

## **AP CHEMISTRY – Summer Assignment**

This course is designed to be equivalent to a two-semester introductory chemistry course in college. It will be a challenging yet rewarding experience for students. This summer assignment is designed to review the basic skills you learned in pre-AP chemistry. Chemistry takes time to process and grasp at a level necessary for success in AP Chemistry. Taking a college level course in high school is difficult, and requires dedication

**Big Idea 1: SCALE, PROPORTION, AND QUANTITY (SPQ)**

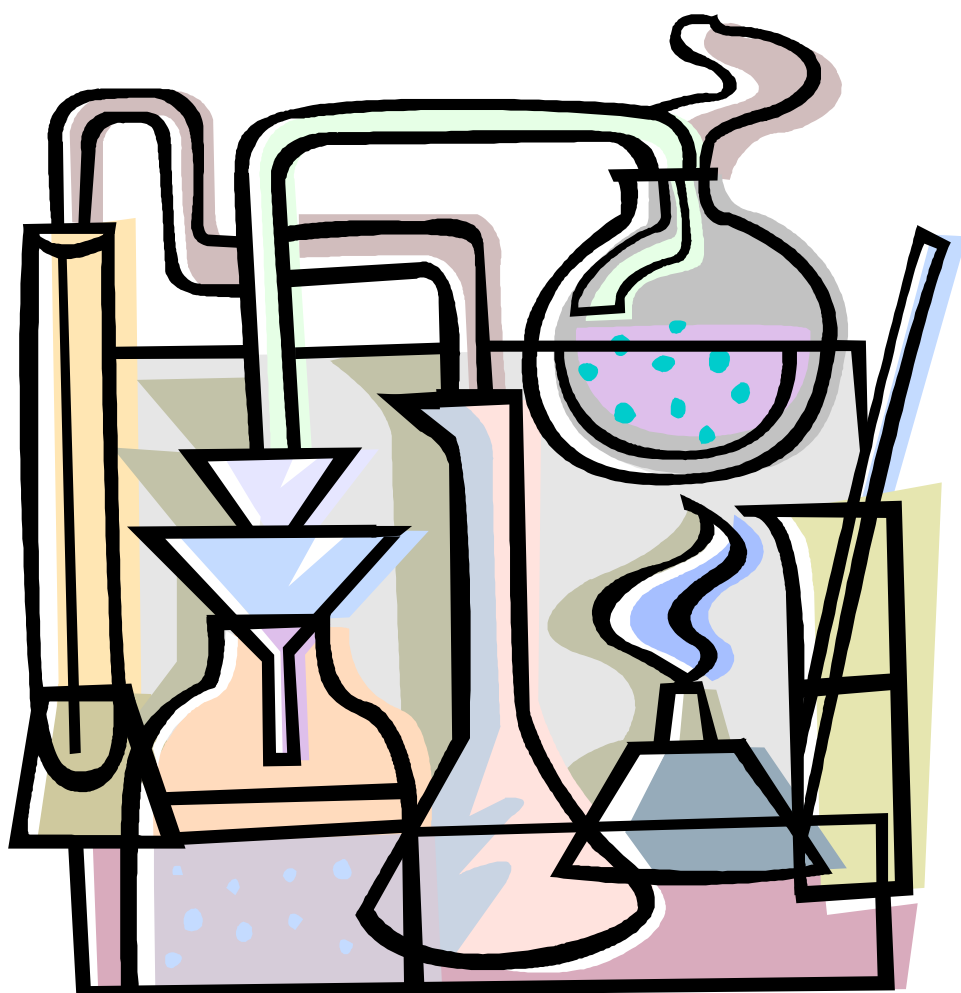
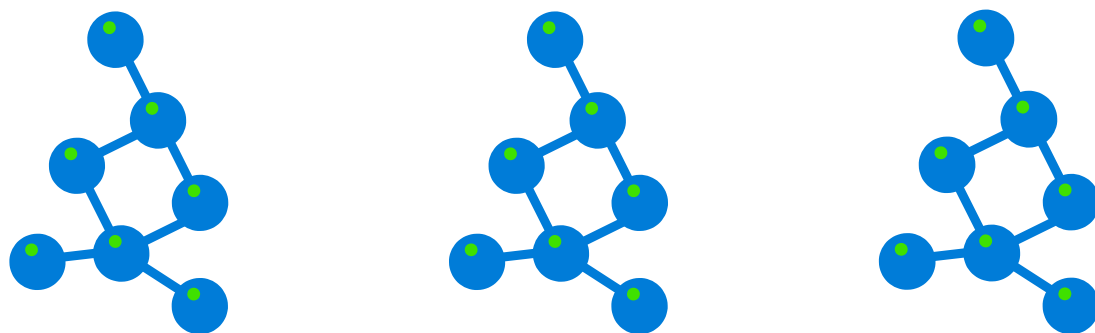
**Big Idea 2: STRUCTURE AND PROPERTIES (SAP)**

