FREE REVISION PACK

Gas Laws & the Ideal Gas Equation

AQA A-level Physics · 7408 · Specification 3.6.2.2

Easy | Medium | Multiple choice · past-paper questions

6	6	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	What doubles when T doubles at constant volume?	AQA June 2022 · A-level Paper 2 · Q8	1 mark
2	Easy	Temperature from a p–V graph	AQA June 2025 · A-level Paper 2 · Q9	1 mark
3	Easy	Final temperature after expanding	AQA June 2024 · A-level Paper 2 · Q10	1 mark
4	Medium	Gradient of a p–θ graph	AQA June 2018 · A-level Paper 2 · Q8	1 mark
5	Medium	Boyle's law in a hanging syringe	AQA June 2025 · A-level Paper 2 · Q8	1 mark
6	Medium	Mass of gas in two connected flasks	AQA November 2020 · A-level Paper 2 · Q8	1 mark

Key ideas to have ready

- Ideal gas equation: $pV = nRT = NkT$, with T in kelvin ($T = \theta + 273$).
- Boyle's law (constant T): pV constant. Charles's law (constant p): $V \propto T$. Pressure law (constant V): $p \propto T$.
- A p–θ (or V–θ) line extrapolates to zero at absolute zero, −273 °C.
- Work done by a gas at constant pressure = $p\Delta V$. Gases at the same pressure share their particles according to $n = pV / RT$.

How to use this pack

1. The questions are grouped into levels (Easy and Medium). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in AQA's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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Easy

Definitions and one-step ideas. Most students get these right.

Questions 1–3

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2022 · A-level Paper 2 · Q8

1 A fixed volume of an ideal gas is heated.

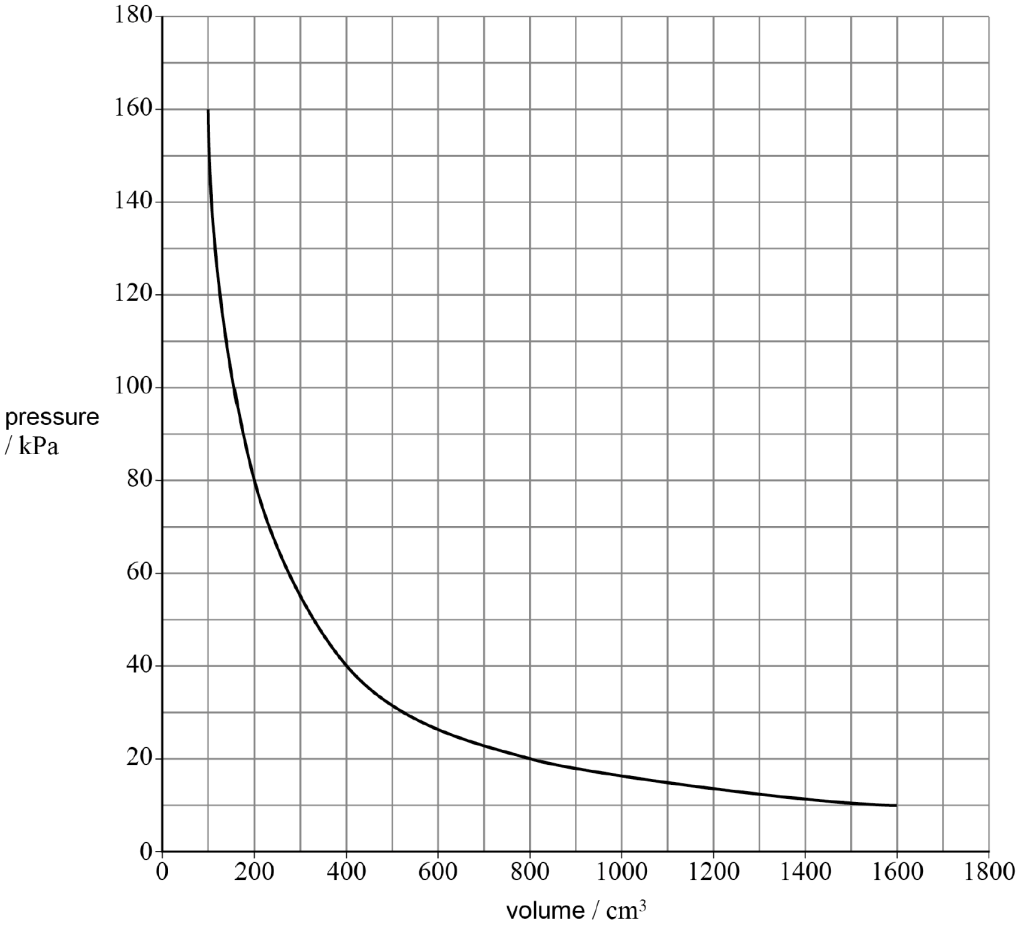
Which row gives quantities that double when the kelvin temperature of the gas doubles?

