



SERANGOON GARDEN SECONDARY SCHOOL

PRELIMINARY EXAMINATION

CANDIDATE
NAME

CLASS

INDEX
NUMBER

PHYSICS

6091/01

28 August 2026
1 hour

Paper 1 Multiple Choice
Secondary 4 Express

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Answer Sheet provided unless this has been done for you.

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.

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 paper.

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

For Examiner's Use	
Total	40

This document consists of **21** printed pages and **1** blank page.
BLANK PAGE

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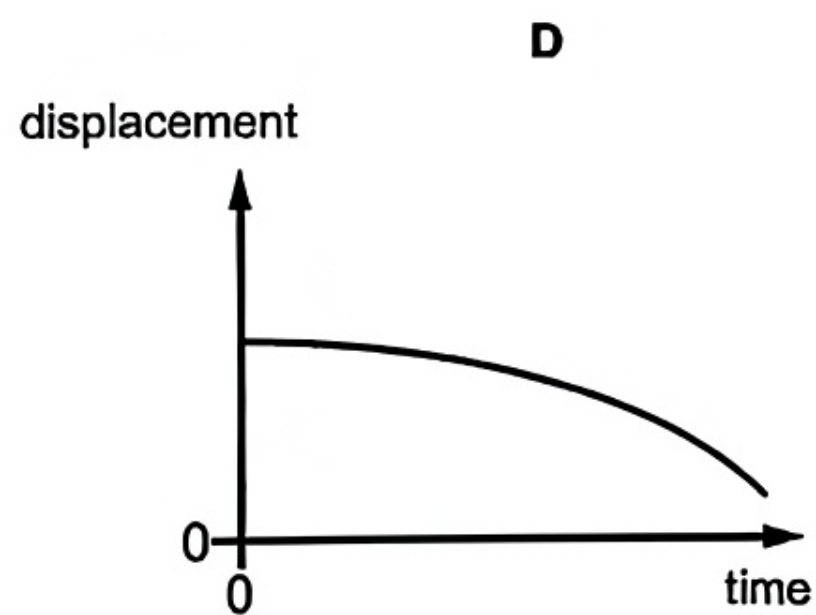
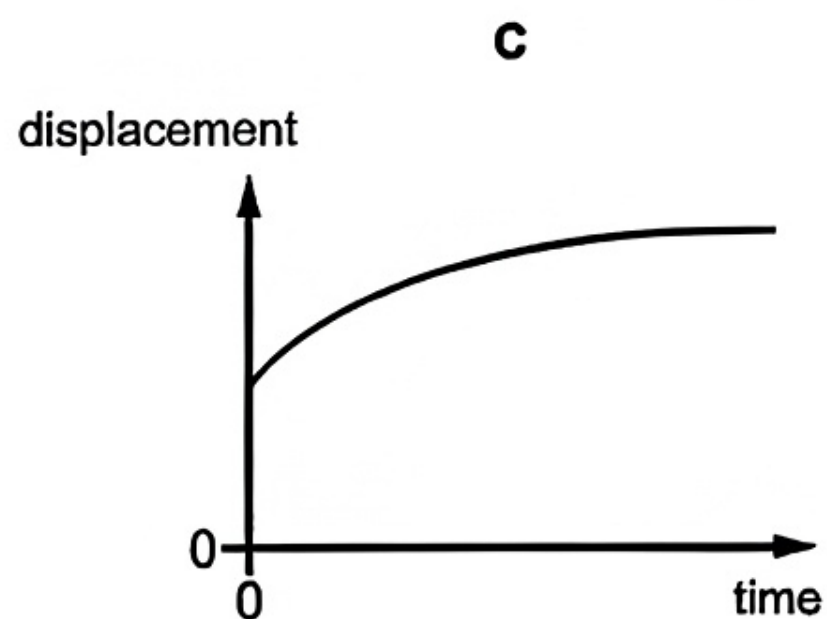
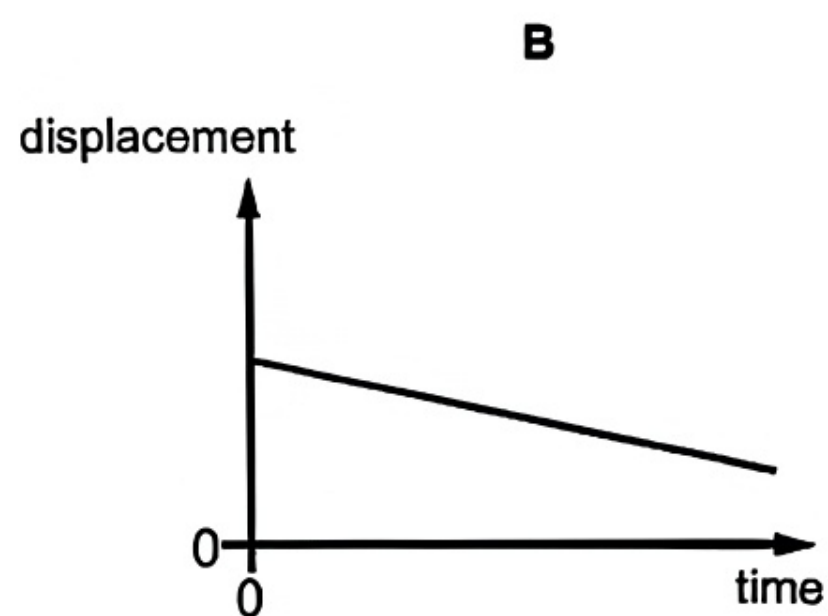
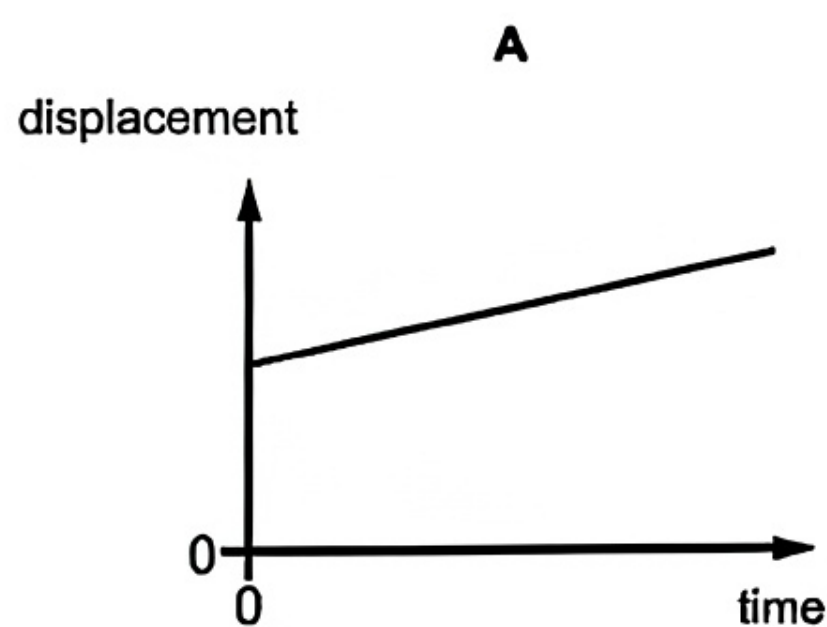
1 Which pair of physical quantities contain a vector and a scalar quantity?

- A area and displacement
- B distance and volume
- C temperature and time
- D weight and velocity

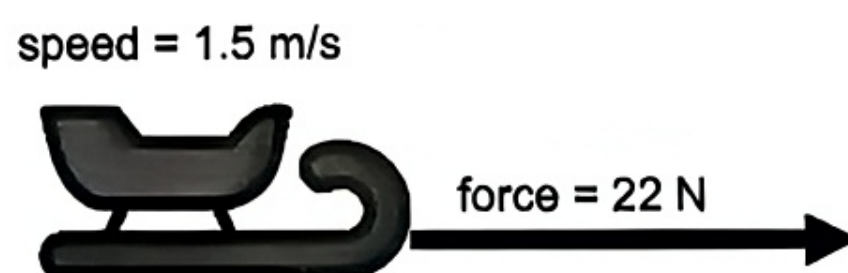
2 A textbook lists the average width of a human hair as 0.0001 m and the distance between the Earth and the Sun as 1.5×10^{11} m. How are these values expressed with prefixes?

	average width of human hair	distance between the Earth and the Sun
A	1.0×10^{-1} mm	1.5×10^{-1} Tm
B	1.0×10^{-1} mm	1.5×10^{-1} Gm
C	1.0×10^{-1} μ m	1.5×10^{-1} Gm
D	1.0×10^{-1} μ m	1.5×10^{-1} Tm

