Name _____
Class _____ Block ___
Teacher _____
Date _____

Stoichiometry and Titration

Show all work for the following problems.

1. How many moles of water are produced if 3.6 moles of hydrogen react with 3.6 moles of oxygen?
Limiting reactant:

2. How many moles of water are produced if 3.6 g of hydrogen react with 3.6 g of oxygen?
Limiting reactant:

3. How many grams of water are produced if 3.6 g of hydrogen react with 3.6 g of oxygen?
Limiting reactant:

4. How many grams of water are produced if 3.6 g of sodium hydroxide react with 3.6 g of hydrochloric acid?
Limiting reactant:

5. What is the molarity of sodium hydroxide if 3.6 g is dissolved in 200.0 mL of water?

6. What is the molarity of hydrochloric acid if 3.6 g is dissolved in 200.0 mL of water?

7. What is the molarity of hydrochloric acid if it is diluted from 1 L of 12 M concentrated acid and you now have 15 L?

8. What is the molarity of hydrochloric acid if 10 mL of it completely neutralizes with 45 mL of 2.0 M sodium hydroxide?

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Stoichiometry and Titration

Show all work for the following problems.

1. How many moles of water are produced if 3.6 moles of hydrogen react with 3.6 moles of oxygen?

Limiting reactant: H_2

$2H_2 + O_2 \rightarrow 2H_2O$

$3.6\ mol\ H_2 \times \frac{2\ mol\ H_2O}{2\ mol\ H_2} = 3.6\ mol\ H_2O$

$3.6\ mol\ O_2 \times \frac{2\ mol\ H_2O}{1\ mol\ O_2} = 7.2\ mol\ H_2O$

2. How many moles of water are produced if 3.6 g of hydrogen react with 3.6 g of oxygen?

Limiting reactant: O_2

$3.6\ g\ H_2 \times \frac{1\ mol\ H_2}{2.016\ g\ H_2} \times \frac{2\ mol\ H_2O}{2\ mol\ H_2} = 1.8\ mol\ H_2O$

$3.6\ g\ O_2 \times \frac{1\ mol\ O_2}{32\ g\ O_2} \times \frac{2\ mol\ H_2O}{1\ mol\ O_2} = 0.23\ mol\ H_2O$

3. How many grams of water are produced if 3.6 g of hydrogen react with 3.6 g of oxygen?

Limiting reactant: O_2

$3.6\ g\ H_2 \times \frac{1\ mol\ H_2}{2.016\ g\ H_2} \times \frac{2\ mol\ H_2O}{2\ mol\ H_2} \times \frac{18.016\ g\ H_2O}{1\ mol\ H_2O} = 32\ g\ H_2O$

$(1.008)2 + 16 = 18.016\ g$

$3.6\ g\ O_2 \times \frac{1\ mol\ O_2}{32\ g\ O_2} \times \frac{2\ mol\ H_2O}{1\ mol\ O_2} \times \frac{18.016\ g\ H_2O}{1\ mol\ H_2O} = 4.1\ g\ H_2O$

4. How many grams of water are produced if 3.6 g of sodium hydroxide react with 3.6 g of hydrochloric acid?

Limiting reactant: NaOH

$NaOH + HCl \rightarrow NaCl + H_2O$

$3.6\ g\ NaOH \times \frac{1\ mol\ NaOH}{40.008\ g} \times \frac{1\ mol\ H_2O}{1\ mol\ NaOH} \times \frac{18.016\ g\ H_2O}{1\ mol\ H_2O} = 1.6\ g\ H_2O$

$NaOH = 23 + 16 + 1.008 = 40.008\ g$

$HCl = 1.008 + 35.45 = 36.458\ g$

$3.6\ g\ HCl \times \frac{1\ mol\ HCl}{36.458\ g} \times \frac{1\ mol\ H_2O}{1\ mol\ HCl} \times \frac{18.016\ g\ H_2O}{1\ mol\ H_2O} = 1.8\ g\ H_2O$

5. What is the molarity of sodium hydroxide if 3.6 g is dissolved in 200.0 mL of water?

$\frac{mol}{L} = M$

$3.6\ g\ NaOH \times \frac{1\ mol\ NaOH}{40.008\ g} = 0.08998\ mol$

$200.0\ mL \times \frac{1\ L}{1000\ mL} = .2000$

$\frac{.08998\ mol}{.2000\ L} = 0.45\ M$

6. What is the molarity of hydrochloric acid if 3.6 g is dissolved in 200.0 mL of water?

$3.6\ g\ HCl \times \frac{1\ mol\ HCl}{36.458\ g\ HCl} = 0.09874376\ mol\ HCl$

$M = \frac{0.09874376\ mol}{0.2000\ L} = 0.49\ M\ HCl$

7. What is the molarity of hydrochloric acid if it is diluted from 1 L of 12 M concentrated acid and you now have 15 L?

$MV = MV$

$(12\ M)(1\ L) = M(15\ L)$

$M = 0.8\ M$

8. What is the molarity of hydrochloric acid if 10 mL of it completely neutralizes with 45 mL of 2.0 M sodium hydroxide?

$MV = MV$

$M(10\ mL) = (2.0\ M)(45\ mL)$

$M = 9\ M\ HCl$