Answer on the question #66415, Chemistry / Other
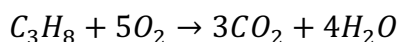
Question:

If you start with 11.8 g of C3H8 and 5.44 g of O2 which one is the limiting reagent?

Solution:

The reaction equation is:
$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$
Thus, the relation of number of the moles of propane and oxygen is 1 to 5:
$$n(C_3H_8) = \frac{n(O_2)}{5}$$
Let's calculate the number of the moles of propane and oxygen from their masses:

$$n(C_3H_8) = \frac{m(C_3H_8)}{M(C_3H_8)} = \frac{11.8(g)}{44.0956(g\ mol^{-1})} = 0.2676(mol)$$

$$n(O_2) = \frac{m(O_2)}{M(O_2)} = \frac{5.44(g)}{31.9988(g\ mol^{-1})} = 0.1700\ (mol)$$

When we multiply the number of the moles of propane by 5, we get the number of the moles of oxygen required for complete combustion: 0.2676*5=1.338 (mol). The number of the moles of oxygen given is less:

0.1700<1.338

Thus, oxygen is the limiting reagent.

Answer: Oxygen is the limiting reagent, as it's number of the moles is inferior to the number of the moles required for combustion of 11.8 g of propane.