

AP Chemistry Summer Assignment

Canvas AP Chem Summer Page: <https://mcpsmd.instructure.com/enroll/NTNNWC>

Read through the entire worksheet to see what is graded and review!

Things I should review if needed:

Chapter 1

1.11 Classify each of the following as a pure substance or a mixture. If a mixture, indicate whether it is homogeneous or heterogeneous: a) rice pudding, b) seawater, c) magnesium, d) gasoline

1.15 Give the chemical symbol or name for the following elements, as appropriate: a) carbon, b) nitrogen, c) bromine, d) zinc, e) iron, f) P, g) Ca, h) He, i) Pb, j) Ag

1.19 Label each of the following as either a physical process or a chemical process: a) corrosion of aluminum metal, b) melting of ice, c) pulverizing an aspirin d) digestion of a candy bar, e) explosion of nitroglycerin

1.25 Make the following conversions: a) 62°F to °C, b) 216.7°C to °F, c) 233°C to K, d) 315 K to °F, e) 2500°F to K

1.35 What is the number of significant figures in each of the following measured quantities? a) 358 kg, b) 0.054 s, c) 6.3050 cm, d) 0.0105 L, e) $7.0500 \times 10^{-3} \text{ m}^3$

1.36 Indicate the number of significant figures in each of the following measured quantities: a) 3.774 km, b) 205 m², c) 1.700 cm, d) 350.00 K, e) 307.080 g

1.37 Round each of the following numbers to four significant figures, and express the result in standard exponential notation: a) 102.53070, b) 656,980, c) 0.008543210, d) 0.000257870, e) -0.0357202

1.39 Carry out the following operations, and express the answers with the appropriate number of significant figures.

a) $12.0550 + 9.05$

b) $257.2 - 19.789$

c) $(6.21 \times 10^3)(0.1050)$

d) $0.0577 / 0.753$

1.46 Carry out the following conversions: a) 0.105 in. to mm, b) 0.650 qt to mL, c) 8.75 μm/s to km/hr, d) 1.966 m³ to yd³, e) \$3.99/lb to \$/kg, f) 8.75 lb/ft³ to g/mL

1.72 Automobile batteries contain sulfuric acid, which is commonly referred to as battery acid. Calculate the number of grams of sulfuric acid in .500 L of battery acid if the solution has a density of 1.28 g/mL and is 38.1% sulfuric acid by mass

Chapter 2

2.22 a) Which two types of the following are isotopes of the same element $^{31}_{16}X$, $^{31}_{15}X$, $^{32}_{16}X$? b) What is the identity of the element whose isotopes you have selected?

2.31 Only two isotopes of copper occur naturally, ^{63}Cu (atomic mass= 62.296 amu; abundance 69.17%) and ^{65}Cu (atomic mass= 64.9278 amu; abundance 30.83%). Calculate the atomic weight (average atomic mass) of copper.

2.41 What can we tell about a compound when we know the empirical formula? What additional information is conveyed by the molecular formula? By the structural formula? Explain in each case.

2.59 Predict whether each of the following compounds is molecular or ionic: a) B_2H_2 , b) HC_3OH , c) LiNO_3 , d) Sc_2O_3 , e) CsBr , f) NOCl , g) NF_3 , h) Ag_2SO_4

2.66 Name the following ionic compounds: a) K_2O , b) NaClO_2 , c) $\text{Sr}(\text{CN})_2$, d) CoOH_2 , e) $\text{Fe}_2(\text{CO}_3)_3$, f) $\text{Cr}(\text{NO}_3)_3$, g) $(\text{NH}_4)_2\text{SO}_3$, h) NaH_2PO_4 , i) KMnO_4 , j) $\text{Ag}_2\text{Cr}_2\text{O}_7$

2.68 Give the chemical formula for each of the following ionic compounds: a) sodium phosphate, b) potassium sulfate, c) copper(I) oxide, d) zinc nitrate, e) mercury(II) bromide, f) iron(III) carbonate, g) sodium hypobromite

2.87 Identify the element represented by each of the following symbols and give the number of protons and neutrons in each: a) $^{74}_{33}X$, b) $^{127}_{53}X$, c) $^{152}_{63}X$, d) $^{209}_{83}X$

2.90 The element (Pb) consists of four naturally occurring isotopes with atomic masses 203.97302, 205.97444, 206.97587, 207.97663 amu. The relative abundances of these four isotopes are 1.4, 24.1, 22.1, and 52.4%, respectively. From these data, calculate the atomic weight of lead.

