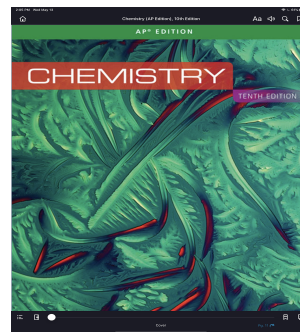# Saint Ignatius College Prep
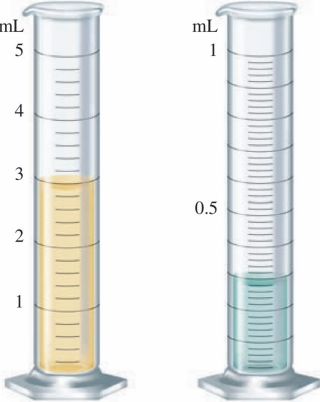# AP CHEMISTRY
2021-2022 Summer Assignment

Textbook: Zumdahl, et al. *Chemistry*. 10th ed.

1. Read Chapter 1.5: Significant figures and calculations
    a. Answer questions # 33-39 odd
2. Read Chapter 1.7: Dimensional analysis
    a. Answer questions # 43
3. Read Chapter 1.8: Temperature
    a. Answer questions #61-63 odd
4. Read Chapter 1.9: Density
    a. Answer questions #69-73 odd
5. Read Chapter 2.5: The Modern Atom
    a. Answer questions #53-57 odd
6. Read Chapter 2.6: Molecules and Ions
    a. Answer questions #67 and 71
7. Read Chapter 2.8: Naming simple Compounds
    a. Answer questions #75-77 all
8. Read Chapter 3.4: Molar Mass
    a. Answer questions #68 and 70
9. Read Chapter 3.6: percent composition
    a. Answer questions #77
10. Read Chapter 3.7: Determining the formula of a compound
    a. Answer questions #29, 89, 90
11. Read Chapter 3.10: Stoichiometric Calculations: Amounts of Reactants and Products
    a. Answer questions #102 and 110
12. Read Chapter 3.11: The Concept of Limiting Reactant
    a. Answer questions #121, 125, and 132

Show your work for each question that you answer. Your summer assignment should be **turned in by the first full day of class.** You can type or write your work; if you type please format your assignment as a pdf. We will review the concepts **briefly** when the school year begins. ***You will have a test on these topics within the first week of class.***

ENJOY YOUR SUMMER BREAK AND COME BACK READY TO LEARN :-)

Chapter 1- Chemical Foundations		
Exercise number	For each numbered item, show or explain one sample calculation.	Personal Reflection
33	**33.** How many significant figures are there in each of the following values? **a.** 6.07×10^{-15} **e.** 463.8052 **b.** 0.003840 **f.** 300 **c.** 17.00 **g.** 301 **d.** 8×10^8 **h.** 300.	
35	**35.** Round off each of the following numbers to the indicated number of significant digits, and write the answer in standard scientific notation. **a.** 0.00034159 to three digits **b.** 103.351×10^2 to four digits **c.** 17.9915 to five digits **d.** 3.365×10^5 to three digits	
37	**37.** You have liquid in each graduated cylinder shown: You then add both samples to a beaker. How would you write the number describing the total volume? What limits the precision of this number?	
39	**39.** Evaluate each of the following, and write the answer to the appropriate number of significant figures. **a.** $212.2 + 26.7 + 402.09$ **b.** $1.0028 + 0.221 + 0.10337$ **c.** $52.331 + 26.01 - 0.9981$ **d.** $2.01 \times 10^2 + 3.014 \times 10^3$ **e.** $7.255 - 6.8350$	
43	**43.** Perform each of the following conversions. **a.** 8.43 cm to millimeters **b.** 2.41×10^2 cm to meters **c.** 294.5 nm to centimeters **d.** 1.445×10^4 m to kilometers **e.** 235.3 m to millimeters **f.** 903.3 nm to micrometers	

61	**61.** Convert the following Fahrenheit temperatures to the Celsius and Kelvin scales.
	  a. $-459°$F, an extremely low temperature
	  b. $-40.°$F, the answer to a trivia question
	  c. $68°$F, room temperature
	  d. 7×10^7 °F, temperature required to initiate fusion reactions in the sun	

63	**63.** Convert the following Celsius temperatures to Kelvin and to Fahrenheit degrees.
	  a. the temperature of someone with a fever, $39.2°$C
	  b. a cold wintery day, $-25°$C
	  c. the lowest possible temperature, $-273°$C
	  d. the melting-point temperature of sodium chloride, $801°$C	

69	**69.** A material will float on the surface of a liquid if the material has a density less than that of the liquid. Given that the density of water is approximately 1.0 g/mL, will a block of material having a volume of 1.2×10^4 in^3 and weighing 350 lb float or sink when placed in a reservoir of water?	
71	**71.** A star is estimated to have a mass of 2×10^{36} kg. Assuming it to be a sphere of average radius 7.0×10^5 km, calculate the average density of the star in units of grams per cubic centimeter.	

