CHE 120 Test 2 October 8, 2004 _____

I. Short Answer

_____ 1. If oxidation occurs in a chemical reaction, reduction must occur also. T(true)/F(false)

_____ 2. HNO_2 is a weak acid. Therefore, in an aqueous solution of moderate concentration, it should exist mainly as

A. HNO_2 molecules B. OH^-, NO^+ ions C. H^+, NO_2^- ions D. H^+, N^{3+}, O^{2-} ions

_____ 3. HNO_3 is a strong acid. Therefore, in an aqueous solution of moderate concentration, it should exist mainly as

A. HNO_3 molecules B. OH^-, NO_2^+ ions C. H^+, NO_3^- ions D. H^+, N^{3+}, O^{2-} ions

_____4. If an element in a compound has an oxidation number of +6, it must have a charge of 6+. T/F

_____5. To prepare 2.0 L of an aqueous 1.5 M solution, one could take

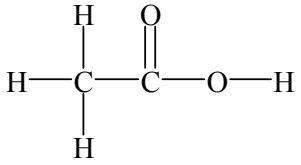
A. 1.5 mol of solute and add 2.0 L of water.

B. 3.0 mol of solute and add 2.0 L of water.

C. 1.5 mol of solute and add enough water to make 2.0 L of solution.

D. 3.0 mol of solute and add enough water to make 2.0 L of solution.

6. Identify the following as either an acid (A) or a base (B).



(a) _____ (b) NH_3____ (c) LiOH _____ d) $HClO_4$ ____

Which one is a strong acid? ____ (a), (b), (c), (d), Which one is a strong base? ____ (a), (b), (c), (d)

7. Assign oxidation numbers to all atoms of the following. Write the oxidation number above the element symbol.

(a) S_8 (b) $K_2S_2O_3$ c) CrO_4^{3-} (d) Ga^{3+}

8. $Fe_2O_3(s) + 3\ C(s) \rightarrow 2\ Fe(l) + 3\ CO(g)$

The substance oxidized is _____ (Fe_2O_3, C, Fe, CO)

The substance reduced is _____ (Fe_2O_3, C, Fe, CO)

The oxidizing agent is _____ (Fe_2O_3, C, Fe, CO)

9. Balance the following equation.

$Cl_2(g)$ + $FeBr_3(aq)$ $\rightarrow$ $Br_2(l)$ + $FeCl_3(aq)$

II. Numerical Problems. Show your work to receive full credit.

1. What volume of 3.00 M CH_4O is needed to produce 250. mL of 0.180 M CH_4O?

2. What volume (in mL) of 3.00 M CH_4O is needed to provide 14.5 g of CH_4O?

III. Stoichiometric Equation. Show your work to receive full credit.

$$\mathbf{4\ NH_3(g) + 5\ O_2(g) \rightarrow 4\ NO(g) + 6\ H_2O(l)}$$

Answer the following questions based on the equation above.

1. How many moles of NH_3 are required to produce 15.0 mol of H_2O?

2. How many grams of O_2 are needed to react with 1.40 mol of NH_3?

3. How many grams of H_2O can be formed from a mixture of 25.0 g of NH_3 and 35.0 g of O_2?

4. When the reaction in question 3 (25.0 g of NH_3 and 35.0 g of O_2) is carried out in the laboratory, 21.0 g of H_2O is obtained.

   The actual yield is _____

   The theoretical yield is _____

   The percentage yield is _____

IV. Chemical Equations

1. Complete and balance the following equations. Indicate the appropriate phases.

(a) Write an equation for the ionization of the weak acid HClO in water.

(b) $NH_3(aq) + H_2O(\ell) \angle$

(c) $C_3H_8(g) + O_2(g) \xrightarrow[\text{flame}]{\text{xsoxygen}}$

2. Complete and balance the following. Write NR if no reaction occurs (maximum of two). Indicate the appropriate phases. Write molecular and net ionic equations for each reaction *if the reaction occurs*.

(a) $HBr(aq) + Fe(OH)_3(s) \rightarrow$

net ionic:

(b) $I_2(aq) + MgBr_2(aq) \rightarrow$

net ionic:

(c) $KOH(aq) + MgBr_2(aq) \rightarrow$

net ionic:

(d) $HCl(aq) + K_2CO_3(aq) \rightarrow$

net ionic:

(e) $AgNO_3(aq) + Al(s) \rightarrow$

net ionic:

(f) $Ca(s) + H_2O(\ell) \rightarrow$

net ionic:

(g) $K_2S(aq) + LiNO_3(aq) \rightarrow$

net ionic:

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