Particle of model matter – 2023 IGCSE Physics 0625

1. Nov/2023/Paper_ 0625/11/No.12

Why can a gas be compressed easily into a smaller volume?

A The particles are far apart.

B The particles do not attract each other.

C The particles move randomly.

D The volume of each particle can be reduced.

2. Nov/2023/Paper_ 0625/12/No.12

Brownian motion is the random motion of particles.

In which states of matter is Brownian motion observed?

A gases, liquids and solids

B gases and liquids only

C gases and solids only

D liquids and solids only

3. Nov/2023/Paper_ 0625/12/No.15

A student investigates the relationship between the pressure of a gas and its volume at constant temperature. He records his results in the table.

reading	pressure / N/cm^2	volume / cm^3
1	10.0	24
2	7.4	32
3	4.0	63
4	13.0	19

What is the correct conclusion from the experiment?

A The volume decreases when the pressure increases.

B The volume increases when the pressure increases.

C The volume initially increases when the pressure increases, but then decreases.

D The volume is independent of the pressure.

4. Nov/2023/Paper_ 0625/13/No.12

A sealed bottle of constant volume contains air.

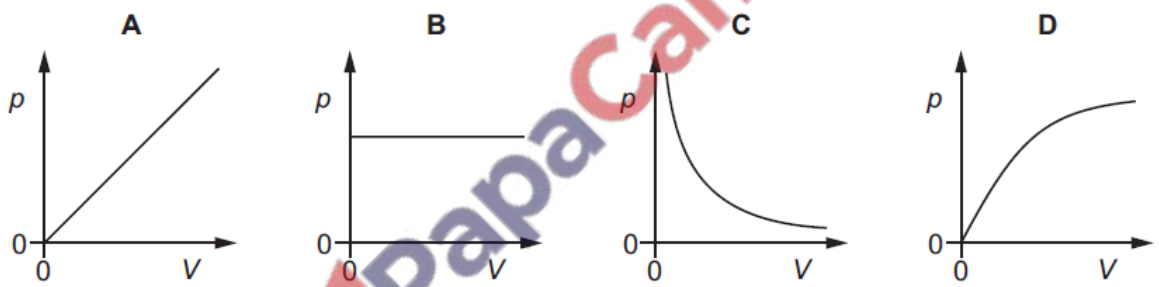
The air in the bottle is heated by the Sun.

What is the effect on the average speed of the air particles in the bottle and the average distance between them?

	average speed of air particles	average distance between air particles
A	decreases	decreases
B	decreases	stays the same
C	increases	increases
D	increases	stays the same

5. Nov/2023/Paper_ 0625/13/No.13

Which graph shows the relationship between the pressure p of a fixed mass of gas and its volume V at a constant temperature?



6. Nov/2023/Paper_ 0625/21/No.12

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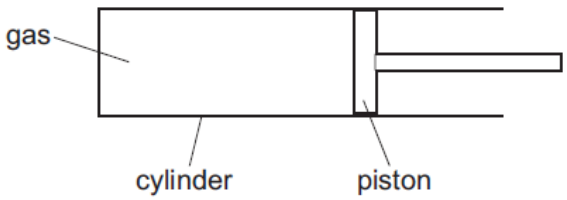
7. Nov/2023/Paper_ 0625/21/No.13

A gas is contained in a cylinder by a movable piston.



The gas is heated so that it expands at **constant pressure**.

How is the force of each collision of a gas particle with the piston affected and how does the frequency of collisions between the gas particles and the piston change?

	force	frequency
A	increases	decreases
B	increases	increases
C	stays the same	decreases
D	stays the same	increases

8. Nov/2023/Paper_ 0625/22/No.12

Brownian motion is the random motion of particles.

In which states of matter is Brownian motion observed?

A gases, liquids and solids

B gases and liquids only

C gases and solids only

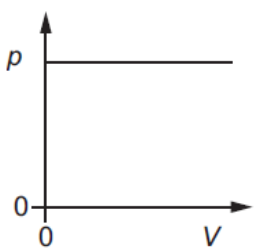
D liquids and solids only

9. Nov/2023/Paper_ 0625/22/No.13

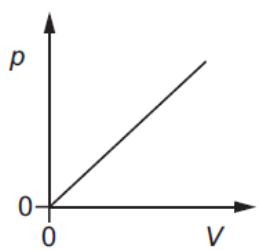
The volume of a fixed mass of gas is varied. The temperature remains constant.