3 Which displacement-time graph represents a body whose magnitude of velocity is decreasing?

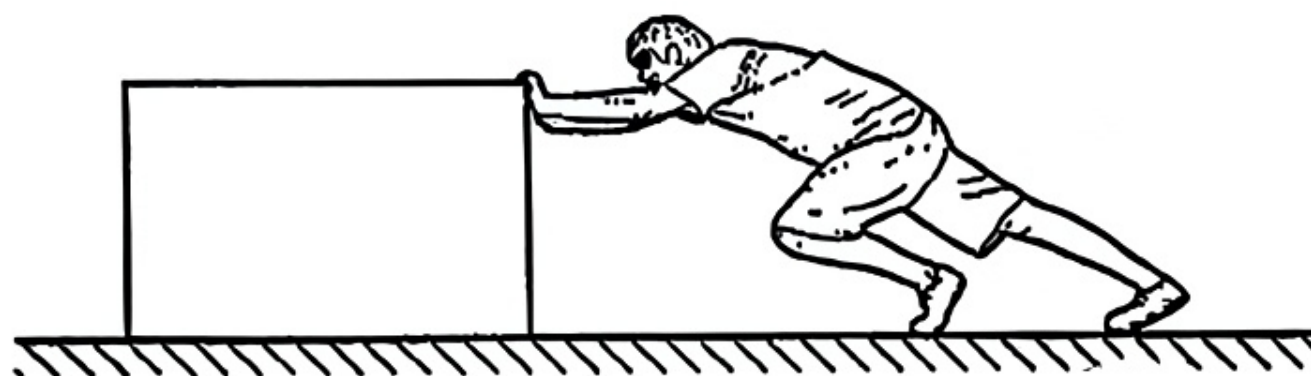


- 4 A sled of mass 12 kg is pulled along the surface of a frozen lake with an initial velocity of 1.5 m / s. It experiences a horizontal force of 22 N and accelerates at a constant rate of 0.5 m / s².



What is the frictional force acting on the sledge?

- A 0 N
 B 6 N
 C 16 N
 D 22 N
- 5 A man pushes a heavy box along the ground.

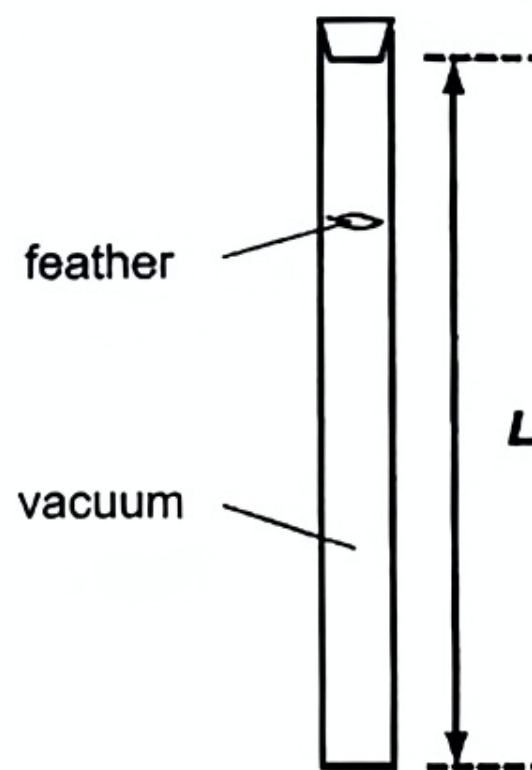


Both the box and the man experience a frictional force.

In which direction do these frictional forces act along?

	frictional force experienced by the box	frictional force experienced by the man
A	towards the left	towards the left
B	towards the left	towards the right
C	towards the right	towards the left
D	towards the right	towards the right

- 6 The diagram shows a laboratory experiment setup in which a feather falls from rest in a long evacuated vertical tube of length L .

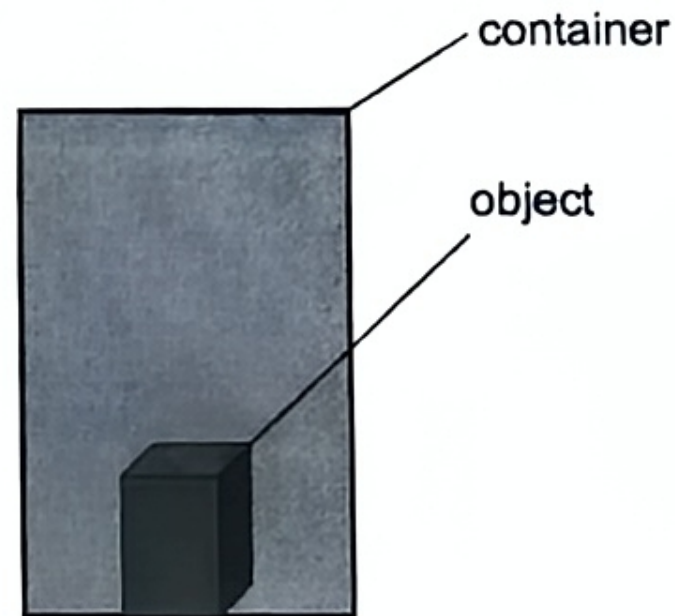


This experiment is carried out on a different planet. The feather took time, t to fall from the top to the bottom of the tube.

How far will the feather have fallen from the top of the tube in $0.5 t$?

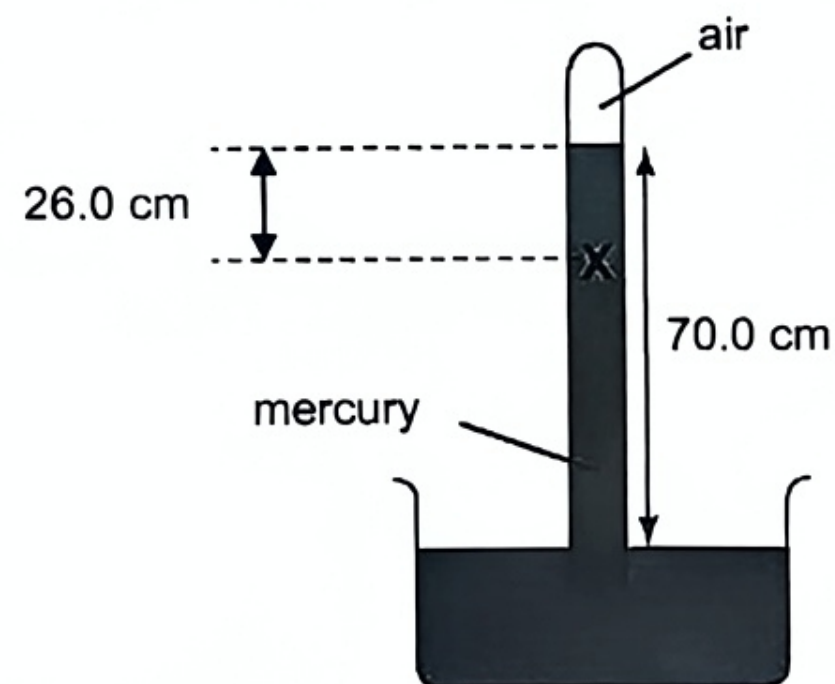
- A $0.13 L$
- B $0.25 L$
- C $0.50 L$
- D $0.75 L$

- 7 A container has an internal volume of 1000 cm^3 . It is filled with water initially. When an object is placed in the container, the volume of water that overflowed from the box is 320 cm^3 .



Given the density of the object is 8.0 g / cm^3 , what is the mass of the object?

