STOICHIOMETRY Worksheet

1. Ammonia is made industrially by reacting nitrogen and hydrogen under high pressure and in the presence of a catalyst. The equation is:

$$3\ H_2\ (g) + N_2\ (g) \rightarrow 2\ NH_3\ (g)$$

If 4.0 mol of H_2 react, how many moles of NH_3 will be produced?

2. Potassium chlorate is sometimes decomposed in the laboratory to generate oxygen. The reaction is:

$$2\ KClO_3\ (s) \rightarrow 2\ KCl\ (s) + 3\ O_2\ (g)$$

What mass of $KClO_3$ do you need to produce 0.5 mol of O_2?

3. How many moles of aluminum will be produced from 30.0 g of Al_2O_3 in the following reaction?

$$2\ Al_2O_3 \rightarrow 4\ Al + 3\ O_2$$

4. Methane burns in air by the following reaction:

$$CH_4\ (g) + 2\ O_2\ (g) \rightarrow CO_2\ (g) + 2\ H_2O\ (g)$$

What mass of water is produced by burning 500 g of methane?

5. Using the following equation:

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

How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and excess sulfuric acid?

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Answers

1. Ammonia is made industrially by reacting nitrogen and hydrogen under high pressure and in the presence of a catalyst. The equation is:

$$3\ H_2\ (g) + N_2\ (g) \rightarrow 2\ NH_3\ (g)$$

If 4.0 mol of H_2 react, how many moles of NH_3 will be produced?

4.0 mol H_2 x (2 mol NH_3/3 mol H_2) = 2.67 mol NH_3

2. Potassium chlorate is sometimes decomposed in the laboratory to generate oxygen. The reaction is:

$$2\ KClO_3\ (s) \rightarrow 2\ KCl\ (s) + 3\ O_2\ (g)$$

What mass of $KClO_3$ do you need to produce 0.5 mol of O_2?

0.5 mol O_2 x (2 mol $KClO_3$/3 mol O_2) x (122.5 g $KClO_3$/1 mol $KClO_3$) = 40.8 g $KClO_3$

3. How many moles of aluminum will be produced from 30.0 g of Al_2O_3 in the following reaction?

$$2\ Al_2O_3 \rightarrow 4\ Al + 3\ O_2$$

30 g Al_2O_3 x (1 mol Al_2O_3 /101.96 mol Al_2O_3) x (4 mol Al/2 mol Al_2O_3) = 0.588 mol Al

4. Methane burns in air by the following reaction:

$$CH_4\ (g) + 2\ O_2\ (g) \rightarrow CO_2\ (g) + 2\ H_2O\ (g)$$

What mass of water is produced by burning 500 g of methane?

500 g CH_4 x (1 mol CH_4/16.01 g CH_4) x (2 mol H_2O/1 mol CH_4)
x (18.02 g H_2O/1 mol H_2O) = 1126 g H_2O

5. Using the following equation:

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

How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and excess sulfuric acid?

200 g NaOH x (1 mol NaOH/40 g NaOH) x (1 mol Na_2SO_4/2 mol NaOH)
x (142.04 g Na_2SO_4/1 mol Na_2SO_4) = 355 g Na_2SO_4