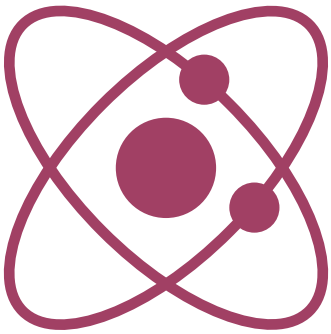
EXPERIENCE CHEMISTRY

STUDENT GUIDEBOOK

Luke & Trisha Gilkerson
with Bekah Kohlmeier

Experience Chemistry: Student Guidebook

Journey Homeschool Academy



WELCOME TO EXPERIENCE CHEMISTRY

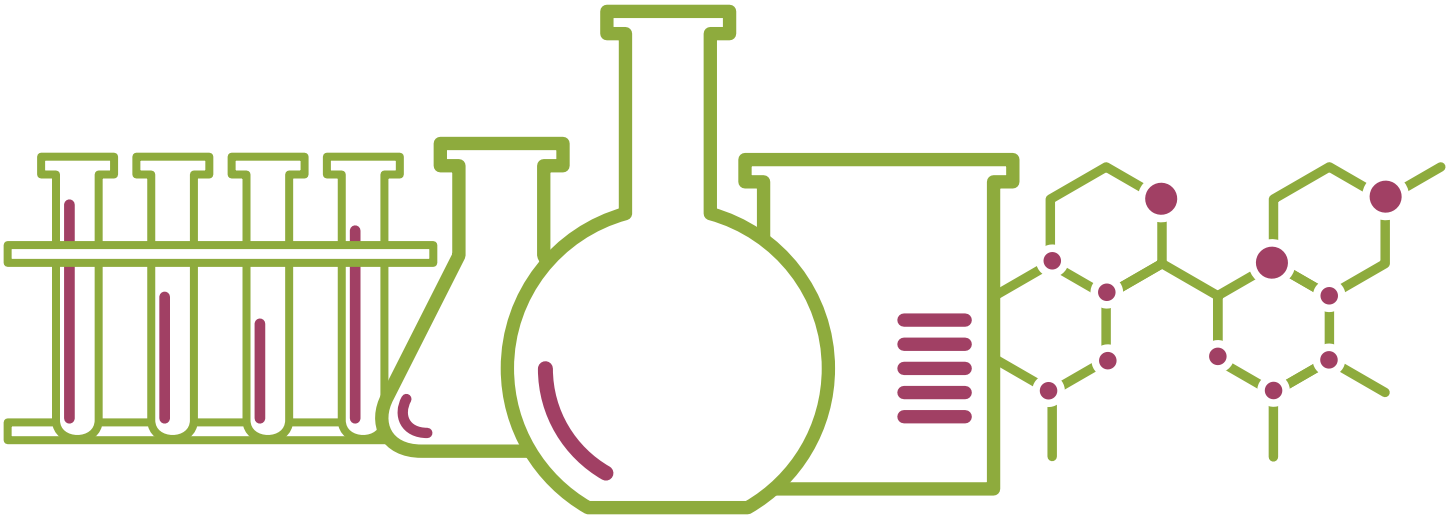
This Student Guidebook was designed for students in the Experience Chemistry online course. Simply follow along with the weekly lecture videos and fill in the blanks as you go. Sections for extra notes have been provided as well: use these to draw helpful diagrams or take extra notes you find particularly useful during the lecture. At the beginning of each lesson, you'll find a list of terms that might be unfamiliar to you. Be sure to familiarize yourself with these terms and use them as you spend time studying each week.

Along the way, you'll also find study guides for the quarterly exams. Each exam covers material from that quarter only, and these study guides will provide you with terms, questions, and concepts you should be familiar with before taking your exams.

We're excited to have you join the adventure as we explore the world God made!

We'll see you inside the course!

Trisha Gilkerson



LESSON 14

TYPES OF CHEMICAL REACTIONS

Every time a car burns fuel to move down the road, it's a chemical reaction. Every time you see rust on a piece of metal, it's because of a chemical reaction. There are different types of reactions, and it is important that we can recognize them. If we know these types, we can predict the products that will form in reactions during a lab. In this lesson, we'll learn how to differentiate between the different types of reactions and what happens to elements and compounds when they react in different ways.

