WLHS / Chem / Monson

Name_____
Date_____Per_____

KEY - PERCENT COMPOSITION PROBLEM SET

Determine the percentage composition of each of the compounds below.

1) $KMnO_4$ molar mass: 158.0 g/mol

% composition: **K:** 24.7% **Mn:** 34.7% **O:** 40.5%

2) HCl molar mass: 36.5 g/mol

% composition: **H:** 2.7% **Cl:** 97.3%

3) $Mg(NO_3)_2$ molar mass: 148.3 g/mol

% composition: **Mg:** 16.4% **N:** 18.9% **O:** 64.7%

4) $(NH_4)_3PO_4$ molar mass: 149.0 g/mol

% composition: **N:** 28.2% **H:** 8.1% **P:** 20.8% **O:** 43.0%

5) $Al_2(SO_4)_3$ molar mass: 342.3 g/mol

% composition: **Al:** 15.8% **S:** 28.1% **O:** 56.1%

6) sodium nitrite formula: $NaNO_2$ molar mass: 69.0 /g/mol

% composition: **Na:** 33.3% **N:** 20.3% **O:** 46.4%

7) calcium chlorite formula: $Ca(ClO_2)_2$ molar mass: 175.1 /g/mol

% composition: **Ca:** 22.9% **Cl:** 40.5% **O:** 36.6%

8) dinitrogen pentoxide formula: N_2O_5 molar mass: 108.0 /g/mol

% composition: **N:** 25.9% **O:** 74.1%

9) aluminum phosphite formula: $AlPO_3$ molar mass: 106.0 /g/mol

% composition: **Al:** 25.5% **P:** 29.2% **O:** 45.3%

10) carbonic acid formula: H_2CO_3 molar mass: 62.0 /g/mol

% composition: **H:** 3.2% **C:** 19.4% **O:** 77.4%

(over)

Solve the following problems:

1) How many grams of oxygen can be produced from the decomposition of 100 g of $KClO_3$?

Molar mass = 122.6 g/mol

% oxygen = 3(16.0) / 122.6 = 39.2% O

(0.392) (100 g) = 39.2 g O

2) How much iron can be recovered from 25.0 g Fe_2O_3?

Molar mass = 159.6 g/mol

% iron = 2(55.8) / 159.6 = 69.9% Fe

(0.699) (25 g) = 17.5 g Fe

3) How much silver can be recovered from 125 g of Ag_2S?

Molar mass = 247.9 g/mol

% silver = 2(107.9) / 247.9 = 87.1% Ag

(0.871) (125 g) = 109 g Ag

4) A 3.56 g sample of pure **iron** powder was heated in gaseous **chlorine**, and 10.39 g of an iron chloride was formed. What is the percent composition of this compound? (Calculate the % of iron, and the % of chlorine in this compound)

3.56 g Fe / 10.39 g total = 34.3% Fe

so, % chlorine = 65.7% Cl

5) Calculate the percent composition of each of the following compounds:

A) acetone, CH_3COCH_3

Molar mass = 58.0 g/mol

%C = 62.1% C
%H = 10.3% H
%O = 27.6% O

B) aspirin, $CH_3COOC_6H_4COOH$

Molar mass = 180.0 g/mol

%C = 60.0% C
%H = 4.4% H
%O = 35.6% O

6) Copper is obtained from ores containing the following minerals:

Azurite, $Cu_3(CO_3)_2(OH)_2$ % Cu: **55.3%**

Chalcocite, Cu_2S % Cu: **79.8%**

Chalcopyrite, $CuFeS_2$ % Cu: **34.6%**

Covelite, CuS % Cu: **66.4%**

Cuprite, Cu_2O % Cu: **88.8%**

Malachite, $Cu_2CO_3(OH)_2$ % Cu: **57.5%**

Calculate the % of each mineral that consists of COPPER. Which mineral has the highest copper content on a percent-by-mass (percent composition) basis? Why might this information be important to a mine developer?

***Highest % Cu is CUPRITE (88.8%).**
****A mine developer needs to know if there is enough Cu available in the ore to make it cost-efficient.**