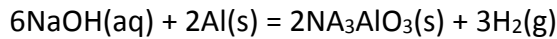


Answer on Question #51553 - Chemistry – Other

Question

If you have 100 g of NaOH and 100 g of Al to perform the reaction, how many grams of H₂ will you produce?



Answer:

Molar masses of the reactants equal:

$$M(\text{NaOH}) = 40 \text{ g/mol}, \quad M(\text{Al}) = 27 \text{ g/mol}$$

Number of moles of the reactants are:

$$n(\text{Al}) = \frac{m(\text{Al})}{M(\text{Al})} = \frac{100}{27} = 3.7 \text{ mol}$$

$$n(\text{NaOH}) = \frac{m(\text{NaOH})}{M(\text{NaOH})} = \frac{100}{40} = 2.5 \text{ mol}$$

Then we make a proportion:

2 moles of Al react with 6 moles of NaOH

3.7 moles of Al – x moles of NaOH

$$x = \frac{3.7 \cdot 6}{2} = 11.1 \text{ moles of NaOH should react with 3.7 moles of Al}$$

There are only 2.5 moles of sodium hydroxide, therefore it is the limiting reactant.

We need to make another proportion to calculate the mass of H₂ that could be produced by the chemical reaction:

6 moles of NaOH produce 3 moles of H₂

2.5 moles of NaOH – x moles of H₂

$$x = \frac{2.5 \cdot 3}{6} = 1.25 \text{ moles of H}_2 \text{ could be produced}$$

The mass of H₂ equals:

$$m(\text{H}_2) = n(\text{H}_2) \cdot M(\text{H}_2) = 1.25 \cdot 2 = 2.5 \text{ g}$$

Answer: 2.5 g of H₂

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