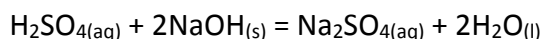


Answer on Question #48206 - Chemistry – Other

Question

Aqueous sulfuric acid will react with solid sodium hydroxide to produce aqueous sodium sulfate and liquid water. Suppose 8.8 g of sulfuric acid is mixed with 6.48 g of sodium hydroxide. Calculate the maximum mass of water that could be produced by the chemical reaction. Be sure your answer has the correct number of significant digits.

Answer: Balanced reaction equation is:



Molar masses of the reactants equal:

$$M(\text{H}_2\text{SO}_4) = 98 \text{ g/mol}, \quad M(\text{NaOH}) = 40 \text{ g/mol}$$

Number of moles of the reactants are:

$$n(\text{H}_2\text{SO}_4) = \frac{m(\text{H}_2\text{SO}_4)}{M(\text{H}_2\text{SO}_4)} = \frac{8.8}{98} = 0.090 \text{ mol}$$

$$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{6.48}{40} = 0.16 \text{ mol}$$

Then we make a proportion:

1 mole of H_2SO_4 reacts with 2 moles of NaOH

0.090 moles of H_2SO_4 – x moles of NaOH

$$x = \frac{0.090 \cdot 2}{1} = 0.18 \text{ moles of NaOH should react with 0.090 moles of } \text{H}_2\text{SO}_4$$

There are only 0.16 moles of sodium hydroxide, therefore it is the limiting reactant.

We need to make another proportion to calculate the maximum mass of H_2O that could be produced by the chemical reaction:

2 moles of NaOH produce 2 moles of H_2O

0.16 moles of NaOH – x moles of H_2O

$$x = \frac{0.16 \cdot 2}{2} = 0.16 \text{ moles of } \text{H}_2\text{O could be produced}$$

The mass of H_2O equals:

$$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 0.16 \cdot 18 = 2.9 \text{ g}$$

Answer: 2.9 g of H_2O