Marks 3

- The balanced equation for the complete oxidation of glucose to carbon dioxide and water is given below.

$$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$$

Calculate the mass of carbon dioxide produced by the complete oxidation of 1.00 g of glucose.

The molar mass of glucose is:

(6 × 12.01 (C)) + (12 × 1.008 (H)) + (6 × 16.00 (O)) = 180.156

1.0 g of glucose corresponds to $\frac{\textbf{mass}}{\textbf{molar mass}} = \frac{\textbf{1.00}}{\textbf{180.156}} = \textbf{0.00555 mol}$

From the chemical equation, oxidation of 1 mol of glucose leads 6 mol of CO_2. Hence the number of moles of CO_2 produced is 6 × 0.00555 = 0.0333 mol.

The molar mass of CO_2 is (12.01 (C)) + (2 × 16.00 (O)) = 44.01

Therefore, the number of mass of CO_2 produced is:

mass = number of moles × molar mass = 0.0333 × 44.01 = 1.47 g

Answer: **1.47 g**

Calculate the volume of this mass of carbon dioxide at 0.50 atm pressure and 37 °C.

The ideal gas law gives PV = nRT, hence:

$$\textbf{V} = \frac{\textbf{nRT}}{\textbf{P}} = \frac{\textbf{(0.0333)×(0.08206)×(273+37)}}{\textbf{(0.50)}} = \textbf{1.69 L}$$

Answer: **1.69 L**