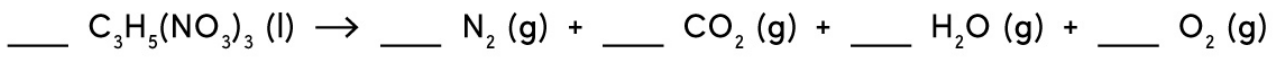
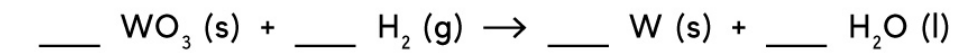
Name : _____ Date : _____

Limiting Reagent and Percentage Yield

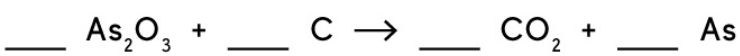
1. When nitroglycerine detonates, it produces a gaseous mixture of nitrogen, water, carbon dioxide, and oxygen. What is the theoretical yield of nitrogen when 5.55 g of nitroglycerine explodes? If the actual amount of nitrogen obtained is 0.991 g, what is the percentage yield? (Balance the reaction first)



2. What is the percentage yield of a chemical reaction in which 41.5 g of solid tungsten (VI) oxide reacts with excess hydrogen to produce metallic tungsten and 9.5 mL of water? The density of water is 1.00 g/mL



3. Arsenic (III) oxide is heated with carbon, which reduces the oxide to arsenic metal according to the following unbalanced equation:



Balance the equation. Suppose 8.87 g of As_2O_3 is used in the reaction and 5.33 g of As is produced. What is the percentage yield?

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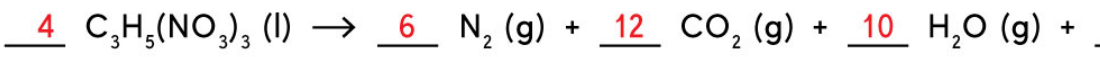
Limiting Reagent and Percentage Yield

Answers

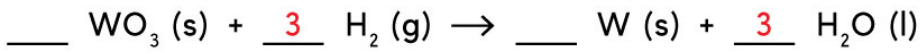
1. When nitroglycerine detonates, it produces a gaseous mixture of nitrogen, water, carbon dioxide, and oxygen. What is the theoretical yield of nitrogen when 5.55 g of nitroglycerine explodes? If the actual amount of nitrogen obtained is 0.991 g, what is the percentage yield? (Balance the reaction first)



$$5.55\ g\ C_3H_5(NO_3)_3 \times \frac{1\ mol\ C_3H_5(NO_3)_3}{277.1\ g\ C_3H_5(NO_3)_3} \times \frac{6\ mol\ N_2}{4\ mol\ C_3H_5(NO_3)_3} \times \frac{28.02\ g\ N_2}{1\ mol\ N_2} = 1.03\ g\ N_2\ (theoretical)$$

$$Percentage\ yield = \frac{actual\ yield}{theoretical\ yield} \times 100 = \frac{0.991\ g}{1.03\ g} \times 100 = 96.2\%$$

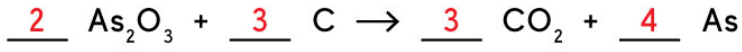
2. What is the percentage yield of a chemical reaction in which 41.5 g of solid tungsten (VI) oxide reacts with excess hydrogen to produce metallic tungsten and 9.5 mL of water? The density of water is 1.00 g/mL



$$41.5\ g\ WO_3 \times \frac{1\ mol\ WO_3}{231.9\ g\ WO_3} \times \frac{3\ mol\ H_2O}{1\ mol\ WO_3} \times \frac{18.02\ g\ H_2O}{1\ mol\ H_2O} \times \frac{1\ mL\ H_2O}{1\ g\ H_2O} = 9.67\ mL\ H_2\ (theoretical)$$

$$Percentage\ yield = \frac{actual\ yield}{theoretical\ yield} \times 100 = \frac{9.5\ mL}{9.67\ mL} \times 100 = 98.2\%$$

3. Arsenic (III) oxide is heated with carbon, which reduces the oxide to arsenic metal according to the following unbalanced equation:



Balance the equation. Suppose 8.87 g of As_2O_3 is used in the reaction and 5.33 g of As is produced. What is the percentage yield?

$$8.87\ g\ As_2O_3 \times \frac{1\ mol\ As_2O_3}{197.84\ g\ As_2O_3} \times \frac{4\ mol\ As}{2\ mol\ As_2O_3} \times \frac{74.92\ g\ As}{1\ mol\ As} = 6.72\ g\ As\ (theoretical)$$

$$Percentage\ yield = \frac{actual\ yield}{theoretical\ yield} \times 100 = \frac{5.33\ g}{6.72\ g} \times 100 = 79.3\%$$