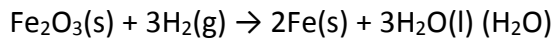


Answer on Question #55664 - Chemistry – General chemistry

Question

For each of the following reactions, calculate the grams of indicated product when 16.9 g of the first reactant and 10.4 g of the second reactant is used:



Answer:

Number of moles of the reactants are:

$$n(\text{Fe}_2\text{O}_3) = \frac{m(\text{Fe}_2\text{O}_3)}{M(\text{Fe}_2\text{O}_3)} = \frac{16.9}{159.69} = 0.106 \text{ mol}$$

$$n(\text{H}_2) = \frac{m(\text{H}_2)}{M(\text{H}_2)} = \frac{10.4}{2.016} = 5.159 \text{ mol}$$

Then we make a proportion:

1 mole of Fe_2O_3 reacts with 3 moles of H_2

0.106 moles of Fe_2O_3 – x moles of H_2

$$x = \frac{0.106 \cdot 3}{1} = 0.318 \text{ moles of } \text{H}_2 \text{ should react with } 0.106 \text{ moles of } \text{Fe}_2\text{O}_3$$

There are 5.159 moles of hydrogen – it's too much, therefore Fe_2O_3 is the limiting reactant.

We need to make another proportion to calculate the mass of H_2O formed:

1 mole of Fe_2O_3 produces 3 moles of H_2O

0.106 moles of Fe_2O_3 – x moles of H_2O

$$x = \frac{0.106 \cdot 3}{1} = 0.318 \text{ moles of } \text{H}_2\text{O} \text{ is formed}$$

The mass of H_2O is:

$$m(\text{H}_2\text{O}) = n(\text{H}_2\text{O}) \cdot M(\text{H}_2\text{O}) = 0.318 \cdot 18 = 5.724 \text{ g}$$

Answer: 5.724 g of H_2O