pb(NO_3)_2\,(aq) + 2KI\,(aq) \rightarrow PbI_2\,(s) + 2KNO_3\,(aq)$

Soluble Compounds	Insoluble Exceptions
Group 1 metals and NH_4^+	
Nitrates (NO_3^-) and acetates (CH_3COO^-)	
Chlorides (Cl), bromides (Br^-) and iodides (I^-)	Ag^+, Pb^{2+} and Hg^+
Sulfates (SO_4^{2-})	Ag^+, Pb^{2+}, Hg^+, Ba^{2+}, Sr^{2+} and Ca^{2+}
Insoluble Compounds	**Soluble Exceptions**
Carbonates (CO_3^{2-}), sulfites (SO_2^{2-}) and phosphates (PO_4^{3-})	Group 1 metals and NH_4^+
Hydroxides (OH^-)	Group 1 metals, NH_4^+, Ca^{2+} and Ba^{2+}
Sulfides (S^{2-})	Group 1 and 2 metals and NH_4^+
Oxides (O^{2-})	Group 1 metals, NH_4^+, Ca^{2+} and Ba^{2+}

Predict the products for each of the following double replacement reactions:

1. $AgNO_3 + NaCl \rightarrow$

2. $KOH + H_2SO_4 \rightarrow$

3. $NaCl + CuNO_3 \rightarrow$

4. $Al_2(SO_4)_3 + NaOH \rightarrow$

5. $K_2CO_3 + BaCl_2 \rightarrow$

6. $AgC_2H_3O_2 + Na_2SO_4 \rightarrow$

7. $BaCl_2 + H_2SO_4 \rightarrow$

8. Solutions of hydrochloric acid and potassium hydroxide are combined.

Combustion

1. $C_3H_8 + O_2 \rightarrow$

2. $C_6H_{14} + O_2 \rightarrow$

3. methane gas (CH_4) is burned in oxygen gas

Mixed Reaction Types

Classify the reaction type and predict the products of the following reactions:

Evidence of Learning:
Complete 10 problems to practice predicting reaction products and check progress

1. __ Ag + __$CuSO_4$ →
2. __ NaI + __ $CaCl_2$ →
3. __ O_2 + __ H_2 →
4. __ HNO_3 + __ $Mn(OH)_2$ →
5. __ $AgNO_2$ + __ $BaSO_4$ →
6. __ HCN + __ $CuSO_4$ →
7. __ C_4H_8 + __ O_2 →
8. __ HNO_3 + __$Fe(OH)_3$ →
9. __ KCl + __ $Mg(OH)_2$ →
10. __ $LiNO_3$ + __Ag →
11. Solid magnesium reacts with gaseous nitrogen to produce …
12. Zinc reacts with copper (II) nitrate to form …
13. Methane (CH_4) is burned in oxgyen to produce …
14. Magnesium reacts with hydrogen chloride to form …
15. Propane (C_3H_8) reacts with oxygen gas to produce …

Evidence of Learning:
Complete any 4 problems to practice predicting reaction products from word equations and check your progress

PREDICTING PRODUCTS OF CHEMICAL REACTIONS

Predict the products of the reactions below. Then, write the balanced equation and classify the reaction.

1. magnesium bromide + chlorine
2. aluminum + iron (III) oxide
3. silver nitrate + zinc chloride
4. hydrogen peroxide (catalyzed by manganese dioxide)
5. zinc + hydrochloric acid
6. sulfuric acid + sodium hydroxide
7. sodium + hydrogen
8. acetic acid + copper

Interpreting Balanced Chemical Equations

$$\_\_\_\_ Bi(s) + \_\_\_\_ H_2O(l) + 175kJ \xrightarrow{heat} \_\_\_\_ Bi_2O_3(aq) + \_\_\_\_ H_2(g)$$

1. Balance this equation.
2. What type of equation is it? _____
3. Is this endothermic or exothermic? (circle)

Exothermic:	Endothermic:

4. What are the states of the reactants? (list them in order) _____ _____
5. What are the states of the products? (list them in order) _____ _____

States of Matter:
s:
l:
g:
aq:

6. What is the ratio of bismuth to hydrogen? _____
7. What is the ratio of bismuth to bismuth oxide? _____

use coefficients as ratios to solve

8. If you use 6 moles of bismuth, how many moles of hydrogen are released?

9. If you use 6 moles of bismuth, how many moles of bismuth oxide are released?

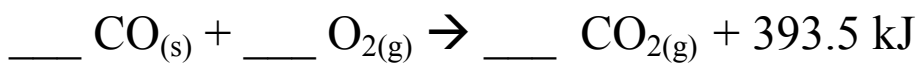
10. If you use 1 mole of bismuth, how many moles of hydrogen are released?

11. If you use 1 mole of bismuth, how many moles of bismuth oxide are released?

12. What is the ratio of hydrogen to energy? _____
13. If 6 moles of hydrogen are released, how much energy is needed?

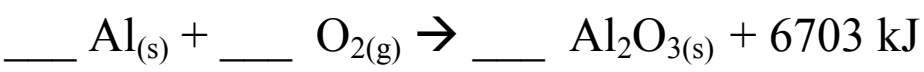
14. If 1 mole of hydrogen is released, how much energy is needed?