73	**73.** Diamonds are measured in carats, and 1 carat $= 0.200$ g. The density of diamond is 3.51 g/cm^3.
	  a. What is the volume of a 5.0-carat diamond?
	  b. What is the mass in carats of a diamond measuring 2.8 mL?	

Chapter 2- Atoms Molecules and Ions

Exercise number	For each numbered item, show or explain one sample calculation.	Personal Reflection
53	**53.** Give the names of the metals that correspond to the following symbols: Sn, Pt, Hg, Mg, K, Ag.	

55	**55.** In the periodic table, how many elements are found in each of the following?
	  a. Group 2A
	  b. the oxygen family
	  c. the nickel group
	  d. Group 8A	

57	**57.** **a.** Classify the following elements as metals or nonmetals:

57. **a.** Classify the following elements as metals or nonmetals:

Mg	Si	Rn
Ti	Ge	Eu
Au	B	Am
Bi	At	Br

b. The distinction between metals and nonmetals is really not a clear one. Some elements, called *metalloids,* are intermediate in their properties. Which of these elements would you reclassify as metalloids? What other elements in the periodic table would you expect to be metalloids?

67. For each of the following ions, indicate the number of protons and electrons the ion contains.

a. Ba^{2+} **d.** Rb^{+} **f.** Te^{2-}

b. Zn^{2+} **e.** Co^{3+} **g.** Br^{-}

c. N^{3-}

71. Complete the following table:

Symbol	Number of Protons in Nucleus	Number of Neutrons in Nucleus	Number of Electrons	Net Charge
$^{238}_{92}U$				
	20	20		2+
	23	28	20	
$^{89}_{39}Y$				
	35	44	36	
	15	16		3−

75. Name the compounds in parts a–d and write the formulas for the compounds in parts e–h.

a. NaBr **e.** strontium fluoride

b. Rb_2O **f.** aluminum selenide

c. CaS **g.** potassium nitride

d. AlI_3 **h.** magnesium phosphide

76. Name the compounds in parts a–d and write the formulas for the compounds in parts e–h.

a. Hg_2O **e.** tin(II) nitride

b. $FeBr_3$ **f.** cobalt(III) iodide

c. CoS **g.** mercury(II) oxide

d. $TiCl_4$ **h.** chromium(VI) sulfide

| 77 | **77.** Name each of the following compounds:

    a. CsF   **d.** MnO_2
    b. Li_3N **e.** TiO_2
    c. Ag_2S **f.** Sr_3P_2 | |

Chapter 3- Stoichiometry

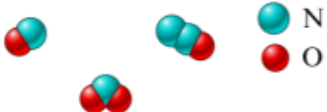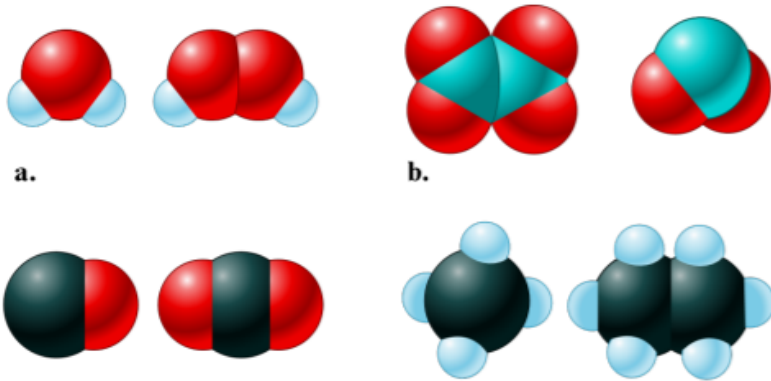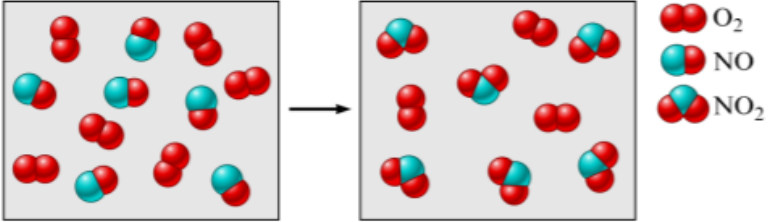| Exercise number	For each numbered item, show or explain one sample calculation.	Personal Reflection

