

# AP Chemistry Summer Reading Assignment

Read chapters 1 and 2 in OpenStax Chemistry 2e <https://openstax.org/books/chemistry-2e/pages/1-introduction>

Print out and complete the practice problems. Show all of your work on the practice problems that require calculations.

I have included links to videos that will be helpful as you complete the reading.

The practice problems will be collected on the first day of school.

There will be a test on this material during the first week of school.

If you have any questions about the summer assignment please email me [witzgallt@faculty.jhs.net](mailto:witzgallt@faculty.jhs.net)

## AP Chemistry - Chapter 1

### 1.1 Chemistry in Context

1) What are some ways that humans have used chemistry throughout history?

2) Why is chemistry considered the central science?

3) Draw diagrams to represent molecules of ice, water, and water vapor at the microscopic scale. Explain how the arrangement of particles at the microscopic level relates to the properties of ice, water, and water vapor at the macroscopic scale.

## 1.2 Phases and Classification of Matter

[https://www.youtube.com/watch?v=g2T\\_HBuNBOU](https://www.youtube.com/watch?v=g2T_HBuNBOU)

1) What is matter?

2) What are the three common phases of matter? What is the fourth, less common phase?

3) Is air matter? Explain why or why not.

4) Complete the following chart

Phase	Shape	Volume
Solid		
Liquid		
Gas		

5) State the law of conservation of matter in your own words.

6) Matter that has a constant composition is called a \_\_\_\_\_.

7) Pure substances can be divided into \_\_\_\_\_ or \_\_\_\_\_.

8) Approximately how many elements are there?

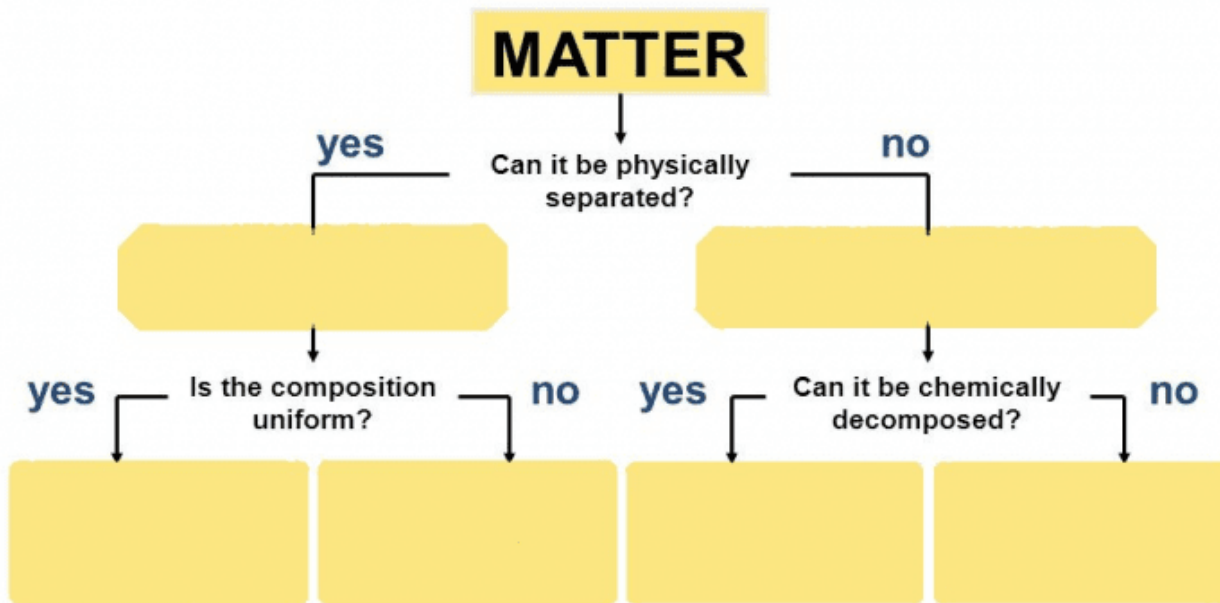
9) Compounds are composed of two or more \_\_\_\_\_.

10) Does a compound always have similar properties to the elements it contains? Explain your answer.

11) What is the difference between a mixture and a compound? Give two examples of each.

