

**AP Chemistry Summer Assignment
2020
Dr. Lewis**

Welcome to AP Chemistry! In preparation for next school year, you will need to complete several assignments this summer. The assignments are due on the first day of school, with the exception of the letter of introduction, which is due August 28th.

Assignment 1: Letter of Introduction (10 point homework grade)

***Due August 28th by email to rlewis@hinghamschools.org**

Assignment 2: Chemistry Fundamentals Practice (30 point homework grade)

***Submit hard copy on first day of school**

Assignment 3: Chemistry Scavenger Hunt (30 point lab grade)

***Submit hard copy by first day of school**

Assignment 4: Study the Polyatomic Ions, Monatomic Ions, and Acids

***We will practice these, then have a quiz within the first few days of school**

Assignment 5: Organize and prepare supplies for AP Chemistry (10 point homework grade)

***Bring in person on first day of school**

You will need the following supplies for AP Chemistry:

1. Composition book for laboratory work (regular lines or graph). Students with lab journals from this past year can plan to continue using those next year. If you had me as a teacher and left your journal in the classroom, I still have it!
 - a. Create a table of contents on the first page that has a column for date, lab title, and page number
 - b. Number all of the pages in the notebook (right hand pages only)
 - c. Write in your lab notebook in pen only (blue or black, ideally)
2. Scientific or graphing calculator
3. Pencils and pens (blue or black preferred)
4. Notebook for class notes, Do Nows, and practice AND folders for handouts

OR

Binder (1 – 2 inches) with a section containing loose-leaf paper for Do Nows at the front, and ~ 10 sections separated by dividers for the course units

Assignment 1: Letter of Introduction

Dear Students,

I am very excited to be your AP Chemistry teacher! I am looking forward to getting to know each of you individually, and to helping you reach your goals. To start off, I'd like to tell you a bit about myself.

I came to teaching from an unusual path. After college, I went to medical school before I decided to become a teacher. Throughout medical school, I kept thinking about teaching, and how it was always something I loved. Finally, I decided I needed to try it, and during my fourth year of medical school, I put together all of my vacation and elective time and student taught for four months. I loved it! After student teaching, I went back to medical school and finished up my last few rotations. But when I graduated, I became a high school teacher, instead of doing a residency and practicing as a physician.

I have been teaching for the past twelve years starting in Swansea and then at two different high schools in Boston for nine years, then here in Hingham the past two years. I've taught a variety of subjects including Geometry, Anatomy and Physiology, Psychology, Biology, Chemistry, and AP Chemistry. I've enjoyed all of those subjects, but Chemistry is my absolute favorite! I hope that you will enjoy studying Chemistry as much as I have.

I live in Hull with my husband, my three year old son Jonah, and my cat Cleo. Most of my time outside of work is spent with my son. I also enjoy Rubik's cubes, gardening, biking, playing piano, and doing many craft activities. I'm pretty much always working on some sort of knitting project!

Hopefully this gives you a better picture of who I am. I look forward to reading your letters and learning more about you too.

Sincerely,



Dr. Lewis

Letter of Introduction Instructions:

Please write a letter of introduction to me that addresses the following questions:

- 1) Why did you sign up for AP Chemistry? What are you looking forward to learning about this year in AP Chemistry or school in general?
- 2) What are your goals for the year? Why are those goals important to you?
- 3) Tell me about one of the most enjoyable learning experiences you've had. What made that experience so great?
- 4) Anything else you want to tell me? Can be about how you learn, hobbies, future aspirations, pets, your family, etc!

Name:

Assignment 2: Chemistry Fundamentals Practice

Questions to write about before practicing:

- 1) How are ionic and covalent compounds different chemically? How are the atoms connected and what makes them stay together?
- 2) How is formula writing/naming different for ionic compounds and covalent compounds? What considerations are involved in each?
- 3) What is stoichiometry? Why is it necessary to convert substances to and from moles when solving a stoichiometry problem? What do the coefficients in a chemical equation represent?
- 4) What are different units of measurement that can be converted to and from moles? (Hints: when is molar mass used? What has to be done when a substance is a gas and measured in liters? What about solutions?) How are these different conversions done? Write about 2 or 3 different examples you can think of.

Questions to write about after you finish:

1. Thinking about the formula writing practice, consider what is involved in your decision making process. For each of the following, when and how is it involved, and how does it impact how you write a formula or name for a substance?
 - a. Charges
 - b. Roman numbers
 - c. Prefixes
 - d. What type of bonding is present in the substance
2. Thinking about the stoichiometry and moles practice, when did you need to...
 - a. Use molar mass
 - b. Use $PV=nRT$
 - c. Write a balanced chemical equation
 - d. Use a mole ratio
 - e. Use the molarity equation (or use molarity as a conversion factor)
 - f. Use Avogadro's number

Name:

Assignment 2: Chemistry Fundamentals Practice

Ionic Compounds: Name to Formula + Formula to Name!

