GET BETTER AT PHYSICS · MARK SCHEME

Gas Laws & the Ideal Gas Equation: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.6.2.2 · 6 questions · 6 marks

1 mark per correct letter | Worked reasoning for every question | **How students did** = from AQA examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5	Q6
D	C	B	A	C	A

Easy

Questions 1–3

1 **D**

What doubles when T doubles at constant volume? · AQA June 2022 · A-level Paper 2 · Q8

At constant volume $p \propto T$, so the pressure doubles. The internal energy of an ideal gas is all kinetic energy, which is proportional to T, so it doubles too: row D.

> **Watch out:** The rms speed is proportional to √T, and the density stays the same because neither the mass nor the volume changes.

2 **C**

Temperature from a p–V graph · AQA June 2025 · A-level Paper 2 · Q9

Read off a few points: 160 kPa × 100 cm^3 = 40 × 400 = 20 × 800 = 10 × 1600 = 16 000. pV is constant, so (for a fixed mass) T is constant as the pressure increases.

> **Watch out:** A curve that gets steeper does not by itself mean the temperature changes. Test pV at several points.

3 **B**

Final temperature after expanding · AQA June 2024 · A-level Paper 2 · Q10

$pV = nRT$, so $T \propto pV$. Initially pV = 5000 J at 300 K. At constant pressure the work done is $p\Delta V$ = 1660 J, so the new pV = 6660 J. T = 300 × 6660 ÷ 5000 = 400 K.

> **Watch out:** pV has units of joules, so the work done can be added directly to it.

Medium

Questions 4–6

4 **A**

Gradient of a p–θ graph · AQA June 2018 · A-level Paper 2 · Q8

The line passes through 100 Pa at 20 °C and would reach zero pressure at absolute zero, −273 °C. Gradient = 100 ÷ (20 + 273) = 0.341 Pa $°C^{-1}$.

> **Watch out:** 5.00 (D) is 100 ÷ 20, which wrongly assumes the line passes through 0 °C.

How students did: 43.8% of students got this right in June 2018.

5 **C**

Boyle's law in a hanging syringe · AQA June 2025 · A-level Paper 2 · Q8

The weight pulls the plunger down, reducing the pressure of the gas: $\Delta p = F / A = 2.5 \div 1.0 \times 10^{-4} = 2.5 \times 10^4$ Pa. New pressure = 0.75×10^5 Pa. pV constant: V = 12 × (1.0 ÷ 0.75) = 16 cm^3.

> **Watch out:** The weight hangs below the plunger and pulls it outwards, so the gas pressure falls and the volume increases.

6 **A**

Mass of gas in two connected flasks · AQA November 2020 · A-level Paper 2 · Q8

No net transfer means the pressures are equal, so n = pV / RT ∝ V / T. X: 2V ÷ 100. Y: V ÷ 400. n_Y / n_X = (1/400) ÷ (2/100) = 1/8, so Y contains m/8.

Watch out: The hotter flask holds fewer particles per unit volume.

How students did: Between 30% and 50% of students got this right in November 2020.

End of mark scheme. Answers from AQA's published keys; explanations written for this pack. AQA material is © AQA. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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