



**Anglo-Chinese School  
(Parker Road)**

**PRELIMINARY EXAMINATION 2024**

**SECONDARY FOUR EXPRESS**

**PHYSICS 6091/01  
PAPER 1**

**TIME: 1 HOUR**

**INSTRUCTIONS TO CANDIDATES:**

Write your name and index number on the OMR Answer Sheet.

There are **forty** questions in this section. 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 OMR sheet.

The OMR Sheet is to be **submitted separately**.

**INFORMATION FOR CANDIDATES:**

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.

1 Which of the following list of SI units contains base units only?

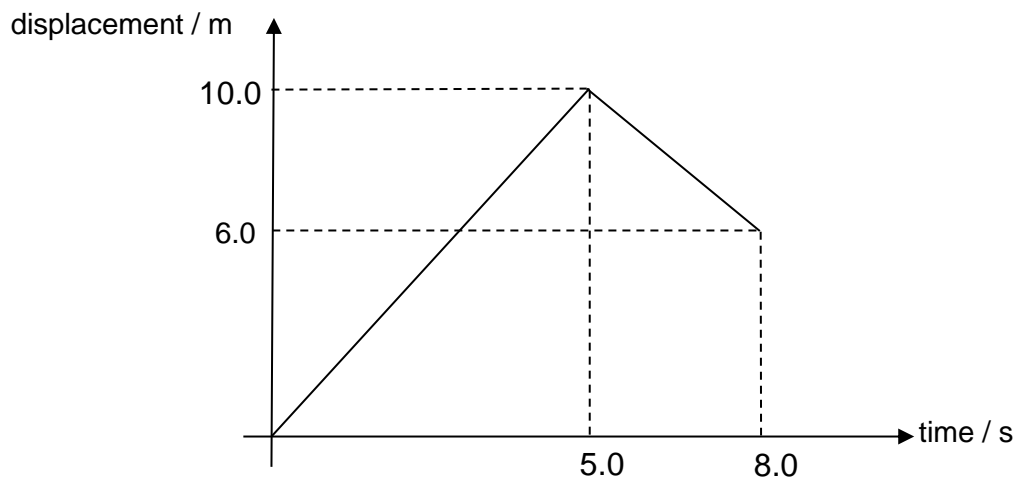
- A ampere, kilogram, hour, volt
- B ampere, kilogram, kilometre, second
- C kelvin, metre, mole, second
- D kelvin, metre, second, volt

2 Nano-technology is about manipulating substances at the nanometre scale. Within 1 nanometre space, 10 hydrogen atoms can be placed side by side.

What is the approximate diameter of one hydrogen atom?

- A  $10^{-4}$  cm                      B  $10^{-4}$  dm                      C  $10^{-4}$   $\mu\text{m}$                       D  $10^{-4}$  mm

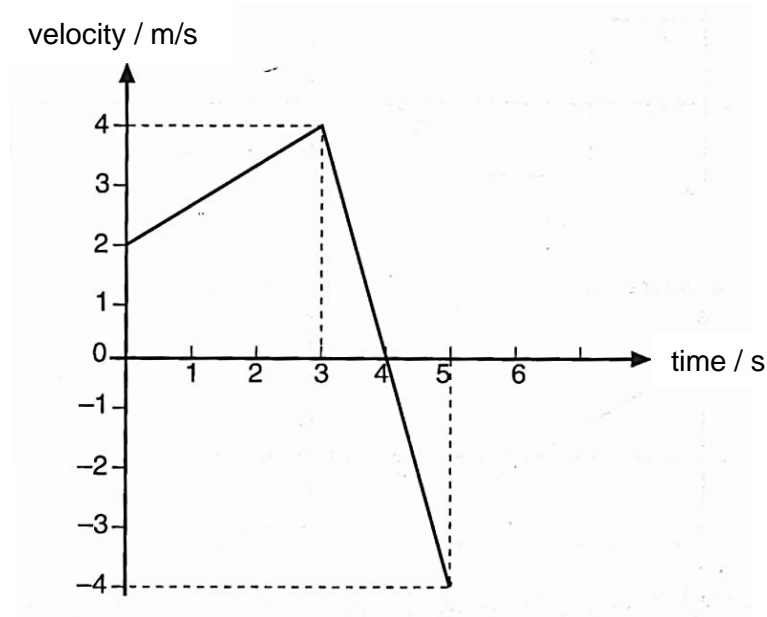
3 The diagram shows how the displacement of a car varies with time.



