GET BETTER AT PHYSICS · MARK SCHEME

Kinetic Theory of Gases: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.6.2.3 · 5 questions · 5 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
C	B	C	B	B

Easy

Questions 1–4

1 **C**

Mean square speed of an air molecule · AQA June 2018 · A-level Paper 2 · Q10

$\frac{1}{2}m(c_{rms})^2 = (3/2)kT$, so $(c_{rms})^2 = 3kT / m = 3 \times 1.38 \times 10^{-23} \times 750 \div 4.8 \times 10^{-26} = 6.5 \times 10^5$ m^2 s^{-2}.

Watch out: The question asks for the mean **square** speed, so don't take the square root.

How students did: 77.6% of students got this right in June 2018.

2 **B**

The cause of Brownian motion · AQA June 2018 · A-level Paper 2 · Q11

Smoke particles are hit unevenly from all sides by fast-moving air molecules, which makes them move randomly.

How students did: 73.6% of students got this right in June 2018.

3 **C**

Root mean square speed of three molecules · AQA June 2024 · A-level Paper 2 · Q9

$c_{rms} = \sqrt{((2.00^2 + 4.00^2 + 5.00^2) \div 3)}\ v = \sqrt{(45 \div 3)}\ v = \sqrt{15}\ v = 3.87v$.

Watch out: Square, then take the mean, then take the root. 3.67v (B) is the ordinary mean speed.

How students did: At least 60% of students got this right in June 2024.

4 **B**

Compressing a gas at constant temperature · AQA November 2021 · A-level Paper 2 · Q8

c_{rms} depends only on the temperature of the gas. The temperature is constant, so c_{rms} is still u.

Watch out: Halving the volume doubles the pressure, but the molecules move no faster.

Hard

Question 5

5 **B**

Change in momentum of a molecule hitting a wall · AQA June 2018 · A-level Paper 2 · Q12

The wall can only push at right angles to its surface, so the change in momentum Δmv is perpendicular to the wall, pointing away from it, with size 2mv cos θ. The component along the wall is unchanged. The vector diagram must show initial momentum + Δmv = final momentum: diagram B.

Watch out: Δmv = final − initial. Drawing it as final + initial, or pointing into the wall, gives the wrong diagrams.

How students did: Only 15.0% of students got this right in June 2018.

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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