Chemistry Worksheet: Limiting Reactant Worksheet #1

1. Consider the following reaction: $2\ Al + 6\ HBr \rightarrow 2\ AlBr_3 + 3\ H_2$
   a. When 3.22 moles of Al reacts with 4.96 moles of HBr, how many moles of H_2 are formed?
   b. What is the limiting reactant?
   c. For the reactant in excess, how many moles are left over at the end of the reaction?

2. Consider the following reaction: $3\ Si + 2\ N_2 \rightarrow Si_3N_4$
   a. When 21.44 moles of Si reacts with 17.62 moles of N_2, how many moles of Si_3N_4 are formed?
   b. What is the limiting reactant?
   c. For the reactant in excess, how many moles are left over at the end of the reaction?

3. Consider the following reaction: $2\ CuCl_2 + 4\ KI \rightarrow 2\ CuI + 4\ KCl + I_2$
   a. When 0.56 moles of $CuCl_2$ reacts with 0.64 moles of KI, how many moles of I_2 are formed?
   b. What is the limiting reactant?
   c. For the reactant in excess, how many moles are left over at the end of the reaction?

4. Consider the following reaction: $4\ FeS_2 + 11\ O_2 \rightarrow 2\ Fe_2O_3 + 8\ SO_2$
   a. When 26.62 moles of FeS_2 reacts with 5.44 moles of O_2, how many moles of SO_2 are formed?
   b. What is the limiting reactant?
   c. For the reactant in excess, how many moles are left over at the end of the reaction?

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1. Consider the following reaction: $2\ Al + 6\ HBr \rightarrow 2\ AlBr_3 + 3\ H_2$
   a. When 3.22 moles of Al reacts with 4.96 moles of HBr, how many moles of H_2 are formed? **2.48 mol H_2**
   b. What is the limiting reactant? **HBr**
   c. For the reactant in excess, how many moles are left over at the end of the reaction? **1.57 mol Al**

   3.22 mol Al * (3 mol H_2 / 2 mol Al) = 4.83 mol H_2
   4.96 mol HBr * (3 mol H_2 / 6 mol HBr) = 2.48 mol H_2

   2.48 mol H_2 * (2 mol Al / 3 mol H_2) = 1.65 mol Al used up

   3.22 mol Al
   –1.65 mol Al
   1.57 mol Al

2. Consider the following reaction: $3\ Si + 2\ N_2 \rightarrow Si_3N_4$
   a. When 21.44 moles of Si reacts with 17.62 moles of N_2, how many moles of Si_3N_4 are formed? **7.147 mol Si_3N_4**
   b. What is the limiting reactant? **Si**
   c. For the reactant in excess, how many moles are left over at the end of the reaction? **3.33 mol N_2**

   21.44 mol Si * (1 mol Si_3N_4 / 3 mol Si) = 7.147 mol Si_3N_4
   17.62 mol N_2 * (1 mol Si_3N_4 / 2 mol N_2) = 8.810 mol Si_3N_4

   7.147 mol Si_3N_4 * (2 mol N_2 / 1 mol Si_3N_4) = 14.29 mol N_2 used up

   21.44 mol N_2
   –14.29 mol N_2
   3.33 mol N_2

3. Consider the following reaction: $2\ CuCl_2 + 4\ KI \rightarrow 2\ CuI + 4\ KCl + I_2$
   a. When 0.56 moles of $CuCl_2$ reacts with 0.64 moles of KI, how many moles of I_2 are formed? **0.16 mol I_2**
   b. What is the limiting reactant? **KI**
   c. For the reactant in excess, how many moles are left over at the end of the reaction? **0.24 mol $CuCl_2$**

   0.56 mol $CuCl_2$ * (1 mol I_2 / 2 mol $CuCl_2$) = 0.28 mol I_2
   0.64 mol KI * (1 mol I_2/ 4 mol KI) = 0.16 mol I_2

   0.16 mol I_2 * (2 mol $CuCl_2$ / 1 mol I_2) = 0.32 mol $CuCl_2$ used up

   0.56 mol $CuCl_2$
   –0.32 mol $CuCl_2$
   0.24 mol $CuCl_2$

4. Consider the following reaction: $4\ FeS_2 + 11\ O_2 \rightarrow 2\ Fe_2O_3 + 8\ SO_2$
   a. When 26.62 moles of FeS_2 reacts with 5.44 moles of O_2, how many moles of SO_2 are formed? **3.96 mol SO_2**
   b. What is the limiting reactant? **O_2**
   c. For the reactant in excess, how many moles are left over at the end of the reaction? **24.64 mol FeS_2**

   26.62 mol FeS_2 * (8 mol SO_2 / 4 mol FeS_2) = 53.24 mol SO_2
   5.44 mol O_2 * (8 mol SO_2/ 11 mol O_2) = 3.96 mol SO_2

   3.96 mol SO_2 * (4 mol FeS_2 / 8 mol SO_2)= 1.98 mol FeS_2 used up

   26.62 mol FeS_2
   –1.98 mol FeS_2
   24.64 mol FeS_2