Answer on Question #43459 - Chemistry - Inorganic Chemistry

Question:

Consider the reaction
C_6H_{12} + 9 O_2 –> 6 CO_2 + 6 H_2O
How many grams of O_2 are consumed when C_6H_{12} is burned to yield 2.5 grams of CO_2?
Give your answer in 1 decimal.

Solution:

Number of moles of CO_2 is calculated as

$$n_{CO_2} = \frac{m_{CO_2}}{M_{CO_2}} = \frac{2.5\ g}{44.0\ g/mol} = 0.057\ mol$$

where M_{CO_2} – molar weight of CO_2.
As is clear from the reaction stoichiometry, **9** moles of O_2 are consumed to yield **6** moles of CO_2. Having calculated the actual number of moles of CO_2 we can write down the proportion:
6 mol (CO_2) – 9 mol (O_2)
0.057 mol (CO_2) – n_{O_2} mol (O_2),
whence

$$n_{O_2} = \frac{0.057 \cdot 9}{6} = 0.085\ mol$$

Mass of O_2 consumed is

$$m_{O_2} = n_{O_2} \cdot M_{O_2} = 0.085 \cdot 32.0 = 2.7\ g$$

where M_{O_2} – molar weight of O_2.

Answer: 2.7 g