

- a. Identify the limiting reagent when 15.0 g of H_2 reacts with 48.0 g of O_2 to produce water.
b. What is the mass of water produced?

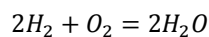
Solution:

We are given:

$$m(H_2) = 15 \text{ g}$$

$$m(O_2) = 48 \text{ g}$$

Reaction equation:



Amount of substance of H_2 :

$$v(H_2) = \frac{m(H_2)}{Mr(H_2)} = \frac{15}{2 * 1} = 7.5 \text{ mol}$$

Amount of substance of O_2 :

$$v(O_2) = \frac{m(O_2)}{Mr(O_2)} = \frac{48}{16 * 2} = 1.5 \text{ mol}$$

According to the reaction equation:

$$\frac{v(H_2)}{v(O_2)} = \frac{2}{1}$$

Obviously, **oxygen O_2 is the limiting reagent**. Only 3 mol of H_2 are required to react with 1.5 mol of O_2

According to the reaction equation:

$$\frac{v(O_2)}{v(H_2O)} = \frac{1}{2}$$

Thus:

$$v(H_2O) = 1.5 * 2 = 3 \text{ mol}$$

$$m(H_2O) = v(H_2O) * Mr(H_2O) = 3 * 18 = \mathbf{54 \text{ g}}$$

Answer:

- a. O_2
b. 54 g

References:

1. http://en.wikipedia.org/wiki/Molecular_mass