

Class	Register Number	Name
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南洋女子學校
Nanyang Girls' High School

End-of-Year Examination 2023 Secondary 4

PHYSICS

Paper 1 Multiple Choice

Monday 9 October

No Additional Materials are required

45 minutes
1200 – 1245

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction tape/fluid.

Write your name, register number and class on the Question Paper and on the Answer Sheet in the spaces provided unless this has been done for you.

There are **thirty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** in the spaces provided on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

Take the acceleration due to gravity g (or gravitational field strength) to be 10 m s^{-2} (or 10 N kg^{-1}) near the Earth's surface.

This document consists of **14** printed pages.

- 1 A pair of vernier calipers is used to measure the width of a wooden block.

Diagram 1 shows the scale when nothing is clamped between its jaws, while diagram 2 shows the scale when the wooden block is clamped between the jaws.

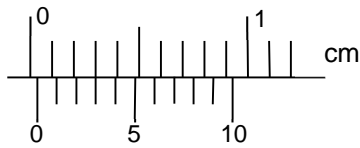


Diagram 1

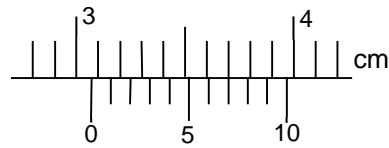
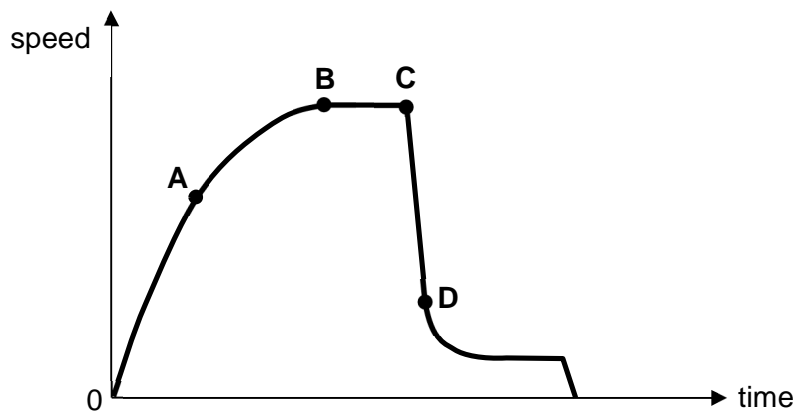


Diagram 2

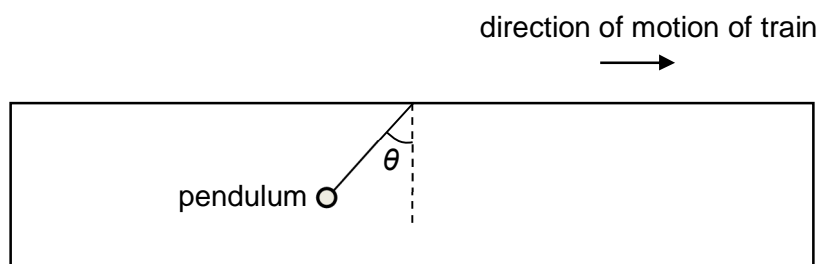
What is the width of the wooden block?

- A** 3.04 cm **B** 3.10 cm
C 3.74 cm **D** 3.80 cm
- 2 Which **cannot** be the magnitude of the resultant force when a force of 3 N and a force of 8 N act on an object?
- A** 3 N **B** 5 N **C** 8 N **D** 10 N
- 3 A stone undergoes free fall from rest to the ground. The stone travels 0.25 of the total distance to the ground in the first 1.0 s of its fall.
- What is the total time taken for the stone to fall to the ground?
- A** 1.4 s **B** 2.0 s **C** 3.0 s **D** 4.0 s
- 4 The diagram shows the speed-time graph for a sky diver. He falls from an aircraft, then opens a parachute and later lands safely on the ground.



