

Class:	Candidate Name:	Candidate Index Number:
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EDGEFIELD SECONDARY SCHOOL

2025 PRELIMINARY EXAMINATION

Secondary 4

O
Syllabus

PHYSICS

Paper 1 Multiple Choice

Additional Materials: OTAS

6091/ 01
August 2025
1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

There are **forty** 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** on the separate Answer Sheet.

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.

FOR EXAMINER'S USE	
TOTAL	/ 40

My target grade/mark: _____

Parent's signature

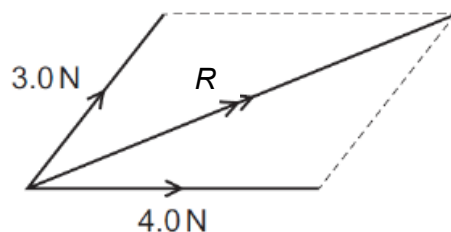
Answer **all** questions

- 1 The approximate diameter of the earth is 1.3×10^7 m and the diameter of a nitrogen atom is 1.5×10^{-10} m.

How are these values expressed with prefixes?

	diameter of the Earth	diameter of nitrogen atom
A	1.3×10^{-2} Mm	1.5×10^{-1} μ m
B	1.3×10^{-2} Gm	1.5×10^{-1} μ m
C	1.3×10^{-2} Mm	1.5×10^{-1} nm
D	1.3×10^{-2} Gm	1.5×10^{-1} nm

- 2 The diagram shows the resultant R of a 3.0 N force and a 4.0 N force acting at a point.



The angle between the 3.0 N force and the 4.0 N force can be any value from 0° to 90° .

Which value of R is not possible?

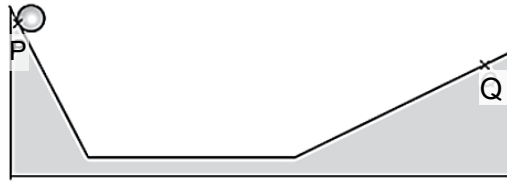
- A** 4.0 N **B** 5.0 N **C** 6.0 N **D** 7.0 N
- 3 A parachutist jumps from a plane and opens his parachute some time later.



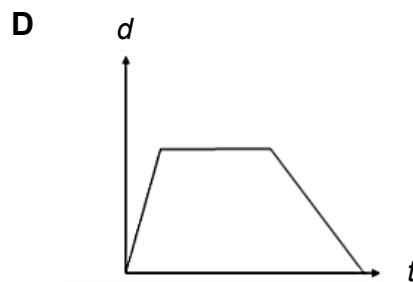
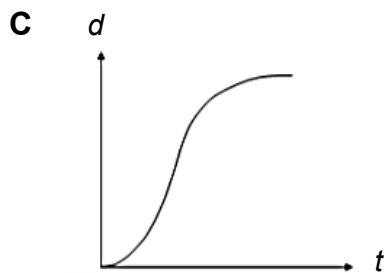
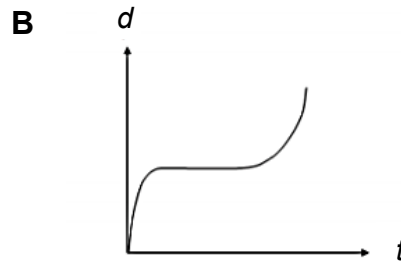
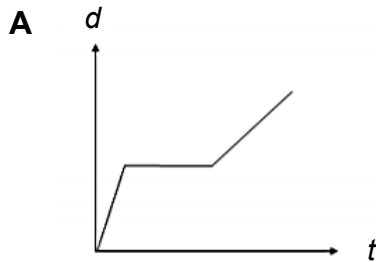
Which of the following is true about the directions of the velocity and acceleration of the parachutist after opening his parachute and before reaching terminal velocity?

	velocity	acceleration
A	downwards	downwards
B	downwards	upwards
C	upwards	downwards
D	upwards	upwards

- 4 A sphere moves along a smooth rail from P to Q as shown.



Which of the following graphs best represents the variation of the distance d travelled by the sphere with time t ?



- 5 A metal cube has a mass of 15 g. Each side measures 4.0 cm. The density of the metal is 3.0 g/cm^3 . There is empty space in the middle of the cube.

What is the volume of the empty space?