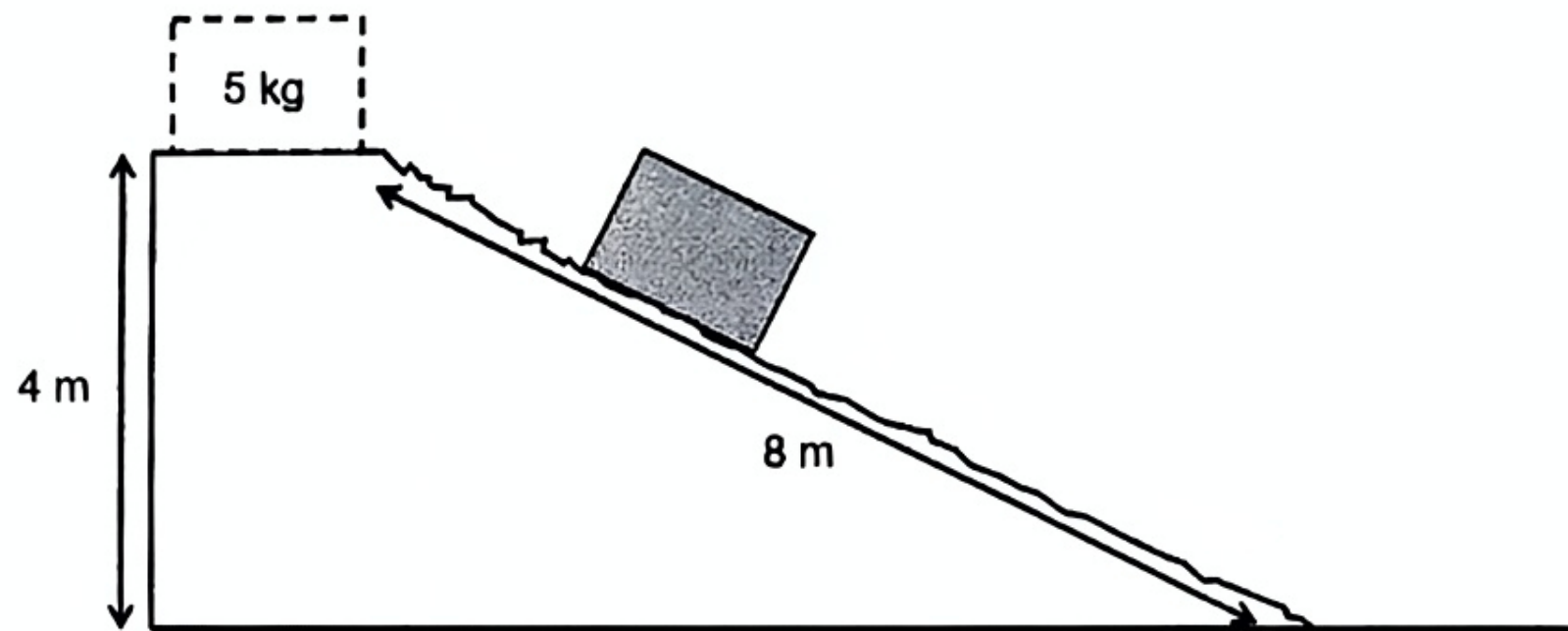
- A 40 g
 B 85 g
 C 2560 g
 D 5440 g
- 8 The diagram shows a barometer containing some air in the space above the mercury column. The height of mercury column is 70.0 cm. X is a point 26.0 cm below the surface of the mercury in the tube. The atmospheric pressure is 76.0 cmHg.



What is the pressure at point X in the mercury?

- A 26.0 cmHg
 B 32.0 cmHg
 C 44.0 cmHg
 D 50.0 cmHg

- 9 A box of 5 kg was placed at the top of a rough inclined plane. As the box slid down, the total work done against friction was 100 J.



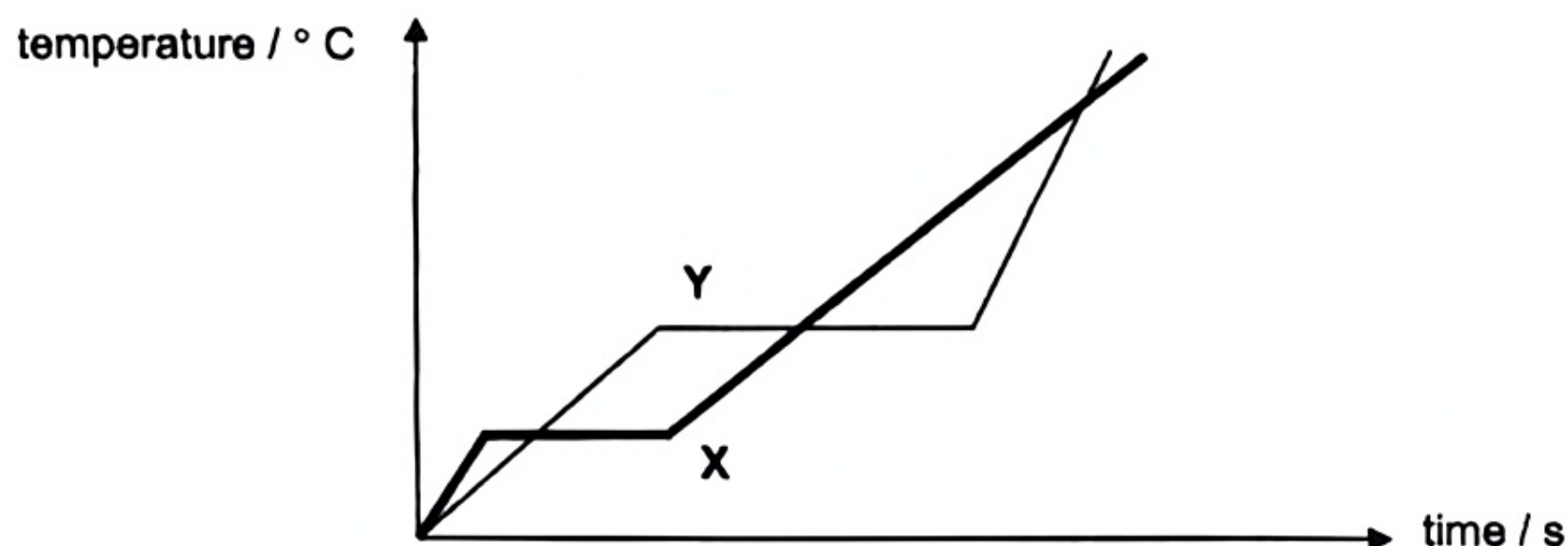
What was the total energy possessed by the box at the bottom of the inclined plane?

- A 20 J
 - B 40 J
 - C 100 J
 - D 200 J
- 10 A filament lamp is connected to a battery. When the switch is closed, the lamp emits light and becomes warm.

Which method of energy transfer does **not** occur?

- A by propagation of waves
- B electrically by an electric current
- C heating due to a temperature difference
- D mechanically by a force acting over a distance

- 11 Equal masses of two liquids **X** and **Y** are heated simultaneously with a datalogger tracking their temperature. Thermal energy is supplied to both at the same rate. The temperature-time graph for the process is shown.



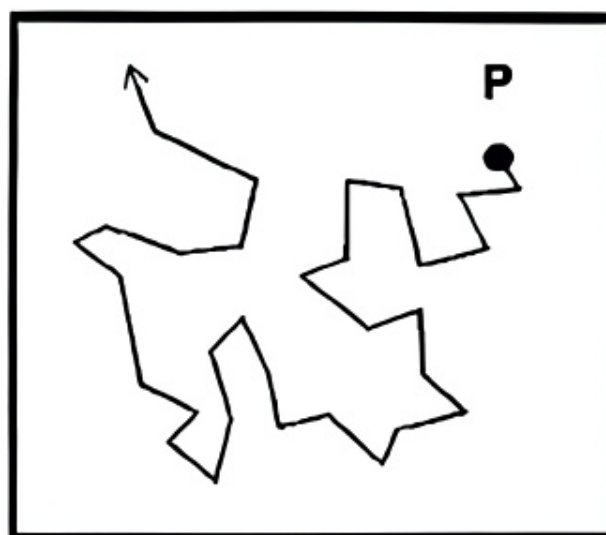
Which statement below is correct?

- A Liquid **X** has a larger specific heat capacity than Liquid **Y**.
 - B Gas **X** has a smaller specific heat capacity than Gas **Y**.
 - C Liquid **X** has a smaller specific latent heat of fusion than Liquid **Y**.
 - D Liquid **X** has a smaller specific latent heat of vaporization than Liquid **Y**.
- 12 An air-conditioner has an input power of 800 W. During normal operation, 120 J of energy is transferred as unwanted sound energy in 2.0 s.

What is the efficiency of the air-conditioner?

- A 7.5 %
- B 92.5 %
- C 96.3 %
- D 99.3 %

- 13 The diagram shows a smoke particle **P** seen moving randomly when suspended in air under a microscope.



Which statement explains why **P** moves randomly?

- A** Air molecules are much larger than **P**.
 - B** Air molecules collide with **P** from different directions.
 - C** **P** is in the gaseous state.
 - D** **P** is much larger than air molecules.
- 14 The total number of particles and the average kinetic energy of the particles in three bodies, **P**, **Q** and **R**, are given in the table.

body	total number of particles	average kinetic energy of particles
P	N	E
Q	$0.5 N$	$2E$
R	$2 N$	E

The temperatures of **P**, **Q** and **R** are denoted by T_P , T_Q and T_R respectively.

Which relationship between T_P , T_Q and T_R is correct?

