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B.3 Gas laws

Checklist

What you should know

After studying this subtopic, you should be able to:

- Calculate pressure using the equation:

$$P = \frac{F}{A}$$

- Define the mole and calculate the amount of substance using the equation:

$$n = \frac{N}{N_\mathrm{A}}$$

- Define what an ideal gas is, describe its properties and state the conditions under which an ideal gas best approximates a real gas.

- Relate simulated experimental data to the empirical gas laws and thereby deduce the ideal gas law equation.

- Apply the first, second and third gas laws.

- Calculate the properties of a gas using the equations:

$$\frac{PV}{T} = \text{constant},$$

$$PV = nRT$$

and

$$PV = Nk_\mathrm{B}T$$

- Calculate the internal energy of an ideal gas using the equations:

$$U = \frac{3}{2}Nk_\mathrm{B}T$$

and

$$U = \frac{3}{2}RnT$$

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- Apply the concepts of force and momentum to explain how gas pressure arises.

- Calculate the pressure of an ideal gas using the equation:

$$P = \frac{1}{3}\rho v^2$$

Practical skills

Once you have completed this subtopic, go to Practical 4: Investigating an ideal gas law (https://app.kognity.com/study/app/physics/sid-423-cid-762593/book/investigating-an-ideal-gas-law-id-46508/) in which you can model the ideal gas behaviour.

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