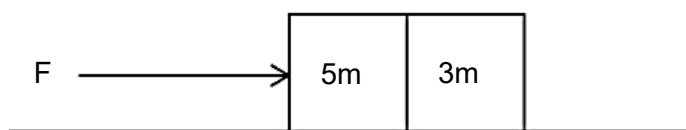
- A** 5.0 cm^3 **B** 11 cm^3 **C** 19 cm^3 **D** 59 cm^3

- 6 An experiment is carried out by an astronaut on the surface of the Moon. A coin and a feather are dropped at the same instant from the same height.

Which of the following statements is correct?

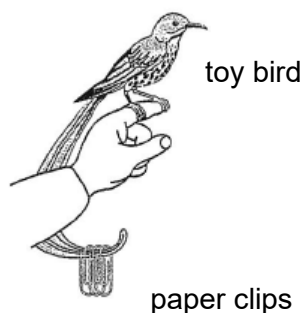
- A** The coin falls faster than the feather, but both take a longer time than if they were falling from the same height on Earth.
B The coin falls faster than the feather, but both take a shorter time than if they were falling from the same height on Earth.
C They fall together, taking a longer time than the coin would in falling from the same height on Earth.
D They fall together, taking a shorter time than the coin would in falling from the same height on Earth.

- 7 Two blocks with mass $5m$ and $3m$ are pushed along a smooth horizontal surface by an applied force F .



What is the magnitude of the force exerted between the blocks?

- A F B $\frac{2}{8}F$ C $\frac{3}{8}F$ D $\frac{8}{3}F$
- 8 A girl uses paper clips to balance a toy bird on her finger, as shown.



What is the effect of the paper clips?

- A They do not affect the centre of gravity but increase the weight.
 B They help to lower the centre of gravity below her finger.
 C They help to raise the centre of gravity above her finger.
 D They help to raise the centre of gravity to her finger.
- 9 The diagram shows a uniform metal bar of mass 30 kg . A student pulls straight up with a force F at one end Y of the bar so that it pivots about the end X.



When the end Y just comes off the ground, what is the value of the force F ?

- A 15 N B 60 N C 150 N D 240 N

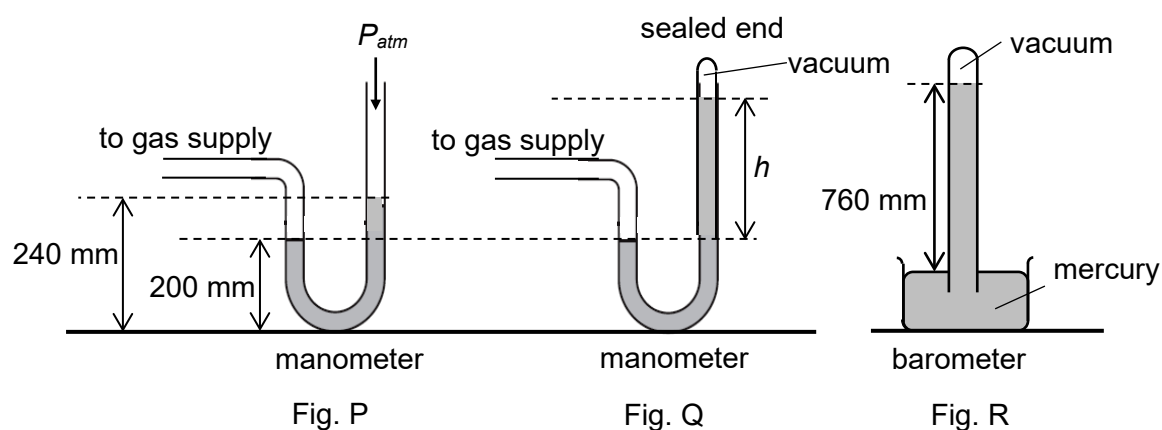
- 10 A fixed mass of gas is heated in a cylinder with a movable piston. The piston is pushed outwards by the gas to maintain a constant pressure in the piston.

Which row about the gas particles is correct?

	frequency of collision with the inner wall of cylinder	average speed
A	decrease	increase
B	decrease	no change
C	increase	increase
D	increase	no change

- 11 The pressure inside a gas cylinder is measured separately using two different mercury manometers as shown in Fig. P and Q. One of the manometers has an open end while the other has a sealed end.

A barometer, as shown in Fig. R, is used to measure the atmospheric pressure at the location of the experiment.