**Big Idea 3: TRANSFORMATIONS (TRA)**

**Big Idea 4: ENERGY (ENE)**

Spread out the summer assignment. Please do not try to complete it all in the final week of the summer. The packet must be completed by the second day. Quizzes are given over the content of this packet following section reviews in class. A test over all review topics will be given the third week of school. Week four will begin an in-depth student of chemistry, presenting many new concepts each unit. Having a strong background is imperative for success in this course.

# ***AP CHEMISTRY: SUMMER ASSIGNMENT***



# SUMMER ASSIGNMENT - AP CHEMISTRY:

Welcome to AP Chemistry! You have chosen a fun yet challenging course of study. To better prepare you for this second chemistry course your summer assignment will cover chapters 1-4 of the text since this material reviews important pre-AP concepts.

## Textbooks:

**Chemistry by Zundahl and Zumdahl - 9th edition. ISBN #10-1-133-61109-5**

You may check a textbook out at the Senior High Campus beginning the second week of June. You may also elect to purchase a text book (@ \$250 new/ \$180 used. ) from any textbook supply company.

➤ *Students are NOT required to purchase a text and CSH does NOT sell books.*

## Study Guide:

AP study guides are beneficial but NOT required. We do NOT use study guides in class. The best book to purchase is the one you will use. Take a few minutes to visit the study guide section of your favorite bookstore and preview selections before purchasing. This is a great idea even if you want to buy material online.

## Summer Assignments:

- 1) Read chapters 1-4 in the Zumdahl textbook.
- 2) Complete the attached review sheet. Bring the completed worksheet to class the first day of school. Please follow these guidelines as you work through this review packet:
  - a) Show all work on math problems. Answers alone will receive no credit.
  - b) Use the correct number of significant figures in your answers
  - c) Include units with your answers.
  - d) Please box final answers for quick grading.
- 3) Review element symbols, polyatomic ions with charges and solubility rules. (This was your pre-AP chemistry summer assignment.) Expect a quiz over these during the first week of school.
- 4) A TEST over your summer assignment topics will be scheduled during the first 3 weeks of school.
- 5) **Copying the work of others, posting answers for others to copy, making information available via the cloud or other sites, sharing work via Skype, sharing logins/ copyrighted/ password protected material, using a computer, phone, internet or any other electronic device to convey quiz or test questions/answers to others, allowing someone (including tutors) to complete your work for your.. EACH of these is an example of Academic DISHONESTY in this class.**
- 6) Maintain the highest levels of integrity at all times, including your work on this summer assignment. Refer to the Honor Code for consequences of academic dishonesty.

I look forward to meeting and working with each of you in the fall. Have a great summer!

