ST. JOSEPH'S ACADEMY
AP/ACP CHEMISTRY

Teacher: Mrs. Julie Iovaldi

ASSIGNMENT:

Welcome to AP/ACP Chemistry! I'm glad you are here!

AP Chemistry is a college-level course designed to challenge you, expand your scientific understanding, and prepare you for the AP Chemistry Exam in May 2027. You may also choose to earn college credit by registering for UMSL's Chemistry 1111 course (5 credit hours). Through a combination of labs, lectures, collaborative problem-solving, and real-world applications, you'll develop skills that will help you not only in science but in any future academic or career path.

COURSE EXPECTATIONS:

- This course is fast-paced and rigorous. It will require significant time and effort outside of class time.
- We will cover topics including atomic structure and periodicity, chemical bonding and molecular geometry, intermolecular forces and properties, chemical reactions and stoichiometry, thermodynamics, kinetics, equilibrium, acids and bases, and electrochemistry
- Success in this course requires consistent effort and attendance. We move very quickly, so missing class should be avoided when possible. It is important to come to class prepared, stay organized and stay up-to-date with assignments.
- You will be expected to actively participate in class, ask questions, collaborate with your peers and independently study/review outside of the classroom. My goal is to support you as we explore chemistry in a fun, engaging, and meaningful way.

COMMUNICATION:

I encourage both students and parents to reach out with any questions or concerns. I will be checking my email periodically throughout the summer and am happy to answer any questions as we approach the new school year. Once our courses for 2026-2027 are loaded into Canvas, I will use that as our main form of communication.

SUMMER ASSIGNMENT:

To help us hit the ground running, I have attached a short summer assignment. This will review foundational topics such as stoichiometry, dimensional analysis, and atomic structure. I want you all to enjoy your summer, but I encourage you to start working on this a few weeks before school begins as a quick refresher of Honors Chemistry. This will be due at the end of the first week of classes.

I'm looking forward to a great year of discovery, challenge, growth, and fun too! I hope you have a fantastic summer, and I can't wait to see all of you in August!

Mrs. Iovaldi
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Topic 1: Significant Figures

1. Determine the number of significant figures in each of the following:

   a. 0.7540 _____

   b. 12500 _____

   c. 1000.01 _____

   d. 1200 _____

   e. 1.04×10^3 _____

   f. 0.0080050 _____

2. Perform the following calculations and round to the appropriate number of significant figures:

   a. $34.66 + 333.0$ _____

   b. $1.23 + 9.66$ _____

   c. $455 - 1.22$ _____

   d. 18.2×1.998 _____

   e. $10.2 \div 1.34$ _____

   f. $\frac{100.23+59.4}{5.22}$ _____

3. Round each of the following numbers to three significant figures:

   a. 167.789 _____

   b. 0.00000445345 _____

   c. 25.0545 _____

   d. 3.1415926536 _____

   e. 8504.0435 _____

   f. 14.4355 _____

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Topic 2: Metric and Temperature Conversions

1. Use dimensional analysis (factor-label method) to make the following metric conversions:

   a. 3.40 m to cm _____ × _____ = _____

   b. 289 cm to nm _____ × _____ × _____ = _____

   c. 125145 J to kJ _____ × _____ = _____

   d. 164 mg to g _____ × _____ = _____

   e. 46.5 mL to L _____ × _____ = _____

2. Make the following temperature conversions:

   a. 162°F to °C _____

   b. 0.0 °F to K _____

   c. -18 °C to K _____

   d. 212 K to °C _____

   e. 98.6 °F to K _____

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Topic 3: Nomenclature

1. Name or write the formula for the following ionic compounds:

a. LiCl		g. tin(II) bromide	
b. $Mg(OH)_2$		h. potassium phosphate	
c. K_3P		i. nickel(II) perchlorate	
d. Fe_2O_3		j. sodium hydroxide	
e. FeO		k. zinc phosphate	
f. $ZnCl_2$		l. ammonium sulfate	