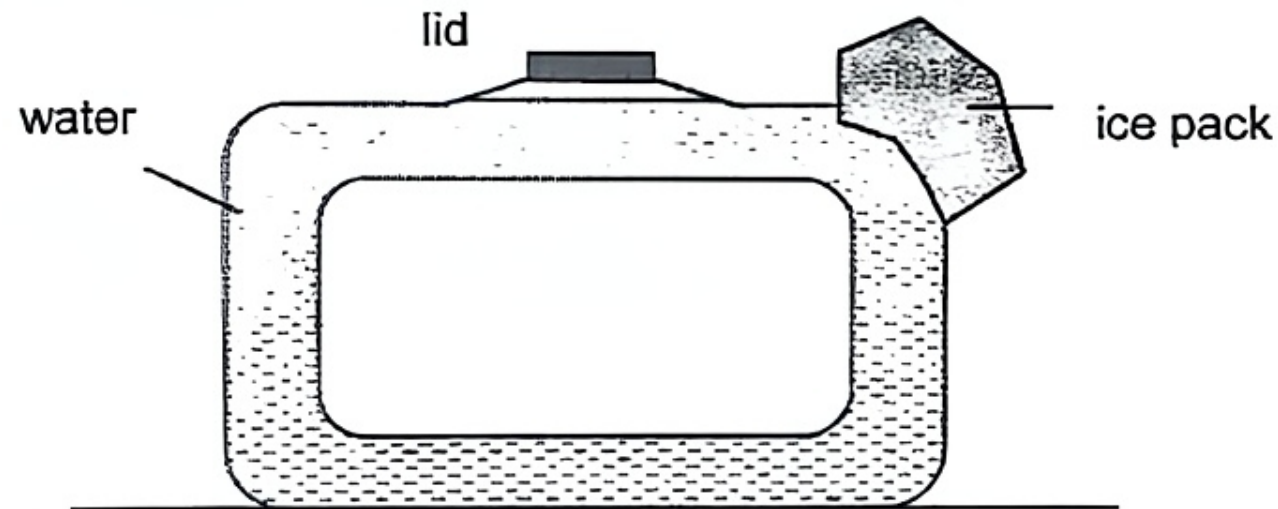
- A** $T_P = T_R < T_Q$
- B** $T_P = T_Q < T_R$
- C** $T_R < T_P < T_Q$
- D** $T_R < T_P = T_Q$

- 15** A vacuum flask is used to keep water hot. The space between the inner container and the outer casing is a vacuum.

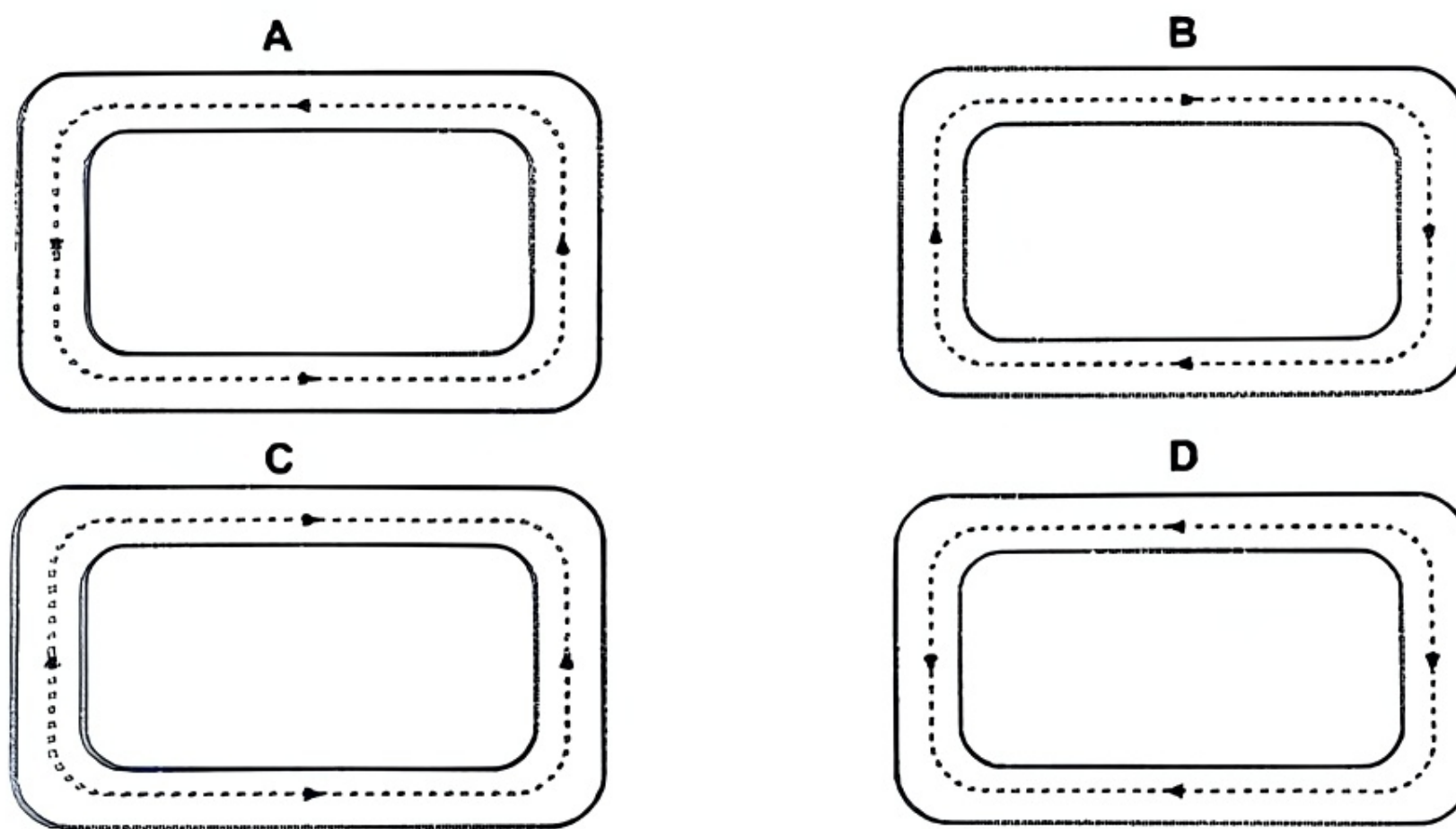
Which methods of energy transfer are prevented by regions of vacuum?

- A** conduction only
 - B** radiation only
 - C** conduction and convection
 - D** conduction and radiation
- 16** Heat capacity is the energy required to raise the temperature of the object by 1 °C.
- What does this energy do in a solid?
- A** It increases the average size of the particles in a solid.
 - B** It increases the forces of attraction between the particles in a solid.
 - C** It increases the internal potential energy of particles in a solid.
 - D** It increases the rate of vibration among the particles in a solid.

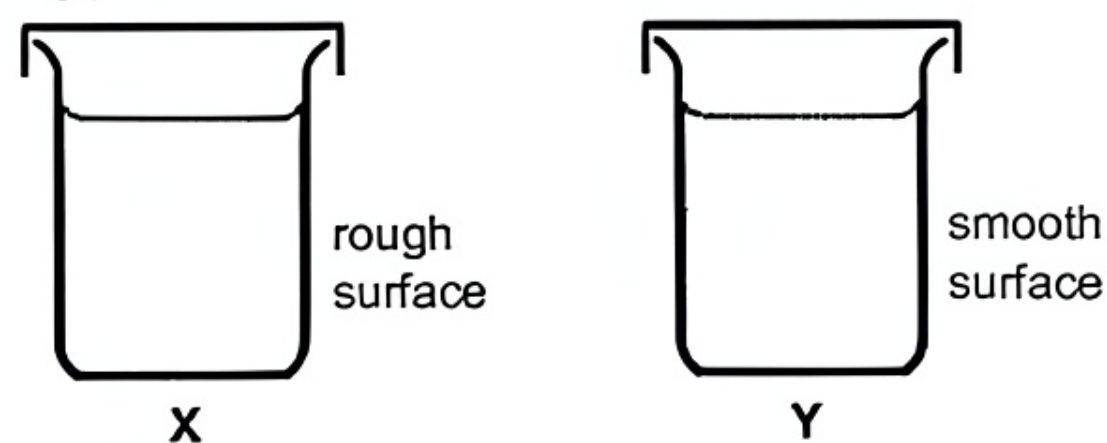
- 17 A student filled an upright ring-shaped container completely with room temperature water. He then placed a pack of ice at a corner of the container.



Which is the correct illustration of the convection current that was set up?



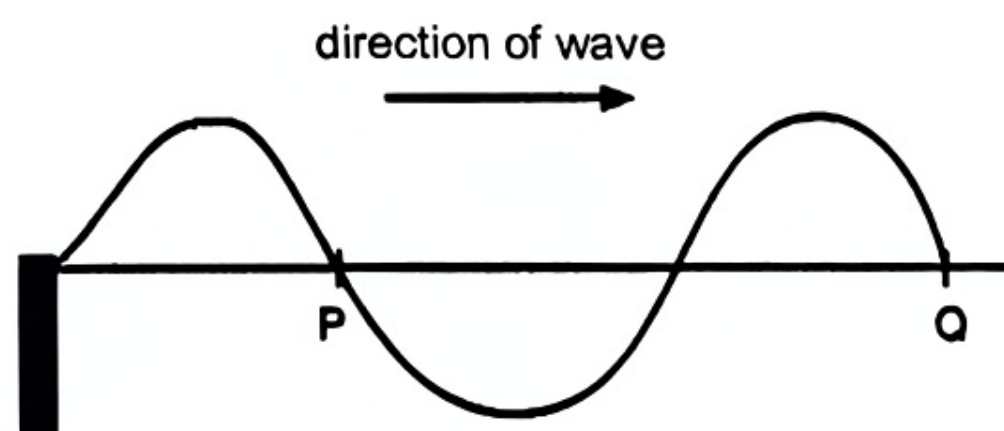
- 18 In the diagram, two copper containers X and Y with outer surface of different texture are filled with the same amount of water at boiling point and left in the room.