At which point did the skydiver open the parachute?

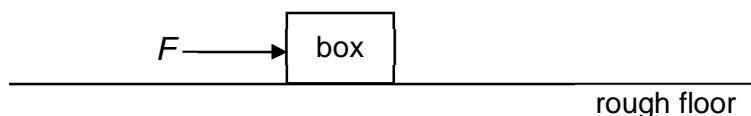
- 5 The diagram shows a pendulum hanging from a string suspended inside a train. The train is travelling to the right.



Which row describes the motion of the train when angle θ is constant?

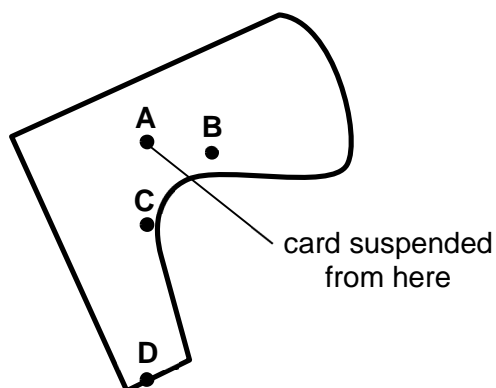
	speed	magnitude of acceleration
A	increasing	increasing
B	increasing	constant
C	decreasing	increasing
D	decreasing	constant

- 6 A man pushes a box along a rough floor with a force F as shown in the diagram. The box moves with constant velocity.



Which force forms an action-reaction pair with F ?

- A** frictional force by the floor on the box
B frictional force by the floor on the man
C normal contact force by the floor on the box
D normal contact force by the box on the man
- 7 The diagram shows a non-uniform object suspended freely from a pin at **A**. When the object is pushed, it swings and then comes to a stop at the position shown.



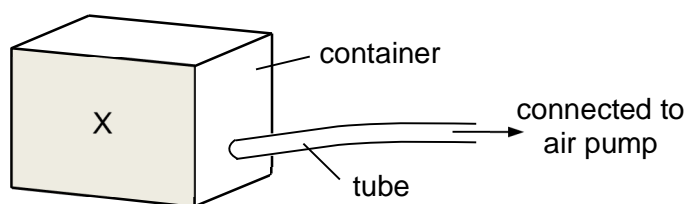
Which labelled point could be the centre of mass of the object?

- 8 A motor in a crane is used to lift a load of mass 900 kg through a height of 5.0 m from rest to a speed of 2.0 m s^{-1} .

What is the work done by the motor in lifting the load?

- A** 1.8 kJ **B** 18 kJ **C** 45 kJ **D** 47 kJ

- 9 The diagram shows a container made of tin and containing only air. It is connected to an air pump through a tube.

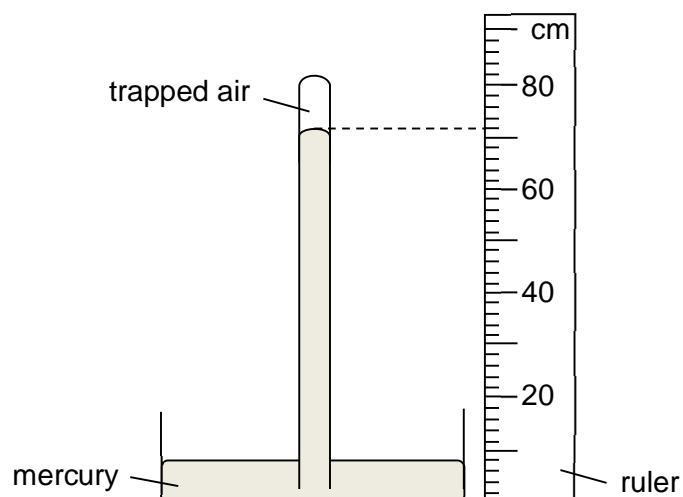


Air is pumped out of the container and it collapses when the pressure of the air inside falls to $2.0 \times 10^4 \text{ Pa}$. Atmospheric pressure is $1.0 \times 10^5 \text{ Pa}$ and the surface area of face X of the container is 0.060 m^2 .

