Exam Two **CHM 203 (Dr. Mattson)** **20 September 2006**	***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. This exam is worth 100 points. BOX YOUR ANSWERS!

1. (10 points) Balance these reactions:

a. $C_7H_{16} + O_2 \longrightarrow CO_2 + H_2O$

b. $NH_3 + NO \longrightarrow N_2 + H_2O$

2. (15 points) In each of the following questions (a – c), you have a choice to do a 5 point question OR a simpler 3 pt question where the formula is already given. The exam adds up to 100 points using the 5 point questions and to 96 using the 3 pt questions. *Whenever possible, do the 5 point question. Do not do both.* What is molar mass (to the tenths place) of

a. (5 pts) dinitrogen trioxide <u>OR</u> (3 pts) V_2O_5

b. (5 pts) ammonium nitrate <u>OR</u> (3 pts) NH_4PF_6

c. copper(I) chloride OR (3 pts) $Sr_3(PO_4)_2$

3. (5 pts) How many moles of calcium carbonate (MM = 100.0 g/mol) are in a 750 mg tablet?

4. (5 pts) What mass of calcium chloride (MM = 110.9 g/mol) is present in a 25.0 mole sample?

5. (a) (5 pts) How many moles of each atom are present in a 0.80 mol sample of caffeine, $C_8H_{10}N_4O_2$?

(b) (3 pts) What is the total number of moles of atoms in this sample?

6. (5 pts) How many *molecules* of caffeine are present in a 12.5 g sample of caffeine, $C_8H_{10}N_4O_2$? (MM = 194 g/mol; $N_A = 6.02 \times 10^{23}$)

7. (5 points) Print (legibly!) the names for the following compounds.

Name	Formula
	ClO_2
	K_2CO_3
	$KC_2H_3O_2$
	NH_4CN
	$Be(NO_3)_2$

8. (4 pts) What are the formulas for the following compounds?

(a) vanadium(II) bromide
(b) vanadium (III) bromide
(c) vanadium (IV) bromide
(d) vanadium (VI) bromide

Use the following balanced equation to answer the next four questions.

$$Fe_2O_3 + 3\ CO \longrightarrow 2\ Fe + 3\ CO_2$$

9. (5 pts) How many moles of CO are needed to react with 0.472 mol Fe_2O_3?

10. (5 pts) How many moles of Fe are expected (theoretical yield) if 0.40 mol Fe_2O_3 are reacted with 1.40 mol CO?

$$Fe_2O_3 + 3\ CO \longrightarrow 2\ Fe + 3\ CO_2$$

11. (5 pts) How many moles of excess reagent remain if 0.40 mol Fe_2O_3 are reacted with 1.40 mol CO?

$$Fe_2O_3 + 3\ CO \longrightarrow 2\ Fe + 3\ CO_2$$

12. (5 pts) Suppose 1.05 mol Fe_2O_3 were reacted with excess CO. What is the percent yield if 81 g Fe were obtained?

$$Fe_2O_3 + 3\ CO \longrightarrow 2\ Fe + 3\ CO_2$$

13. (5 pts) Consider the reaction:

$$2\ KMnO_4 + 5\ H_2C_2O_4 + 3\ H_2SO_4 \longrightarrow 2\ MnSO_4 + 10\ CO_2 + 8\ H_2O + K_2SO_4$$

Determine the limiting reagent if the following quantities of reagents are used: 270 g $KMnO_4$ (MM = 158 g/mol), 350 g $H_2C_2O_4$ (MM = 90 g/mol), and 220 g H_2SO_4 (MM = 98 g/mol)

14. (5 pts) What is the molarity of a solution prepared by dissolving 3.116 g NaCl (MM = 58.5 g/mol) in water to make 250.0 mL?

15. (5 pts) Suppose a 10.0 mL sample of a 0.824 M solution of ammonium bromide were diluted to a volume of 500.0 mL. What is the new concentration (molarity)?

16. (5 pts) What is the empirical formula of stannous bromide? Its mass percent composition is 57.38% Br and 42.62% Sn.

17. (3 pts) 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 ≥ 6

Answers:

1. a. $C_7H_{16} + 11\ O_2 \longrightarrow 7\ CO_2 + 8\ H_2O$

b. $4\ NH_3 + 6\ NO \longrightarrow 5\ N_2 + 6\ H_2O$

2.
   a. 76.0 g/mol
   b. 80.1 g/mol
   c. 99.0 g/mol

3. (5 pts) 0.0075 mol calcium carbonate

4. (5 pts) 2772 g calcium chloride

5.
   6.4 mol C
   8.0 mol H
   3.2 mol N
   1.6 mol O
   19.2 mol atoms total

6. 3.88×10^{22} molecules $C_8H_{10}N_4O_2$

7.
   chlorine dioxide
   potassium carbonate
   potassium acetate
   ammonium cyanide
   beryllium nitrate

8. (4 pts) What are the formulas for the following compounds?

   (a) VBr_2

   (b) VBr_3

   (c) VBr_4

   (d) VBr_5

9. 1.42 mol CO

10. 0.80 mol Fe

11. 0.20 mol excess CO

12. 69%

13. H_2SO_4

14. 0.213 M NaCl

15. 0.0165 M NH_4Br

16. $SnBr_2$