CEM 141 FL 07 Final Exam Name _____

1. (8) What is the molecular formula of 1-bromobutane which is composed of 35.06% Carbon by mass, 6.63% Hydrogen by mass, and 58.31% Bromine by mass. The molar mass of 1-bromobutane is 137.03g/mol.

2. (8) What is the difference between dissolve and dissociate. Give examples of each.

3. (36) Consider the combustion of methanol, CH_3OH

a. (6) write the balanced equation

b. (6) What is the mass percent of H in methanol?

c. (6) Consider the product, carbon dioxide. Which is smaller, a neutral oxygen atom or the oxygen atom in carbon dioxide? **WHY?** Hint: What is the charge on the oxygen in carbon dioxide?

d. (6) Which has a smaller ionization energy, neutral C or neutral O. Why?

e. (6) 43.2 g of methanol was burned in excess oxygen. What mass of carbon dioxide was produced?

f. (6) All of the carbon dioxide in part e was placed in a 401. mL flask at 23.3 deg C. What was the pressure of this carbon dioxide product?

4. (8) a. (4)Draw the Lewis structure for the nitrate ion.

b. (4) How many sigma bonds are there in a nitrate ion?

5. (9) Name the following: a. $CuCrO_4$ b. $BaSO_4$ c. $Co(MnO_4)_2$

6. (14) Given the chemical equation $TeF_6 + AgC_2H_3O_2 \rightarrow Te(C_2H_3O_2)_6 + AgF$

a. (4) re-write (on your answer sheet) and balance the equation

b. (4) Draw the Lewis structure for TeF_6.

c. (3) What is the molecular geometry around the Te in TeF_6?

d. (3) What is the hybridization of Te in TeF_6?

7. (20) Consider the following 'reaction': barium hydroxide reacting with carbonic acid yields barium carbonate and water

a. (4) Write and balance the reaction.

b. (4) What kind of reaction is this?

c. (12) When 0.5 gram of each reactant are allowed to react, what is the mass of water produced?

8. (20) Consider the following unbalanced equation:
$Na_2CO_3(aq) + NiSO_4(aq) \rightarrow Na_2SO_4(aq) + NiCO_3(s)$

a. (5) Draw (or explain) the most stable lewis structure for the carbonate ion

b. (3) What is the bond order of all the carbon-oxygen bonds in carbonate?

c. (3) What is the molecular geometry of carbonate?

d. (5) Does carbonate have an overall dipole moment? EXPLAIN.

e. (6) If 35.0 mL of 2.10 M Na_2CO_3 is mixed with excess $NiSO_4$, what is the mass of the solid product?

9. (16) A 110.0 g piece of Molybdenum metal is heated to 100.0 C and put into a calorimeter whose heat capacity is 0.23 kJ/C. The 150.0 g of water in the calorimeter (and the calorimeter itself) initially at 24.2 C went up to a T of 27.0 at which point all E transfer stopped. What is the specific heat of Molybdenum metal? The specific heat of water is 4.184 J/Kg.

10. (9) Aluminum metal reacts with chlorine: $2\ Al(s) + 3\ Cl_2(g) \rightarrow 2\ AlCl_3(s)\ \Delta H = -1408.4$ kJ
How much energy is released when 3.22 g of $AlCl_3$ is formed?