What is the resultant force on face X when the container just collapses?

- A** $1.2 \times 10^3 \text{ N}$ **B** $4.8 \times 10^3 \text{ N}$
C $3.3 \times 10^5 \text{ N}$ **D** $1.3 \times 10^6 \text{ N}$

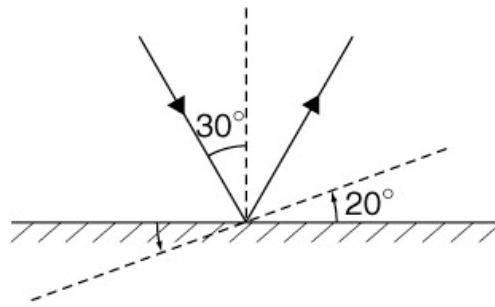
- 10 The diagram shows a mercury barometer that contains some trapped air. The atmospheric pressure is 74 cm Hg.



What is the pressure of the trapped air?

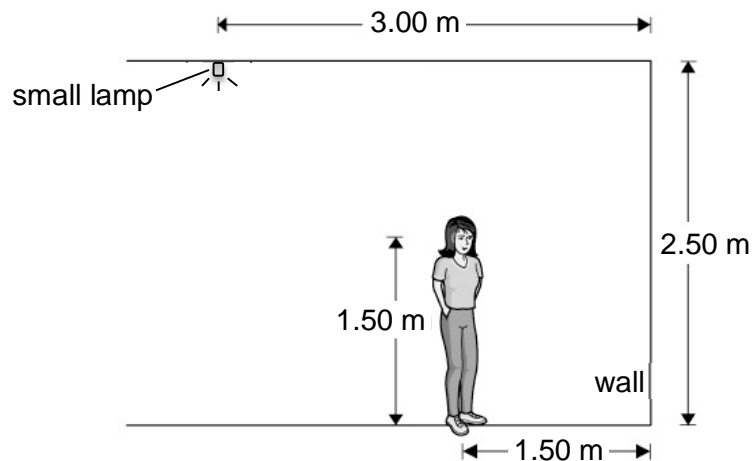
- A** 2 cm Hg **B** 8 cm Hg
C 10 cm Hg **D** 12 cm Hg

- 11 In the diagram below, the angle of incidence of a light ray on a horizontal plane mirror is 30° .



What is the angle of reflection if the mirror is rotated anti-clockwise through an angle of 20° ?

- A** 10° **B** 20° **C** 30° **D** 50°
- 12 A girl with her eyes 1.50 m above the ground stands in front of a 2.50 m high wall, as shown in the diagram (not drawn to scale).

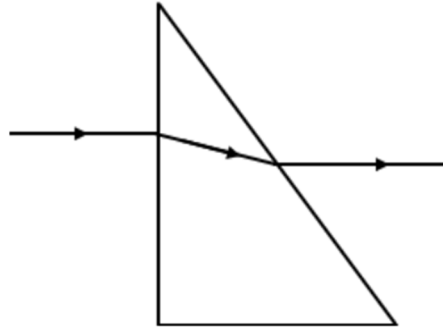


If a small mirror is to be hung on the wall, which position should it be placed so that the girl can see the small lamp behind her?

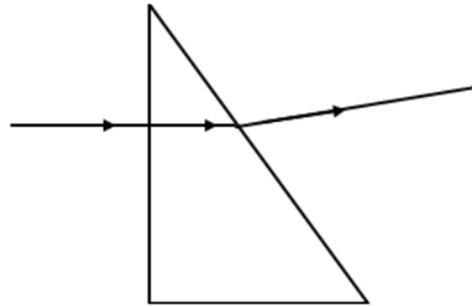
- A** 1.50 m above the ground
B 1.63 m above the ground
C 1.75 m above the ground
D 1.83 m above the ground

- 13 Which diagram correctly shows the path of the light ray when it enters a right-angled triangular glass block?