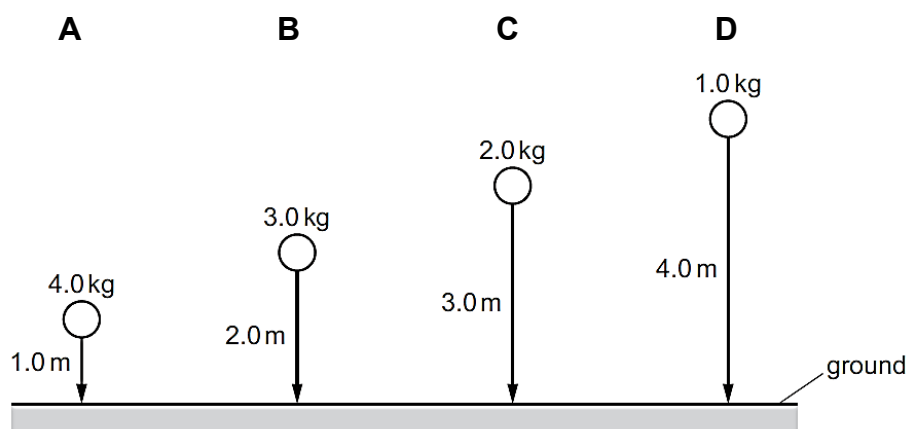
The diagrams are not drawn to scale.

What is the height, h , of the mercury in Fig. Q?

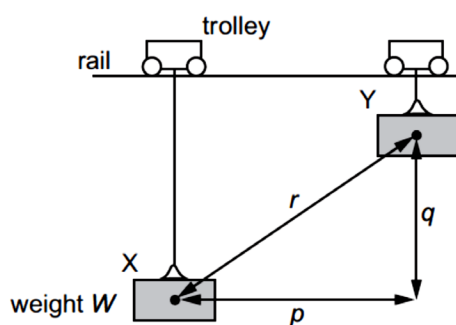
- A** 40 mm **B** 720 mm **C** 800 mm **D** 1000 mm

- 12** Four balls with different masses are dropped from the heights shown. Air resistance may be ignored.

Which ball has the smallest average speed?



- 13** A weight W hangs from a trolley that runs along a rail. The trolley moves horizontally through a distance p and simultaneously raises the weight through a height q .

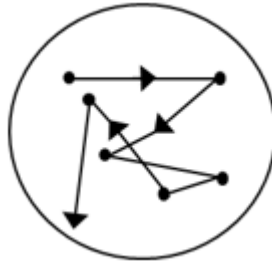


As a result, the weight moves through a distance r from X to Y. It starts and finishes at rest.

How much work is done on the weight during this process?

- A** Wp **B** $W(p + q)$ **C** Wq **D** Wr

- 14 Smoke particles in a transparent container are observed under a microscope. A small point of light is seen to move around as shown.

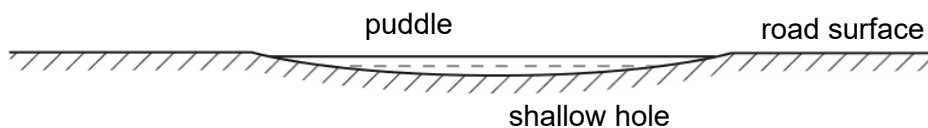


When the temperature in the container is raised, what change can be observed?

- A The small point of light becomes brighter.
 - B The small point of light changes direction more frequently.
 - C The small point of light increases in size.
 - D The small point of light moves slower.
- 15 A substance consists of particles that are close together and moving past each other at random. The average speed of the particles is gradually increasing.

What best describes the substance?

- A a gas being heated
 - B a liquid being heated
 - C a liquid undergoing solidification
 - D a solid being heated
- 16 The diagram shows the cross-sectional area of a shallow puddle of water on a road after rain.

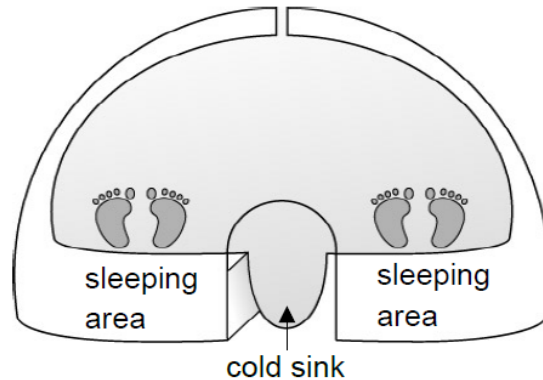


The surrounding temperature and the wind speed remain constant.

