

How many grams of water can be produced when 65.5 grams of sodium hydroxide reacts with excess sulfuric acid?

Unbalanced equation: $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{H}_2\text{O} + \text{Na}_2\text{SO}_4$

Show, or explain, all of your work along with the final answer.

Solution:

$\text{H}_2\text{SO}_4 + 2 \text{NaOH} \rightarrow 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$

Find the amount of the substance sodium hydroxide:

$$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})}$$
$$n(\text{NaOH}) = \frac{65.5g}{40g/mole} = 1.64 \text{ mole}$$

Find the equation of the reaction mass of water which formed. Since sulfuric acid is reacted in excess, we find that the mass of water by weight sodium hydroxide:

$$\frac{n(\text{NaOH})}{n(\text{H}_2\text{O})} = \frac{2}{2} = \frac{1}{1}$$
$$\frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})}$$
$$m(\text{H}_2\text{O}) = \frac{m(\text{NaOH}) * M(\text{H}_2\text{O})}{M(\text{NaOH})}$$
$$m(\text{H}_2\text{O}) = \frac{65.5g * 18g/mole}{40g/mole} = 29.475g$$

Answer: 29.475 g of water.