AQA GCSE Physics | 8463

SPECIFICATION POINT 4.3.3.1

Particle motion in gases

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**5**
Available paper years	**2020–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.3.3.1 Particle motion in gases

Answer 01 · Mark scheme

November 2020 | 8463/1F | Original Q6

Question 6

Question	Answers		Mark	AO/ Spec. Ref
06.1	**Level 2:** The method would lead to the production of a valid outcome. Key steps are identified and logically sequenced.		3–4	AO3 4.3.3.2
	Level 1: The method would not necessarily lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content: • record the initial volume of air • record the initial pressure • push the plunger of the syringe • to decrease the volume of air • read the new value on the pressure gauge • record the new value of the volume • repeat for different volumes			
06.2	(when the volume is halved) the pressure doubles	allow for **1** mark when the volume is halved the pressure increases	2	AO3 4.3.3.2
06.3	kinetic energy speed		1 1	AO1 4.3.3.1
Total			**8**	

4.3.3.1 Particle motion in gases

Answer 02 · Mark scheme

November 2021 | 8463/1F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	0 to 25 cm^3		1	AO2 4.3.3.2
08.2	temperature		1	AO1 4.3.3.2
08.3	101 000 × 12 = constant constant = 1 212 000 (Pa cm^3)		1 1	AO2 4.3.3.2
08.4	p × 24 = 1 212 000 $p = \frac{1\,212\,000}{24}$ p = 50 500 (Pa)	allow ecf from question **08.3**	1 1 1	AO2 4.3.3.2
08.5	there is more space between the gas particles		1	AO1 4.3.3.2
Total			**8**	

4.3.3.1 Particle motion in gases

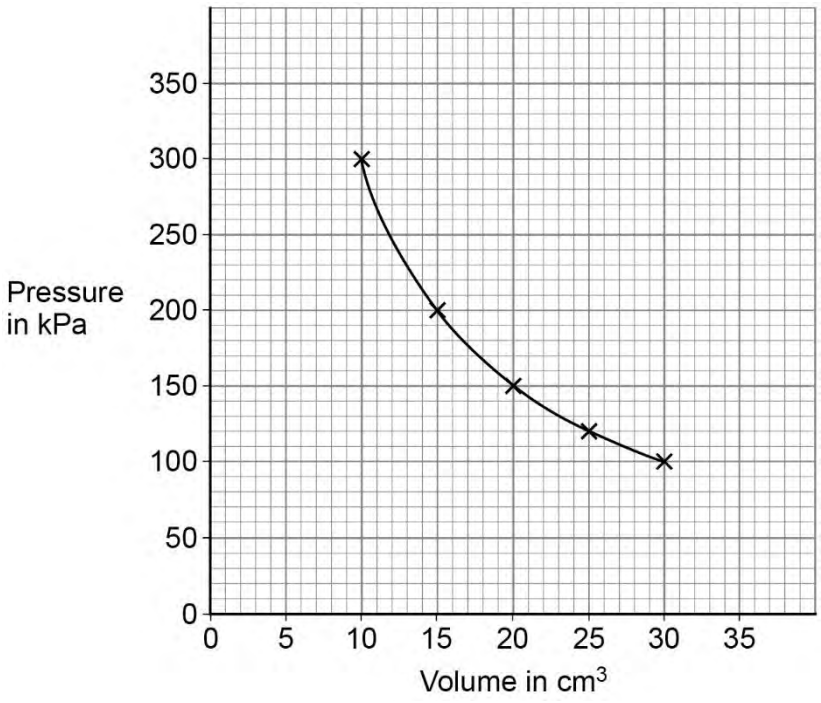
Answer 03 · Mark scheme

June 2023 | 8463/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	random directions		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	a range of speeds		1	AO1 4.3.3.1

Question	Answers	Mark	AO / Spec. Ref.
07.3	 2 marks for plotting 4 points correctly 1 mark for plotting 2 or 3 points correctly 1 mark for line of best fit	3	AO2 4.3.3.2

4.3.3.1 Particle motion in gases

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	300 × 10 = constant constant = 3000	allow use of any correct pair of values	1 1	AO2 4.3.3.2

Question	Answers	Mark	AO / Spec. Ref.
07.5	<table><tr><th>Quantity</th><th>Decreases</th><th>Stays the same</th><th>Increases</th></tr><tr><td>Mean time between collisions of the particles with the tube</td><td></td><td></td><td>✓</td></tr><tr><td>Mean distance between the particles</td><td></td><td></td><td>✓</td></tr><tr><td>Mean speed of the particles</td><td></td><td>✓</td><td></td></tr></table> additional tick in a row negates the mark for that row	1 1 1	AO1 4.3.3.2

Total Question 7	10

4.3.3.1 Particle motion in gases

Answer 04 · Mark scheme

June 2024 | 8463/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	the volume decreased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	the distance decreased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	the frequency of collisions increased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	the air pressure increased		1	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	the mean speed of the particles increases		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	$0.0130 = 2.60\times10^{-8} \times 1010 \times \Delta\theta$ $\Delta\theta = \dfrac{0.0130}{(2.60 \times 10^{-8} \times 1010)}$ $\Delta\theta = 495$ (°C)	 allow a correct answer given to more than 3 s.f.	1 1 1	AO2 4.1.1.3 4.3.2.2

Total Question 5	8

4.3.3.1 Particle motion in gases

Answer 05 · Mark scheme

June 2025 | 8463/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	the speed increased		1	AO1 4.3.3.1