Which graph shows how the pressure p of the gas varies with volume V?

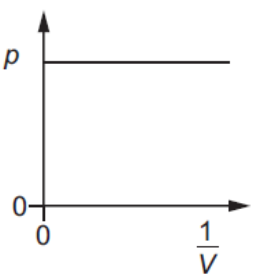
A



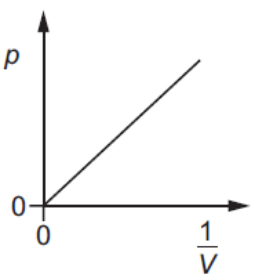
B



C



D



10. Nov/2023/Paper_ 0625/23/No.12

A sealed bottle of constant volume contains air.

The air in the bottle is heated by the Sun.

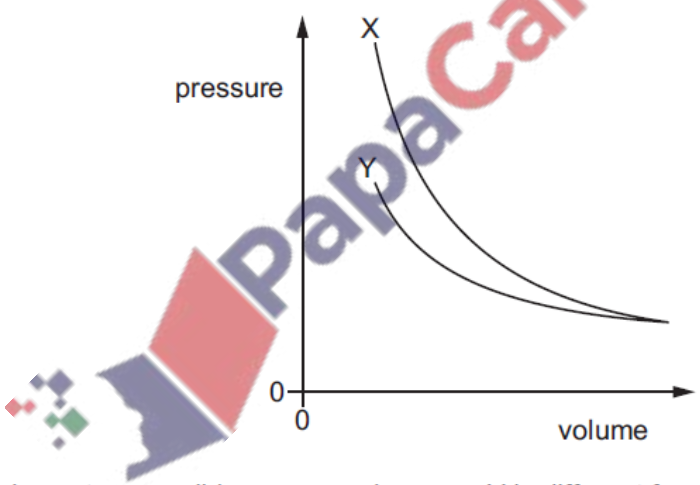
What is the effect on the average speed of the air particles in the bottle and the average distance between them?

	average speed of air particles	average distance between air particles
A	decreases	decreases
B	decreases	stays the same
C	increases	increases
D	increases	stays the same

11. Nov/2023/Paper_ 0625/23/No.13

In an experiment to investigate the relationship between the volume of a sample of air and its pressure, the volume of the sample is decreased and its pressure is measured continuously.

Curve X on the graph shows the results that would be expected for a fixed mass of air at constant temperature. Curve Y shows the results that are obtained in this particular experiment.



Which row shows two possible reasons why curve Y is different from curve X?

	1	2
A	the temperature of the air **increases** as the volume is decreased	air leaks **into** the container as the volume is decreased
B	the temperature of the air **increases** as the volume is decreased	air leaks **out of** the container as the volume is decreased
C	the temperature of the air **decreases** as the volume is decreased	air leaks **into** the container as the volume is decreased
D	the temperature of the air **decreases** as the volume is decreased	air leaks **out of** the container as the volume is decreased

12. Nov/2023/Paper_ 0625/31/No.3(a, b)

Fig. 3.1 represents the arrangement and separation of particles in a liquid. Each circle represents a particle.

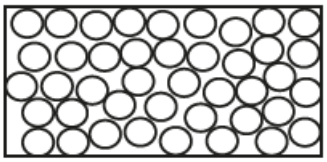


Fig. 3.1

(a) In the box in Fig. 3.2, draw at least **four** circles to show the arrangement and separation of particles in a **gas**.

Fig. 3.2

[2]

(b) Describe the arrangement, separation and motion of particles in a **solid**.

.....

.....

..... [3]

13. Nov/2023/Paper_ 0625/41/No.3(a)

Liquids are difficult to compress whereas gases can be compressed easily.

(a) Explain, in terms of particles, why it is difficult to compress liquids.

.....

.....

..... [2]

14. Nov/2023/Paper_ 0625/42/No.4(a)

Fig. 4.1 shows a bottle part-filled with water. The air inside the bottle is at the same pressure as the air outside the bottle. The bottle and its contents are at room temperature.

