

Ideal Gases

Question Paper

Level	International A Level
Subject	Physics
Exam Board	CIE
Topic	Ideal Gases
Sub Topic	
Paper Type	Multiple Choice
Booklet	Question Paper

Time Allowed: 28 minutes

Score: /23

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 Which statement about molecules in a gas is correct?

- A In Brownian motion experiments, the molecules can be seen moving randomly in all directions.
- B The pressure exerted by a gas is caused by molecules bouncing against each other and changing kinetic energy.
- C The pressure exerted by a gas is caused by molecules rebounding from the walls of a container and changing momentum.
- D When the average speed of the molecules in a closed container increases, the density must also increase.

2 A student is studying Brownian motion.

Using a microscope, she observes particles of smoke in a glass container, illuminated by a strong light. The particles of smoke have a zig-zag path, constantly changing speed and direction.

What happens to the smoke particles if the air in the container is heated?

- A The smoke particles become easier to see.
- B The smoke particles change direction more frequently.
- C The smoke particles increase in volume.
- D The smoke particles move further apart.

3 The graph shows the distribution of speeds for the molecules of a gas at a particular temperature.



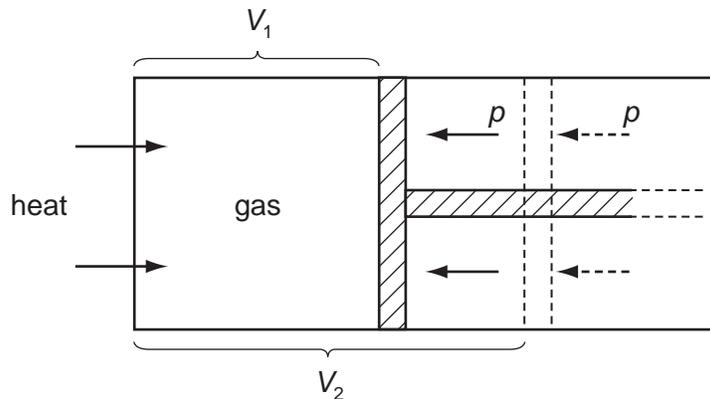
Which statement is correct?

- A All the molecules have the same kinetic energy.
- B The commonest value of speed is also the average speed.
- C The graph shows that the molecules of a gas are widely spaced apart.
- D The peak value of the graph would move to the right if the temperature is increased.

- 4 In an experiment to demonstrate Brownian motion, a transparent container is filled with smoke particles suspended in air.

What can be seen when the contents of the container are strongly illuminated and viewed through a microscope?

- A molecules in random motion
 - B molecules vibrating regularly
 - C smoke particles in random motion
 - D smoke particles vibrating regularly
- 5 A gas is enclosed inside a cylinder which is fitted with a frictionless piston.



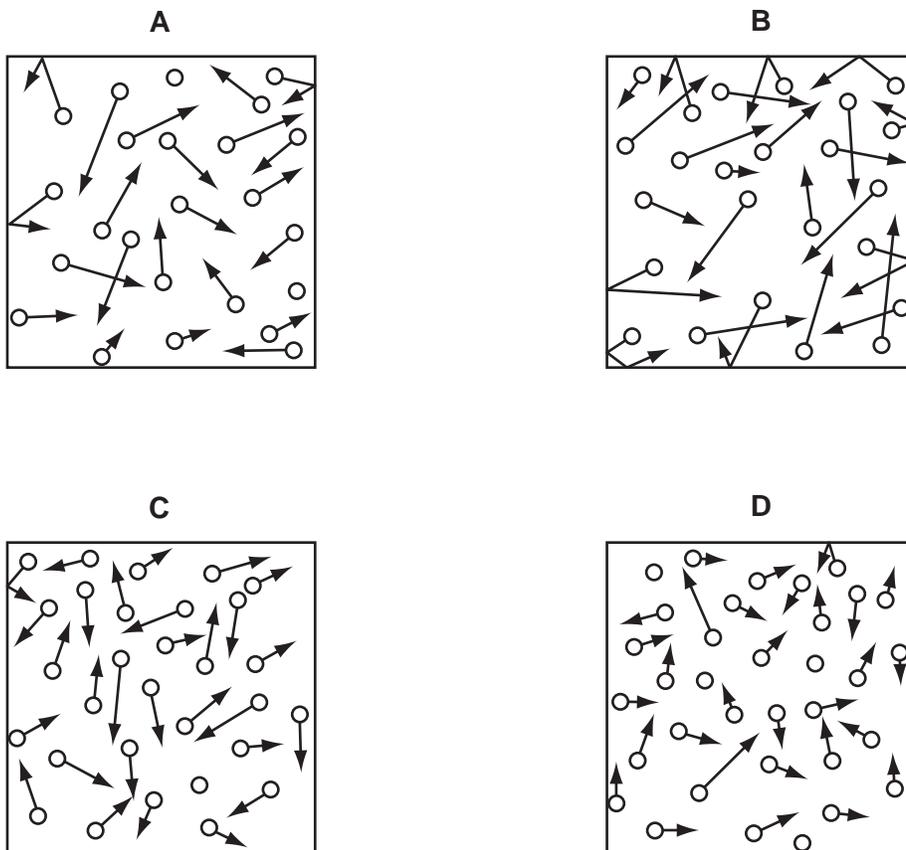
Initially, the gas has a volume V_1 and is in equilibrium with an external pressure p . The gas is then heated slowly so that it expands, pushing the piston back until the volume of the gas has increased to V_2 .