Vocabulary

Combustion

Decomposition

Double replacement

Single replacement

Synthesis

OUTLINE & NOTES

LESSON 14A: TYPES OF CHEMICAL REACTIONS

I. Chemical Reaction #1: Synthesis

A. Two separate elements _____ to form _____

B. Example: sodium + chlorine gas → sodium chloride

C. Equation: _____

D. Balanced equation:

II. Chemical Reaction #2: Decomposition

A. One compound _____ into _____ smaller parts

B. Example: electrolysis of water

1. Equation: _____
2. Balanced equation: _____

C. Example: solid potassium chlorate, when heated, produces potassium chloride gas and oxygen gas

1. Equation: _____
2. Balanced equation:

III. Chemical Reaction #3: Single Replacement

A. A _____ plus a _____ react to form a different _____ _____ and a different _____

B. Example: solid aluminum plus aqueous hydrochloric acid forms aqueous aluminum chloride and hydrogen gas

1. Equation: _____
2. Balanced equation:

3. Will this reaction occur? Why? _____ _____

IV. Chemical Reaction #4: Double Replacement

A. Starts with _____ added together, and elements _____ to form two _____

B. Example: strontium oxide plus iron (III) bromide forms strontium bromide and iron (III) oxide (most similar elements switch places)

1. Equation: _____
2. Balanced equation:

V. Chemical Reaction #5: Combustion

A. A reaction where _____ plus _____ yields _____and _____

B. Example: methane (CH_4) combustion

1. Equation: _____

2. Balanced equation:

VI. Practice

A. $3\ AgNO_3 + K_3PO_4 \rightarrow Ag_3PO_4 + 3\ KNO_3$

1. Type of reaction: _____

B. $H_2CO_3 \rightarrow H_2O + CO_2$

1. Type of reaction: _____

C. $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

1. Type of reaction: _____

D. $P_4 + 5\ O_2 \rightarrow 2\ P_2O_5$

1. Type of reaction: _____

E. $2\ AgNO_3 + Ni \rightarrow Ni(NO_3)_2 + 2\ Ag$

1. Type of reaction: _____

Activity Series of Metals		
Most reative	lithium	Li
	rubidium	Rb
	potassium	K
	barium	Ba
	strontium	Sr
	calcium	Ca
	sodium	Na
	magnesium	Mg
	beryllium	Be
	aluminum	Al
	manganese	Mn
	zinc	Zn
	cadmium	Cd
	iron	Fe
	cobalt	Co
	nickel	Ni
	tin	Sn
	lead	Pb
	(hydrogen)	(H_2)
	copper	Cu
	mercury	Hg
	silver	Ag
	palladium	Pd
	platinum	Pt
Least reactive	gold	Au

Activity Series of Non-Metals		
Most reative	flourine	F
	chlorine	Cl
	oxygen	O
	bromine	Br
	iodine	I
	sulfur	S
Least reactive	(red) phosphorus	P

OUTLINE & NOTES
LESSON 14B: TYPES OF CHEMICAL REACTIONS

I. The Importance of Prediction Products of Chemical Reactions

A. In the lab, _____ what will happen in a reaction

B. If we know the _____ , we can predict the _____

II. Steps of Prediction

A. Write _____ if necessary

B. Use reactants to determine _____

C. Based on type of reaction, _____

1. DO NOT _____ from one side to another; _____ and _____
2. Similar elements and ions _____
3. Combustion always ends with _____ and _____