Mrs. Sherry Martin  
Carroll Senior High School

**Learning Target 1 – I can count the number of significant figures in a measurement.**

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 14-17

Wikipedia: Significant Figures

1) Count the number of significant figures in the following measurements:

- a) 2.71 g \_\_\_\_\_      b) 0.00047 kg \_\_\_\_\_      c)  $7.0 \times 10^5$  m \_\_\_\_\_      d) 1,030 L \_\_\_\_\_  
e) 150 pencils \_\_\_\_\_      f) 37500 g \_\_\_\_\_      g) 0.1010 cm \_\_\_\_\_

**Learning Target 2 – I can convert numbers to scientific notation while applying significant figures.**

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 14-17

Wikipedia: Significant Figures

2) Express each of the following in proper scientific notation (Pay attention to sig figs and units)

- a) 0.000125 m \_\_\_\_\_      b) 155.0 mL \_\_\_\_\_  
c) 123,030,000 kg \_\_\_\_\_      d)  $481.9 \times 10^{-9}$  cm \_\_\_\_\_

**Learning Target 3 - I can add, subtract, multiply, and divide with the correct number of significant figures.**

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 14-17

Wikipedia: Significant Figures

3) Calculate the correct answer with proper units and sig figs for each of the following:

- a)  $12 \text{ g} + 0.677 \text{ g} + 86.33 \text{ g} =$  \_\_\_\_\_  
b)  $(355.78 \text{ g}) / (0.056 \text{ g}) =$  \_\_\_\_\_  
c)  $97.34 \text{ mL} - 34.1 \text{ mL} =$  \_\_\_\_\_  
d)  $14.68 \times 5 =$  \_\_\_\_\_

4) Perform the following calculations involving scientific notation. Report your answer with the correct number of significant figures.

- a)  $0.14 \times (6.02 \times 10^{23}) =$  \_\_\_\_\_  
b)  $\frac{(9.875 \times 10^4) - (9.795 \times 10^4)}{9.875 \times 10^4} \times 100 \% =$  \_\_\_\_\_ (assume 100 is exact)  
c)  $\frac{(3.8 \times 10^{-12} + 4.0 \times 10^{-13})}{(4 \times 10^{12} + 6.3 \times 10^{13})} =$  \_\_\_\_\_

**Learning Target 4 – *I can use conversions to solve dimensional analysis problems.***

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 18-22 Google: Dimensional Analysis links 3 or 4

- 5) Solve the following problems using conversions and dimensional analysis.
- A large railroad car is filled with 1745 gallons of milk. The car springs a leak in the bottom, and milk starts dripping out at a rate of 204.84 mL/sec. If the train is traveling at a speed of 65.4 miles per hour, calculate how many miles it will travel before all the milk has drained out of the car. (1 gal = 3.78 L, 1 mile = 5280 ft, 1 in = 2.54 cm)
  - The world record for the hundred meter dash is 9.77 seconds. What is the corresponding average speed in units of m/sec, km/hr, ft/sec, and miles/hr?

**Learning Target 5 – *I can explain density and use the density equation to find an unknown.***

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 26-27 Wikipedia: Density

- A rectangular block has dimensions of 2.9 cm x 3.5 cm x 10.0 cm. The mass of the block is 615.0 grams. What are the volume and the density of the block?
- The density of pure silver is 10.5 g/mL at 20°C. If 5.25 grams of pure silver pellets are added to a graduated cylinder containing 11.2 mL of water, to what volume will the water in the cylinder rise?

**Learning Target 6 – *I can define and explain terms that identify physical/chemical characteristics of matter.***

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 27-30 Wikipedia: Matter or Wikipedia any of the terms below

- 8) Identify the following as a physical property, physical change, chemical property, or chemical change:
- Ethanol has a density of 0.697 g/mL. \_\_\_\_\_
  - The solution turns blue upon mixing water and food coloring. \_\_\_\_\_
  - Wood burns in an oven. \_\_\_\_\_
  - Methyl alcohol is highly flammable. \_\_\_\_\_
  - Ice melts in a beaker. \_\_\_\_\_
  - Methyl ethanoate smells like apples. \_\_\_\_\_
  - A car crashes into a wall. \_\_\_\_\_
  - Sugar dissolves in water. \_\_\_\_\_



13) Solve the following problem:

Tin – Oxygen compound	Tin % by mass	Oxygen % by mass
Stannous oxide	88.10%	11.90%
Stannic oxide	78.70%	21.30%

Tin – Oxygen compound	Tin mass	Oxygen mass
Stannous oxide	100.0 grams	
Stannic oxide	100.0 grams	

a) Use the Law of Definite Proportions to determine the mass of oxygen needed to combine with the given masses of tin for stannous oxide and stannic oxide.

b) Does the Law of Multiple Proportions hold true in this case? Explain why or why not.

