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QUESTION WORKBOOK

Ideal gases and the gas laws

Thermal physics · Year 13

AQA 3.6.2.2 · CIE 14.2, 15.1, 15.2 · OCR A 5.1.4

10 questions · 30 marks

PRINT EDITION

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SECTION A · Warm-up

A1 State Boyle's law for a fixed mass of gas. [2]

A2 A gas has 2.0 mol in a volume of 0.05 m^3 at 300 K. Calculate its pressure using $pV = nRT$ ($R = 8.31$ J mol^{-1} K^{-1}). [2]

A3 Explain how extrapolating a graph of pressure against temperature leads to the idea of absolute zero. [2]

SECTION B · Standard

B1 A gas at 1.0×10^5 Pa occupies 0.020 m^3. It is compressed at constant temperature to 0.005 m^3. Calculate its new pressure. [3]

B2 Calculate the volume occupied by 0.50 mol of an ideal gas at a pressure of 2.0×10^5 Pa and a temperature of 300 K. [4]

B3 A container of volume 0.010 m^3 holds 3.0×10^{23} gas molecules at 290 K. Calculate the pressure using $pV = NkT$ ($k = 1.38 \times 10^{-23}$ J K^{-1}). [3]

B4 A gas of volume 0.010 m^3 at 300 K is heated at constant pressure to 400 K. Calculate its new volume. [3]

SECTION C · Stretch

C1 A gas expands from 0.010 m^3 to 0.015 m^3 at a constant pressure of 2.0×10^5 Pa. Calculate the work done by the gas. [4]

C2 A gas occupies 0.024 m^3 at a pressure of 1.0×10^5 Pa and a temperature of 300 K. Calculate the number of molecules present. [4]

C3 State the conditions under which a real gas behaves most like an ideal gas. [3]