2. Name or write the formula for the following covalent compounds:

a. CO		e. nitrogen tribromide	
b. CBr_4		f. tetraphosphorus decaoxide	
c. SO_2		g. xenon hexafluoride	
d. N_2O_4		h. dicarbon tetrafluoride	

3. Name or write the formula for the following acids:

a. HCl		e. hydrobromic acid	
b. HNO_3		f. hydronitric acid	
c. $HC_2H_3O_2$		g. phosphoric acid	
d. H_2SO_4		h. hydrosulfuric acid	

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Topic 4: Atomic Structure

1. Determine the number of protons, neutrons and electrons in each of the following:

   a. $^{39}_{19}K$ protons: _____ neutrons: _____ electrons: _____

   b. $^{23}_{11}Na^{1+}$ protons: _____ neutrons: _____ electrons: _____

   c. $^{208}_{82}Pb$ protons: _____ neutrons: _____ electrons: _____

   d. $^{33}_{15}P^{3-}$ protons: _____ neutrons: _____ electrons: _____

2. Write the symbol for the atom that contains
   a. 24 protons, 21 electrons and 24 neutrons

   b. 34 protons, 45 neutrons, 34 electrons

   c. 8 protons, 10 neutrons, 10 electrons

3. What experimental evidence supports these statements?
   a. The nucleus of an atom is small.

   b. The atom consists of both positive and negative charges.

   c. The nucleus of the atom is positive.

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Topic 5: Writing and Balancing Chemical Equations

1. Balance the following chemical equations:
   a. _____ $Cr_{(s)}$ + _____ $O_{2(g)} \rightarrow$ _____ $Cr_2O_{3(s)}$

   b. _____ $SiH_{4(g)} \rightarrow$ _____ $Si_{(s)}$ + _____ $H_{2(g)}$

   c. _____ $SO_{3(g)} \rightarrow$ _____ $SO_{2(g)}$ + _____ $O_{2(g)}$

   d. _____ $Pb(NO_3)_{2(s)} \rightarrow$ _____ $PbO_{(s)}$ + _____ $NO_{2(g)}$ + _____ $O_{2(g)}$

   e. _____ $C_3H_{8(g)}$ + _____ $O_{2(g)} \rightarrow$ _____ $CO_{2(g)}$ + _____ $H_2O_{(g)}$

   f. _____ $C_2H_5OH_{(l)}$ + _____ $O_{2(g)} \rightarrow$ _____ $CO_{2(g)}$ + _____ $H_2O_{(g)}$

2. Write a balanced chemical equation for each of the following reaction descriptions:
   a. When solid calcium carbonate is heated, solid calcium oxide and gaseous carbon dioxide are formed.

   b. Aluminum metal reacts with oxygen to form solid aluminum oxide.

   c. When solid mercury(II) sulfide is heated with oxygen, liquid mercury metal and gaseous sulfur dioxide are produced.

   d. When aqueous solutions of aluminum sulfate and barium chloride are mixed, solid barium sulfate and aqueous aluminum chloride are formed.

   e. Solid sodium bicarbonate reacts with hydrochloric acid to produce sodium chloride, water, and carbon dioxide gas.

   f. Gaseous ammonia and oxygen react to produce nitrogen monoxide gas and water

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Topic 6: Moles and Stoichiometry

1. Vinegar is a dilute solution of acetic acid, CH_3COOH.
   a. Calculate the molar mass of acetic acid.

   b. How many molecules of CH_3COOH are contained within 43.4 g of acetic acid?

   c. How much would 0.450 moles of acetic acid weigh?

2. How many moles of hydrogen gas can be produced if 1.35 g of solid zinc reacts with excess hydrochloric acid according to the equation

$$Zn + 2\ HCl \rightarrow H_2 + ZnCl_2$$

3. The reaction for the combustion of propane is

$$____ C_3H_8 + ____ O_2 \rightarrow _____ CO_2 + ____ H_2O$$

   a. If 20.0 g of C_3H_8 and 20.0 g of O_2 are reacted, how many moles of CO_2 can be produced?