III. Examples

A. Solid iodine + lead (III) bromide →

1. Reactants: _____
2. Type of reaction: _____

3. Equation: _____
4. Balanced equation:
5. Will the reaction occur? _____

B. $Cu^{2+} + Ag(NO_3) \rightarrow$

1. Type of reaction: _____
2. Equation: _____
3. Balanced equation:

4. Will the reaction occur? _____

C. $Na + O_2 \rightarrow$

1. Type of reaction: _____
2. Equation: _____
3. Balanced equation:

D. $C_7H_{14} + O_2 \rightarrow$

1. Type of reaction: _____
2. Equation: _____
3. Balanced equation:

E. $HgO \xrightarrow{\Delta}$

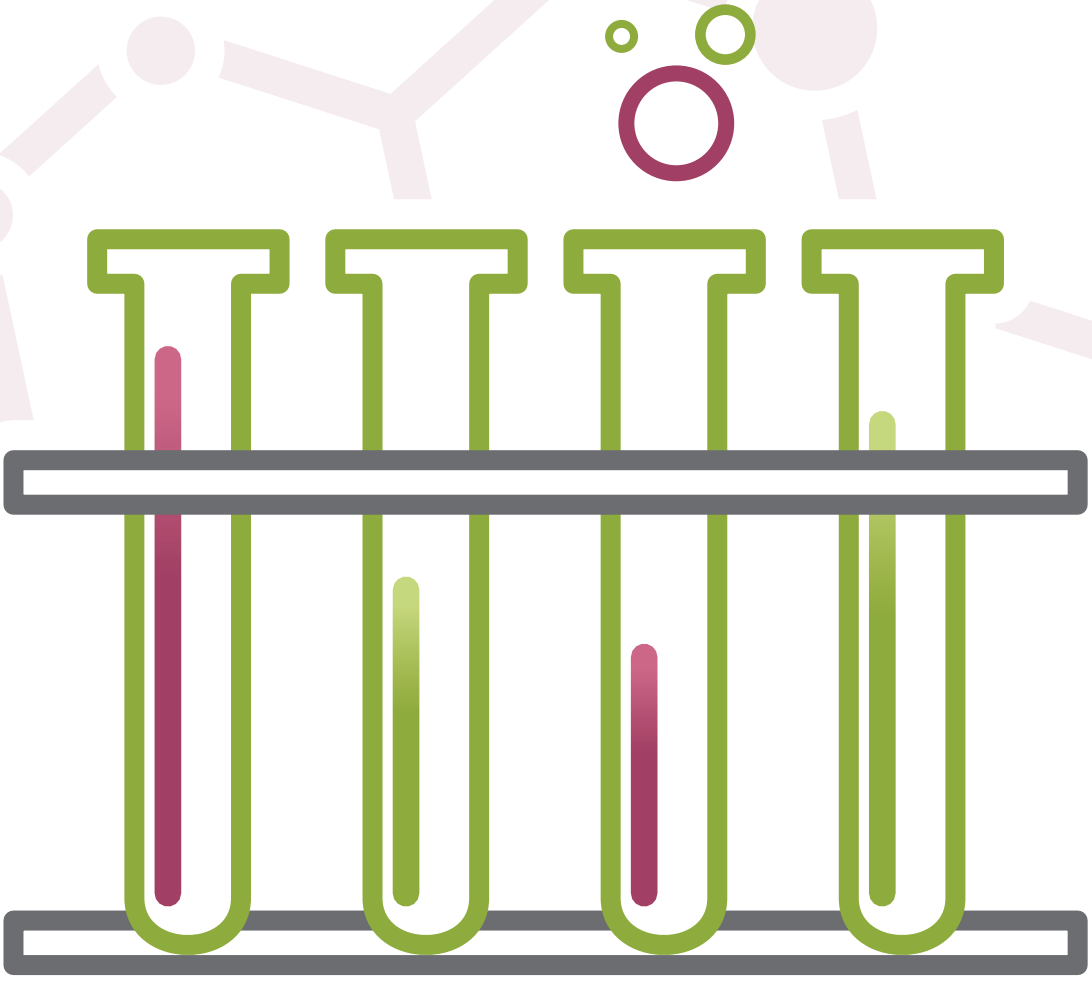
1. Type of reaction: _____
2. Equation: $HgO \xrightarrow{\Delta}$ _____
3. Balanced equation:

F. $H_3PO_4 + LiOH \rightarrow$

1. Type of reaction: _____
2. Equation: _____
3. Balanced equation:

G. $KF + Pb_2(SO_4)_3 \rightarrow$

1. Type of reaction: _____
2. Equation: _____
3. Balanced equation:



EXPERIENCE CHEMISTRY

STUDENT LAB GUIDE

Luke & Trisha Gilkerson
with Bekah Kohlmeier

LESSON 14

TYPES OF CHEMICAL REACTIONS

In this lab you'll have the opportunity to watch chemical reactions take place. You'll observe, predict, classify, and write balanced chemical equations that illustrate the chemical reactions you complete.