**Learning Target 9 – I can name and write formulas for ionic compounds.**

Review Reading: Zumdahl 9<sup>th</sup> Ed. Pg 60-70

Wikipedia: IUPAC nomenclature of inorganic compounds

14) Name or give the formula for the following compounds:

Name	Formula
Sodium fluoride	_____
_____	K <sub>2</sub> O
Calcium phosphate	_____
_____	FeCl <sub>3</sub>
Iron (II) chloride	_____
_____	Hg <sub>2</sub> O
Sodium sulfate	_____
_____	CaCO <sub>3</sub>
Lithium phosphate	_____
_____	SO <sub>2</sub>
Calcium hydroxide	_____
_____	H <sub>2</sub> SO <sub>4</sub>

**Learning Target 10 – *I can write and balance equations.***

Review Reading:

Zumdahl 9<sup>th</sup> Ed. 103-108

[www.chymist.com/Equations.pdf](http://www.chymist.com/Equations.pdf)

Write and balance the following equations:

- a) Iron metal reacts with oxygen to form rust, iron (III) oxide.
- b) Calcium metal reacts with water to produce aqueous calcium hydroxide and hydrogen gas.
- c) Aqueous barium hydroxide reacts with aqueous sulfuric acid to produce solid barium sulfate and water.

**Learning Target 11 – *I can do conversions associated with moles.***

Review Reading:

Zumdahl 9<sup>th</sup> Ed. 85-92

Google: Mole Calculations

15) Solve the following problems:

- a) Calculate the mass of 500 atoms of iron (Fe).
- b) How many formula units are present in 87.2 grams of lead (IV) carbonate?
- c) Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. Aspartame is marketed as Nutra-Sweet. The molecular formula of aspartame is  $C_{14}H_{18}N_2O_5$ .
  - i. Calculate the molar mass of aspartame.
  - ii. Calculate the mass, in grams, of 1.56 mol of aspartame.
  - iii. How many molecules are in 5.0 mg of aspartame?
  - iv. How many atoms of nitrogen are in 1.2 g aspartame?
  - v. What is the mass of one molecule of aspartame?



**Learning Target 12 – *I can calculate percent by mass for an element in a compound.***

Review Reading:      Zumdahl 9<sup>th</sup> Ed. 94-96      Google: percent mass

16) Calculate the percent by mass for each element in aspartame from the previous problem.

**Learning Target 13 – *I can calculate the average atomic mass of an isotope using percent abundance.***

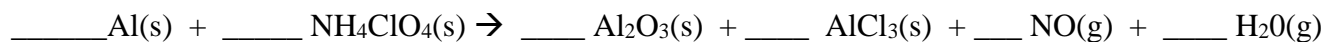
Review Reading:      Zumdahl 9<sup>th</sup> Ed. 83-85      Google: average atomic mass

17) An element consists of 1.40% of an isotope with a mass of 203.973 amu, 24.10% of an isotope with mass 205.9745 amu, 22.10% of an isotope with mass 206.9759 amu, and 52.40% of an isotope with mass 207.9766 amu. Calculate the average atomic mass and identify the element.

**Learning Target 14 – *I can solve stoichiometry problems, include those with limiting and excess reagents.***

Review Reading:      Zumdahl 9<sup>th</sup> Ed. 108-123      Google: stoichiometry problems

18) The reusable booster rockets of the U.S. space shuttle employs a mixture of aluminum and ammonium perchlorate for fuel. A possible reaction for this is:



a) Balance the following reaction:

b) If 4.0 g of aluminum reacted with 15.0 g of ammonium perchlorate, what would be the limiting reactant? How much excess of the other reactant would you have?

c) Using the previous information, calculate the number of grams of aluminum chloride produced.

d) If you actually collected 4.18 g of aluminum chloride what would be the percent yield?