68	**68.** Consider the following space-filling models for dry ice, ethanol, and caffeine:
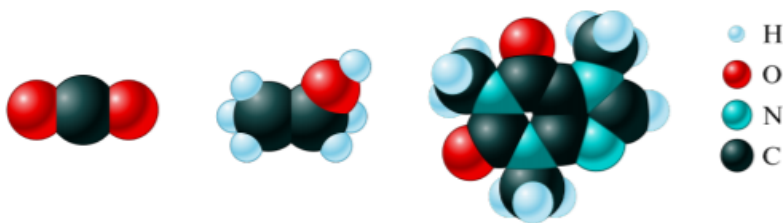	
	Dry ice Ethanol Caffeine
	
	What amount (moles) is represented by each of the following samples?
	
	    a. 1.50 g of dry ice
	    b. 2.72×10^{21} molecules of ethanol
	    c. 20.0 mg of caffeine	

70	**70.** Complete the following table. 	Mass of Sample	Moles of Sample	Molecules in Sample	Total Atoms in Sample
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4.24 g C_6H_6	_____	_____	_____
_____	0.224 mol H_2O	_____	_____
_____	_____	2.71×10^{22} molecules CO_2	_____
_____	_____	_____	3.35×10^{22} total atoms in CH_3OH sample		

77	**77.** The percent by mass of nitrogen for a compound is found to be 46.7%. Which of the following could be this species?	
29	**29.** Which of the following compounds have the same empirical formulas?	
	a. b.	
	c. d.	
89	**89.** A compound containing only sulfur and nitrogen is 69.6% S by mass; the molar mass is 184 g/mol. What are the empirical and molecular formulas of the compound?	
90	**90.** Determine the molecular formula of a compound that contains 26.7% P, 12.1% N, and 61.2% Cl, and has a molar mass of 580 g/mol.	
102	**102.** Balance each of the following chemical equations. a. $KO_2(s) + H_2O(l) \rightarrow KOH(aq) + O_2(g) + H_2O_2(aq)$ b. $Fe_2O_3(s) + HNO_3(aq) \rightarrow Fe(NO_3)_3(aq) + H_2O(l)$ c. $NH_3(g) + O_2(g) \rightarrow NO(g) + H_2O(g)$ d. $PCl_5(l) + H_2O(l) \rightarrow H_3PO_4(aq) + HCl(g)$ e. $CaO(s) + C(s) \rightarrow CaC_2(s) + CO_2(g)$ f. $MoS_2(s) + O_2(g) \rightarrow MoO_3(s) + SO_2(g)$ g. $FeCO_3(s) + H_2CO_3(aq) \rightarrow Fe(HCO_3)_2(aq)$	

110	**110.** The reaction between potassium chlorate and red phosphorus takes place when you strike a match on a matchbox. If you were to react 52.9 g of potassium chlorate ($KClO_3$) with excess red phosphorus, what mass of tetraphosphorus decaoxide (P_4O_{10}) could be produced? $$KClO_3(s) + P_4(s) \longrightarrow P_4O_{10}(s) + KCl(s) \quad \text{(unbalanced)}$$	
121	**121.** Consider the reaction between $NO(g)$ and $O_2(g)$ represented below. What is the balanced equation for this reaction, and what is the limiting reactant?	
125	**125.** Hydrogen peroxide is used as a cleansing agent in the treatment of cuts and abrasions for several reasons. It is an oxidizing agent that can directly kill many microorganisms; it decomposes on contact with blood, releasing elemental oxygen gas (which inhibits the growth of anaerobic microorganisms); and it foams on contact with blood, which provides a cleansing action. In the laboratory, small quantities of hydrogen peroxide can be prepared by the action of an acid on an alkaline earth metal peroxide, such as barium peroxide: $$BaO_2(s) + 2HCl(aq) \longrightarrow H_2O_2(aq) + BaCl_2(aq)$$ What mass of hydrogen peroxide should result when 1.50 g barium peroxide is treated with 88.0 mL hydrochloric acid solution containing 0.0272 g HCl per mL? What mass of which reagent is left unreacted?	
132	**132.** DDT, an insecticide harmful to fish, birds, and humans, is produced by the following reaction: $$2C_6H_5Cl + C_2HOCl_3 \longrightarrow C_{14}H_9Cl_5 + H_2O$$ chlorobenzene chloral DDT In a government lab, 1142 g of chlorobenzene is reacted with 485 g of chloral. **a.** What mass of DDT is formed, assuming 100% yield? **b.** Which reactant is limiting? Which is in excess? **c.** What mass of the excess reactant is left over? **d.** If the actual yield of DDT is 200.0 g, what is the percent yield?	