[1 mark]

A	rms speed of the molecules	pressure of the gas	⬭
B	density of the gas	rms speed of the molecules	⬭
C	internal energy of the gas	density of the gas	⬭
D	pressure of the gas	internal energy of the gas	⬭

AQA June 2025 · A-level Paper 2 · Q9

2 The graph shows the variation of pressure with volume for a constant mass of a gas.



The temperature of the gas:

[1 mark]

A decreases as the pressure increases. ⬭

B increases as the pressure increases. ⬭

C is constant as the pressure increases. ⬭

D is a maximum when the pressure is 40 kPa. ⬭

AQA June 2024 · A-level Paper 2 · Q10

3 An ideal gas is enclosed in an insulated container with a small electric heater.
The initial temperature of the gas is $300\ \text{K}$.
The product of pressure and volume is $5000\ \text{J}$.
The gas expands at constant pressure and does $1660\ \text{J}$ of work.

What is the final temperature of the gas?

[1 mark]

A $300\ \text{K}$ ⬭

B $400\ \text{K}$ ⬭

C $450\ \text{K}$ ⬭

D $900\ \text{K}$ ⬭

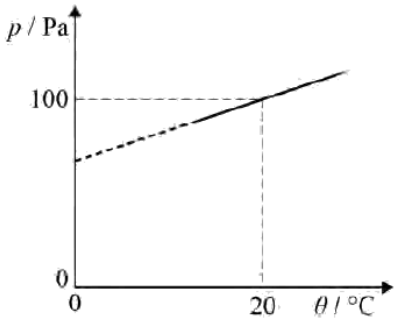
Medium Two or three steps. Roughly a third to a half of students get these right. **Questions 4–6**

AQA June 2018 · A-level Paper 2 · Q8

4 The graph shows the variation of pressure p with temperature θ for a fixed mass of an ideal gas at constant volume.

What is the gradient of the graph?

[1 mark]



A 0.341 ○

B 0.395 ○

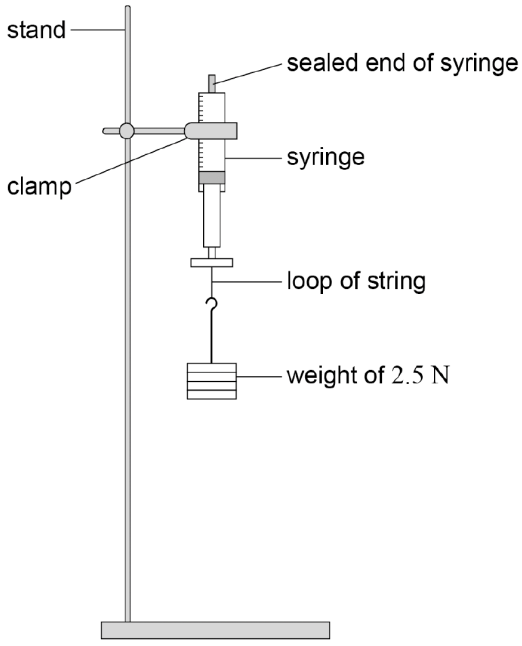
C 2.93 ○

D 5.00 ○

AQA June 2025 · A-level Paper 2 · Q8

5 In an investigation of Boyle's law, a sealed syringe of cross-sectional area $1.0 \times 10^{-4}\ \text{m}^2$ contains $12\ \text{cm}^3$ of gas. The gas is initially at atmospheric pressure.

A weight of $2.5\ \text{N}$ is then suspended from the plunger of the syringe as shown in the diagram.



The temperature of the gas in the syringe and the atmospheric pressure are constant.

atmospheric pressure = $1.0 \times 10^5\ \text{Pa}$

What is the new volume of gas in the syringe?

[1 mark]

A $3\ \text{cm}^3$ ⬭

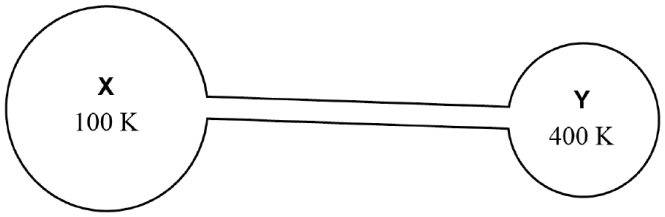
B $9\ \text{cm}^3$ ⬭

C $16\ \text{cm}^3$ ⬭

D $48\ \text{cm}^3$ ⬭

AQA November 2020 · A-level Paper 2 · Q8

6 The diagram shows two flasks **X** and **Y** connected by a thin tube of negligible volume.



The flasks contain an ideal gas.

The volume of **X** is twice the volume of **Y**. When **X** is at a temperature of $100\ \text{K}$ and **Y** is at a temperature of $400\ \text{K}$ there is no net transfer of particles between the flasks.

X contains gas of mass m.

What is the mass of gas in **Y**?

[1 mark]

A $\frac{m}{8}$ ⬭

B $\frac{m}{2}$ ⬭

C $2m$ ⬭

D $8m$ ⬭

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition:
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