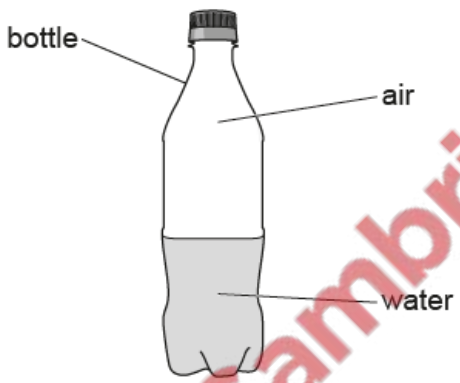


Fig. 4.1

(a) The temperature of the bottle and its contents are increased.

(i) Explain, in terms of particles, how the air pressure inside the bottle changes as the temperature increases.

.....

.....

.....

..... [3]

(ii) The lid is removed from the bottle.

State and explain how the air pressure inside the bottle changes.

statement .....

explanation .....

.....

[2]

15. June/2023/Paper_0625/11/No.14

Gases, liquids and solids are made up of small particles.

Which row gives the relative separation of the particles?

	gas	liquid	solid
A	far apart	far apart	far apart
B	far apart	far apart	close together
C	far apart	close together	close together
D	close together	close together	far apart

16. June/2023/Paper_0625/11/No.15

Which statements about evaporation of water are correct?

1 Evaporation causes the remaining liquid to cool.

2 During evaporation, the more energetic particles escape from the surface of the liquid.

3 Evaporation only happens at 100 °C.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

17. June/2023/Paper_0625/12/No.14

Four students describe the phrase 'absolute zero' during a lesson on the particle model.

Which student is correct?

A This is the lowest possible temperature.

B Particles in a solid start vibrating.

C Particles do not have any weight.

D Particles have the least gravitational potential energy.

18. June/2023/Paper_0625/12/No.15

At the surface of a liquid, the more energetic molecules can escape from the liquid into the atmosphere.

Which name is given to this process?

A boiling

B condensation

C evaporation

D melting

19. June/2023/Paper_0625/13/No.14

What is the lowest possible temperature (absolute zero) and what happens to the energy of particles at this temperature?

	lowest possible temperature / °C	particle energy
A	–273	particles have least kinetic energy
B	–273	particles have zero gravitational potential energy
C	0	particles have least kinetic energy
D	0	particles have zero gravitational potential energy

20. June/2023/Paper_0625/13/No.15

Which statement about the particles of a substance after condensation is correct?

A They are close to each other and slide over each other.

B They are close to each other and vibrate about fixed points.

C They are far apart from each other and vibrate about fixed points.

D They are far apart from each other and move freely within the container.

21. June/2023/Paper_0625/21/No.14

A student uses a microscope to observe pollen moving on the surface of water.

Which statement describes the reason for this movement?

A Water molecules are moved by microscopic pollen particles.

B Water molecules are moved by pollen molecules.

C Microscopic pollen particles are moved by water molecules.

D Pollen molecules are moved by water molecules.

22. June/2023/Paper_0625/21/No.15

Which statements about evaporation of water are correct?

1 Evaporation causes the remaining liquid to cool.

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25. June/2023/Paper_0625/22/No.14

Four students describe the phrase 'absolute zero' during a lesson on the particle model.

Which student is correct?

A This is the lowest possible temperature.

B Particles in a solid start vibrating.

C Particles do not have any weight.

D Particles have the least gravitational potential energy.

26. June/2023/Paper_0625/22/No.15

Four students are asked to state and explain the relative magnitudes of the thermal expansion of solids and gases.

Which student is correct?

A Gases expand more than solids because the molecules in a gas are in random motion.

B Gases expand more than solids because the attractive forces between molecules are much weaker in gases.

C Solids expand more than gases because the molecules are closer together in solids.

D Solids expand more than gases because the molecules in a solid are in a regular pattern.

27. June/2023/Paper_0625/23/No.14

What is the lowest possible temperature (absolute zero) and what happens to the energy of particles at this temperature?

	lowest possible temperature / °C	particle energy
A	–273	particles have least kinetic energy
B	–273	particles have zero gravitational potential energy
C	0	particles have least kinetic energy
D	0	particles have zero gravitational potential energy

28. June/2023/Paper_0625/23/No.15

Which statement about the particles of a substance after condensation is correct?

A They are close to each other and slide over each other.

B They are close to each other and vibrate about fixed points.

C They are far apart from each other and vibrate about fixed points.

D They are far apart from each other and move freely within the container.

29. June/2023/Paper_0625/31/No.5

Fig. 5.1 represents some particles of a gas in a metal box. The arrows represent the directions of movement of the particles.