19) You add aluminum to a solution of copper (II) chloride and it reacts exothermically. Write and balance the equation here:

a) If you react 1.25 g of Al, how much copper (II) chloride do you need to add for the Al to fully react?

b) How much of each product would you collect using the amount of Al from part (a)?

20) When 125.0 g of ethylene (C<sub>2</sub>H<sub>4</sub>) burns in 60.0 grams of oxygen to give carbon dioxide and water, how many grams of CO<sub>2</sub> are formed? (Hint: balance the equation and determine limiting reactant first)

**Learning Target 15 – *I can determine the empirical and molecular formula by calculation.***

**Review Reading:** Zumdahl 7<sup>th</sup> Ed. 99-103      **Google:** empirical formula

21) Phenol is a compound that contains 76.57% carbon, 6.43% hydrogen, and 17.0% oxygen.

a) Calculate the empirical formula.

b) If the molecular weight of phenol is 188 g/mol, what would be its molecular formula?

**Learning Target 16 - *I can calculate the empirical formula of an unknown hydrocarbon using a combustion reaction and calculation.***

**Review Reading:** Zumdahl 7<sup>th</sup> Ed. 99-103      **Google:** combustion analysis

22) One killer of a problem – a GOLD STAR if you can get this one:

Menthol, the substance we can smell in mentholated cough drops, is composed of carbon, hydrogen, and oxygen. A 0.1005 gram sample of menthol is combusted producing 0.2829 g of CO<sub>2</sub> and 0.1159 g of H<sub>2</sub>O. What is the empirical formula for menthol? Show work.

**Learning Target 17 - *I can calculate the concentration of solutions***

**Review Reading:** Zumdahl 9<sup>th</sup> Ed. 145-149      **Google:** molarity

23) Calculate the molarity of the following solutions:

a) 28.92 g of HNO<sub>3</sub> in enough water to make 250 mL of solution

b) 57.61 g of KOH in enough water to make 1250 mL of solution

24) Describe how to prepare the following solutions from solid reagents and water:

a) 750 mL of 0.5 M  $\text{K}_2\text{Cr}_2\text{O}_7$

b) 1 L of 6.0 M  $\text{Na}_2\text{SO}_4$

25) Describe how to make one concentration from another solution:

a) Make 50 mL of 1.0 M  $\text{NaCl}$  from 12.0 M  $\text{NaCl}$

b) Make 350 mL of 0.15 M  $\text{FeSO}_4$  from 4.0 M  $\text{FeSO}_4$

**Learning Target 18 - *I can determine substances that will precipitate in a solution.***

Review Reading: Zumdahl 9<sup>th</sup> Ed. 153-158 Google: solubility rules

26) A solution contains  $\text{Pb}^{2+}$ ,  $\text{Ag}^+$  and  $\text{Fe}^{3+}$ . You want to selectively precipitate the  $\text{Pb}^{2+}$ . Describe a procedure that will allow you to separate ALL the ions from the sample:

( HINT : Think about the SOLUBILITY RULES and your Quantitative analysis lab!!)

**Learning Target 19 - *I can write net ionic equations.***

Review Reading: Zumdahl 9<sup>th</sup> Ed. 158-160 Google: net ionic equations

27) Write **molecular equations**, predicting the expected products for the following:

a) silver nitrate is mixed with sodium chloride

b) magnesium nitrate combines with sodium hydroxide

c) solid zinc is mixed with hydrochloric acid

28) Write **net ionic equations** for the preceding examples in question #5. Include symbols indicating the states for each species- (s), (l), (g), or (aq)

a)

b)

c)

**Learning Target 20 - *I can calculate stoichiometry problems for basic precipitation reactions.***

Review Reading: Zumdahl 9<sup>th</sup> Ed. 160-162

Google: Stoichiometry of reactions in solutions

29) Calculate the mass of solid NaCl that must be added to 1.50 L of a 0.100 M AgNO<sub>3</sub> solution to precipitate all the Ag<sup>+</sup> ions in the form of AgCl.

30) What mass of Na<sub>2</sub>Cr<sub>2</sub>O<sub>4</sub> is required to precipitate all of the silver ions from 75.0 mL of a 0.100M AgNO<sub>3</sub>?