Compound Name	Cation Symbol with Charge	Anion Symbol with Charge	Ionic Formula
Barium hydroxide			
Ammonium sulfide			
Copper(II) sulfate			
	Fe^{3+}	CO_3^{2-}	
	Mg^{2+}	NO_3^{1-}	
	Co^{2+}	PO_4^{3-}	
			$\text{Zn}_3(\text{PO}_4)_2$
			NiSO_4
			$\text{V}_2(\text{CO}_3)_5$

Mixed Ionic/Covalent Compound Naming

Ionic or Covalent?	Formula	Name
	Na_2CO_3	
	P_2O_5	
	SiO_2	
	CoBr_2	
	B_2H_4	
	CO	
	N_2O_3	
		lithium sulfate
		phosphorus trifluoride
		aluminum hydroxide
		copper (I) phosphate
		tetraphosphorus triselenide
		iron (II) phosphide
		disilicon hexabromide
		gallium oxide

Name:

Assignment 2: Chemistry Fundamentals Practice

Stoichiometry and Moles Practice Problem Set

1. Calculate the mass in grams of 0.0782 moles of iron (III) phosphate. (HINT! You will need to write a formula for this substance first!)
2. A sample of cobalt (II) phosphite contains 2.6×10^{24} oxygen atoms. How much does this sample weigh in grams? (HINT! You will need to write a formula for this substance first!)
3. How many C atoms are found in a 2.56 gal sample of heptane (C_7H_{16})? The density of heptane is 0.684 g/mL.
4. Calcium reacts with oxygen gas to form calcium oxide.
 - a. If 42.5 grams of calcium oxide were produced, how many moles of oxygen gas were used?
 - b. How many grams of oxygen is this?
 - c. If each mole of oxygen gas occupies 22.4 L at STP (standard temperature and pressure), how many L does the oxygen gas occupy?
 - d. How many oxygen molecules were used?
 - e. How many oxygen atoms were used?

5. How many grams of AlCl_3 are produced from the reaction of 0.38 grams of aluminum with excess CuCl_2 solution? The other product is solid copper.

6. What volume of hydrogen gas (H_2) is produced by the reaction of 3.24 grams of zinc with excess HCl at 298K and 1.05 atm?

7. Fe reacts with water to form H_2 and Fe_2O_3 . If 7.3×10^{22} atoms of Fe were used, how many moles of water were needed?

8. 3.0 M HCl is reacted with 2.0 grams of Na_2CO_3 to produce water, salt, and carbon dioxide. How many mL of HCl solution will be needed in the reaction?

9. I have 500 mL of 2.0 M NaOH solution. How many mL of 1.0 M HCl solution do I need to neutralize this amount of NaOH ?

10. N_2 reacts with H_2 to form ammonia (NH_3). How many moles of H_2 are needed to completely react with 2 moles of N_2 ?

Name:

Assignment 3: Chemistry Scavenger Hunt

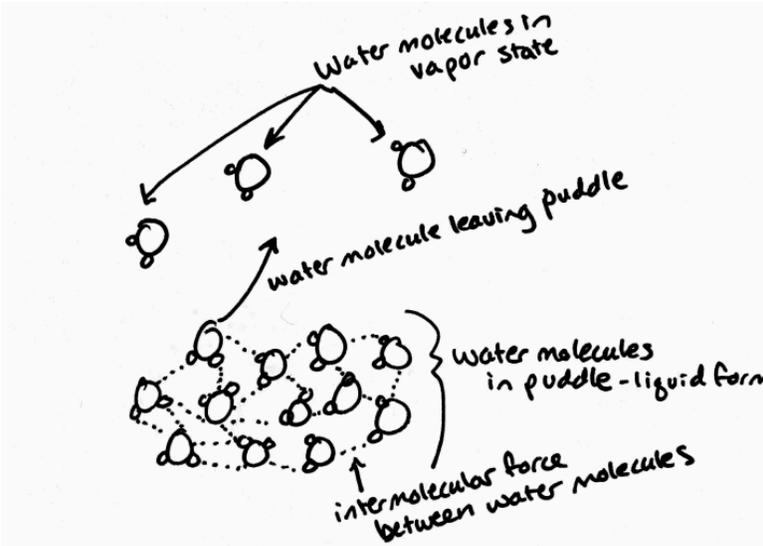
Chemistry is all around us! One way that chemists think about analyzing and describing phenomena is by looking at them from three different perspectives: macroscopic, particulate, and representative. The macroscopic level focuses on what can be directly seen or observed with the naked eye. The particulate level examines what is going on with the atoms, ions, and molecules to cause the phenomenon. The representative level utilizes chemical symbols and equations to show what is happening chemically.

For this assignment you will select **one** chemical concept or term from **each** category below (total of 3 terms/concepts). You will examine each concept or term from the three chemistry perspectives.