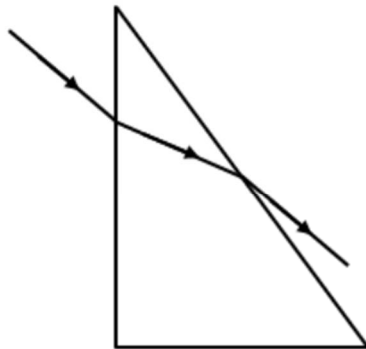
A



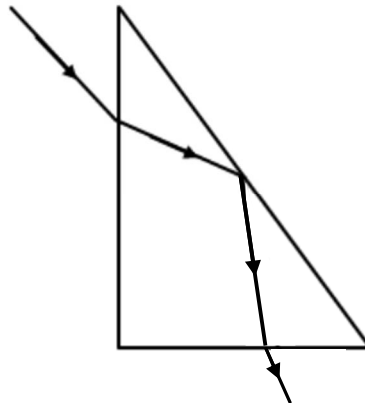
B



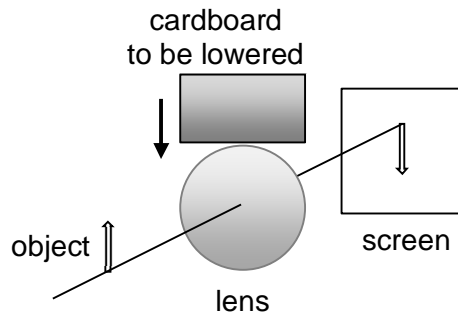
C



D



- 14 The diagram shows an object and a lens positioned to form a well-focused, inverted image on a screen.



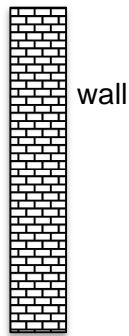
A piece of cardboard is then lowered just in front of the lens to cover the top half of the lens. What will happen to the image on the screen?

- A The upper half of the image will disappear.
 - B The lower half of the image will disappear.
 - C The image will become fuzzy and out of focus.
 - D The image will become dimmer.
- 15 When electromagnetic waves travel from one medium to another, which properties of the waves will change?
- A frequency only
 - B speed only
 - C speed and wavelength only
 - D frequency, speed and wavelength
- 16 A wave moves across the surface of water in a ripple tank. In 4.0 minutes, a wavefront moves a distance of 100 wavelengths.

What is the frequency of the wave?

- | | |
|------------|-----------|
| A 0.040 Hz | B 0.42 Hz |
| C 25 Hz | D 400 Hz |

- 17 A man stands facing a wall. He claps his hands and hears the echo after 2.50 s.