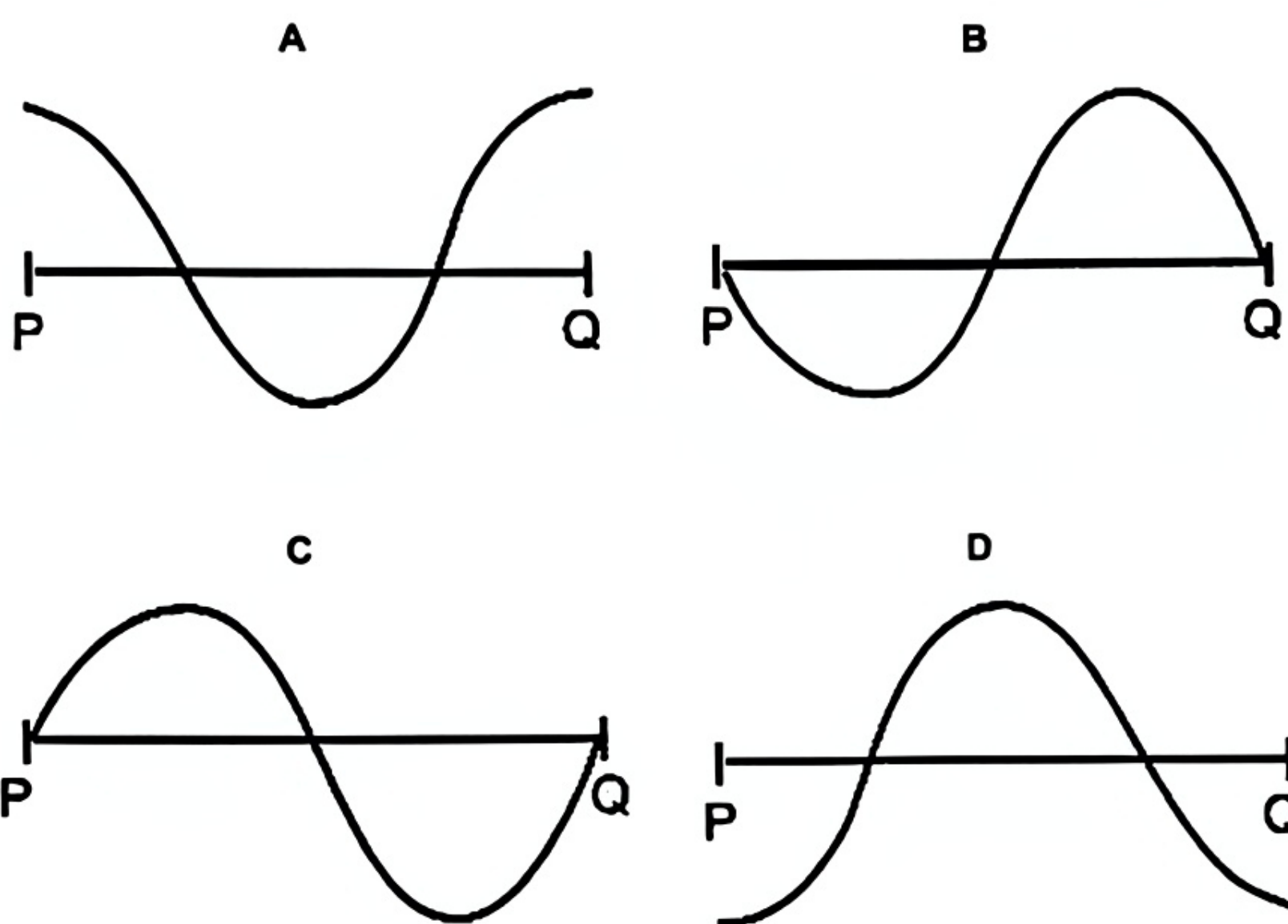
Which of the following statements about the temperature of the two containers after a short while is correct?

- A Y is cooler because a smooth surface is a good emitter of radiation.
- B Y is cooler because a smooth surface is a poor absorber of radiation.
- C Y is warmer because a smooth surface is a good absorber of radiation.
- D Y is warmer because a smooth surface is a poor emitter of radiation.

- 19** A wave generator generates a travelling wave on a string. The diagram shows the shape of the string at a certain instance.



Which is the correct shape of the string between P and Q after half a period?

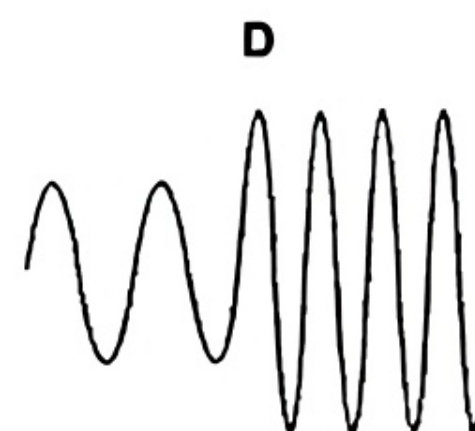
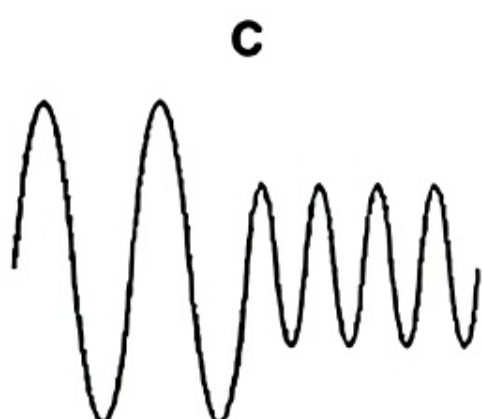
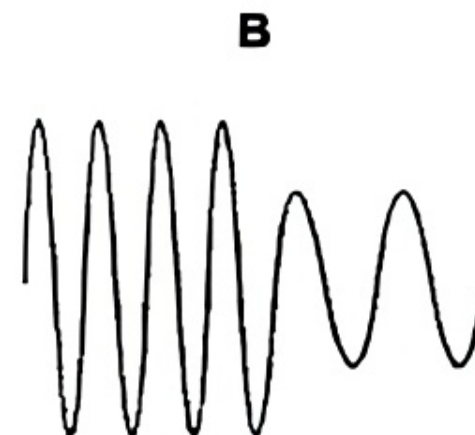
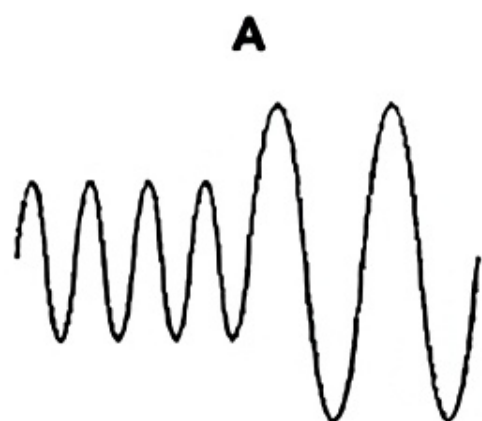


- 20** Which row correctly describes what happens to sound waves as it travels from air into water?

	frequency	wavelength	speed
A	remains the same	reduced	reduced
B	remains the same	increased	increased
C	increased	increased	reduced
D	increased	reduced	increased

- 21** Sound waves are displayed as a trace on the screen of an oscilloscope.

Which trace shows a sound that becomes softer with a lower pitch?



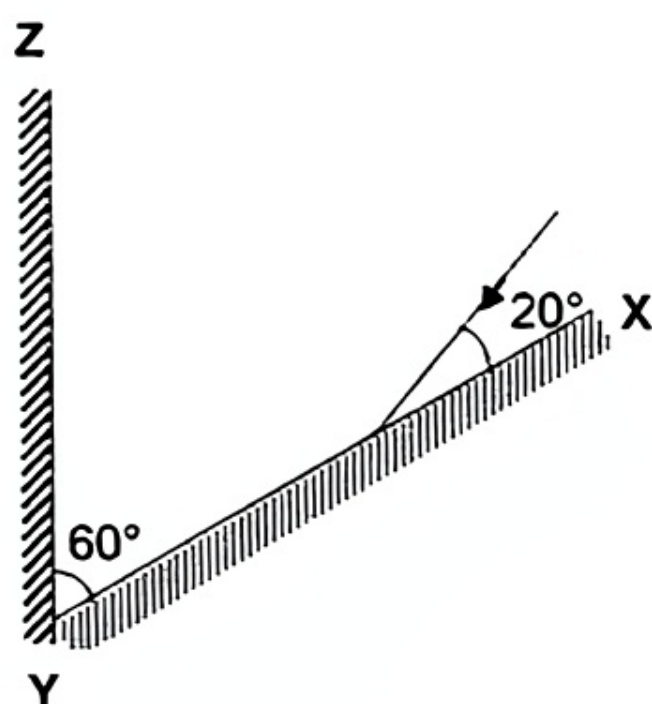
- 22** The diagram shows the main sections of the electromagnetic spectrum in order of increasing frequency. Some of the sections are labelled.

radio waves			visible light	P		gamma-rays
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Which application makes use of region **P**?