Which of the following best explains how the rate of evaporation of the water from the puddle changes?

	rate of evaporation	explanation
A	decreases	depth of puddle decreases
B	decreases	surface area decreases
C	increases	volume of water decreases
D	remains constant	temperature and wind speed do not change

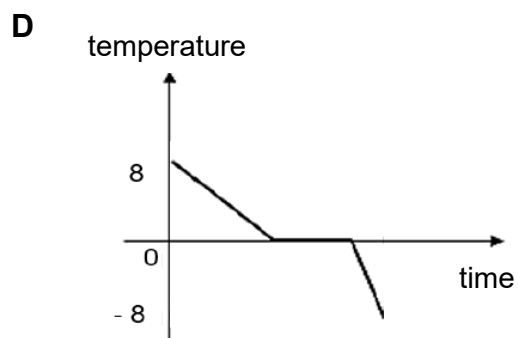
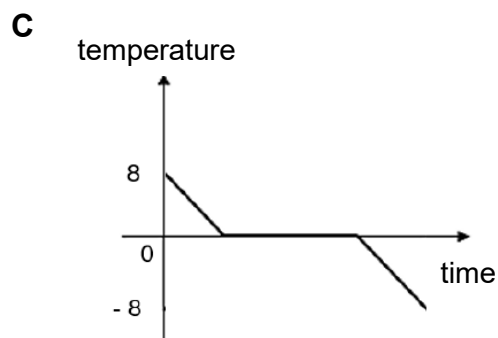
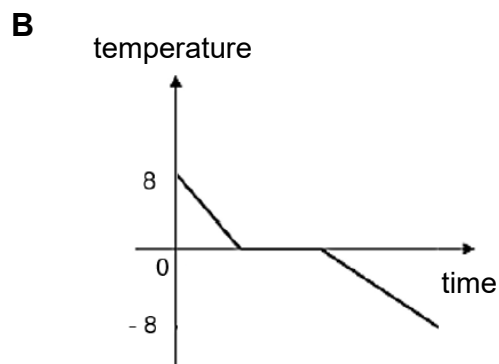
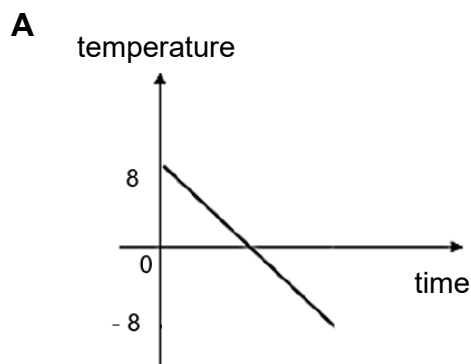
- 17** Eskimos build igloos as temporary shelter in extremely cold places such as the Arctic. The diagram shows a cross-section of an igloo. The entrance is dug deep enough (lower than the sleeping area) to create a cold sink.



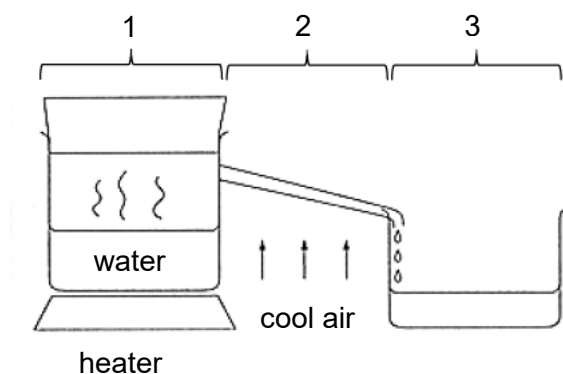
Which of the following statements about the air in the igloo is correct?

- A** Cold air is denser and remains in the cold sink.
 - B** The air in the igloo is heated up by conduction only.
 - C** The warm air in the igloo is less dense, contracts and rises.
 - D** Warm air in the cold sink expands, becomes denser and rises out of the cold sink to heat up the rest of the igloo.
- 18** A cup of water at 8°C was cooled to ice at -8°C .

Given that ice has a lower specific heat capacity than water, which of the following cooling curves shows how the temperature changes with time?



- 19** The diagram below shows a simple water distiller. Water is kept boiling in region 1, completely condensed in region 2 and collected in region 3.