a man claps
his hands

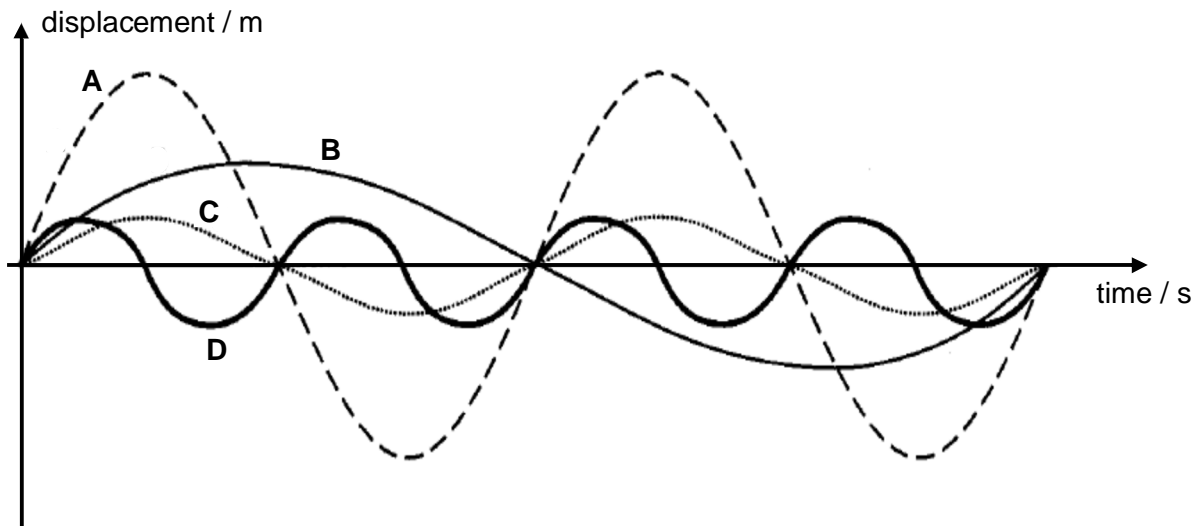


If the speed of sound is 340 m s^{-1} , what is the distance between the man and the wall?

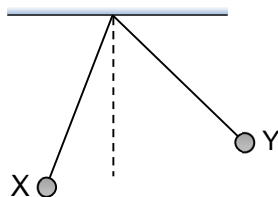
- A 425 m
- B 625 m
- C 850 m
- D 1250 m

- 18 The diagram shows the displacement-time graphs of different musical notes played on a flute.

Which musical note, **A**, **B**, **C** or **D**, has the lowest pitch?



- 19 Two charged spheres X and Y are hanging from two nylon threads of the same length attached to a point on a ceiling. They remain at rest as shown in the diagram.



Which statement(s) below **must be correct**?

- (1) Both spheres carry positive charges.
- (2) The force acting on Y by X is larger than the force acting on X by Y.
- (3) The mass of X is larger than Y.

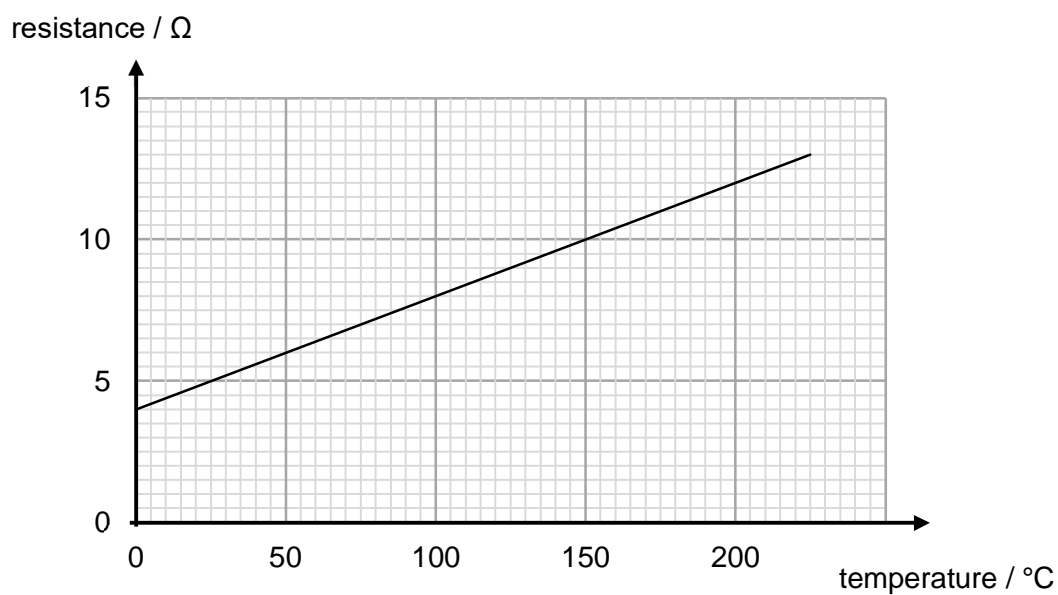
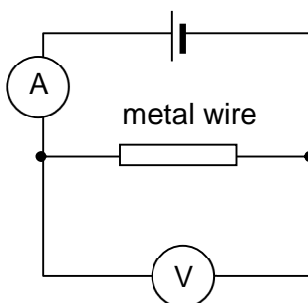
- A (1) only
- B (3) only
- C (1) and (2) only
- D (2) and (3) only

