Name _____ AP Chem ___/___/___

Practice Exam 1
Part 1 - 20 Multiple Choice Question – 20 minutes

1. _____ When potassium dichromate($K_2Cr_2O_7$) is dissolved in water, it is best represented by:
a. $K_2^+ + Cr_2O_7^{2-}$ b. $2K^+ + Cr_2O_7^{2-}$ c. $2K^+ + Cr_2O_7^-$
d. $K_2^{2+} + Cr_2O_7^{2-}$ e. $2K^+ + 2Cr^{4+} + 7O^{2-}$

2. _____ Which of the following pairs of compounds can be used to illustrate the law of multiple proportions?
a. $KMnO_4$ and KOH b. HI and HIO_3 c. O_2 and O_3
d. SO_3 and SO_2 e. both C & D

3. _____ Which of the following elements forms a polyatomic anion where it has an oxidation number of +5?
a. Ca b. S c. Fe d. N e. Cs

4. _____ How many electrons does a sulfide ion have?
a. 18 b. 20 c. 14 d. 16 e. 32

5. _____ When the following half reaction is balanced with the smallest whole number coefficients, it will contain: $CN^- \rightarrow CNO^-$
a. $2e^-$ on the right side b. $1e^-$ on the right side c. H_2O on the right side
d. $2H^+$ on the left side e. a coefficient of 2 for CNO^-

6. _____ The compound that contains 28.6% oxygen is:
a. NaOH b. CaO c. Al_2O_3 d. BaO e. $Ca(OH)_2$

7. _____ Which of the following cannot be a reducing agent?
a. Au b. S^{2-} c. Mn^{7+} d. Cu^+ e. O^{2-}

8. _____ How many grams of $Ca(OH)_2$ (molar mass = 74.0 g/mol) are contained in 5.00×10^2 mL of a 0.80 M calcium hydroxide solution?
a. 40 g b. 60. g c. 30. g d. 18 g. e. none of these

9. _____ $CH_3OH(g) + \_\_\_O_2(g) \rightarrow \_\_\_CO_2(g) + \_\_\_H_2O(g)$
The reaction above represents the oxidation of methanol. How many moles of O_2 are needed to oxidize 1 mole of CH_3OH?
a. 3/2 moles b. 5/2 moles c. 2 moles d. 1/2 moles e. 1 mole

10. _____ A 450. mL sample of a 0.375 M solution is left on a hot plate overnight; the following morning the solution is 1.50 M. What volume of solvent has evaporated from the 0.375 M solution?
a. 338 mL b. 56.3 mL c. 112 mL d. 230. mL e. 288 mL

11. _____ What is the mass ratio of iron to oxygen in iron(II) oxide?
a. 3.5 to 1 b. 2.3 to 1 c. 1 to 3.5 d. 1 to 2.3 e. 1 to 1.75

12. _____ When 100 grams of butane gas (C_4H_{10}, MW = 58.14) is burned in excess oxygen gas, the theoretical yield of H_2O (in grams) is:
a. $\frac{(58.14)(18.02)}{(100)(5)}$ b. $\frac{(58.14)(5)}{(100)(18.02)}$ c. $\frac{(4)(18.02)}{(58.14)(5)}$ d. $\frac{(5)(58.14)(18.02)}{(100)}$ e. $\frac{(100)(5)(18.02)}{(58.14)}$

13. _____ Excess $S_8(s)$ is heated with a metallic element until the metal reacts completely. All excess sulfur is combusted to a gaseous compound and escapes from the crucible. Given the information that follows, determine the most probable formula for the residue.

Mass of crucible, lid and metal = 55.00 grams
Mass of crucible and lid = 41.00 grams
Mass of crucible , lid and residue = 62.00 grams

a. CuS b. Cu_2S c. FeS d. Fe_2S_3 e. not enough information

14. _____ What ions would you find in solution if potassium perchlorate was dissolved in water?
a. KCl, O_2 b. K^+, ClO^-, O^{2-} c. KCl, O^{2-} d. K^+, ClO_4^- e. K^+, Cl^-, O^{2-}

15. _____ Arrange the following species in order of increasing oxidation number of the sulfur atom
SCl_2 S_8 SO_2 H_2S S_2Cl_2 SO_3

a. H_2S, S_8, S_2Cl_2, SCl_2, SO_2, SO_3
b. SO_3, SO_2, SCl_2, S_2Cl_2, S_8, H_2S
c. H_2S, S_8, SCl_2, S_2Cl_2, SO_3, SO_2
d. SO_2, SO_3, S_2Cl_2, H_2S, SCl_2, S_8
e. S_8, H_2S, SO_3, SCl_2, SO_2, S_2Cl_2

16. _____ How much 2.0 M H_2SO_4 would be required to make 500 mL of 0.50 M H_2SO_4?
a. 100 mL b. 125 mL c. 250 mL d. 500 mL e. 400 mL

17. _____ Balance the following equation using the lowest possible whole-number coefficients.
$NH_3 + CuO \rightarrow Cu + N_2 + H_2O$
The sum of the coefficients is:
a. 9 b. 10 c. 11 d. 12 e. 13

18. _____ If a 10. cm^3 sample of unknown contains 1 cm^3 of 0.1 M $AlCl_3$, then the concentration of Al^{3+} in the unknown is about:
a. 0.001 M b. 0.01 M c. 0.1 M d. 1 M e. 10 M

19. _____ Which one of the following is correct?
a. $KClO_3$, potassium perchlorate b. CuO copper oxide
c. $Al_3(SO_3)_2$ aluminum sulfate d. $MgPO_4$ magnesium phosphate
e. $Na_2Cr_2O_7$ sodium dichromate

20._____ A student was given 31.5 mg of $Ba(OH)_2 * 8H_2O$ (MW = 315 g/mol). She wanted to make a solution where the $[OH^-]$ is 0.10 M. How much water should she add to make the solution?
a. 1.0 mL b. 2.0 mL c. 4.0 mL d. 8.0 mL e. 99 mL

Name _____ AP Chem ___/___/___

Practice Exam 1
Part 2 - 2 Free Response Question – 20 minutes

Answer the following questions that relate to the analysis of chemical compounds.
(a) A compound containing the elements C, H, N and O is analyzed. When a 2.1106 g sample is burned in excess oxygen, 3.2017 g of $CO_2(g)$ is formed.The combustion analysis also showed that the sample contained 0.1710 g of hydrogen.

(i) Determine the mass, in grams, of C in the 2.1106 g sample of the compound.
(ii) When the compound is analyzed for N content only, the mass percent of N is found to be 32.16%. Determine the mass, in grams of N in the original 2.1106 g sample of the compound.
(iii) Determine the mass, in grams, of oxygen in the original 2.1106 g sample of the compound.
(iv) Determine the empirical formula of the compound.
(v) The molecular mass of the compound is 174.2 g/mol. Determine the molecular formula of the compound.

#2. The reaction between solid copper metal and silver nitrate was demonstrated to you early in the course. It can be represented by the following reaction:

$Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$

(a) A 1.87 g sample of copper wire was placed in 225 mL of 0.250 M $AgNO_3$ at 25°C.

(i) Identify the limiting reactant.

(ii) What is the maximum mass of solid silver that can be produced?

(iii) Determine the value of $[Cu^{2+}]$ after the reaction is complete. Assume the volume change is negligible.

(iv) When all of the limiting reactant has been consumed, how many moles of the other reactant remain?

(b) Answer the following questions about the reaction above.

(i) Which substance acts as the oxidizing agent?

(ii) How many electrons are transferred in the reaction?