What is the average speed of the car?

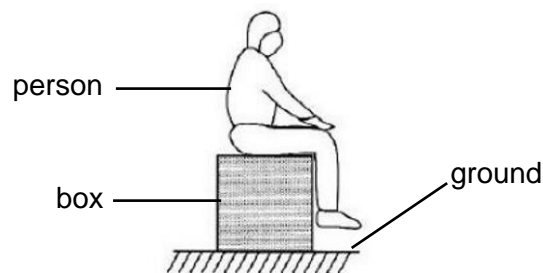
- A 0.75 m/s                      B 1.25 m/s                      C 1.75 m/s                      D 2.0 m/s

- 4 The diagram shows how the velocity of a body varies with time.



What is the displacement of the body at the end of 5 s?

- A** 4.0 m                      **B** 9.0 m                      **C** 11.0 m                      **D** 13.0 m
- 5 The figure below shows a person sitting on a box that rests on the ground.



Which of the following action-reaction pairs is correct?

- A** The weight of the box and the normal force from the ground on the box.  
**B** The weight of the man and the normal force from the box supporting the man.  
**C** The weight of the man and the contact force on the box by the man.  
**D** The weight of the man and the force of man on Earth.
- 6 A hammer hits a nail on a piece of wood with a speed of 6 m/s. If it drives the nail 0.1 m into the wood, what is the average deceleration of the hammer?

- A** 18 m/s<sup>2</sup>                      **B** 60 m/s<sup>2</sup>                      **C** 120 m/s<sup>2</sup>                      **D** 180 m/s<sup>2</sup>

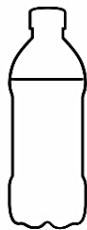
- 7 Four identical bottles are filled with different amounts of water. Which bottle has the lowest centre of gravity?

**A**

quarter-filled bottle

**B**

half-filled bottle

**C** $\frac{3}{4}$  filled bottle**D**

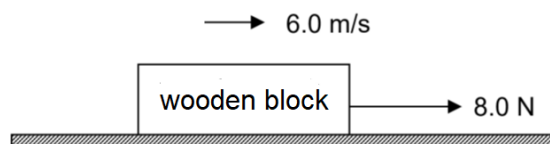
almost fully filled bottle

- 8 An Eskimo stands on snow wearing snow-shoes. The mass of the Eskimo is 40 kg and the snow-shoes have a total area of  $0.50 \text{ m}^2$  in contact with the snow. The gravitational field strength  $g$  is  $10 \text{ N/kg}$ .

What pressure does the Eskimo exert on the snow?

- A**  $20 \text{ N/m}^2$       **B**  $80 \text{ N/m}^2$       **C**  $200 \text{ N/m}^2$       **D**  $800 \text{ N/m}^2$

- 9 A block of wood is pulled along a horizontal bench at a constant speed of  $6.0 \text{ m/s}$  by a force of  $8.0 \text{ N}$ .



How much work is done against the frictional force in  $5 \text{ s}$ ?

- A**  $40 \text{ J}$   
**B**  $48 \text{ J}$   
**C**  $240 \text{ J}$   
**D**  $480 \text{ J}$

- 10** In a power station, fossil fuel is used to boil the water into steam. The steam is then used to rotate turbines which power generators.

Which of the following represents the main energy conversion taking place?