- A** cooking of food
- B** forgery detection
- C** Global Positioning System (GPS)
- D** remote control of a television

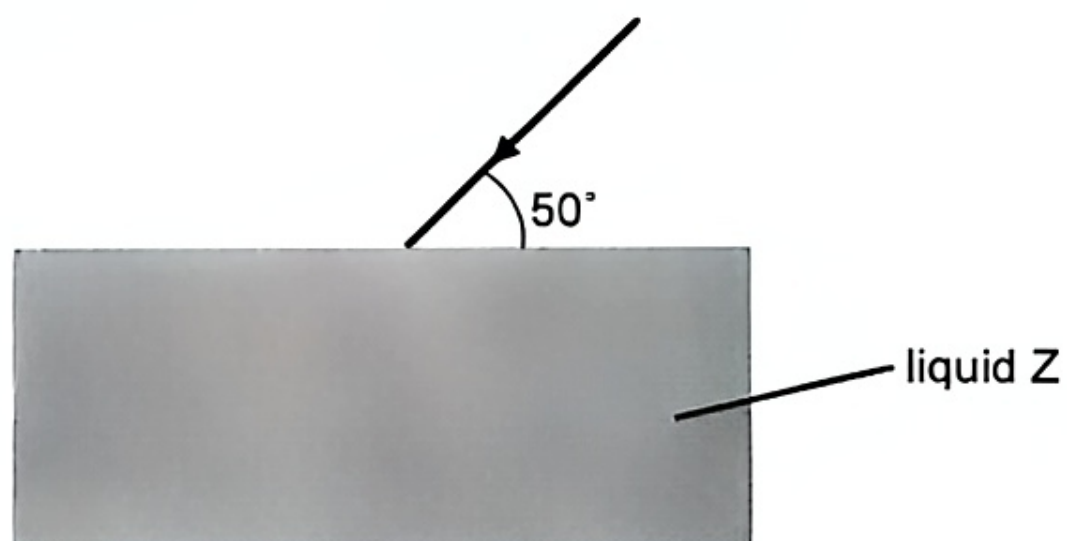
- 23** A ray of light is incident at an angle of 20° to a mirror **XY**. Another mirror **YZ** is arranged at an angle of 60° to **XY** as shown in the diagram below.



After reflection from **XY**, the ray is incident on **YZ**.

What is the angle of incidence of the ray at the mirror **YZ**?

- A** 0°
 - B** 10°
 - C** 20°
 - D** 60°
- 24** The diagram shows a ray of light travelling from air into an unknown liquid **Z**.

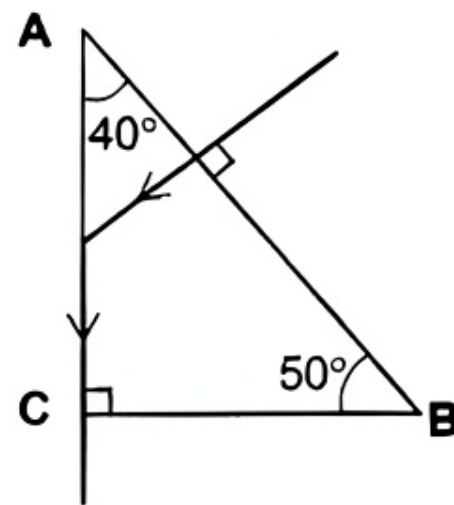


It was measured that the speed of light in unknown liquid **Z** is approximately $1.72 \times 10^8 \text{ m / s}$.

What is the angle of refraction of the ray?

- A** 13°
- B** 22°
- C** 26°
- D** 40°

- 25** The diagram shows a ray of light entering a glass prism at the surface **AB** and travelling along the surface **AC**.



What is the refractive index of the glass prism?

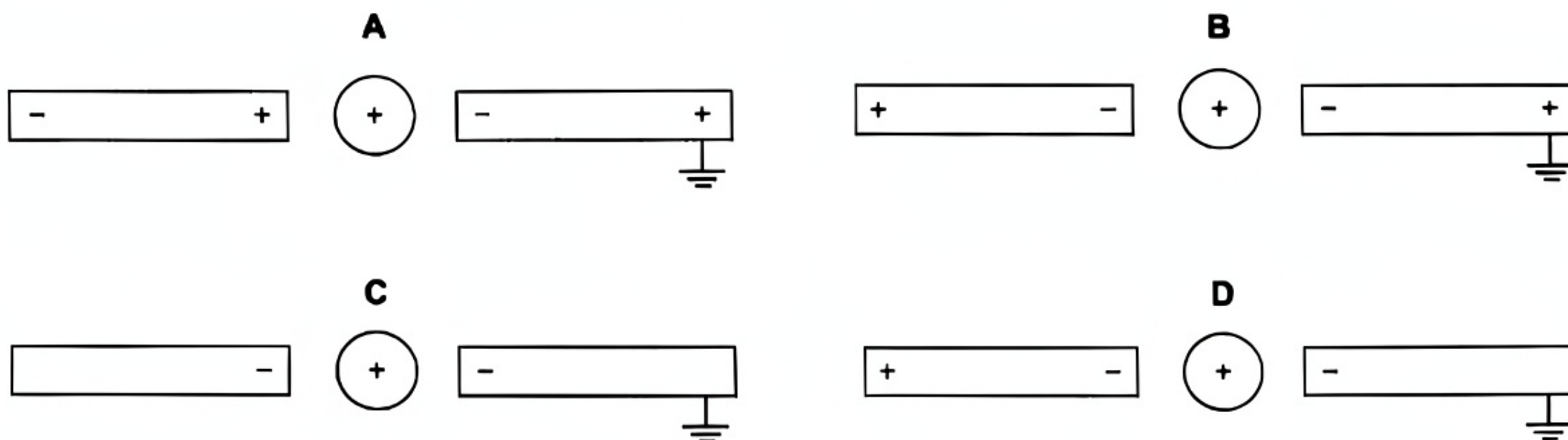
- A** 1.31
B 1.41
C 1.50
D 1.56
- 26** A plastic rod is rubbed with a cloth. The rod becomes positively charged.

What happens to the plastic rod and what is the charge on the cloth?

	plastic rod	charge on cloth
A	gains electron	positive
B	gains protons	positive
C	loses electrons	negative
D	loses protons	negative

- 27** A positively-charged metal sphere is placed midway between two previously uncharged metal rods, one of which is connected to the earth.

Which diagram shows the resulting charges on the rods?

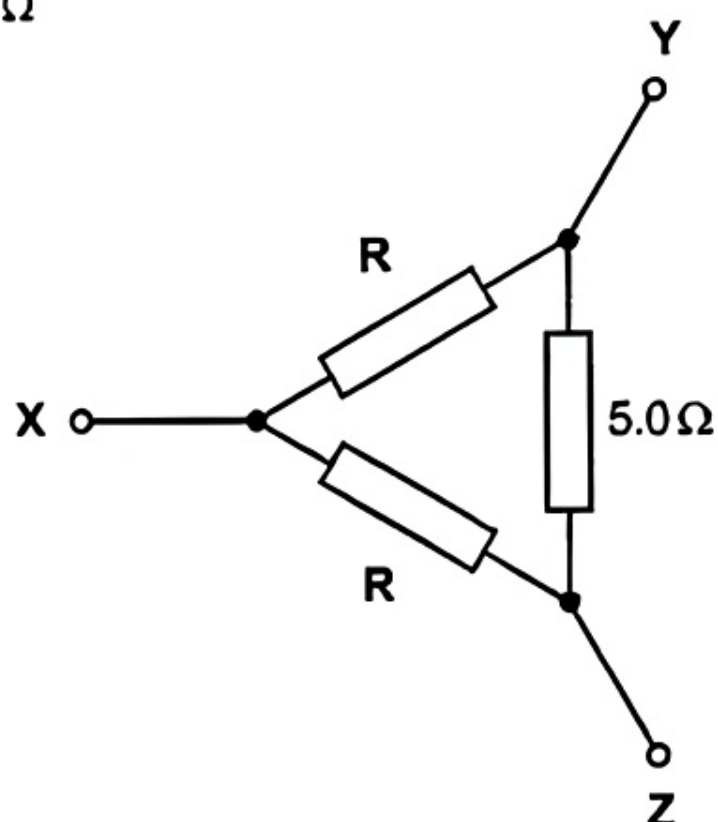


- 28** As a battery drives 400 C of charge around a circuit, the total work done is 600 J.