12) What is the difference between a heterogeneous mixture and a homogeneous mixture? Give two examples of each.

13) Complete the following chart.

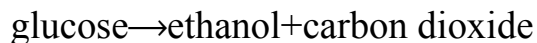


14) What is the smallest particle of an element that has the properties of that element?

15) Classify the following as elements, compounds, homogeneous mixtures, or heterogeneous mixtures:

- Sea water
- Magnesium
- Gasoline
- Rice pudding
- Air
- Sand
- Copper
- Ethanol

16) Yeast converts glucose to ethanol and carbon dioxide during anaerobic fermentation as depicted in the simple chemical equation here:



(a) If 200.0 g of glucose is fully converted, what will be the total mass of ethanol and carbon dioxide produced?

(b) If the fermentation is carried out in an open container, would you expect the mass of the container and contents after fermentation to be less than, greater than, or the same as the mass of the container and contents before fermentation? Explain.

(c) If 97.7 g of carbon dioxide is produced, what mass of ethanol is produced?

16) Give the symbols for the following elements:

Sodium

Potassium

Silver

Calcium

Lead

17) Name the following elements:

Mn

Mg

Li

Cr

Ti

Au

Br

### 1.3 Physical and Chemical Properties

<https://www.youtube.com/watch?v=Z5L2NOMEWT0&t=146s>

1) What is the difference between a physical and chemical property? Give two examples of each.

2) What is the difference between an extensive and intensive property? Give two examples of each.

3) Identify the following changes as chemical or physical

- Melting ice
- Digesting a candy bar
- Burning gasoline
- Crushing ice

### 1.4 Measurements

<https://www.youtube.com/watch?v=HH-jCJKaPUs>

1) Write the following numbers in scientific notation.

- 153,000
- 0.000034
- 20,100,000
- 0.000000000000296

2) Write the following numbers without exponents.

- $3.5 \times 10^5$
- $3.5 \times 10^{-5}$
- $1.03 \times 10^9$
- $9.35 \times 10^{-7}$

3) Complete the chart

Prefix	Abbreviation	Meaning
Picto		
Nano		
Micro		
Milli		
Centi		
Kilo		

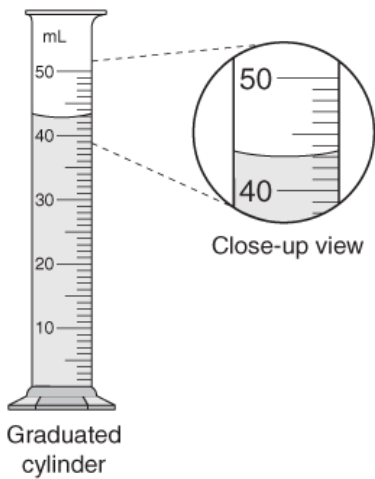
4) What metric unit would you use to measure the following things?

- The distance between your house and school
- The thickness of a human hair
- The length of a piece of paper
- The mass of an apple
- The mass of a car
- The mass of mass of aspirin in a tablet
- The volume of soda in a soda can
- The volume of a drop of water
- The volume water in a bathtub

### 1.5 Measurements Uncertainty, Accuracy and Precision

<https://www.youtube.com/watch?v=wQpp-1nSSjc&t=1s>

1) How would you record the volume of water in the graduated cylinder shown below?



2) How many significant figures are in each of the following numbers?

5600

5600.

0.056

5.00006

5.60000

0.00056

0.005600

3) Do the following calculations and round your answer to the correct number of significant figures.

$$12.0550 + 9.05 =$$

$$34.00 \times 0.013 =$$

$$0.0577 / 0.753 =$$

$$10.34 - 8.34210 =$$

### 1.6 Mathematical Treatment of Measurement Results

<https://www.youtube.com/watch?v=2e1LSe9bk3M&t=3s>

Complete the following conversions Show your work! Use dimensional analysis!

$$2.54 \text{ cm} = 1 \text{ inch}$$

$$12 \text{ inches} = 1 \text{ foot}$$

$$3 \text{ feet} = 1 \text{ yard}$$

$$2.205 \text{ lbs} = 1 \text{ kg}$$

1) Convert 15 inches into cm

2) Convert 150 lbs into kg.

