Honors Chemistry PracTest Part 1: Stoichiometry

1. *Study your notes, A sample of concept questions and short response are below.*   (10 Pts.)

a.)   __**5 mol A: 2 mol B**__ A student determined that 0.0465 moles of A produced 0.0186 moles of B.   What is the
        mole ratio of A:B? (*Not B:A*)

b.)   ____**PbO**_____ For the reaction: $3PbO + 2\ Al \longrightarrow Al_2O_3 + 3\ Pb$, If 1.0 mol of PbO reacts with 1 mol of
        Al, which is the limiting reactant?

c.)   ____**2.26 g**_____ A reaction had a 44.9% yield. If the actual yield is 1.015 grams, what is the theoretical
        yield?

d.)   ____ **Less** _____ For an exothermic reaction the products have (more /less) potential energy than the reactants.

e.)   ___ **Al** _____ Al reacts with oxygen to produce aluminum oxide. If 0.881 mol of Al reacts with 0.700 mol
        of oxygen which is the limiting reactant? (*Did you write a balanced equation?*)

2. A structural diagram of a reaction to analyze.   (3 pts.)

**3. For the following problems show all work and box final answer. You may have to provide a balanced
    equation.**

a.)   What volume of carbon dioxide gas at STP is produced when a person consumes 454 g (1 lbs.) of sucrose?
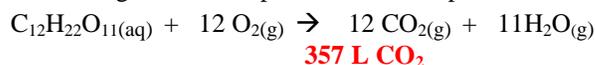
$$C_{12}H_{22}O_{11(aq)} + 12\ O_{2(g)} \rightarrow 12\ CO_{2(g)} + 11H_2O_{(g)}$$ (3 pts.)

357 L CO$_2$

b.)   Given that $4\ Al_{(s)} + 3\ O_{2(g)} \longrightarrow 2Al_2O_{3(s)}$ a chemist reacted 1.00 grams of aluminum with an excess of oxygen
        and actually formed 1.47 grams of aluminum oxide what is the theoretical and percent yield?   (3 pts.)

Theoretical= 1.89g   Percent= 77.8%

c.) $3\ Zn(C_2H_3O_2)_2 \cdot 2H_2O_{(aq)} + 2Na_3PO_4 \cdot 12H_2O_{(aq)} \longrightarrow Zn_3(PO_4)_2 \cdot 4H_2O_{(s)} + 6\ NaC_2H_3O_{2(aq)} + 26\ H_2O_{(l)}$ (3 pts.)
        What mass of precipitate is formed when 3.17g of $Zn(C_2H_3O_2)_2 \cdot 2H_2O$ is reacted with 4.96 g of $Na_3PO_4 \cdot 12H_2O$?

2.21 grams precipitate

d.)   The space shuttle orbiter utilizes the oxidation of methyl hydrazine by dinitrogen tetroxide for propulsion:
        How much heat is produced when 180.0 liters of LIQUID methyl hydrazine, ($N_2H_3CH_3$ D= 0.87 g/ml)
        reacts with 200.0 liters of LIQUID dinitrogen tetroxide, (N_2O_4, D= 1.45 g/ml)?

Please Do NOT use 22.4 L/mol. These are liquids, NOT gases!
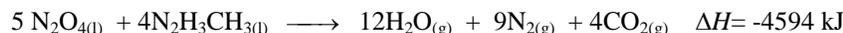
$$5\ N_2O_{4(l)} + 4N_2H_3CH_{3(l)} \longrightarrow 12H_2O_{(g)} + 9N_{2(g)} + 4CO_{2(g)}\quad \Delta H = -4594\ kJ$$ (5 pts.)

N_2O_4 is limiting with 3150 moles. 2.896x10^6 kJ

Honors Chemistry PracTest Part 2: Stoichiometry

e.) According to the reaction: $Cr^{6+}_{(aq)}$ + 2 $PO_4^{3-}_{(aq)}$ $\longrightarrow$ $Cr(PO_4)_{2(s)}$, what mass of chromium(VI) nitrate would completely react with a solution that contains 42.00 grams of sodium phosphate?   (3 pts)

54.29g

f.) An alkali metal, "X" reacts with 1.120 grams of selenium to produce 1.311 grams of the alkali metal selenide. What is the identity of the alkali metal? Please write a balanced equation to show the reaction of X with Selenium.   (3 pts.)

2X + Se $\longrightarrow$ X$_2$Se, 6.7 g/mol, Li

g.) 26.21 ml of a 0.4356 g/ml (by mass) HNO_3 solution is used to dissolve and analyze 18.250 grams an alloy containing aluminum. *The aluminum reacts with nitric acid.* What is the percentage of aluminum in the sample? How many liters of H_2 gas would be created in the reaction of HNO_3 with Al at STP?   (6 pts.)

6HNO$_3$ + 2Al $\longrightarrow$ 2Al(NO$_3$)$_3$ + 3 H$_2$, 11.42 g of HNO$_3$ reacts with 1.63 g Al (stoichiometry)
Percent Al in Alloy; 1.63g Al/18.250 alloy*100= 8.93% Al, 2.03L H$_2$ at STP (stoichiometry)

h.) During the manufacturing of a medication it often becomes contaminated with nickel(II) acetate. To analyze the amount of contamination a chemist measures 3.000 grams of the medication and dissolves it into 100.0ml of water. To this solution he adds enough phosphoric acid to precipitate all of the nickel(II) acetate as nickel(II) phosphate. This precipitate is then dried and measured. If the mass of nickel(II) phosphate is 0.03913 grams what is the percentage of nickel(II) acetate in the medication.   (6 pts.)

3 Ni(C$_2$H$_3$O$_2$)$_2$ + 2 H$_3$PO$_4$ $\longrightarrow$ Ni$_3$(PO$_4$)$_2$ + 6 HC$_2$H$_3$O$_2$
0.05666g Ni(C$_2$H$_3$O$_2$)$_2$ / 3.000g of contaminated medicine= 1.889%