AP Chemistry Summer Assignment
2019
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 (40 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. Some students prefer ones with graph paper for easier data collection and analysis. Students with lab journals from this past year can plan to continue using those next year.
    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)
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 eleven years starting in Swansea and then at two different high schools in Boston for nine years, then here in Hingham starting last school year. I've taught a variety of subjects including Geometry, Anatomy and Physiology, 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 toddler 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) Describe a time when you've struggled to learn something. What made it difficult? How did you deal with that situation? What did you learn from the experience?
4) Tell me about one of the most enjoyable learning experiences you've had. What made that experience so great?

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-}	
			$Zn_3(PO_4)_2$
			$NiSO_4$
			$V_2(CO_3)_5$

Mixed Ionic/Covalent Compound Naming

Ionic or Covalent?	Formula	Name
	Na_2CO_3	
	P_2O_5	
	NH_3	
	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 2: Chemistry Fundamentals Practice**

Mixed Review of First Year Chemistry!

1. Calculate the volume of gold needed to have a 12.8 g sample of gold. The density of gold is 19.3 g/mL.

2. Write the electron configuration and draw a Bohr diagram for chromium.

3. Why does oxygen have a larger atomic radius than fluorine? Why is cesium way more reactive than sodium?

4. Label the Bronsted Lowry acid, base, conjugate acid, and conjugate base in the reaction below:

$$NH_4^+ + H_2O \rightarrow H_3O^+ + NH_3$$

5. Which direction would this reaction shift if pressure were decreased? Why?

$$2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$$

6. What factors increase the rate of a reaction?

7. Write the complete element symbol for an atom that contains 19 protons, 18 electrons, and 21 neutrons. Write the symbol for a different isotope of this element.

8. Draw Lewis dot diagrams for CO_2 and OF_2.

Which one is polar? How do you know?

Which would you expect to have a higher boiling point? Why?

9. If a 25 mL sample of a gas starting at 15°C is heated to 128°C, and the pressure on the gas is reduced from 1.5 atm to 1.1 atm, what will the new volume of the gas be?

10. What is the pH of a solution made by dissolving 2.3 grams of HBr in 25 L of water?8.

11. What is the pH of a solution of 1.5 M NH_3, a weak base, that has an ionization rate of 0.05%?

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.

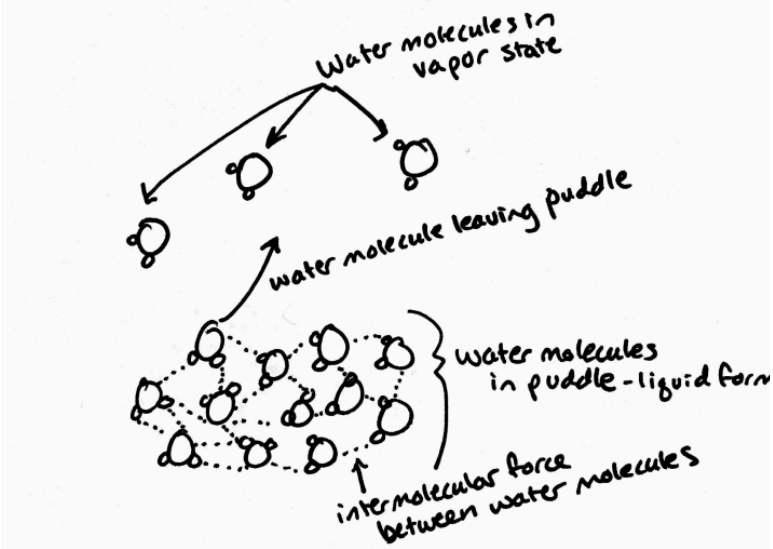
1) ***Macroscopic level:*** Take a photograph of something that demonstrates the concept or term. This should be something you observe in everyday life. The photographs must be original! Ways to prove this: include yourself in the photo OR choose a mascot (stuffed animal, small toy, figurine) to include 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**
• 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	• Element • Compound • Mixture • Density • Chemical property • Physical property • Chemical change • Physical change • Acid • Base • Solution • Solute • Solubility • Electron • Conductivity	• 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	Phases of Matter
Macroscopic Level:	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. 
Particulate Level:	Water molecules move from liquid to vapor form, which is evaporation: 
Representative Level:	$H_2O_{(l)} \rightarrow H_2O_{(g)}$

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

Anions with a -1 charge	
CH_3COO^- $C_2H_3O_2^-$	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
$Cr_2O_7^{2-}$	Dichromate
$C_2O_4^{2-}$	Oxalate
0_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_2CO_3	Carbonic acid
H_2SO_4	Sulfuric acid
H_3PO_4	Phosphoric acid
$HC_2H_3O_2$	Acetic Acid