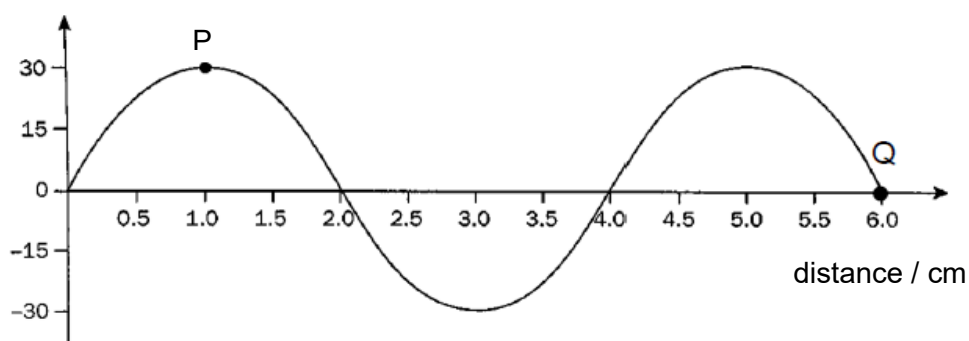


In which region is latent heat of vaporisation absorbed or released by the water?

	absorbed	released
A	1	2
B	1	3
C	2	1
D	3	1

- 20** A transverse wave is represented by the graph below.

displacement / cm

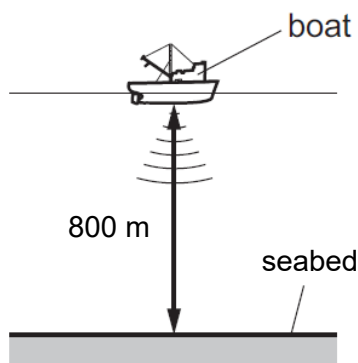


Given that the frequency of the wave is 5.0 Hz, how long does it take for the crest to travel from P to Q?

- A** 0.20 s **B** 0.25 s **C** 0.30 s **D** 0.50 s

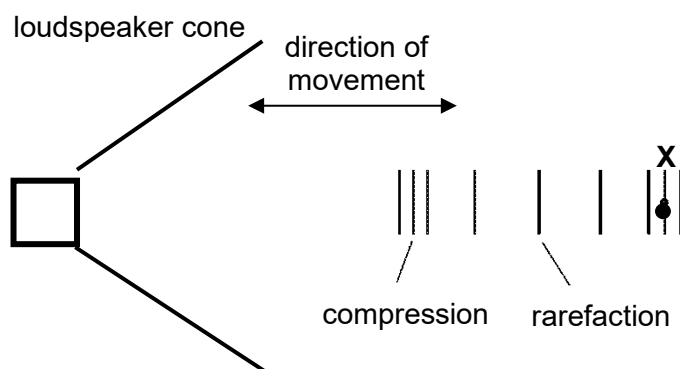
- 21** A pulse of sound is transmitted vertically downwards from the bottom of a stationary boat. The time taken for its echo to be detected back at the boat is 1.4 s.

The seabed is 800 m below the boat.



What is the speed of sound in the water?

- A** 286 m/s **B** 571 m/s **C** 1140 m/s **D** 2290 m/s
- 22** Compressions and rarefactions are sent out from a loudspeaker cone as it vibrates backwards and forwards. The frequency of vibration is 50 Hz.



Point **X** is at the centre of a compression.

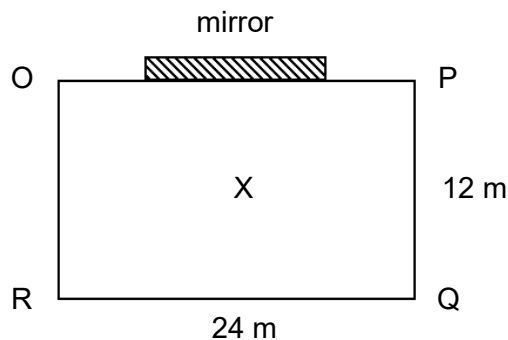
How much time elapses before the next rarefaction arrives at **X**?

- A** 0.010 s **B** 0.020 s **C** 25 s **D** 50 s

- 23** Visible light, X-ray and microwaves are all components of the electromagnetic spectrum.

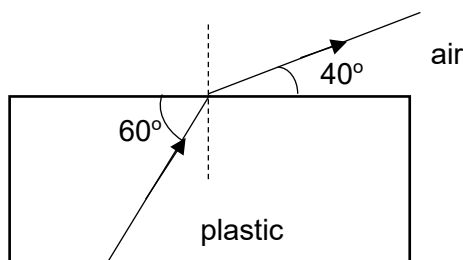
Which of the following statements about the waves is correct?

- A** In a vacuum, microwaves travel at the same speed as visible light and have a shorter wavelength.
 - B** In a vacuum, microwaves travel at the same speed as X-rays and have a shorter wavelength.
 - C** In a vacuum, X-rays travel at the same speed as visible light and have a shorter wavelength.
 - D** In a vacuum, X-rays travel faster than visible light and have a shorter wavelength.
- 24** A plane mirror is to be installed in the middle of wall OP in a rectangular room 24 m by 12 m.