- 1) **Macroscopic level:** Take a photograph of something that demonstrates the concept or term. This should be something you observe in everyday life. The photographs must be original! Ways to prove this: include yourself in the photo OR choose a mascot (stuffed animal, small toy, figurine) to include in all of your photos. Write a caption explaining what is happening in your photo and how that shows the meaning of the concept or term. Explain the phenomenon as much as you can. You must use a **different** phenomenon for each of your three terms!
- 2) **Particulate level:** Describe and draw what is happening chemically on a particle level. This should relate what is shown in your photograph with the chemical concept or term. Show as much as you can to demonstrate what you understand.
- 3) **Representative level:** Use chemical symbols to show what is happening in your photograph. This may involve writing a chemical equation to depict what is going on, or writing formulas for different substances that are involved in the phenomenon.

Chemical Reactions	Chemistry Basics	Chemical Bonding/Phases of Matter
<ul style="list-style-type: none">• Decomposition reaction• Synthesis reaction• Double replacement reaction• Single replacement reaction• Combustion reaction• Redox reaction• Reaction rate• Equilibrium• LeChatelier's Principle• Precipitate• Exothermic reaction• Endothermic reaction• Entropy• Enthalpy/ΔH• Reaction favorability//ΔG	<ul style="list-style-type: none">• Element• Compound• Mixture• Density• Chemical property• Physical property• Chemical change• Physical change• Acid• Base• Solution• Solute• Solubility• Electron• Conductivity	<ul style="list-style-type: none">• Covalent bond• Ionic bond• Metallic bond• Alloy• Polymer• Network covalent bond• Bonds breaking• Bonds forming• Intermolecular force• Condensation• Sublimation• Melting• Freezing• Desublimation• Combined gas law• Vapor pressure

The assignment should be typed. You can print it in order to add your drawings by hand, or you can take a picture of your drawings to add them to the document electronically. See example on following page.

Chemistry Term:	Evaporation
Category	Chemical Bonding/Phases of Matter
Macroscopic Level:	<p>This picture shows a puddle of water that has been shrinking. The reason that the puddle is shrinking is that water molecules in the liquid state are bit by bit evaporating into the air. This happens because the puddle of water contains molecules that are at a variety of different kinetic energies. The molecules with the highest kinetic energy are able to move fast enough to break their attractions with nearby water molecules, which allows them to leave the puddle and enter the air. This process keeps happening over time until the puddle disappears. This process is called evaporation.</p> 
Particulate Level:	<p>Water molecules move from liquid to vapor form, which is evaporation:</p> 
Representative Level:	$\text{H}_2\text{O}_{(l)} \rightarrow \text{H}_2\text{O}_{(g)}$

Assignment 4: Polyatomic Ion List to Study

We will review and practice these together on the first day or two of school too!

Anions with a -1 charge	
CH ₃ COO ⁻ C ₂ H ₃ O ₂ ⁻	Acetate
OH ⁻	Hydroxide
NO ₃ ⁻	Nitrate
NO ₂ ⁻	Nitrite
CN ⁻	Cyanide
MnO ₄ ⁻	Permanganate
ClO ₄ ⁻	Perchlorate
ClO ₃ ⁻	Chlorate
ClO ₂ ⁻	Chlorite
ClO ⁻	Hypochlorite
IO ₃ ⁻	Iodate
BrO ₃ ⁻	Bromate
Anions with a -2 charge	
SO ₄ ²⁻	Sulfate
SO ₃ ²⁻	Sulfite
CO ₃ ²⁻	Carbonate
CrO ₄ ²⁻	Chromate
Cr ₂ O ₇ ²⁻	Dichromate
C ₂ O ₄ ²⁻	Oxalate
O ₂ ²⁻	Peroxide
Anions with a -3 charge	
PO ₄ ³⁻	Phosphate
PO ₃ ³⁻	Phosphite

This side contains common monatomic ions and acids that you should also learn:

Cations	
Ag ⁺	Silver
Zn ²⁺	Zinc
Pb ²⁺ or Pb ⁴⁺	Lead (II) or Lead (IV)
Fe ²⁺ or Fe ³⁺	Iron (II) or Iron (III)
Cu ⁺ or Cu ²⁺	Copper (I) or Copper (II)
Ni ²⁺ or Ni ³⁺	Nickel (II) or Nickel (III)
Hg ²⁺	Mercury
NH ₄ ⁺	Ammonium

Acids	
HF	Hydrofluoric acid
HCl	Hydrochloric acid
HBr	Hydrobromic acid
HI	Hydroiodic acid
HNO ₃	Nitric acid
HNO ₂	Nitrous acid
H ₂ CO ₃	Carbonic acid
H ₂ SO ₄	Sulfuric acid
H ₃ PO ₄	Phosphoric acid
HC ₂ H ₃ O ₂	Acetic Acid