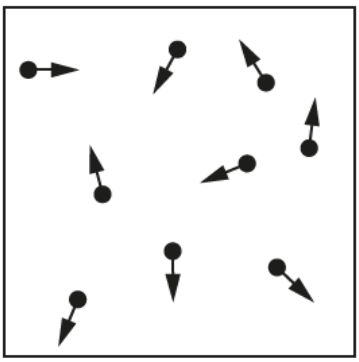

Fig. 5.1 (not to scale)

(a) Describe how the particles in Fig. 5.1 exert a pressure on the walls of the box.

.....

.....

..... [3]

(b) The number of gas particles in the box increases. The temperature of the gas does **not** change.

State and explain the effect, if any, on the pressure exerted by the gas particles on the walls of the box.

.....

.....

..... [2]

[Total: 5]

30. June/2023/Paper_0625/32/No.4(a, b)

A student has a block of solid metal at room temperature.

(a) (i) Describe the arrangement, separation and motion of the particles in the solid metal.

.....

.....

.....

..... [3]

(ii) The student cools the block of metal in a freezer.

State the effect, if any, of cooling on the kinetic energy of the particles in the block of metal.

..... [1]

(b) (i) State the name of the temperature at which particles have the least kinetic energy.

..... [1]

(ii) State the value of temperature at which particles have the least kinetic energy. Include the unit.

..... [1]

31. June/2023/Paper_0625/33/No.4(a, b)

A tight-fitting lid keeps air inside a metal can.
An airtight rubber bung holds a liquid-in-glass thermometer that is inserted through a hole in the lid, as shown in Fig. 4.1.

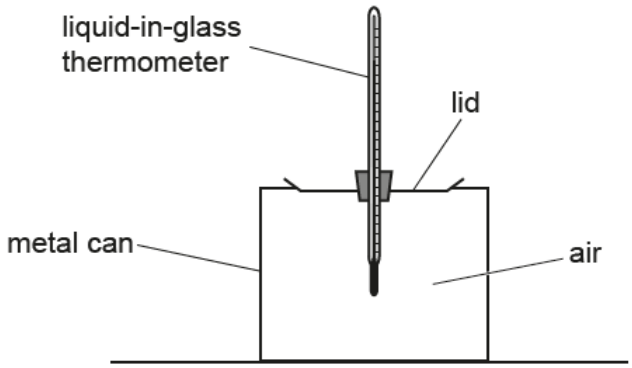

Fig. 4.1

(a) **(i)** State what happens to the liquid in the thermometer when the air temperature rises.

..... [1]

(ii) The temperature of the air in the can is 18 °C.

Calculate the temperature of the air in kelvin.

temperature = ... K [2]

(b) The can is placed in a refrigerator. The temperature of the air inside the can decreases.

State and explain what happens to the pressure exerted by the air in the can. Use your ideas about gas particles.

.....

.....

.....

..... [3]

32. June/2023/Paper_0625/41/No.3

A rubber balloon is inflated with helium and sealed so that no helium escapes.

The balloon is positioned immediately below the ceiling in a room.

Heaters are switched on and the temperature of the air in the room increases.

(a) When the heaters are first switched on, the temperature of the air immediately below the ceiling increases more quickly than the temperature of the air in the rest of the room.

Explain why this happens.

.....

.....

..... [2]

(b) The temperature of the helium in the balloon increases and as the rubber stretches, the volume occupied by the helium increases.

(i) State what happens to the motion of the helium particles as the temperature increases.

.....

..... [1]

(ii) As the rubber stretches and the volume of the helium increases, the pressure of the helium remains constant.

Explain, in terms of the particles of helium, how the pressure of the helium remains constant.

.....

.....

.....

..... [3]

[Total: 6]

33. June/2023/Paper_0625/42/No.4

(a) The temperature of a fixed mass of gas at constant volume is decreased.

State and explain, in terms of particles, how the pressure of the gas changes.

.....

.....

.....

..... [3]

(b) **(i)** State the value of absolute zero in °C.

value of absolute zero = ... °C [1]

(ii) Explain what is meant by the term absolute zero. Refer to particles in your answer.

.....

.....

..... [2]

(c) Cylinder 1 contains 350 cm^3 of gas at a pressure of 9.0×10^4 Pa. The gas is transferred to cylinder 2 and the pressure increases to 1.6×10^5 Pa. The temperature remains constant.

Calculate the volume of cylinder 2.

volume = ... [3]

[Total: 9]