EXAM TWO **CHM 203 (Dr. Mattson)** **24 SEPTEMBER 2008**	***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 how 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 and then attach the periodic table. BOX YOUR ANSWERS! Write legibly.

CHAPTER 3. FORMULAS, EQUATIONS AND MOLES

1. (10 pts) Balance the following equations with the smallest possible whole numbers:

(a) $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

(b) $NO_2 + NH_3 \rightarrow N_2 + H_2O$

2. (10 pts) Write balanced chemical equations for the these demonstrations you observed in class:
(a) I heated elemental calcium and elemental sulfur, S_8, together in a test tube. After awhile, there was a bright glow and calcium sulfide was produced.

(b) When I light a match, one important reaction that takes place can be summed as: tetraphosphorus hexasulfide reacts with molecular oxygen from the air to produce diphosphorus pentoxide and sulfur dioxide.

3. (9 pts) Determine the molar mass of:

(a) iron(III) oxide

(b) H_2SO_4

calcium acetate

4. (6 pts) How many moles of sucrose, $C_{12}H_{22}O_{11}$, are in a 440 g sample?

5. (6 pts) How many moles of calcium ions are in a 205.0 g sample of calcium phosphate, $Ca_3(PO_4)_2$, (MM = 310 g/mol)?

6. (6 pts) Diarsenic trioxide reacts with iodic acid in water according to the equation given below. How many moles of iodic acid are required to react with 22 moles diarsenic trioxide?

$5\ As_2O_3 + 4\ HIO_3 + 13\ H_2O \rightarrow 10\ H_3AsO_4 + 2\ I_2$

7. (6 pts) Copper(I) sulfate reacts with elemental magnesium to produce elemental copper and magnesium sulfate. What mass of magnesium is needed to react completely with 5.78 g Cu_2SO_4 (MM = 223.1 g/mol)?

$Cu_2SO_4 + Mg \rightarrow 2\ Cu + MgSO_4$

8. (6 pts) Magnesium nitride is formed by heating magnesium metal in an atmosphere of nitrogen. If 51 g magnesium and 38 g nitrogen are used in the reaction, which reagent is the limiting reagent? (*Must show work!*)

$3\ Mg + N_2 \rightarrow Mg_3N_2$

(b) (6 pts) How many moles of the excess reagent are left over?

9. (6 pts) Calcium phosphide is made by heating elemental calcium and phosphorus together. If 1.94 mole of calcium is reacted with excess phosphorus, what is the theoretical yield (in grams) of calcium phosphide (MM = 182 g/mol)?

$6\ Ca + P_4 \rightarrow 2\ Ca_3P_2$

(b) (6 pts) If actual yield were 105 g calcium phosphide, what is the percent yield?

10. (6 pts) Sodium azide, the solid used in automobile airbags, contains only sodium and nitrogen. The analysis of sodium azide gives 35.36% Na. What is the empirical formula of sodium azide?

11. (5 pts) Name the following covalent molecular compounds

Formula:	Printed name:
CO	
SCl_2	
SO_3	
N_2O_4	
CF_4	

12. (12 pts) Name the following acids and oxyanions:

Formula:	Printed name:
HClO	
$HClO_2$	
$HClO_3$	
$HClO_4$	
ClO^-	
ClO_2^-	
ClO_3^-	
ClO_4^-	
HNO_2	
HNO_3	
H_2SO_3	
H_2SO_4	

(1 pt) Print your name here and sign Academic Integrity Statement on other side.

Your exam score (100 possible): _____

Determine your grade:
A+ ≥ 95; A ≥ 90; B+ ≥ 85; B ≥ 80; C+ ≥ 75; C ≥ 70; D ≥ 60

ANSWERS

1.

(a) $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

(b) $6\ NO_2 + 8\ NH_3 \rightarrow 7\ N_2 + 12\ H_2O$

2. (a) $8\ Ca + S_8 \rightarrow 8\ CaS$

(b)) $P_4S_6 + 11\ O_2 \rightarrow 2\ P_2O_5 + 6\ SO_2$

3. (a) 159.6 g/mol; (b) 98 g/mol; (c) 158 g/mol

4. 1.29 mol $C_{12}H_{22}O_{11}$

5. 1.98 mol Ca^{+2}; 6. 17.6 mol HIO_3

7. 0.630 g Mg; 8. Mg; (b) 0.66 mol N_2

9. 117.7 g Ca_3P_2; (b) 89.2%; 10. NaN_3

11.

CO	carbon monoxide
SCl_2	sulfur dichloride
SO_3	sulfur trioxide
N_2O_4	dinitrogen tetroxide
CF_4	carbon tetrafluoride

12.

HClO	hypochlorous acid
$HClO_2$	chlorous acid
$HClO_3$	chloric acid
$HClO_4$	perchloric acid
ClO^-	hypochlorite
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	perchlorate
HNO_2	nitrous acid
HNO_3	nitric acid
H_2SO_3	sulfurous acid
H_2SO_4	sulfuric acid