What is the minimum width of the plane mirror on wall OP such that a person standing in the middle of the room at X can see the entire wall QR in the mirror?

- A** 8 m
 - B** 12 m
 - C** 16 m
 - D** 24 m
- 25** A ray of light travels from plastic to air as shown.



The speed of light in air is 3.0×10^8 m/s.

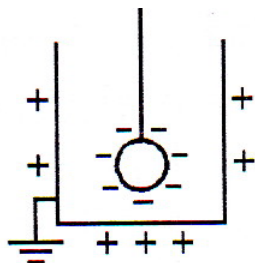
What is the speed of light in the plastic?

- A** 1.5×10^8 m/s
- B** 2.0×10^8 m/s
- C** 3.0×10^8 m/s
- D** 4.5×10^8 m/s

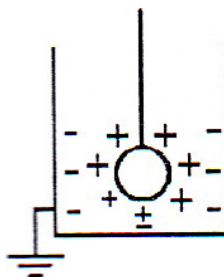
- 26** A charged sphere is suspended by an insulating thread inside a metal can. The outside of the can is earthed.

Which diagram shows the correct resulting charges on the sphere and on the can?

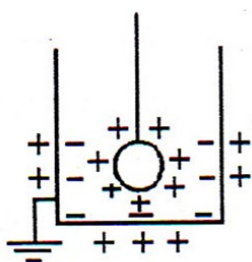
A



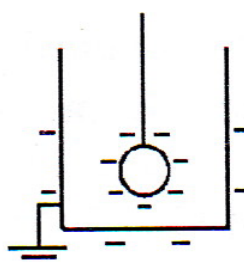
B



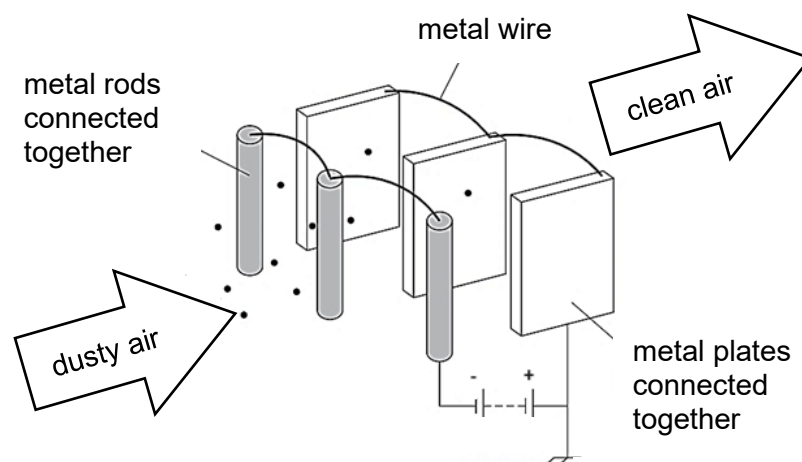
C



D



- 27** In an electrostatic precipitator, a fan blows dusty air past several metal rods and metal plates. There is a large potential difference between the metal rods and the metal plates.



How do dust particles get removed in this precipitator?

- A** Dust particles gain electrons and get attracted to the metal plates.
- B** Dust particles gain protons and move away from the metal plates.
- C** Dust particles lose electrons and move away from the metal plates.
- D** Dust particles lose protons and get attracted to the metal plates.

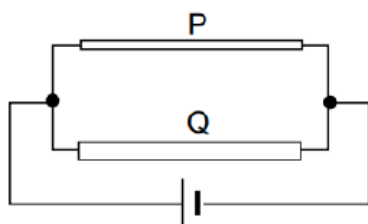
- 28** A 12 V car battery is fully charged. It is connected in series to a lamp labelled “12 V, 24 W”. The lamp shines at normal brightness for 8 hours.

What is the magnitude of the charge that passes through the lamp during this time?

- A** 960 C **B** 14 400 C **C** 57 600 C **D** 691 200 C

- 29** The diagram shows two wires P and Q, each of the same length and the same material, connected in parallel to a battery.

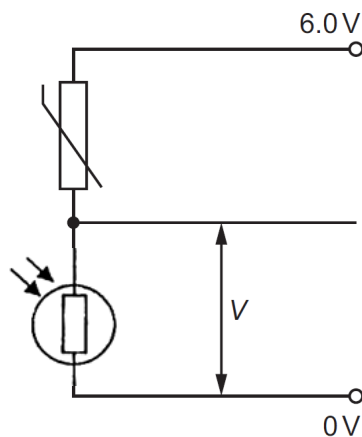
The cross-sectional area of Q is twice that of P.