- 20 The diagrams show the range and symbols of four ammeters.

A	B	C	D
full-scale deflection = 1.5 A	full-scale deflection = 5 A	full-scale deflection = 1 mA	full-scale deflection = 50 mA

Which ammeter should be used to measure a current of 0.5 A?

- 21 A student sets up the following circuit and makes measurements to plot a resistance-temperature graph of the metal wire as shown below.

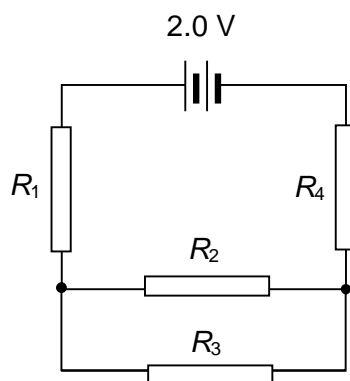


When the ammeter reading is 1.0 A, the temperature of the metal wire is 25 $^{\circ}\text{C}$.

What is the reading of the ammeter when the temperature of the metal wire is 200 $^{\circ}\text{C}$?

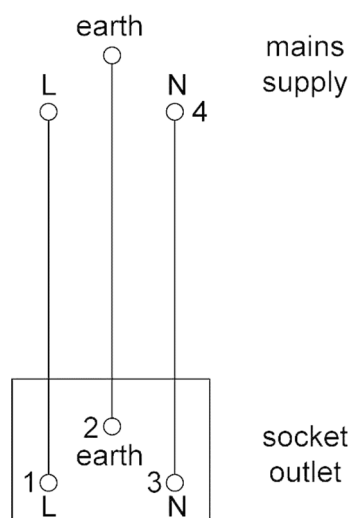
- A** 0.36 A **B** 0.42 A **C** 0.60 A **D** 1.5 A

- 22 In the circuit below, the e.m.f. of the battery is 2.0 V.
The ratio of the resistance of R_1 , R_2 , R_3 and R_4 is 1 : 2 : 3 : 4.



What is the potential difference (p.d.) across R_3 ?

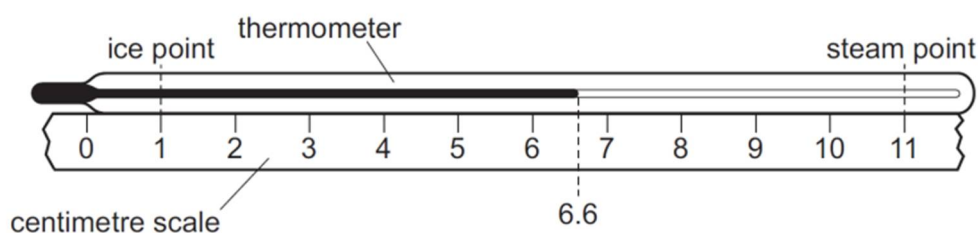
- 23 The wiring from a 240 V mains supply to a socket outlet in a house is shown in the diagram.
L is live and N is neutral.



The socket outlet provides 240 V for an electrical appliance with a 2-pin plug.
Which two terminals should the appliance be connected to?

