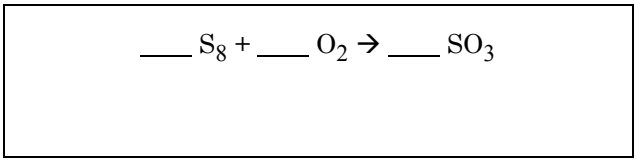
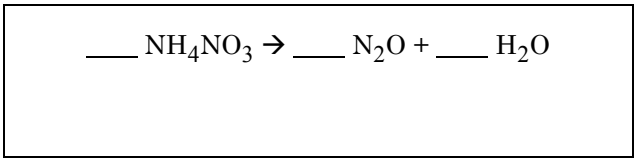
Exam Two **CHM 203 (Dr. Mattson)** **19 SEPTEMBER 2007**	***Academic Integrity Pledge:*** *In keeping with Creighton University's ideals and with the Academic Integrity Code adopted by the College of Arts and Sciences, I pledge that this work is my own and that I have neither given nor received inappropriate assistance in preparing it.* *Signature:*

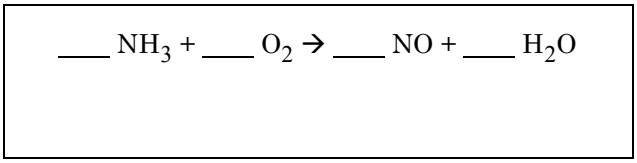
Instructions: Show all work whenever a calculation is required! You will receive credit for <u>how</u> you worked each problem as well as for the correct answer. If you need more space, you may use the back of your periodic table — Write: "See PT" in box. BOX YOUR ANSWERS! Write legibly.

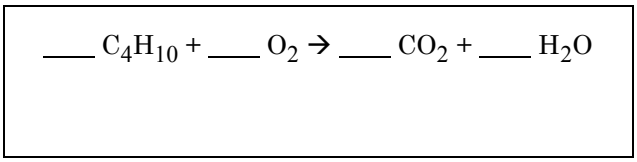
Chapter 3. Formulas, Equations and Moles

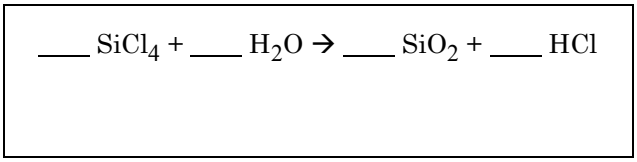
1. (3 pts each) Balance the equations with the smallest whole number coefficients.











2. (3 pts each) What is the molar mass of

(a) triboron trinitride?

(b) chromium(III) nitrate?

(c) sodium sulfate monohydrate?

3. (a) (5 pts) How many moles of $(NH_4)_3PO_4$ are in a 550 g sample of the substance? (MM = 149 g/mol)

(b) (4 pts) How many moles of ammonium cations are in the sample in 3(a)?

(c) (4 pts) How many hydrogen atoms are in the sample in 3(a)? [Given: $N_A = 6.02 \times 10^{23}$]

4. In class you observed the following reaction:

$$Fe_2O_3 + 3\ H_2 \rightarrow 2\ Fe + 3\ H_2O$$

(a) (4 pts) How many moles of hydrogen would be required to react with 4.65 mol of iron(III) oxide?

(b) (4 pts) What is the theoretical yield of iron in moles if 4.65 mol iron(III) oxide were reacted with excess hydrogen?

(c) (4 pts) What is the theoretical yield of water in grams if 4.65 mol iron(III) oxide were reacted with excess hydrogen?

5. (5 pts) Calcium carbonate can be made from the reaction given in the box below. How many moles of calcium carbonate would you expect from the reaction of 150 g calcium chloride (MM = 111 g/mol) with 160 g sodium carbonate (MM = 106 g/mol)?

$CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + 2\ NaCl$

(2 pts) Circle the limiting reagent: $CaCl_2$ or Na_2CO_3

6. (5 pts) Determine the limiting reagent in the following reaction if 35 mol NO, 28 mol O_2 and 19 mol H_2O were used in the reaction.

$4\ NO + 3\ O_2 + 2\ H_2O \rightarrow 4\ HNO_3$

The limiting reagent is: NO O_2 H_2O HNO_3

7. (5 pts) In the following reaction, 7.2 moles of NaN_3 produced 255 g N_2. What is the percent yield?

