Chem 107 PRACTICE EXAM III
CCBC-Catonsville

******* *ALWAYS ANSWER IN FULL SENTENCES!*
*** On numerical problems, you MUST show your set ups. When dimensional analysis is specified, you MUST set up the problem by dimensional analysis.
*** Use your time wisely. Do not get stuck on one question.
*** Answer each question carefully, with thought and with confidence! Do not stop to check over your work until you have worked through the entire exam.

PAGE	TOTAL SCORE POSSIBLE	YOUR SCORE
1	31	
2	19	
3	20	
4	20	
5	10	
TOTAL	100	
Bonus p.5	7	

Adjusted total to Exam III =

Current Course Total =

1. (8 pts) Give the formula or name as indicated below:

Name	Formula	Formula	Name (Watch your spelling!)
copper(II) bicarbonate	_____	$Fe(H_2PO_4)_2$	_____
potassium hydrogen phosphate	_____	HCl (g)	_____
phosphorous acid	_____	HCl (aq)	_____
ammonium nitrite	_____	SnO_2	_____

2. (12 pts) Regardless of whether the reaction will go, complete the following molecular equations, balance them and fill in physical states:

   a) $Al(NO_3)_3$ *(aq)* + Mg (s) $\longrightarrow$

   b) $Sr(C_2H_3O_2)_2$ *(aq)* + K_2SO_4 *(aq)* $\longrightarrow$

   c) $Ni(OH)_2$ *(s)* + $HClO_4$ *(aq)* $\longrightarrow$

3. (3 pts) Which of the above reactions in Question #2 will occur? Circle all that applies:

   (a) (b) (c)

4. (8 pts) Write a balanced molecular equation for each of the following. Be sure to include physical states:
   a) When iron is added to an aqueous solution of nickel (II) nitrate, an iron(III) compound is formed.

   b) The complete combustion of liquid decane($C_{10}H_{22}$)

5. (8 pts) Write the 3 equations for the reaction that occurs when aqueous solutions of barium hydroxide and acetic acid are allowed to react. Remember to include physical states and proper charges wherever applicable.
   MOLECULAR EQUATION

   TOTAL IONIC EQUATION

   NET IONIC EQUATION

   Spectator ions in this reaction is/are:

6. (3 pts) Write the dissolving equations for the following to show the difference between a strong and weak acid. Be sure to include physical states:

   a) $HClO_2$ *(aq)*

   b) $HClO_4$ *(aq)*

7. (2 pts) What is/are the predominant species in each of the solution? Give the formulas and the physical states:

   a) $HClO_2$ *(aq)* _____

   b) $HClO_4$ *(aq)* _____

8. (4 pts) Which of the following is/are strong electrolytes? Circle all that applies.

   $PbSO_4$ $Pb(NO_3)_2$ H_3PO_4 HBr Ag

9. (2 pts) Define the following by completing the sentence:
   The enthalpy of reaction is…

10. (20 pts) Consider the reaction below taking place in a blast furnace. All questions below must be done by dimensional analysis. Remember to give the answer in the correct sig.fig.

$$3Fe_2O_3\ (s) + CO\ (g) \longrightarrow 2\ Fe_3O_4\ (s) + CO_2\ (g) \quad \Delta H = -48.5\ kJ$$

a) If we wanted to produce 3.21 kg of Fe_3O_4, how many moles Fe_2O_3 would we need?

Ans. _____

b) If we started with 7.81 g of Fe_2O_3, how much heat would be absorbed or evolved? Be sure to state whether it is absorbed or evolved in your answer.

Ans. _____

c) If we started with 7.81 g of Fe_2O_3 and 0.634 g CO and obtained 7.21 g of Fe_3O_4, what is the percent yield? Which is the limiting reactant? SHOW YOUR WORK CLEARLY.

Ans. % yield = _____

Ans. Limiting reactant is _____

d) Is the reaction endothermic or exothermic? Ans. _____

11. (6 pts) How many grams of NaCl are in 250.0 mL of a solution that is 0.650 M NaCl? Show your dimensional analysis and give the answer to the correct sig. fig.

Ans. _____

12 (6 pts) Calculate the grams of magnesium hydroxide that will precipitate from 37.8 mL of 0.273 M magnesium chloride by addition of excess sodium hydroxide. Show your dimensional analysis and give the answer to the correct sig. fig.

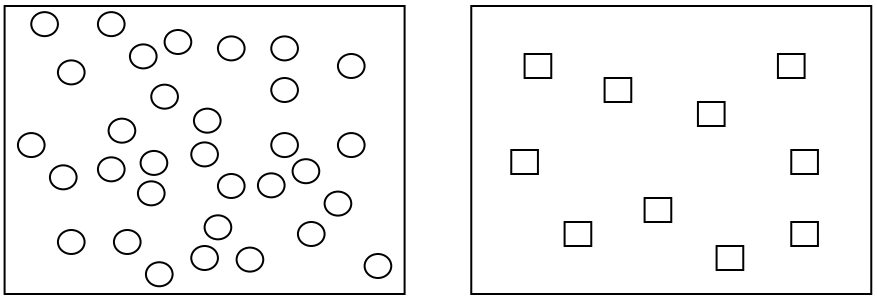
Ans. _____

13. (4 pts) Write the two forms of thermochemical equation for this reaction:
The reaction of solid sulfur (S_8) and hydrogen gas produces hydrogen sulfide gas. The heat evolved is 20.2 kJ per mole hydrogen sulfide.

thermochemical equation 1:

thermochemical equation 2:

14. (4 pts) If X = ○ and Y = □ and the two react to form X_3Y, based on the figures below, which would be the limiting reactant?



Which is the limiting reactant? Ans. X or Y ? Circle one.
How much of the excess reactant will be left over at the end of the reaction? Ans. _____

(2 pts each) Multiple choice: CIRCLE the letter corresponding to the best answer in each case.

15. In the reaction shown, is lead gaining or losing electrons?
$3Pb(NO_3)_2$ (aq) + 2Cr (s) $\longrightarrow$ $2Cr(NO_3)_3$ (aq) + 3Pb (s)

A. Lead is gaining electrons B. Lead is losing electrons.

16. In the reaction shown above (question #15), lead is…
A. being oxidized B. being reduced.

17. In the reaction A + B $\longrightarrow$ C $\Delta H = -58$ kJ
A. Substance A must be hotter than B.
B. Substance B must be hotter than A.
C. Substance A and B together must be hotter than C.
D. None of the above.

18. When 5 moles of Na_2SO_4 dissolve in water, how many moles of ions will be formed?
A. 2 mol B. 3 mol C. 7 mol D. 15 mol E. 35 mol F. $5 \times 6.02 \times 10^{23}$ mol

19. What type of compound is C_3H_5OH?
A. molecular compound B. ionic compound C. an acid D. hydrocarbon

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BONUS POINTS

(1 pt) ***Make sure you have your <u>full name</u> on <u>both</u> sides of <u>every</u> page!!!***

(2 pts) What <u>type</u> of molecular compound when dissolved in water changes into an ionic compound?

(2 pts) Interpret the following reaction at the particulate level by filling in the blanks with words such as moles, molecules, atoms, formula units.

$2\ K + H_2O \longrightarrow 2\ KOH + H_2$

Two potassium _____ reacted with one water _____ to produce

two _____ of potassium hydroxide and one _____ of hydrogen.

(1 pts) Give the formula of methane: _____

(1 pt) Oxalic acid has the formula $H_2C_2O_4$.
What is the formula of the oxalate ion? Ans. _____