Chapter 3: Graded Assignment

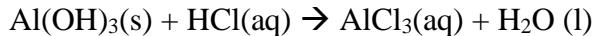
3.35 a) What is the mass, in grams, of 2.50×10^{-3} mol of ammonium phosphate? b) How many moles of chloride ions are in 0.2550 g of aluminum chloride? c) What is the molar mass, in grams, of 7.70×10^{20} molecules of caffeine, $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$? d) What is the molar mass of cholesterol if 0.00105 mol weighs 0.406 g?

3.42 At least 25 μg of tetrahydrocannabinol (THC), the active ingredient in marijuana, is required to produce intoxication. The molecular formula of THC is $\text{C}_{21}\text{H}_{30}\text{O}_2$. How many moles of THC does 25 μg represent?

3.49 Determine the empirical and molecular formulas of each of the following substances:

- Ibuprofen, a headache remedy, contains 75.69% C, 8.80% H, and 15.51% O by mass, and has a molar mass of 206 g/mol.
- Cadavarine, a foul smelling substance produced by the action of bacteria on meat, contains 58.55% C, 13.81% H, and 27.40% N by mass; its molar mass is 102.2 g/mol

3.59 Several brands of antacids use Al(OH)_3 to react with stomach acid, which contains primarily HCl:



- Balance the equation
- Calculate the number of grams of HCl that can react with .500 g of Al(OH)_3 .
- Calculate the number of grams of Al(OH)_3 and the number of H_2O formed when .500 g of Al(OH)_3 reacts.
- Show your calculations in parts b) and c) are consistent with the law of conservation of mass

3.71 Sodium hydroxide reacts with carbon dioxide as follows:



Which reagent is the limiting reactant when 1.85 mol NaOH and 1.00 mol CO_2 are allowed to react? How many moles of Na_2CO_3 can be produced? How many moles of the excess reactant remain after the completion of the reaction?

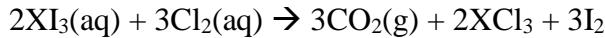
3.73 The fizz produced when an Alka-Seltzer tablet is dissolved in water is due to the reaction between sodium bicarbonate and citric acid:



In a certain experiment, 1.00 g of sodium bicarbonate and 1.00 g of citric acid are allowed to react. (a) Which is the limiting reactant? (b) How many grams of carbon dioxide form? (c) How many grams of the excess reactant remain after the limiting reactant is completely consumed?

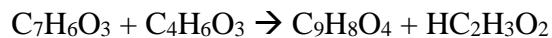
3.88 Vanillin, the dominant flavoring in vanilla, contains C, H, & O. When 1.05 g of this substance is completely combusted, 2.43 g of CO_2 and 0.50 g of H_2O are produced. What is the empirical formula of vanillin?

3.91 An element X forms an iodide (XI_3) and a chloride (XCl_3). The iodide is quantitatively converted to the chloride when it is heated in a stream of chlorine.



If .5000 g of XI_3 is treated, .2360 g of XCl_3 is obtained. (a) Calculate the atomic weight of the element X.

3.100 Aspirin ($C_9H_8O_4$) is produced from salicylic acid ($C_7H_6O_3$) and acetic anhydride ($C_4H_6O_3$):



- (a) How much salicylic acid is required to produce 150 kg of aspirin, assuming that all of the salicylic acid is converted to aspirin? (b) How much salicylic acid would be required if only 80% of the salicylic acid is converted to aspirin? (c) What is the theoretical yield of aspirin if 185 kg of salicylic acid is allowed to react with 125 kg of acetic anhydride? (d) If the situation described in part (c) produces 182 kg of aspirin, what is the percentage yield?