What fraction of the total current passes through P?

- A** $\frac{1}{5}$ **B** $\frac{1}{4}$ **C** $\frac{1}{3}$ **D** $\frac{1}{2}$

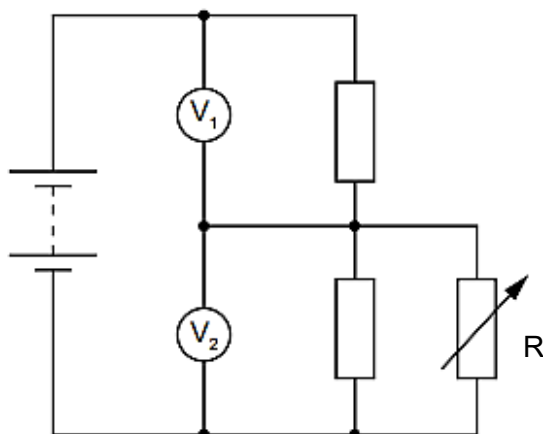
- 30** A potential divider consists of a negative temperature coefficient (NTC) thermistor and a light-dependent resistor (LDR).



Which of the following conditions will give the smallest voltage V across the LDR?

- A** cold and bright
B cold and dark
C hot and bright
D hot and dark

- 31 The circuit diagram shows a variable resistor R connected in parallel to the lower half of a potential divider.



The resistance of R increases.

What happens to the voltmeter readings?

	reading on V_1	reading on V_2
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 32 Four possible situations are listed below.

- 1 The live wire touches the earth wire.
- 2 The live wire touches the neutral wire.
- 3 The earth wire is touched by a person.
- 4 The fuse is fixed on the neutral wire instead of the live wire.

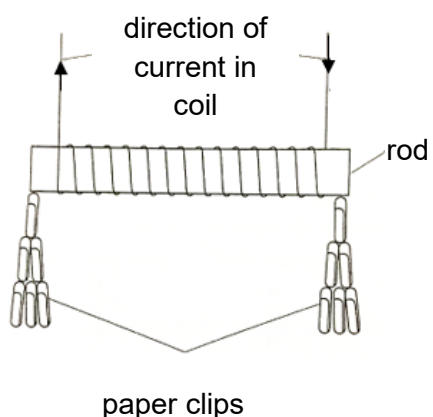
In which of the following situation(s) would a fuse melt?

- A** 2 only
B 1 and 2 only
C 3 and 4 only
D 1, 2 and 3 only
- 33 A 2.0 kW heater and a 1.0 kW fan are connected in parallel to a 240 V mains supply.

Which of the following fuse ratings should be installed in the household circuit?

- A** 10 A **B** 12 A **C** 13 A **D** 30 A

- 34** Four rods are placed, in turn, inside a coil of copper wire.

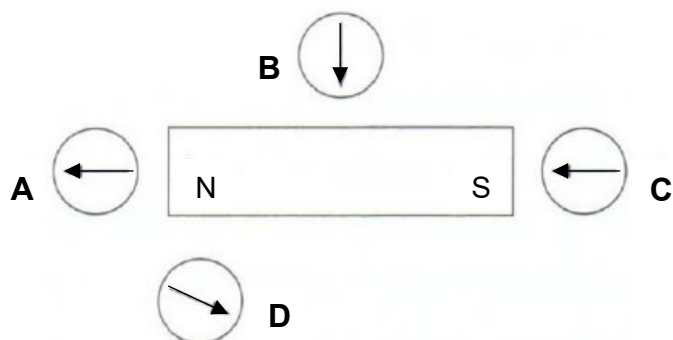


The table below gives the results of the experiment.

Which rod would be the most suitable to use as the core of a coil in a circuit breaker?

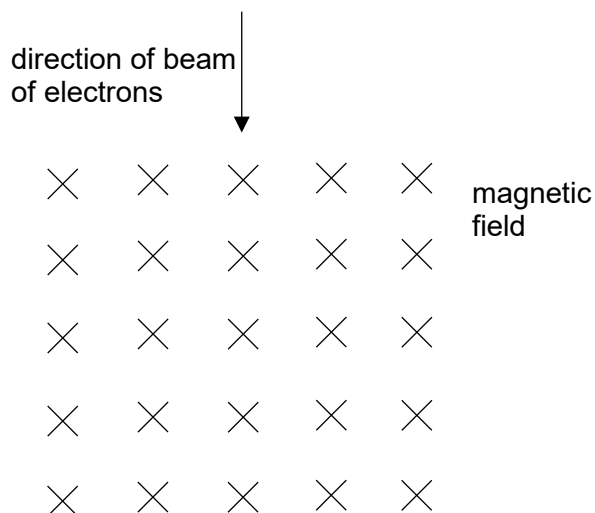
	number of paper clips picked up when there is current in the coil	number of paper clips picked up when there is no current in the coil
A	1	0
B	20	5
C	40	0
D	40	20

- 35** Four compasses are placed around a bar magnet, as shown in the diagram.



