

Answer on Question#67628 – Chemistry – General chemistry

Question:

A student performs an experiment where he reacts 15.5 g of NaOH w/ 25 grams of H₂SO₄

Calculate mass of each product that the reaction will produce

What is the excess reactant left at the end of reaction?

PLEASE SHOW ALL WORK I'M HERE TO LEARN NOT TO BE SPOONFED

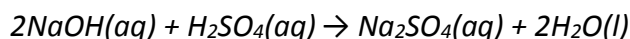
Solution:

1. Calculate moles of NaOH and H₂SO₄.

$$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{15.5 \text{ g}}{40 \text{ g/mol}} = 0.388 \text{ mol}$$

$$n(\text{H}_2\text{SO}_4) = \frac{m(\text{H}_2\text{SO}_4)}{M(\text{H}_2\text{SO}_4)} = \frac{25 \text{ g}}{98 \text{ g/mol}} = 0.255 \text{ mol}$$

2. There is a reaction between NaOH and H₂SO₄:



2 moles of NaOH is needed for every 1 mole of H₂SO₄.

$$\frac{n(\text{NaOH})}{2} = \frac{0.388 \text{ mol}}{2} = 0.194 \text{ mol} - \text{H}_2\text{SO}_4 \text{ is needed for}$$

reaction with 0.388 mol NaOH

$$n(\text{H}_2\text{SO}_4 \text{ excess}) = 0.255 \text{ mol} - 0.194 \text{ mol} = 0.061 \text{ mol or}$$

$$m(\text{H}_2\text{SO}_4 \text{ excess}) = 98 \frac{\text{g}}{\text{mol}} \times 0.061 \text{ mol} = 5.98 \text{ g}$$

3. Calculate mass of each product that the reaction will produce

$$n(\text{Na}_2\text{SO}_4) = \frac{1}{2}n(\text{NaOH}) = \frac{1}{2} \times 0.388 = 0.194 \text{ mol}$$

$$m(\text{Na}_2\text{SO}_4) = 142 \frac{\text{g}}{\text{mol}} \times 0.194 \text{ mol} = 27.6 \text{ g}$$

$$n(\text{H}_2\text{O}) = n(\text{NaOH}) = 0.388 \text{ mol}$$

$$m(\text{H}_2\text{O}) = 18 \frac{\text{g}}{\text{mol}} \times 0.388 \text{ mol} = 6.98 \text{ g}$$

Answer:

27.6 g Na₂SO₄ ; 6.98 g H₂O

5.98 g H₂SO₄ excess