Supplies

- Disposable pipettes
- 2 small beakers
- Glass funnel (optional)
- 0.75 oz packet active dry yeast
- Liquid dish soap
- Penny
- Small piece of magnesium ribbon
- 1 g iron (III) chloride
- 1 g copper (II) chloride
- 3 test tubes
- 50 mL graduated cylinder
- 30 mL of 30% hydrogen peroxide
- 150 mL Erlenmeyer flask
- Food coloring (optional)
- 0.25 g silver nitrate
- 10 mL hydrochloric acid
- 2.5 g sodium hydroxide
- 0.5 g sodium phosphate
- Pie tin, baking dish, or any flat surface with edges

Instructions

1. Combustion of ethanol (C_2H_5OH)
    a. Watch the demonstration video for the combustion of ethanol (C_2H_5OH).
    b. Record your observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

2. Aluminum and iodine

    a. Watch the demonstration video for the reaction between aluminum and iodine.

    b. Record your observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

3. Breakdown of hydrogen peroxide

    a. Place a 150 mL Erlenmeyer flask on a pie tin (or other flat surface with edges). Measure out 30 mL of 30% hydrogen peroxide in a graduated cylinder and add to the flask.

    b. Add a squeeze of liquid dish soap and a few drops of food coloring (optional) to the hydrogen peroxide and swirl the flask for a few seconds to mix them together.

    c. Quickly pour the packet of active dry yeast into the mixture and take a step back.

    d. Record observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

4. Copper (+2) and silver nitrate

    a. Create a solution of silver nitrate by first measuring out 25 mL of water in a graduated cylinder. Pour into a small beaker.

    b. Add 0.25 g of silver nitrate into the beaker. Stir until dissolved.

    c. Place a penny into a small beaker. Using a disposable pipette, add the silver nitrate solution to the beaker until the penny is completely submerged.

    d. Let the beaker sit for a few minutes, then record observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

5. Magnesium and hydrochloric acid

    a. Place a small piece of magnesium ribbon into a test tube. Use a disposable pipette to add drops of hydrochloric acid to the test tube until the piece of magnesium is covered.

    b. Record observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

6. Sodium hydroxide and iron (III) chloride

    a. Create a solution of sodium hydroxide by first measuring out 10 mL of water in a graduated cylinder. Pour into a small beaker.

    b. Add 2.5 g sodium hydroxide to the beaker. Stir until dissolved.

    c. Create a solution of iron (III) chloride by first measuring out 10 mL of water in a graduated cylinder. Pour in a second small beaker.

    d. Add 1 g iron (III) chloride to the second beaker. Stir until dissolved.

    e. Using a disposable pipette, add 20 drops of sodium hydroxide to a test tube. Using a different disposable pipette, add 20 drops of iron (III) chloride to the test tube. Swirl to thoroughly mix the two solutions.

    f. Record observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

7. Sodium phosphate and copper (II) chloride

    a. Create a solution of copper (II) chloride by first measuring 10 mL of water in a graduated cylinder. Pour into a small beaker.

    b. Add 1 g copper (II) chloride to the beaker. Stir until dissolved.

    c. Create a solution of sodium phosphate by first measuring 10 mL of water in a graduated cylinder. Pour into a second small beaker.

    d. Add 0.5 g sodium phosphate to the second beaker. Stir until dissolved.

    e. Using a disposable pipette, add 15 drops of copper (II) chloride to a test tube. Using a different disposable pipette, slowly and carefully add five drops of sodium phosphate to the test tube.

    f. Record observations for the reaction, identify the type of reaction, then write and balance an equation for the reaction.

8. Clean up everything from the lab. All solids can go in the garbage. All liquids can be poured down the sink with lots of water.

Experiment 1	Combustion of ethanol (C_2H_5OH)
Observations	
Type of reaction	
Balanced chemical equation	

Experiment 2	Aluminum and iodine
Observations	
Type of reaction	
Balanced chemical equation	

Experiment 3	Breakdown of hydrogen peroxide (H_2O_2)
Observations	
Type of reaction	
Balanced chemical equation	

Experiment 4	Copper (+2) and silver nitrate
Observations	
Type of reaction	
Balanced chemical equation	

Experiment 5	Magnesium and hydrochloric acid
Observations	
Type of reaction	
Balanced chemical equation	

Experiment 6	Sodium hydroxide and iron (III) chloride
Observations	
Type of reaction	
Balanced chemical equation	

Experiment 7	Sodium phosphate and copper (II) chloride
Observations	
Type of reaction	
Balanced chemical equation	

LAB REPORT

LESSON 14

Write a lab report that includes the title, introduction, and the data tables above. Also include any pertinent safety information in your lab report.

LAB NOTES

LN