3) Convert 1350 cm into feet

4) Convert 37 yards into cm

5) Convert 17.03 m into km

6) Convert 8.25 g into mg

7) Convert 250 cl into ml

8) Convert 3.14 kg into mg

9) Convert 1.0 g/ml into  $\mu\text{g/L}$

10) Convert 3.25 mg/dl into g/L

11) Convert 3.5 hours into seconds

12) Convert 8.25 meters<sup>2</sup> into cm<sup>2</sup>

13) Convert 60 meters/second into kilometers/hour

14) Convert 40 L/second into ml/second

15) A piece of wood measures 1.35 cm by 3.56 cm by 18.5 cm and has a mass of 75.36 grams. What is its density? Will it float or sink in water?

16) The density of brass is 8.41 g/cm<sup>3</sup>. What is the mass of a 13.18 cm<sup>3</sup> piece of brass?

17) The density of steel is 7.36 g/cm<sup>3</sup>. What is the volume of a 39.91 gram piece of steel?

18) A piece of metal measures 4.59 cm by 3.41 cm by 12.69 cm and has a mass of 1762.00 grams. What is its density?

## AP Chemistry - Chapter 2

### 2.1 Early Ideas in Atomic Theory

1) What are the five postulates of Dalton's atomic theory?

2) Samples of compound X, Y, and Z are analyzed, with results shown here.

Compound	Description	Mass of Carbon	Mass of Hydrogen
X	clear, colorless, liquid with strong odor	1.776	0.148
Y	clear, colorless, liquid with strong odor	1.974	0.329
Z	clear, colorless, liquid with strong odor	7.812 g	0.651 g

Do these data provide example(s) of the law of definite proportions, the law of multiple proportions, neither, or both? What do these data tell you about compounds X, Y, and Z?

### 2.2 Evolution of Atomic Theory

<https://www.youtube.com/watch?v=xazQRcSCRaY>

1) Describe J.J. Thomson's cathode ray experiment. How did his experiment change our understanding of the atom?

2) Describe Ernest Rutherford's gold foil experiment. How did his experiment change our understanding of the atom?



3) What is an isotope? Explain how the existence of isotopes violates one of Dalton's original postulates.

### 2.3 Atomic Structure and Symbolism

Protons, neutrons, and electrons. <https://www.youtube.com/watch?v=Gd7IGI9BVQc>

Isotopes and atomic weight <https://www.youtube.com/watch?v=rbSupsoBxyI>

1) Complete the following table

Subatomic particle	charge	Mass (grams)	Mass (amu)	Location

2) How do you find the number of protons in an atom or ion?

3) How do you determine the number of electrons in an atom or ion?

4) How do you determine the number of neutrons in an atom or ion?

5) How many protons, neutrons and electrons are in an argon-39 atom?

6) How many protons, neutrons, and electrons are in an argon-40 atom?

7) How many protons, neutrons and electrons are in a potassium-39 atom?

8) What is the symbol for an element with 25 protons and 32 neutrons?

9) How many protons, neutrons and electrons are in  $^{58}\text{Ni}^{2+}$  ?

10) How many protons, neutrons and electrons are in  $^{77}\text{Se}^{2-}$  ?

11) Write the symbol for the neutral atom with the atomic number 56 and a mass number of 139.

12) Write the symbol for the ion with 15 protons, 18 electrons, and 16 neutrons.

13) What is the symbol of the ion with 20 protons and 18 electrons and 21 neutrons?

14) What is the symbol of the ion with 35 protons and 36 electrons and 37 neutrons?

15) Complete the following chart:

<b>Chemical Symbol</b>	<b>Number of Protons</b>	<b>Number of Electrons</b>	<b>Number of Neutrons</b>	<b>Atom or Ion</b>	<b>Charge</b>
${}^9\text{Be}$					0
${}^{131}\text{I}^-$				Ion	-1
	35	36	45		
	11		12	Atom	
		55	78	Atom	
		18	16		-2
	13		14		+3
	29		35		+1

16) There are two isotopes of chlorine, chlorine-35 and chlorine-37. Chlorine-35 has a mass of 34.969 amu and an abundance of 75.53%. Chlorine-37 has a mass of 36.97 amu and an abundance of 24.47%. Calculate the average atomic mass of chlorine. (show your work)

