Test 3 Review

For each reaction below:

- Predict the products, and write a balanced molecular equation.
- If no reaction occurs, write "No Reaction" after the arrow.
- For precipitation reactions, identify the precipitate, and write a ***net ionic equation***.

1. $H_2SO_4\,(aq) + KOH\,(aq) \longrightarrow$

2. $Ca(NO_3)_2\,(aq) + Na_2SO_4\,(aq) \longrightarrow$

3. $NaNO_3\,(aq) + CuSO_4\,(aq) \longrightarrow$

4. $MgCl_2\,(aq) + NaOH\,(aq) \longrightarrow$

5. $K_2CO_3\,(aq) + HCl\,(aq) \longrightarrow$

6. $KCl\,(aq) + Fe(NO_3)_2\,(aq) \longrightarrow$

7. Calculate the number of moles of NaOH that are needed to react with 500.0 g of H_2SO_4 according to the following equation:

$$H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2\ H_2O$$

8. Calculate the mass of NH_3 that can be produced from the reaction of 125 g of NCl_3 according to the following equation:

$$NCl_3 + 3\ H_2O \rightarrow NH_3 + 3\ HOCl$$

9. Silicon dioxide (SiO_2) can be produced by the unbalanced reaction shown below in 85.0% yield. In one experiment 155 g of $SiCl_4$ are completely reacted with excess water. How many grams of SiO_2 are actually produced in this reaction?

$$SiCl_4 + H_2O \rightarrow SiO_2 + HCl$$

10. Classify each of the reactions below as exothermic or endothermic:

a) $2\ Na\ (s) + Cl_2\ (g) \rightarrow 2\ NaCl\ (s) + 819\ kJ$ _____

b) $PCl_5\ (g) + 67\ kJ \rightarrow PCl_3\ (g) + Cl_2\ (g)$ _____

c) $Ca(OH)_2\ (s) \rightarrow CaO\ (s) + H_2O\ (l) \quad \Delta H = +65.3\ kJ$ _____

d) $Si\ (s) + 2\ Cl_2\ (g) \rightarrow SiCl_4\ (g) \qquad \Delta H = -657\ kJ$ _____

11. Iron (III) oxide reacts with carbon monoxide as shown below:

$$Fe_2O_3\ (s) + 3\ CO\ (g) \rightarrow 2\ Fe\ (s) + 3\ CO_2\ (g)$$

A reaction mixture initially contains 22.55 g of Fe_2O_3 and 14.78 g of CO. Once the reaction has occurred as completely as possible, what mass (in grams) of the excess reactant is left?

12. PCl_3 reacts with water to form HCl and aqueous H_3PO_3.

a) Write a balanced equation for this reaction.

b) Calculate the percent yield of a reaction in which 200.0 g of PCl_3 react with excess water to form 128 g of HCl.

13. Liquid hydrogen peroxide is used in many rocket fuel mixtures because it produces oxygen gas on decomposition, as shown below:

$$2\ H_2O_2\ (l) \rightarrow 2\ H_2O\ (l) + O_2\ (g) \qquad \Delta H = -196.1\ kJ$$

How much heat is released when 732 kg of H_2O_2 is decomposed?

14. Consider the reaction shown below:

$$2\ NO\ (g) + 5\ H_2\ (g) \rightarrow 2\ NH_3\ (g) + 2\ H_2O\ (g)$$

A reaction mixture initially contains 5 mol NO and 10 mol of H_2. Determine the moles and identity of all substances present in the mixture after all the reaction has taken place.

15. What solution can be added to the mixture of each of the ions listed below to precipitate one while keeping the other in solution?

a) Sr^{2+} and Hg_2^{2+}

b) NH_4^+ and Ca^{2+}

ANSWERS:

1-6) No Answers provided

7) 10.20 mol NaOH

8) 17.7 g NH_3

9) 46.6 g SiO_2

10a) Exothermic

10b) Endothermic

10c) Endothermic

10d) Exothermic

11) 2.91 g of CO

12) 80.3% yield

13) 2.11×10^6 kJ

14) 1 mol NO; 4 mol NH_3; 4 mol H_2O