Interpreting Balanced Chemical Equations



Evidence of Learning: Complete a set of problems to practice interpreting complete chemical equation and check your progress

1. Is this reaction endothermic or exothermic?
2. What are the states of the reactants?
3. What are the states of the products?
4. What is the ratio of CO to CO_2?
5. If 11 moles of CO are consumed, how many moles of CO_2 are released?
6. What is the ratio of O_2 to CO_2?
7. If 7 moles of O_2 is consumed, how many moles of $CO_2$are released?
8. What is the ratio of CO to energy?
9. If 2 moles of CO are burned, how much energy is released?
10. If 3 moles of CO are burned, how much energy is released?



11. Is this reaction endothermic or exothermic?
12. What are the states of the reactants?
13. What are the states of the products?
14. What is the ratio of Al to Al_2O_3?
15. If 5.5 moles of Al are consumed, how many moles of $Al_2O_3$are made?
16. What is the ratio of O_2 to Al_2O_3?
17. If 7 moles of $O_2$is consumed, how many moles of $Al_2O_3$are made?
18. What is the ratio of Al to energy?
19. If 2 moles of Al are used, how much energy is released?
20. If 8 moles of Al are used, how much energy is released?

Honors Chemical Reactions Test Review

1. What is a chemical reaction? Why do chemical reactions occur?

2. How does the law of conservation of matter relate to balanced equations?

3. What are 5 signs (evidence) that a chemical reaction has occurred?

4. Recognize the following terms and symbols as they relate to chemical reactions:
   reactant, product, subscript, coefficient, s, l, g, aq, →, diatomic element

Balance the following equations:

___ $Al(OH)_3$ + ___ H_2SO_4 → ___ $Al_2(SO_4)_3$ + ___ H_2O

___ Na_2O_2 + ___ H_2O → ___ O_2 + ___ NaOH

___ $Mg(HCO_3)_2$+ ___ H_3PO_4 → ___ $Mg_3(PO_4)_2$+ ___ H_2O+ ___ CO_2

___ C_6H_{14} + ___ O_2 → ___ H_2O + ___ CO_2

Classify the following reaction types:

1. $S + Cl_2 \rightarrow SCl_2$ _____
2. $K + MgBr_2 \rightarrow KBr + Mg$ _____
3. $AgNO_3 + MgCl_2 \rightarrow AgCl + Mg(NO_3)_2$ _____
4. $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$ _____
5. $H_2O_2 \rightarrow H_2O + O_2$ _____

Write the following word equations and then balance each equation:

1. Silver nitrate and sodium chloride react to form silver chloride and sodium nitrate.

2. Bromine reacts with sodium iodide to form sodium bromide and iodine.

Single replacement reactions:

1. List one metal that would be able to displace Al in $Al(NO_3)_3$

2. What is an activity series?

Mixed Reaction Predictions

Predict the reaction products or write no reaction and then balance the equation.
For double replacement reactions, indicate which product is insoluble.

1. $2\ Li + CuSO_4 \rightarrow$
2. $Ba + Cl_2 \rightarrow$
3. $2\ HCl + FeS \rightarrow$
4. $8\ Fe + S_8 \rightarrow$
5. $2\ N_2O_5 \rightarrow$
6. $Cu + MgSO_4 \rightarrow$
7. $HCl + NaOH \rightarrow$
8. $2\ C_4H_{10} + 13\ O_2 \rightarrow$
9. Magnesium and iron (III) chloride →
10. Strontium chloride and sodium phosphate →

Energy of Reactions

$$2\ KClO_{3(s)} \rightarrow 2\ KCl_{(s)} + 3\ O_{2(g)} + 78\ kJ$$

1. Is this reaction endothermic or exothermic?
2. What are the states of the reactants? Products?
3. What is the ratio of potassium chlorate to oxygen?
4. What is the ratio of potassium chlorate to potassium chloride?
5. If 12 moles of $KClO_3$ are consumed, how many moles of O_2 are released?
6. If 1 mole of $KClO_3$ is consumed, how many moles of KCl are released?
7. What is the ratio $KClO_3$ to energy?
8. If 6 moles of $KClO_3$ are consumed, how much energy is generated?

Long Term Learning Target: I can predict the products of chemical reactions to write complete chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion reactions).

Learning Target	Learning Activities	Progress Reflection (date each entry) Self-reflect and evaluate yourself as Beginning, Developing, Accomplished, or Exemplary What evidence supports that I am meeting the target? *or* What are my next steps for growth to meet the target?
I can describe evidence of a *chemical* reaction from experimental observations.	Copper One Tube Lab Reactions of Copper Lab Demo/ Experimental Observations	
I can balance chemical equations to fulfill the Law of Conservation of Mass.	Problem Set (pg 2, 3, 4)	
I can write chemical reactions by interpreting word equations.	Word Equations Problem Set (pg 5) Reactions of Copper Lab	
Balancing Equations, Word Equations Quiz (recommended due date: 1/23)		
I can interpret changes in matter and energy from complete chemical equations.	Problem Set (pg 15-16)	
Interpreting Chemical Reactions Quiz (recommended due date: 1/26)		
I can classify reaction types (synthesis, decomposition, single replacement, double replacement, combustion).	Problem Set (pg 2, 3, 4, 8) Reaction Types Project Reactions of Copper Lab Mission Impossible Lab	
I can predict the products of chemical reactions.	Problem Set (pg 12-13) Reaction Types Project Reactions of Copper Lab Mission Impossible Lab	
Predicting Products Quiz (recommended due date: 1/28)		

Ch 9 Test (completed by 1/30)

Beginning = I need more help on this - I don't really understand it at all!
Developing =I kind of understand, but I need to spend more time reviewing/practicing.
Accomplished = I understand! I'm confident and can explain what I've learned on a test.
Exemplary = I could teach someone who knows nothing about this target everything they need to know.