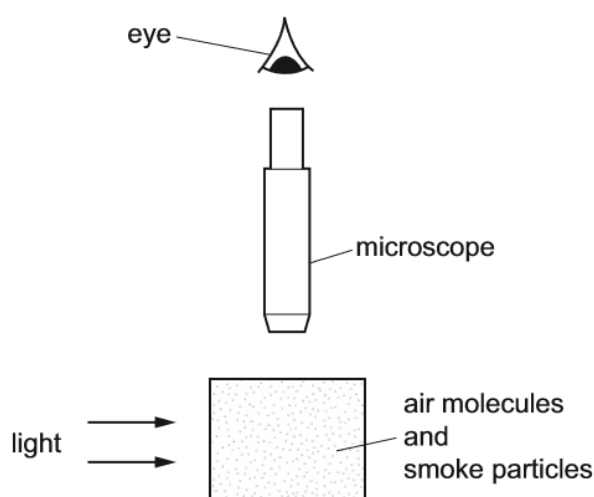
- | | |
|------------------|------------------|
| A 1 and 3 | B 1 and 2 |
| C 2 and 3 | D 2 and 4 |

- 24** A centimetre scale is fixed next to an unmarked mercury-in-glass thermometer. The ice point and the steam point are marked on the scale.



What is the temperature shown on the thermometer?

- A** 44 °C **B** 56 °C **C** 60 °C **D** 66 °C
- 25** A student observes the motion of smoke particles in air through a low-power microscope.



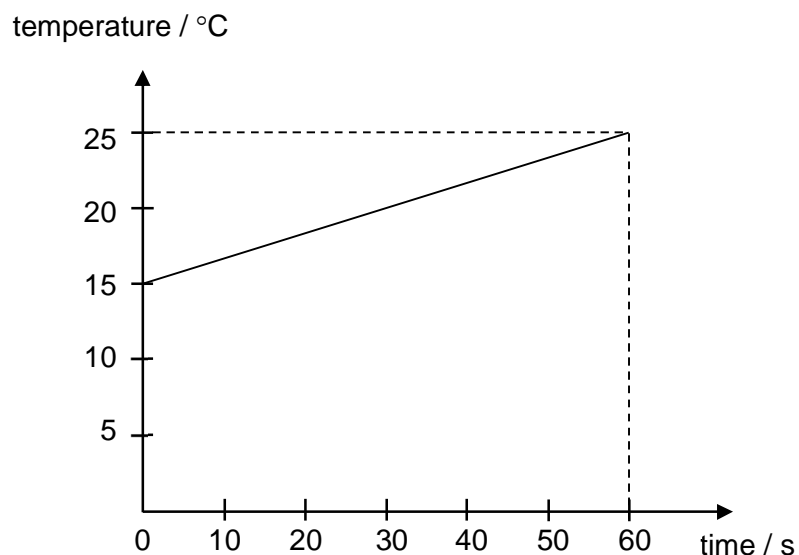
What does the student observe when the temperature of the air is increased?

- A** Air molecules move around at higher speeds.
B Air molecules collide with the smoke particles more forcefully.
C Smoke particles move more rapidly in a random manner.
D Smoke particles vibrate about fixed positions at a higher frequency.
- 26** A fixed mass of gas in a container is being compressed and the temperature of the gas remains constant.
 How do these properties of the gas particles change?

	frequency of collisions with wall of container	average speed of gas particles	average distance between gas particles
A	decreases	increases	decreases
B	increases	increases	unchanged
C	increases	unchanged	decreases
D	increases	unchanged	unchanged

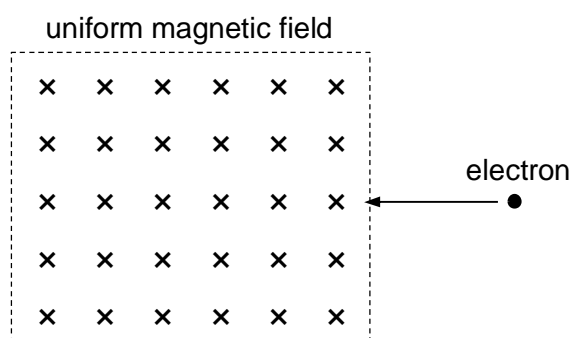
- 27 The graph shows the variation of the temperature of a liquid with time when the liquid is heated by a 400 W heater. The mass of the liquid is 2.0 kg.