What is the electromotive force of the battery?

- A** 0.67 V
- B** 1.50 V
- C** 0.80 V
- D** 200 V

- 29 The diagram shows a network of three resistors. Two of these, marked as **R**, are identical. The other resistor has a resistance of $5.0\ \Omega$

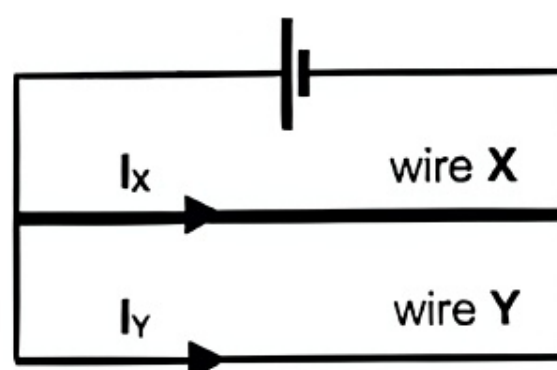


The resistance between **Y** and **Z** is found to be $2.5\ \Omega$.

What is the resistance of **R**?

- A** $0.2\ \Omega$
B $0.5\ \Omega$
C $2.5\ \Omega$
D $5.0\ \Omega$
- 30 Two resistance wires **X** and **Y**, are connected across a dry cell. Both wires are made of the same material and are of the same length. However, wire **Y** has a diameter that is half that of wire **X**.

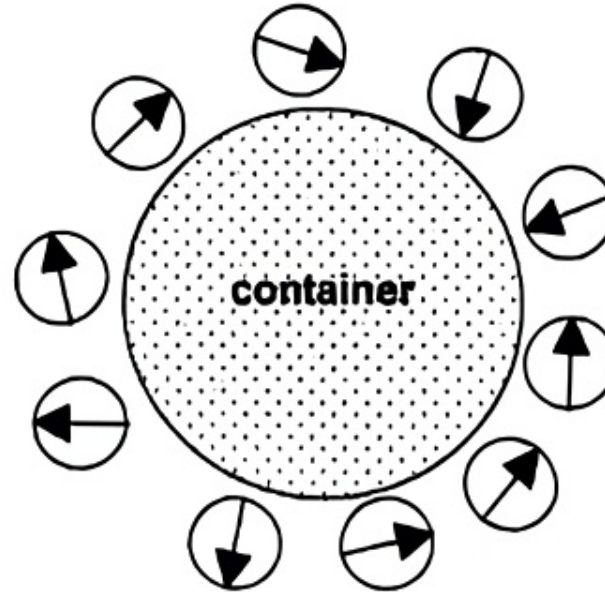
Currents I_X and I_Y flows through resistors **X** and **Y** respectively.



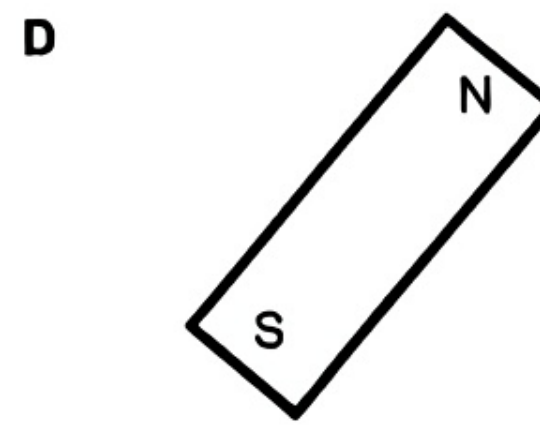
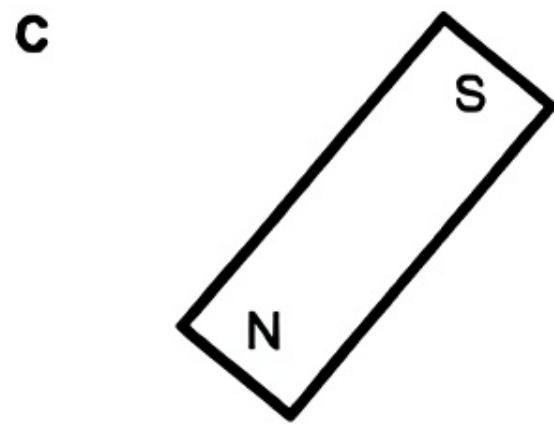
What is the ratio of $I_X:I_Y$?

- A** 1:4
B 1:2
C 2:1
D 4:1

- 31** The diagram shows a circular container which has a bar magnet hidden inside it. Compasses are placed around the outside and their needles point as shown.

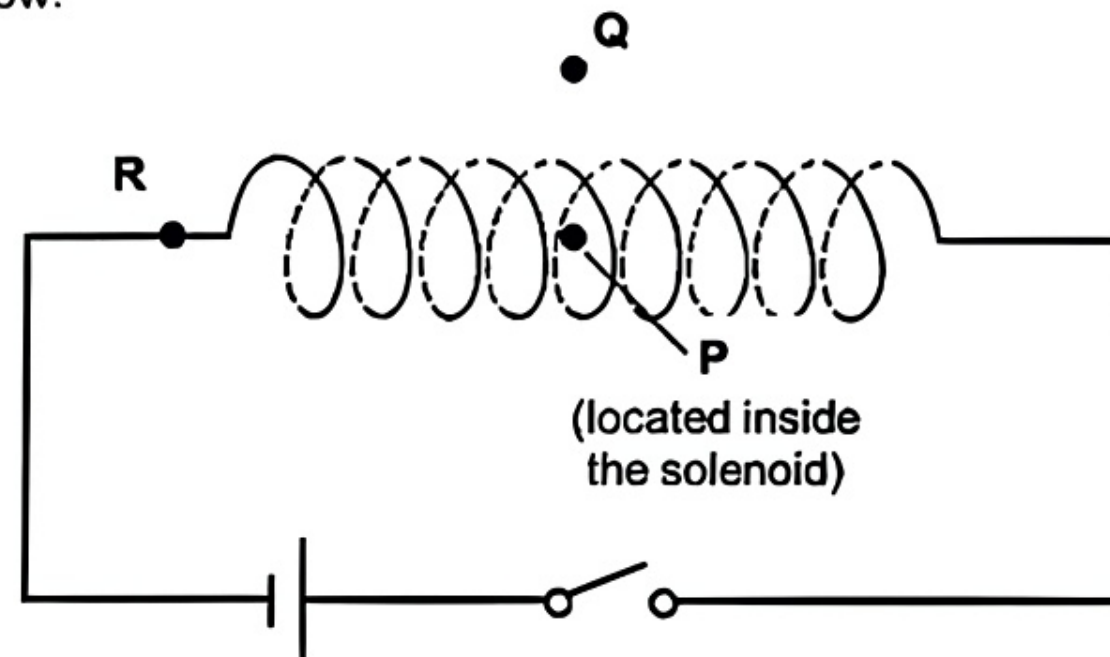


Which diagram shows the orientation of the magnet inside the box?



- 32** A student wants to produce a permanent bar magnet from an unmagnetized steel bar. Which of the following methods is most suitable?
- A** Heat the steel bar strongly and allow it to cool in air.
 - B** Place the steel bar in a weak magnetic field.
 - C** Place the steel bar inside a solenoid connected to an alternating current (a.c.) supply.
 - D** Stroke the steel bar repeatedly with one pole of a permanent magnet in the same direction.

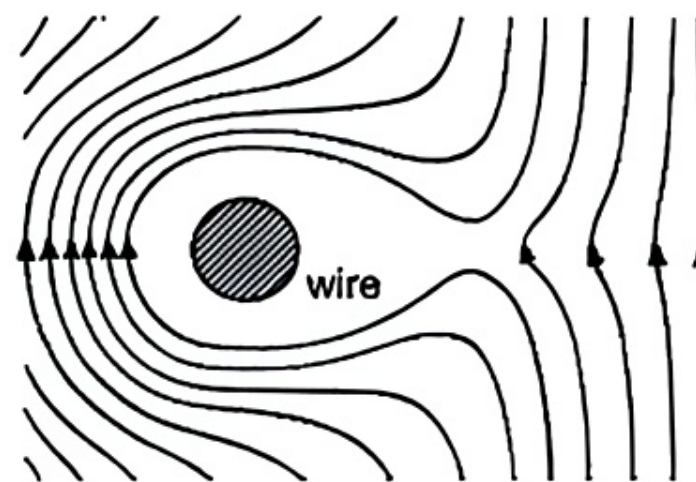
- 33** A solenoid is connected to a d.c. supply and three compasses, **P**, **Q** and **R**, are placed around the solenoid as shown below.



When the switch is closed, which row shows the direction in which the compass needles point to?

