Worked example 1 – Chapter 11

This example shows how to handle significant figures in calculations where the original data includes values with different numbers of significant figures.

An ideal gas occupies 5.9 × 10^{-6} m^3 at 425 K and 2.0 × 10^5 Pa. How many moles of gas are present? R = 8.31 J K^{-1} mol^{-1}.

The quantities are quoted to either two or three significant figures.

volume of gas = $5.9 \times 10^{-6} \pm 0.05 \times 10^{-6}$ m^3

temperature = 425 ± 0.5 K

pressure = $2.0 \times 10^5 \pm 0.05 \times 10^5$ Pa

The equation for working out the number of moles of gas is:

$$n = \frac{2.0\times10^5\times5.9\times10^{-6}}{8.31\times425}$$

$$= 3.3411 \times 10^{-4} \text{ mol}$$

Inserting the maximum and minimum values into the equation gives

maximum = 3.4577×10^{-4} mol

minimum = 3.2262×10^{-4} mol

The difference between the calculated values is in the first position after the decimal place. Therefore, the value should be quoted to **two** significant figures: 3.3×10^{-4} mol.

This supports the rule that the final answer should be quoted to the number of significant figures of the piece of data with the **fewest** significant figures.