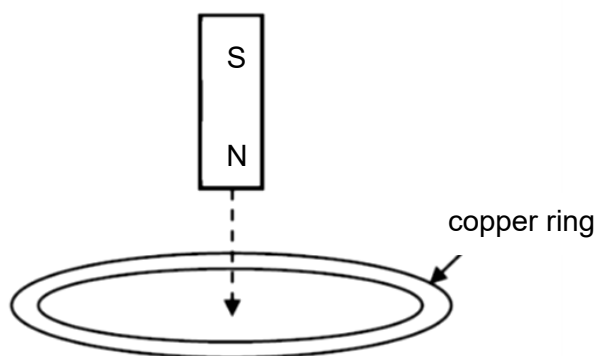
Which of the compasses is pointing in the wrong direction?

- 36 The diagram shows a beam of electrons entering a magnetic field.



Which of the following describes the movement of the electrons as they enter the magnetic field?

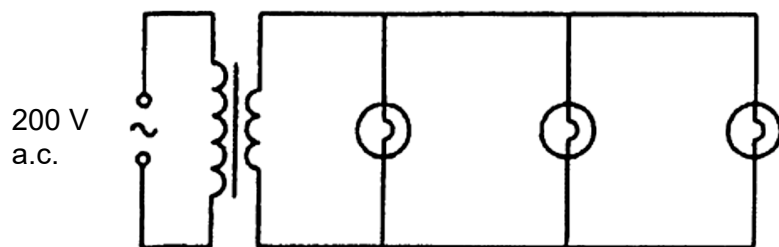
- A The electrons are deflected into the paper.
 - B The electrons are deflected out of the paper.
 - C The electrons are deflected to the left.
 - D The electrons are deflected to the right.
- 37 A magnet is dropped vertically through a copper ring. The induced electromotive force is larger than the weight of the magnet.



Which of the following statements is **incorrect**?

- A A current flows in the ring just after the magnet passes through the ring.
- B A current flows in the ring just before the magnet passes through the ring.
- C The magnet accelerates just after it passes through the ring.
- D The magnet slows down just before it passes through the ring.

- 38** A transformer as shown below is 60% efficient. Each light bulb is “12 V, 24 W” and is working at the rated value.



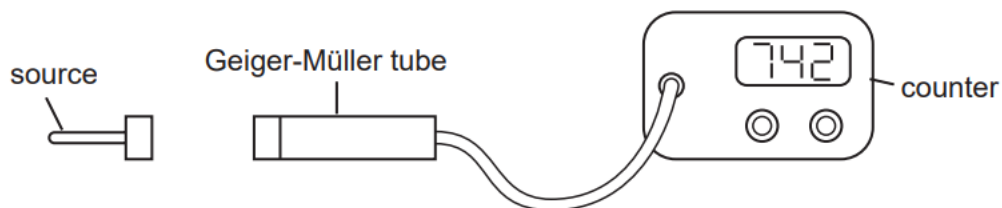
What is the primary current in the circuit?

- A** 0.36 A **B** 0.45 A **C** 0.60 A **D** 0.80 A
- 39** The half-life of a certain radioactive element is such that $\frac{7}{8}$ of a given quantity decays in 12 days.

What fraction remains undecayed after 24 days?

- A** $\frac{1}{128}$ **B** $\frac{1}{64}$ **C** $\frac{1}{32}$ **D** $\frac{1}{16}$

- 40** A radioactive source is placed 3 cm from a Geiger-Müller tube in air. The average count rate is 742 counts / minute.



Three measurements are taken with sheets of different materials placed between the source and the tube.

The results are recorded in the table as shown below.

material of sheet between source and tube	thin card	aluminium foil	thick lead
average count rate / counts per minute	273	275	68

Which types of radiation does the source emit?

- A** alpha and beta only
- B** alpha and gamma only
- C** alpha, beta and gamma
- D** beta and gamma only

End of Paper