4. If 20.0 g of C_3H_8 and 80.0 g of O_2 are reacted, how many grams of CO_2 can be produced

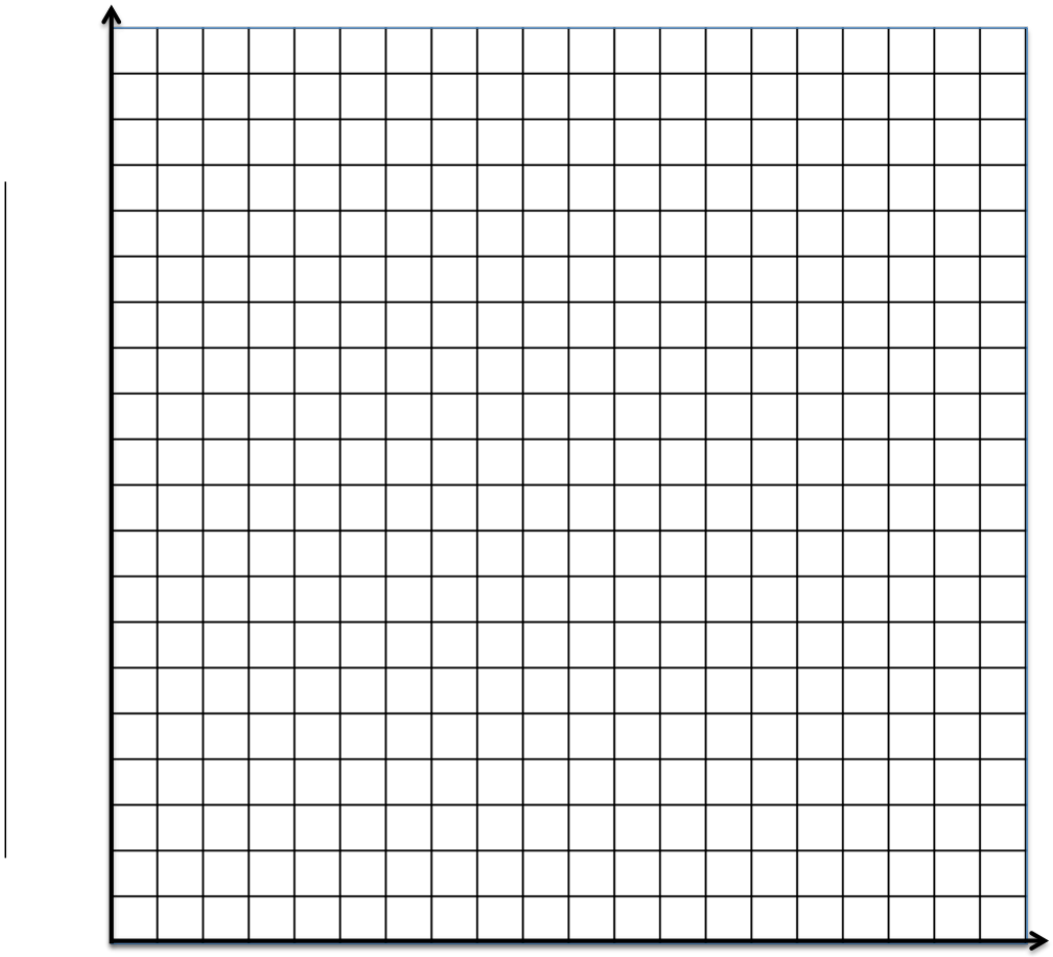
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Topic 7: Graphing and Data Analysis

1. When anhydrous calcium chloride is dissolved in water, the temperature of the system changes. A student obtains the following data when dissolving increasing amounts of $CaCl_2$ into 100 mL of water:

Mass of $CaCl_2$ dissolved, g	0.91	2.94	5.92	8.81	10.89
ΔT, °C	1.8	6.6	12.8	18.9	23.2

Plot the data on the graph below. Choose an appropriate scale, and label the axes appropriately.