Assume all the energy given out by the heater is absorbed by the liquid.



What is the specific heat capacity of the liquid?

- A 83 J kg⁻¹ °C⁻¹ B 480 J kg⁻¹ °C⁻¹
 C 1200 J kg⁻¹ °C⁻¹ D 2400 J kg⁻¹ °C⁻¹
- 28 The diagram shows an electron moving horizontally into a region of uniform magnetic field.



In which direction does the electron deflect as it enters the magnetic field?

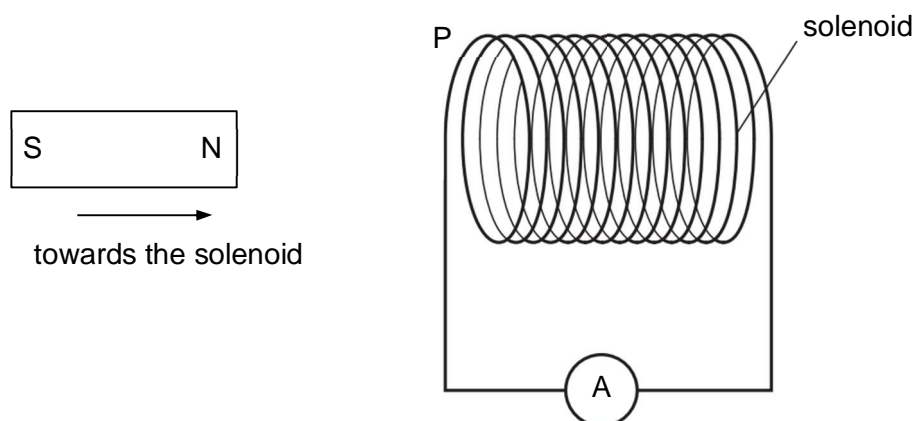
- A towards the top of the page
 B towards the bottom of the page
 C into the page
 D out of the page

29 Which of these tests proves that a metal bar is a permanent magnet?

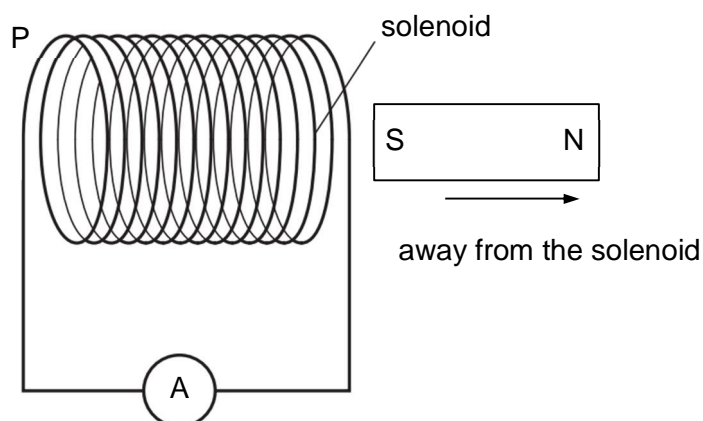
- A** It affects the direction in which a compass needle points.
- B** It picks up a paper clip made of iron.
- C** It attracts another magnet.
- D** It repels another magnet.

30 A magnet is moved in two stages in a horizontal direction.

First the magnet is moved towards the solenoid.



Then the magnet is moved away from the solenoid.



What is the magnetic pole induced at point P during the two stages of motion?

	magnet is moved towards the solenoid	magnet is moved away from the solenoid
A	N pole	S pole
B	N pole	N pole
C	S pole	S pole
D	S pole	N pole