Answer on Question #40480, Chemistry, Other

Task:

Glucose, $C_6H_{12}O_6$, is used as an energy source for the human body. The overall reaction in the body is described by the equation:

$C_6H_{12}O_6(aq)+6O_2(g)=6CO_2(g)+6H_2O(l)$

Calculate the number of grams of oxygen, required to convert 43.0 g of glucose to CO_2 and H_2O. Also compute the number of grams of CO_2 produced.

Answer:

$C_6H_{12}O_6(aq)+6O_2(g)=6CO_2(g)+6H_2O(l)$

$$\nu=\frac{m}{M}$$

where m-mass, grams;

M-molar mass, gram/mol.

$M(C_6H_{12}O_6)=180\,g/mol$

$$\nu(C_6H_{12}O_6)=\frac{43.0}{180}=0.24 \text{ moles}$$

The amount of moles of O_2 is 6 times greater, than that of $C_6H_{12}O_6$:

$\nu(O_2)=6\cdot\nu(C_6H_{12}O_6)=6\cdot0.24=1.44$ moles

$m(O_2)=\nu(O_2)\cdot M(O_2)$

$M(O_2)=32\,g/mol$

That is why the mass of O_2 is equal to:

$m(O_2)=1.44\cdot32.0=46.1\,g$

$\nu(CO_2)=\nu(O_2)=6\cdot\nu(C_6H_{12}O_6)=6\cdot0.24=1.44$ moles

$m(CO_2)=\nu(CO_2)\cdot M(CO_2)$

$M(CO_2)=44.0$ g/mol

That is why the mass of CO_2 is equal to:

$m(CO_2)=1.44\cdot44.0=63.4\,g$