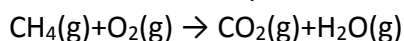


Answer on Question#54709 – Chemistry – General Chemistry

Question 1:

When methane (CH₄) burns, it reacts with oxygen gas to produce carbon dioxide and water.

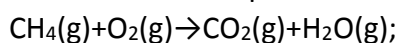
The unbalanced equation for this reaction is



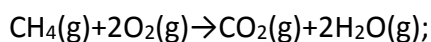
This type of reaction is referred to as a complete combustion reaction.

Solution:

The unbalanced equation for this reaction is



The balanced equation is



Question 2:

What mass of carbon dioxide is produced from the complete combustion of 9.00×10^{-3} g of methane?

Express your answer with the appropriate units.

Solution:

$$m(\text{CH}_4) = 9.00 \times 10^{-3} \text{ g};$$

$$v = m/M;$$

$$v(\text{CH}_4) = m(\text{CH}_4)/M(\text{CH}_4);$$

$$v(\text{CH}_4) = 5.625 \times 10^{-4} \text{ mol};$$

According to the balanced equation of the reaction: $v(\text{CH}_4) : v(\text{CO}_2) = 1:1$;

$$v(\text{CH}_4) = v(\text{CO}_2);$$

$$M(\text{CO}_2) = 44 \text{ g/mol};$$

$$m(\text{CO}_2) = M(\text{CO}_2) \times v(\text{CO}_2);$$

$$m(\text{CO}_2) = 0,02475 \text{ g}$$

Answer: 2.475×10^{-2} g

Question 3:

What mass of water is produced from the complete combustion of 9.00×10^{-3} g of methane?

Express your answer with the appropriate units.

Solution:

$$M(\text{H}_2\text{O}) = 18 \text{ g/mol};$$

According to the balanced equation of the reaction: $v(\text{CH}_4) : v(\text{H}_2\text{O}) = 1:2$;

$$v(\text{H}_2\text{O}) = v(\text{CH}_4) \times 2 = 1.125 \times 10^{-3} \text{ mol};$$

$$m(\text{H}_2\text{O}) = M(\text{H}_2\text{O}) \times v(\text{H}_2\text{O}) = 0.02025 = 2.025 \times 10^{-2} \text{ g}$$

Answer: $2.025 \times 10^{-2} \text{ g}$

Question 4:

What mass of oxygen is needed for the complete combustion of $9.00 \times 10^{-3} \text{ g}$ of methane?
Express your answer with the appropriate units.

Solution:

$$M(\text{O}_2) = 32 \text{ g/mol};$$

According to the balanced equation of the reaction: $v(\text{CH}_4) : v(\text{O}_2) = 1:2$;

$$v(\text{O}_2) = v(\text{CH}_4) \times 2 = 1.125 \times 10^{-3} \text{ mol};$$

$$m(\text{O}_2) = M(\text{O}_2) \times v(\text{O}_2) = 0.036 = 3.6 \times 10^{-2} \text{ g}$$

Answer: $3.6 \times 10^{-2} \text{ g}$