

Name: _____

Quiz #5

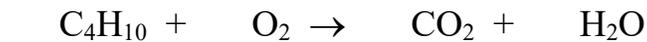
CHEM 1411 — Spring 2019

Due Tuesday, February 19 by 8:00 am

Late papers will not be accepted!

1. (a) How many grams of CO₂ are there in 2.55 mol of CO₂? (b) How many molecules of CO₂ are there in 2.55 mol of CO₂? (10 pts)

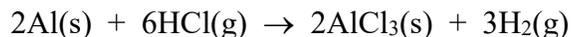
2. Consider the following unbalanced reaction: (10 pts)



- a. How many moles of H₂O form when 4.00 moles of C₄H₁₀ react?

- b. How many moles of C₄H₁₀ are needed to react with 5.00 moles of O₂?

3. Calculate the mass of hydrochloric acid, HCl, that will be needed to react with 125 g of Al in the following reaction. (MM: Al = 26.98 g/mol; HCl = 36.46 g/mol, AlCl₃ = 133.34 g/mol; H₂ = 2.02 g/mol) (10 pts)



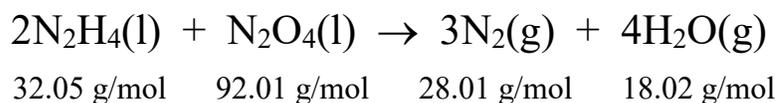
4. Sodium and sulfur react to form sodium sulfide according to the following equation:



Calculate the number of grams of sulfur needed to ensure a complete reaction with 50.0 g of sodium. (10 pts)

Limiting Reactants

5. The lunar module (LM) which was used to land on the surface of the moon during the *Apollo* missions used a mixture of hydrazine, N_2H_4 , and dinitrogen tetroxide, N_2O_4 , as a fuel source (the molar masses of the reactants and products are written under the equation):



During an experiment, 325 g of N_2H_4 and 325 g of N_2O_4 are mixed. (30 pts)

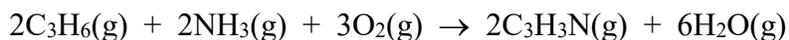
- a. Which of the two reactants is the limiting reagent, and what is the theoretical yield of N_2 ?
- b. What is the theoretical yield of H_2O ?
- c. How many grams of excess reagent will be left over?

a. _____

b. _____

c. _____

6. Acrylonitrile (C_3H_3N) is the starting material for many synthetic carpets and fabrics. It is produced by the following reaction:



If 5.00 g C_3H_6 , 20.0 g O_2 , and 15.0 g NH_3 are reacted, what is the limiting reactant, and what is the theoretical yield of acrylonitrile? (10 pts)

Percent Composition and Empirical Formulas

7. A compound of nitrogen and oxygen with a molecular mass of 76.01 g/mol contains 36.85% N and 63.15% O. Calculate the **empirical** and **molecular** formulas, arranging the atoms in the order NO. (10 pts)
8. Cryofluorane, also known as Freon 114, is a chlorofluorocarbon which was once used as a refrigerant and an aerosol propellant. It contains carbon, fluorine, and chlorine. The percent composition of this substance is 14.05% C, 44.46% F, and 41.48% Cl, and the molar mass is 170.92 g/mol. What are the **empirical** and **molecular** formulas of cryofluorane? (Write the symbols in the order C, F, Cl.) (10 pts)