How much work is done by the gas during this expansion?

- A $p(V_2 - V_1)$
- B $\frac{1}{2}p(V_2 - V_1)$
- C $p(V_2 + V_1)$
- D $\frac{1}{2}p(V_2 + V_1)$

- 6 Each box shows identical molecules of a gas represented by circles with arrows to show the direction of travel and the speed of the molecule. A longer arrow represents a higher speed.

Which box contains a gas of the highest density and the lowest temperature?



- 7 A mass of gas enclosed in a cylinder by a piston is heated gently. At the same time, the piston is moved so that the pressure remains constant.

As a result of this, what will **not** occur?

- A The average velocity of the molecules will increase.
- B The mean separation of the molecules will increase.
- C The molecules will travel greater distances between collisions.
- D The number of collisions per second of the molecules on the piston will increase.

- 8 In an experiment to demonstrate Brownian motion, a transparent container is filled with smoke particles suspended in air.

What can be seen when the contents of the container are strongly illuminated and viewed through a microscope?

- A** air molecules that are colliding with smoke particles
 - B** air molecules that are moving in straight lines
 - C** smoke particles that are moving in random zigzag paths
 - D** smoke particles that are moving in straight lines
- 9 Why does the pressure increase when a sealed container of gas is heated?
- A** The gas molecules collide more often with each other.
 - B** The gas molecules expand when they are heated.
 - C** The gas molecules travel faster and hit the walls of the container more often.
 - D** There are more gas molecules present to collide with the walls of the container.
- 10 Pollen grains are suspended in a liquid and are illuminated strongly. When observed under a microscope they are seen to be in continuous random motion.

What is the reason for this?

- A** convection currents in the liquid
- B** evaporation of the liquid
- C** molecules of the liquid colliding with the pollen grains
- D** pollen grains colliding with each other

- 11 In an experiment to demonstrate Brownian motion, smoke particles in a container are illuminated by a strong light source and observed through a microscope.

The particles are seen as small specks of light that are in motion.

What causes the Brownian motion?

- A** collisions between the smoke particles and air molecules
- B** collisions between the smoke particles and the walls of the container
- C** convection currents within the air as it is warmed by the light source
- D** kinetic energy gained by the smoke particles on absorption of light

- 12 Below are four short paragraphs describing the molecules in a beaker of water at 50°C.

Which paragraph correctly describes the molecules?

- A** The molecules all travel at the same speed. This speed is not large enough for any of the molecules to leave the surface of the water. There are attractive forces between the molecules.
- B** The molecules have a range of speeds. Some molecules travel sufficiently fast to leave the surface of the water. There are no forces between the molecules.
- C** The molecules have a range of speeds. Some molecules travel sufficiently fast to leave the surface of the water. There are attractive forces between the molecules.
- D** The molecules have a range of speeds. The fastest molecules are unable to leave the surface of the water. There are attractive forces between the molecules.

- 13 In the kinetic model of gases, what is pressure equal to?

- A** the number of atoms hitting and rebounding from a surface of the gas container
- B** the number of atoms hitting and rebounding from a unit area of the gas container surface
- C** the force exerted by the atoms hitting and rebounding from a surface of the gas container
- D** the force exerted by the atoms hitting and rebounding from a unit area of the gas container surface

14 Which row best describes how the molecules move in solids, in liquids and in gases?

	solids	liquids	gases
A	fixed in position	only vibrate	move about freely
B	slowly in all directions	quickly in all directions	very quickly in all directions
C	vibrate about mean position	vibrate and move about	move about freely
D	vibrate in one direction only	vibrate in two directions	vibrate in all three directions

15 Why does the pressure of a gas increase when the gas is compressed at constant temperature?

- A** The gas molecules collide more often with each other.
- B** The gas molecules expand under pressure.
- C** The gas molecules hit the walls of the container more frequently.
- D** The gas molecules travel faster.

16 Why does an ideal gas exert pressure on its container?

- A** The molecules of the gas collide continually with each other.
- B** The molecules of the gas collide continually with the walls of the container.
- C** The molecules of the gas collide inelastically with the walls of the container.
- D** The weight of the molecules exerts a force on the walls of the container.

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The particles are seen as small specks of light that are in motion.

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- B** collisions between the smoke particles and the walls of the container
- C** convection currents within the air as it is warmed by the light source
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What is the reason for this?

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- B evaporation of the liquid
- C molecules of the liquid colliding with the pollen grains
- D pollen grains colliding with each other

- 21 Particles of dust, suspended in water, are viewed through a microscope. The particles can be seen to move irregularly.

This movement is due to

- A convection currents in the water.
- B evaporation of the water near the dust particles.
- C gravitational forces acting on the particles of dust.
- D water molecules hitting the dust particles in a random way.

- 22 In an experiment to demonstrate Brownian motion, smoke particles in a container are illuminated by a strong light source and observed through a microscope.

The particles are seen as small specks of light that are in motion.

What causes this motion?

- A collisions between the smoke particles and air molecules
- B collisions between the smoke particles and the walls of the container
- C convection currents within the air as it is warmed by the light source
- D kinetic energy gained by the smoke particles on absorption of light

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