	P	Q	R
A	→	←	→
B	←	→	←
C	←	←	→
D	→	→	←

- 34** The diagram below shows the resultant field pattern around the cross-section of a direct current carrying straight wire placed in a uniform magnetic field.

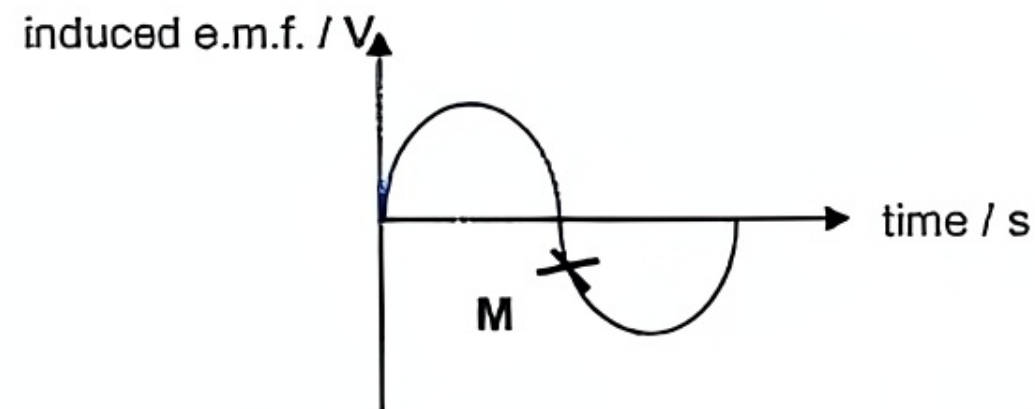


What is the direction of the current flowing through the wire?

- A** along the direction of the arrows
- B** into the page
- C** opposite the direction of the arrows
- D** out of the page

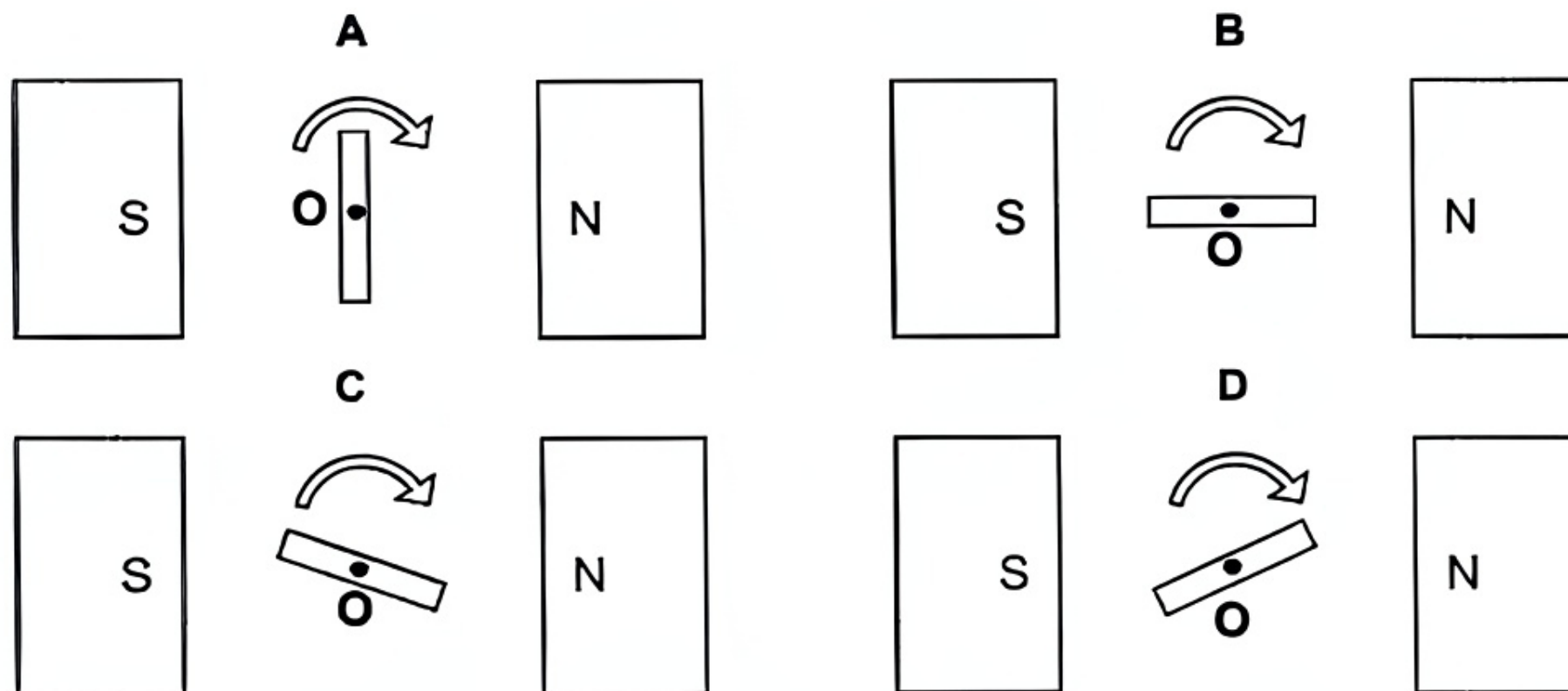
- 35** The graph shows how the induced e.m.f. of a simple a.c. generator varies with time.

The initial position of the coil is vertical.



The diagrams below show the front view of the coil of an a.c. generator. The coil is being rotated about an axis through O in a uniform magnetic field.

Which of them shows the position of the coil when the value of the induced e.m.f. is at **M**?

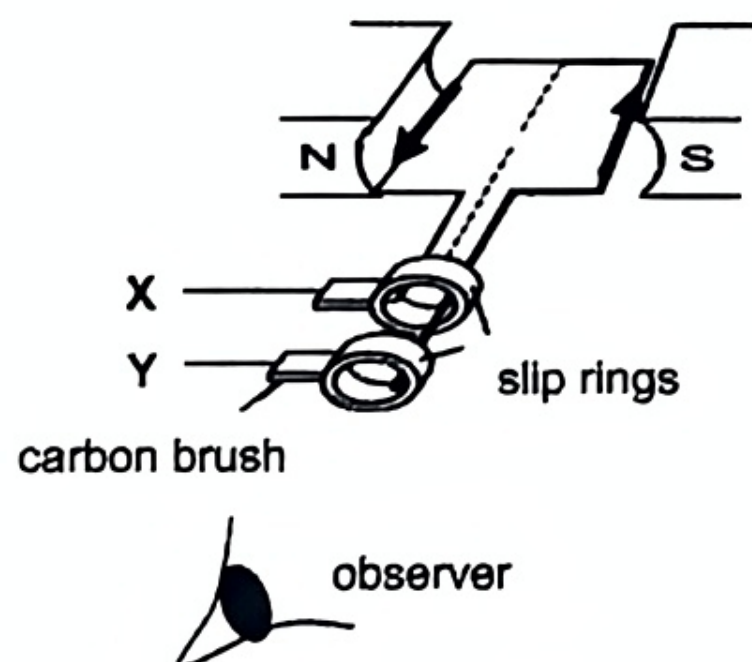


- 36** A power station produces 150 MW of power. It uses a transformer to step-up the transmission voltage to 250 kV. The transmission cable has a resistance of $15\ \Omega$.

What is the ratio of power loss in the transmission cable to the power produced?

- A** 0.00036
- B** 0.0036
- C** 0.036
- D** 0.36

- 37** The diagram shows an a.c. generator connected to leads **X** and **Y**. The current direction in the coil is as shown.



Which row shows the direction of rotation of the coil as seen by an observer and the rule used to obtain the direction of current as shown?

	direction of rotation	rule used
A	anti-clockwise	Fleming's right hand rule
B	anti-clockwise	Fleming's left hand rule
C	clockwise	Fleming's right hand rule
D	clockwise	Fleming's left hand rule

- 38** What happens when a simple a.c. generator doubles the number of turns in its coil?

- A** The amplitude of induced e.m.f. does not change and frequency is doubled.
- B** The amplitude of induced e.m.f. is doubled and frequency does not change.
- C** The amplitude of induced e.m.f. is doubled and frequency is doubled.
- D** The amplitude of induced e.m.f. is doubled and frequency is halved.

- 39** Beta particles are often used in the measurement of the thickness of materials.

Which statement explains why beta particles are suitable for this application?

- A** They are completely blocked by all materials, making them ideal for precise measurements.
- B** They can only be detected in a vacuum, which ensures accurate readings.
- C** They can pass through thin materials but are partially absorbed by thicker ones.
- D** They have high penetrating power, so they easily pass through all materials.

40 Atoms **P** and **Q** are isotopes.

How does the composition of atoms of **P** compare with atoms of **Q**?

	number of protons	number of neutrons	number of electrons
A	different	different	different
B	different	same	same
C	same	different	same
D	same	same	different

– END OF PAPER –