Name _____
Class _____ Block ___
Teacher _____
Date _____

H₂O each time

Stoichiometry and Titration

(circled) 1-4
2 sig. figs

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:

$3.6 \text{ mol } H_2 \times \dfrac{2 \text{ mol } H_2O}{2 \text{ mol } H_2} = \boxed{3.6 \text{ mol } H_2O}$ $\boxed{L.R. = H_2}$

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

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

$36 \text{ g } H_2 \times \dfrac{1 \text{ mol } H_2}{2.016 \text{ g } H_2} \times \dfrac{2 \text{ mol } H_2O}{2 \text{ mol } H_2} = 1.78 = 1.8 \text{ mol } H_2O$

$3.6 \text{ g } O_2 \times \dfrac{1 \text{ mol } O_2}{32.00 \text{ g } O_2} \times \dfrac{2 \text{ mol } H_2O}{1 \text{ mol } O_2} = 0.225 = \boxed{0.23 \text{ mol } H_2O}$ $\boxed{LR = O_2}$

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

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

$3.6 \text{ g } O_2 \times \dfrac{1 \text{ mol } O_2}{32.00 \text{ g } O_2} \times \dfrac{2 \text{ mol } H_2O}{1 \text{ mol } O_2} \times \dfrac{18.016 \text{ g } H_2O}{1 \text{ mol } H_2O} = \boxed{4.1 \text{ g } H_2O}$ $\boxed{LR = O_2}$

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: $NaOH + HCl \rightarrow NaCl + H_2O$ (Balanced) $NaOH = 22.99 + 16 + 1.008 / HCl = 1.008 + 35.45$

$3.6 \text{ g } NaOH \times \dfrac{1 \text{ mol } NaOH}{39.99 \text{ g } NaOH} \times \dfrac{1 \text{ mol } H_2O}{1 \text{ mol } NaOH} \times \dfrac{18.016 \text{ g } H_2O}{1 \text{ mol } H_2O} = \boxed{1.6 \text{ g } H_2O}$ $\boxed{LR = NaOH}$

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

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?

L.R. each time

Stoichiometry and Titration

1-4
2 sig figs

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:

$3.6 \, mol \, H_2 \times \dfrac{1 \, mol \, O_2}{2 \, mol \, H_2} = 1.8 \, mol \, O_2$ O_2 is excess, H_2 is limiting

$3.6 \, mol \, H_2 \times \dfrac{2 \, mol \, H_2O}{2 \, mol \, H_2} = 3.6 \, mol \, H_2O$

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

$3.6 \, g \, H_2 \times \dfrac{1 \, mol \, H_2}{2.016 \, g \, H_2} \times \dfrac{1 \, mol \, O_2}{2 \, mol \, H_2} \times \dfrac{32.00 \, g \, O_2}{1 \, mol \, O_2} = 29 \, g \, O_2$ O_2 is limiting

$3.6 \, g \, O_2 \times \dfrac{1 \, mol \, O_2}{32.00 \, g \, O_2} \times \dfrac{2 \, mol \, H_2O}{1 \, mol \, O_2} = 0.23 \, mol \, H_2O$

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

$3.6 \, g \, H_2 \times \dfrac{1 \, mol \, H_2}{2.016 \, g \, H_2} \times \dfrac{1 \, mol \, O_2}{2 \, mol \, H_2} \times \dfrac{32.00 \, g \, O_2}{1 \, mol \, O_2} = 29 \, g \, O_2$ O_2 is limiting

$3.6 \, g \, O_2 \times \dfrac{1 \, mol \, O_2}{32.00 \, g \, O_2} \times \dfrac{2 \, mol \, H_2O}{1 \, mol \, O_2} \times \dfrac{18.016 \, g \, H_2O}{1 \, mol \, H_2O} = 4.1 \, g \, H_2O$

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:

$3.6 \, g \, NaOH \times \dfrac{1 \, mol \, NaOH}{39.998 \, g \, NaOH} \times \dfrac{1 \, mol \, HCl}{1 \, mol \, NaOH} \times \dfrac{36.458 \, g \, HCl}{1 \, mol \, HCl} = 3.3 \, g \, HCl$ $NaOH$ is limiting

$3.6 \, g \, NaOH \times \dfrac{1 \, mol \, NaOH}{39.998 \, g \, NaOH} \times \dfrac{1 \, mol \, H_2O}{1 \, mol \, NaOH} \times \dfrac{18.016 \, g \, H_2O}{1 \, mol \, H_2O} = 1.6 \, g \, H_2O$

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?

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