SCH 4C1 Unit 2 Problem Set

1. A small pin contains 0.0178 mol of iron. How many atoms of iron are in the pin?
2. A sample contains 4.70 x 10-4 mol of gold. How many atoms of gold are in the sample?
3. How many atoms make up the following compounds?
   1. MgF2
   2. Al(OH)3
   3. Pb3(PO4)4
   4. (NH4)2SO4
4. Find the Molar Mass of each compound
5. NH3
6. C6H12O6
7. K2Cr2O7
8. Fe2(SO4)3
9. SrSO4
10. Calculate the mass of each sample.
11. 103 moles of Mo
12. 1.32 x 104 moles of NaCl
13. 0.736 moles of MgO
14. 56.3 moles of H2O
15. How many moles of compound are in each sample?
16. 39.2 g of SiO2
17. 7.34 g of HNO2
18. 1.55 x 105 g of CF4 q. 8.11 x 10-3 g of C8H9I
19. Determine the number of molecules or formula units in each sample.
20. 10.0 g of water
21. 52.4 g of methanol, CH3OH
22. 23.5 g of disulphur dichloride, S2Cl2
23. 0.337 g of lead (II) phosphate, Pb3(PO4)2
24. Consider the following reaction:

2H2(g) + O2(g) → 2H2O(l)

1. Write the all the mole ratios
2. How many moles of O2 are required to react with 10.0 moles of H2?
3. How many moles of water are formed when 24.78 moles of O2 react?
4. How many moles of H2 are required to react completely with 6.02 x 1023 molecules of O2?
5. Aluminum bromide can be prepared by reacting small pieces of aluminum foil with liquid bromine at room temperature. The reaction is accompanied by flashes of red light.
6. Write a balanced chemical equation of the above reaction.
7. How many moles of bromine are needed to produce 5 mol of aluminum bromide?
8. How many moles of aluminum are needed to react?
9. Ammonium sulfate, (NH4)2SO4, is used as a source of nitrogen in some fertilizers. It reacts with sodium hydroxide to produce sodium sulfate, water and ammonia.

(NH4)2SO4(s) + 2NaOH(aq) → Na2SO4(aq) + 2NH3(g) + 2H2O(l)

What mass of sodium hydroxide is required to react completely with 15.4 g of (NH4)2SO4?

1. Iron (III) oxide, also known as rust, can be removed from iron by reacting it with hydrochloric acid to produce iron (III) chloride and water.

Fe2O3(s) + 6HCl(aq) → FeCl2(aq) + H2(g)

What mass of hydrogen chloride is required to react with 1.00 x 102 g of rust?

1. Iron reacts slowly with hydrochloric acid to produce iron (II) chloride and hydrogen gas.

Fe(s) + 2HCl → FeCl2(aq) + H2(g) What mass of HCl is required to react with 3.56 g of iron?

1. Dinitrogen pentoxide is a white solid. When heated it decomposes to produce nitrogen dioxide and oxygen.

2N2O5(s) → 4NO2(g) + O2(g)

How many grams of oxygen will be produced in this reaction when 2.34 g of NO2 are made?

1. Hydrogen fluoride is a highly toxic gas. It is produced by the double displacement reaction of calcium fluoride with concentrated sulfuric acid.

CaF2(s) + H2SO4(l) → 2HF(g) + CaSO4(s)

1. Determine the limiting reactant when 10.0 g of CaF2 reacts with 15.5 g of H2SO4.
2. Use the following equations to answer the questions below: 6ClO2(g) + 3H2O(l) → 5HClO3(aq) + HCl(aq)
   1. If 71.00 g of ClO2 is mixed with 19.00 g of water, what is the limiting reactant?
   2. What mass of HClO3 is expected in part a)?
   3. How many molecules of HCl are expected in part a)?
3. A student performs the following reaction with 1.23 g of MnI2 and 25.0 g of F2. 2MnI2(s) + 13F2(g) → 2MnF3(s) + 4IF5(l)

What mass of MnF3 is expected?

1. Barium sulphate forms as a precipitate in the reaction between barium nitrate and sodium sulphate. When 35.0 g of barium nitrate is reacted with excess sodium sulphate, 29.8 g of precipitate is recovered.
   * + 1. Calculate the theoretical yield
       2. Calculate the percentage yield
2. Yeast can act on sugar to produce alcohol in the following reaction:

C6H12O6(aq) → 2C2H5OH(l)+ 2CO2(g)

If 223 g of alcohol are recovered after 1.63 kg of sugar react, what is the percentage yield?

1. The following reaction proceeds with a 70% yield:

C6H6(l) + NNO3(aq) → C6H5NO2(l) + H2O(l)

Calculate the mass of C6H5NO2 expected if 12.8 g of C6H6 reacts with excess NNO3.

1. Marble is made primarily of calcium carbonate. When calcium carbonate reacts with hydrogen chloride, it reacts to form calcium chloride, carbon dioxide and water. If this reaction occurs with 81.5% yield, what mass of carbon dioxide will be collected if

15.7 g of calcium carbonate is added to sufficient hydrogen chloride?

1. A student mixes 5.3 g of barium chloride and 6.9 g of sodium sulphate. What mass of barium sulphate is produced?

20.1g of HBRO3 is reacted with excess HBr.

HBrO3(aq) + 5HBr(aq) → 3H2O(l) + 3Br2(aq)

* + - 1. What is the theoretical yield of Br2?
      2. If 47.3 g of Br2 is produced, what is the percentage yield for this reaction?

23.If 50.8 g of copper (II) chloride react in a single displacement reaction with 19.3 g of magnesium metal. If the reaction has a 54.3% yield, how much copper metal will be recovered?