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
$CH_4(g)+O_2(g) \rightarrow CO_2(g)+H_2O(g)$
This type of reaction is referred to as a complete combustion reaction.

Solution:

The unbalanced equation for this reaction is
$CH_4(g)+O_2(g)\rightarrow CO_2(g)+H_2O(g)$;

The balanced equation is

$CH_4(g)+2O_2(g)\rightarrow CO_2(g)+2H_2O(g)$;

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:

$m(CH_4) = 9.00 \text{ x } 10^{-3}$ g;

ν=m/M;

$\nu(CH_4) = m(CH_4)/M(CH_4)$;

$\nu(CH_4) = 5.625\text{x}10^{-4}$ mol;

According to the balanced equation of the reaction: ν(CH4): ν(CO2) = 1:1;

$\nu(CH_4) = \nu(CO_2)$;

$M(CO_2) = 44$ g/mol;

$m(CO_2) = M(CO_2)\text{x } \nu(CO_2)$;

$m(CO_2) = 0{,}02475$ g

Answer: $2.475\text{x}10_{-2}$ 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:

$M(H_2O)$ = 18 g/mol;

According to the balanced equation of the reaction: $\nu(CH_4)$: $\nu(H_2O)$ = 1:2;

$\nu(H_2O) = \nu(CH_4) x2 = 1.125x10^{-3}$ mol;

$m(H_2O) = M(H_2O) x\ \nu(H_2O) = 0.02025 = 2.025x10^{-2}$ g

Answer: $2.025x10^{-2}$ g

Question 4:
What mass of oxygen is needed for the complete combustion of 9.00×10−3 g of methane? Express your answer with the appropriate units.

Solution:

$M(O_2)$ = 32 g/mol;

According to the balanced equation of the reaction: $\nu(CH_4)$: $\nu(O_2)$ = 1:2;

$\nu(O_2) = \nu(CH_4) x2 = 1.125x10^{-3}$ mol;

$m(O_2) = M(O_2) x\ \nu(O_2) = 0.036 = 3.6x10^{-2}$ g

Answer: $3.6x10^{-2}$ g