17) There are three isotopes of Silicon. Silicon-28 has a mass of 27.977 amu and an abundance of 92.21%. Silicon-29 has a mass of 28.976 amu and an abundance of 4.70%. Silicon-30 has a mass of 29.974 amu and an abundance of 3.09%. Calculate the average atomic mass of silicon. (show your work)

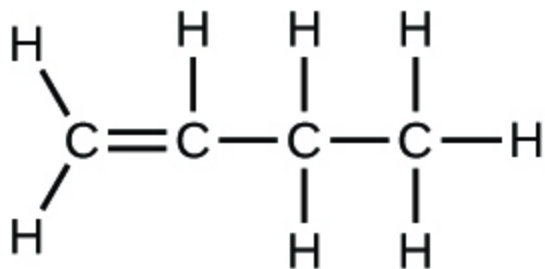
18) Magnesium has two isotopes, Magnesium-24 and Magnesium-25. The average atomic mass of magnesium is 24.305. Which isotope of magnesium is more abundant? Explain your answer.

## 2.4 Chemical Formulas

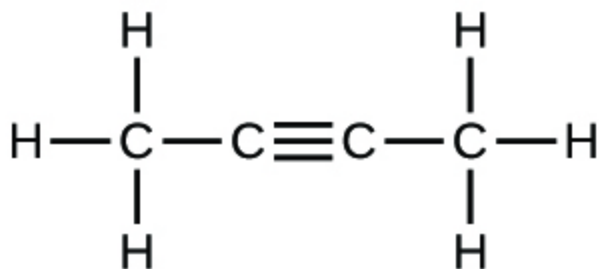
Empirical and Molecular formulas <https://www.youtube.com/watch?v=WVpLq9ablgw>

1) Write the molecular and empirical formulas of the following compounds:

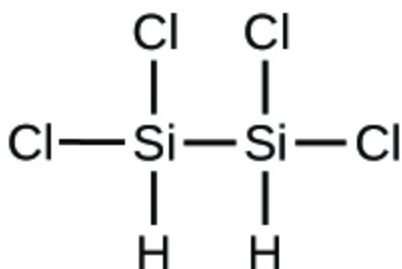
(a)



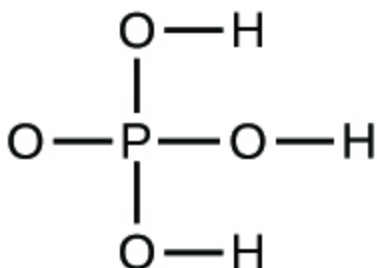
(b)



(c)



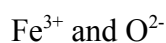
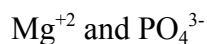
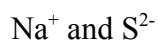
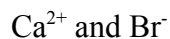
(d)





Oxygen  
Potassium  
Sulfur  
Bromine  
Aluminum  
Beryllium  
Boron  
Nitrogen  
Lithium  
Iodine  
Phosphorus

3) Predict the formula of the ionic compound formed by the following pairs of ions.



4) Determine if the following substances are ionic, molecular, or acids

$\text{NaCl}$  \_\_\_\_\_

$\text{HClO}_2$  \_\_\_\_\_

$\text{NCl}_3$  \_\_\_\_\_

$\text{CuCl}_2$  \_\_\_\_\_

$\text{HBr}$  \_\_\_\_\_

$\text{Na}_2\text{O}$  \_\_\_\_\_

$\text{Na}_2\text{CO}_3$  \_\_\_\_\_

$\text{P}_4\text{O}_{10}$  \_\_\_\_\_

$\text{NH}_4\text{NO}_3$  \_\_\_\_\_

$\text{FeSO}_4$  \_\_\_\_\_

$\text{SiO}_2$  \_\_\_\_\_

$\text{Fe}(\text{OH})_3$  \_\_\_\_\_

$\text{HC}_2\text{H}_3\text{O}_2$  \_\_\_\_\_

$\text{PCl}_3$  \_\_\_\_\_

$\text{CO}$  \_\_\_\_\_

$\text{Cr}(\text{CO}_3)_3$  \_\_\_\_\_

## 2.7 Chemical Nomenclature

*Nomenclature is not a part of the AP chemistry curriculum. You should read this section so you are familiar with the names you will see in this course, but you don't need to be an expert at naming compounds.*