$2\ NaN_3 \rightarrow 3\ N_2 + 2\ Na$

8. Hydrocarbons are a broad class of compounds that contain only carbon (C = 12.01) and hydrogen (H = 1.008) and have the formula C_xH_y.

(a) (5 pts) If a certain hydrocarbon contains 85.63% C and 14.37% H, what is its empirical formula?

(b) (5 pts) Which of the following could be the actual molecular formula? There may be more than one.

C_2H_4 C_2H_6 C_3H_6 C_3H_8 C_5H_{10}

9. (6 pts) The mineral stephanite contains only silver (Ag = 107.87), antimony (Sb = 121.76) and sulfur (S = 32.064). If stephanite contains 68.33% silver and 15.43% antimony, what is the empirical formula for this mineral?

Chapter 2. Nomenclature

10. (5 pts) Choose the correct name for each of these compounds.

SO_3	sulfur(IV) oxide	sulfur(III) oxide
	sulfur trioxide	sulfur oxide
$CrBr_2$	chromium(II) bromide	chromium bromide
	chromium dibromide	chromium bromide(II)
$Ca(NO_3)_2$	calcium nitride	calcium nitrate
	calcium(II) nitrate	calcium nitrite
S_4O_6	sulfur(IV) oxide(VI)	disulfite
	tetrasulfur hexoxide	sulfur oxide
V_2O_5	vanadium(V) oxide	vanadium oxide
	divanadium pentoxide	vanadium(V) pentoxide

11. (6 pts) Print the name for each of the following compounds.

KBr
$MgSO_4$
SCl_2
$FeCO_3$
IF_5
$Ca(C_2H_3O_2)_2$

12. (5 pts) Print the name for each of these acids.

HBr
$HClO_2$
H_2SO_4
H_2SO_3
$HBrO_4$

Sign the Academic Integrity pledge *and* print your name here:

Your exam score (100 possible): _____

Determine your grade:

A+ ≥ 95; A ≥ 90; B+ ≥ 85; B ≥ 80; C+ ≥ 75; C ≥ 70; D ≥ 60

Answers

Chapter 3. Formulas, Equations and Moles

1. Balance the equations with the smallest whole number coefficients.

$$1\ S_8 + 12\ O_2 \rightarrow 8\ SO_3$$

$$1\ NH_4NO_3 \rightarrow 1\ N_2O + 2\ H_2O$$

$$4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$$

$$2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$$

$$1\ SiCl_4 + 2\ H_2O \rightarrow 1\ SiO_2 + 4\ HCl$$

2. (a) triboron trinitride, MM = 74.4 g/mol

(b) chromium(III) nitrate, MM = 238.0 g/mol

(c) sodium sulfate monohydrate, MM = 160.0 g/mol

3. (a) 3.69 mol $(NH_4)_3PO_4$

(b) 11.07 mol NH_4^+

(c) 2.67×10^{25} hydrogen atoms

4. (a) 13.95 mol H_2

(b) 9.3 mol Fe

(c) 251 g H_2O

5. 1.35 mol $CaCO_3$; limiting reagent is $CaCl_2$

6. NO

7. 84.3%

8. (a) CH_2

(b) C_2H_4 C_3H_6 C_5H_{10}

9. Ag_5SbS_4

Chapter 2. Nomenclature

10. (5 pts) Choose the correct name for each of these compounds.

SO_3	sulfur trioxide
$CrBr_2$	chromium(II) bromide
$Ca(NO_3)_2$	calcium nitrate
S_4O_6	tetrasulfur hexoxide
V_2O_5	vanadium(V) oxide

11. (6 pts) Print the name for each of the following compounds.

KBr	potassium bromide
$MgSO_4$	magnesium sulfate
SCl_2	sulfur dichloride
$FeCO_3$	iron(III) carbonate
IF_5	iodine pentafluoride
$Ca(C_2H_3O_2)_2$	calcium acetate

12. (5 pts) Print the name for each of these acids.

HBr	hydrobromic acid

$HClO_2$	chlorous acid
H_2SO_4	sulfuric acid
H_2SO_3	sulfurous acid
$HBrO_4$	perbromic acid