Refer to the graph to answer the following questions.

Independent Variable: _____

Dependent Variable: _____

Provide a descriptive title for the graph: _____

2. Describe the relationship between grams of calcium chloride salt and change in temperature in a sentence.

3. Draw a line of best fit. Determine its slope, including units.

4. Predict the change in temperature when

   a. 4.33 g of $CaCl_2$ are dissolved

   b. 9.56 g of $CaCl_2$ are dissolved

   c. 15.4 g of $CaCl_2$ are dissolved

5. Predict what mass of $CaCl_2$ will result in

   d. a 12.4˚C change in temperature

   e. a 44.9 ˚C change in temperature

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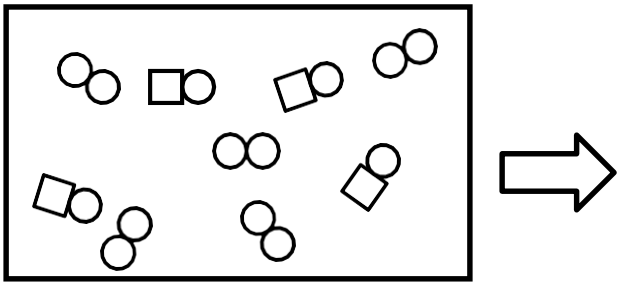
Topic 8: Particulate Diagrams

1. Consider the synthesis of nitrogen dioxide

$$2\ NO + 1\ O_2 \longrightarrow 2\ NO_2$$

a. In the diagram below, nitrogen atoms are represented with squares and oxygen atoms are represented with circles. Using the conservation of matter, draw what you would expect to find in the reaction vessel once the reaction is complete.

Before Reaction: After Reaction

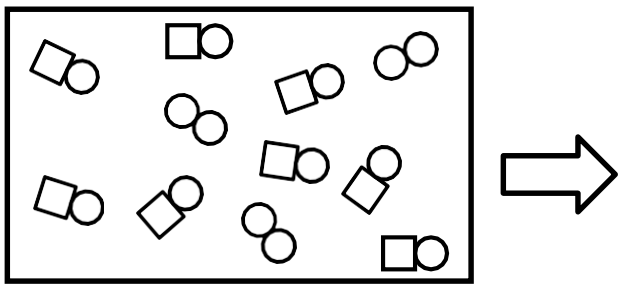


Limiting Reactant: Excess Reactant:

Explanation

b. Consider the same reaction, with different starting quantities. Draw the contents of the reaction vessel after the reaction is complete.

Before Reaction: After Reaction



Limiting Reactant: Excess Reactant:

Explanation

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Topic 9: Elements and Ions to Memorize

1. Prepare flash cards for the following elements/ions and their symbols

H	hydrogen
He	helium
Li	lithium
Be	beryllium
B	boron
C	carbon
N	nitrogen
O	oxygen
F	fluorine
Ne	neon
Na	sodium
Mg	magnesium
Al	aluminum
Si	silicon
P	phosphorus
S	sulfur
Cl	chlorine
Ar	argon
K	potassium
Ca	calcium
Cr	chromium
Mn	manganese
Fe	iron
Cu	Copper
Zn	zinc
Ag	silver
Pb	lead

$C_2H_3O_2^-$	acetate
ClO_3^-	chlorate
ClO_2^-	chlorite
CN^-	cyanide
HCO_3^-	bicarbonate
OH^-	Hydroxide
NO_3^-	nitrate
NO_2^-	nitrite
ClO_4^-	perchlorate
MnO_4^-	permanganate
SCN^-	thiocyanate
CO_3^{2-}	carbonate
CrO_4^{2-}	chromate
SO_4^{2-}	sulfate
SO_3^{2-}	sulfite
PO_4^{3-}	phosphate
PO_3^{3-}	phosphite
NH_4^+	ammonium

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