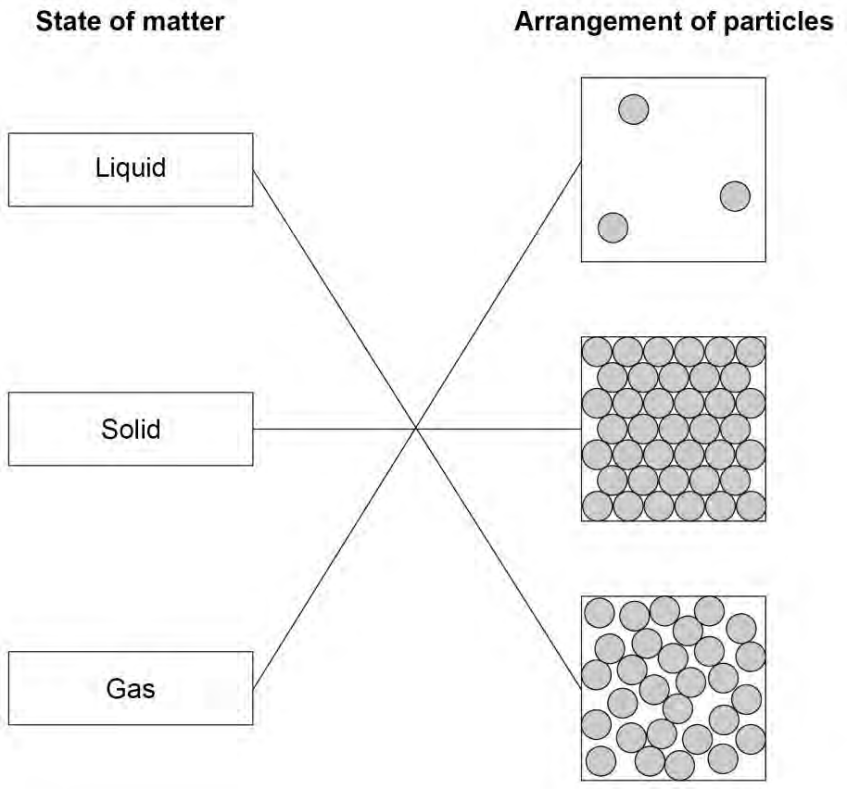
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the kinetic energy increased		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	the number of collisions each second increased		1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	the force exerted increased		1	AO1 4.3.3.1

4.3.3.1 Particle motion in gases

Answer 05 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
04.5	 do **not** accept more than one line from a box on the left allow **1** mark for 1 or 2 correct lines	2	AO1 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	liquid		1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	solid		1	AO3 4.3.1.2

4.3.3.1 Particle motion in gases

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>04.8</td><td>
<table>
<tr><th></th><th>Decreases</th><th>Stays the same</th><th>Increases</th></tr>
<tr><td>Kinetic energy of particles</td><td></td><td>✓</td><td></td></tr>
<tr><td>Potential energy of particles</td><td></td><td></td><td>✓</td></tr>
</table>
do not accept more than one tick in each row
</td><td>1

1</td><td>AO1
4.3.2.1</td></tr>
</table>

Total Question 4	10

4.3.3.1 Particle motion in gases

Answer 03 · Examiner comments — June 2023 | 8463/1F | Original Q7

Question 7 (Low and Standard Demand)

07.1 89% of students correctly identified the direction of the particles.

07.2 56% of students correctly identified the movement of the particles.

Answer 03 · Examiner comments — June 2023 | 8463/1F | Original Q7

07.3 30 % of student scored 3 marks, while 58 % of students scored 2 marks for completeing this graph Lines of best fit extended beyond the plotted points were ignored. The line of best fit needed to pass through, or close to, every point to score. Dot to dot lines were not acceptable.

07.4 86% of students scored 2 marks for this calculation.

07.5 Only 7% of students scored 3 marks, while 35% scored 2 marks and 36% scored 1 mark for identifying the effect of increatsng the volume of the gas.

Answer 04 · Examiner comments — June 2024 | 8463/1F | Original Q5

Question 5 (Low / Standard demand)

05.1 48% of students understood that the volume of air in the syringe decreased.

05.2 83% of students understood that the distance between the particles decreased.

05.3 85% of students understood that the frequency of collisions increased.

05.4 86% of students understood that the air pressure increased.

05.5 85% of students answered this question correctly, linking temperature increase to the mean speed of gas particles.

05.6 A standard demand calculation of temperature change, which was a good discriminator between students who could or could not rearrange an equation. 35% of students scored 3 marks, while 45% of students scored no marks.

4.3.3.1 Particle motion in gases

Answer 05 · Examiner comments June 2025 | 8463/1F | Original Q4

04.1
Just over 90 % of the students knew that the speed of the gas particles increased.

04.2
Nearly 80 % of the students knew that the kinetic energy of the gas particles increased.

04.3
Nearly 90 % of the students knew that the number of collisions each second increased.

04.4
Just over 70 % of the students knew that the force exerted by the gas particles increased.

04.5
When completing a matching type questions students should be encouraged to draw straight lines only.

04.6
Just fewer than 50 % of the students identified the state as liquid.

04.7
Just over 50 % of the students identified the state as solid.

Answer 05 · Examiner comments June 2025 | 8463/1F | Original Q4

04.8
Students found this question about internal energy difficult. Only about 11 % of the students scored 2 marks, while a further 33 % of the students scored 1 mark.