- A** chemical potential energy → thermal energy → electrical energy → kinetic energy
- B** chemical potential energy → thermal energy → kinetic energy → electrical energy
- C** kinetic energy → thermal energy → chemical potential energy → electrical energy
- D** kinetic energy → thermal energy → electrical energy → chemical potential energy

- 11** When fine pollen grains suspended in water are viewed under a microscope, they are seen to be making small erratic movements.

What is the explanation for this observation?

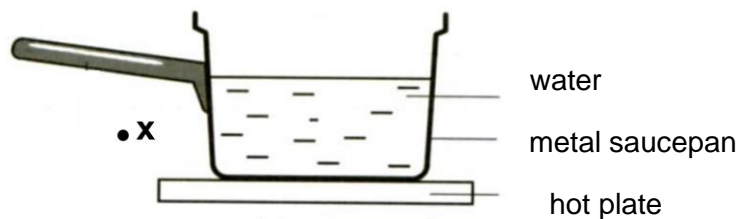
- A** There are convection currents in the water.
- B** The pollen grains are being bombarded by other suspended particles.
- C** The pollen grains are being bombarded by water molecules.
- D** The pollen grains are colliding with one another.

- 12** Air is pumped into a bicycle tyre. The volume and temperature of the tyre remains constant.

Why does the pressure increase?

- A** Air molecules are closer together.
- B** Air molecules are hitting the walls of the tyre with a higher frequency.
- C** Air molecules have a smaller intermolecular forces of attraction.
- D** Air molecules have higher kinetic energy.

- 13 Which statements best describe thermal energy transfer between two objects?
- (i) Energy transferred from a body with higher amount of thermal energy to one with lower amount of thermal energy.
  - (ii) Energy transferred from a body with higher temperature to one with lower temperature.
  - (iii) There is no net transfer of energy when the temperatures of the two objects are the same.
- A (i) and (ii) only  
 B (i) and (iii) only  
 C (ii) and (iii) only  
 D All of the above
- 14 The diagram shows a metal saucepan filled with water and placed on a hot plate. After some time, the air at point **x** also becomes hot.



What are the main ways by which heat travels through the materials?

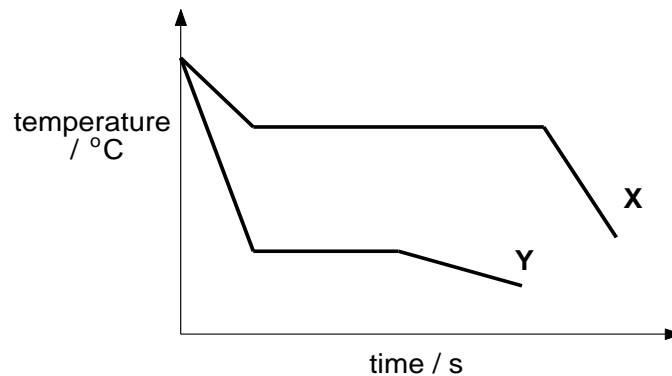
	through base of saucepan	through water	through air to point <b>x</b>
<b>A</b>	conduction	convection	convection
<b>B</b>	conduction	convection	radiation
<b>C</b>	radiation	convection	conduction
<b>D</b>	radiation	conduction	radiation

- 15 A block of iron and a volume of water both with a mass of 2.0 kg are heated to the same temperature and then allowed to cool in a room.

Why does the iron cool more quickly than the water?

- A Iron has a higher specific heat capacity than water.
  - B Iron has a higher specific latent heat of fusion than water.
  - C Iron has a lower specific heat capacity than water.
  - D Iron has a lower specific latent heat of fusion than water.
- 16 Which statement about boiling and evaporation is correct?
- A Boiling only occurs at the surface of a liquid.
  - B Bubbles are not formed in the liquid during boiling.
  - C Evaporation is not affected by the surface area of the liquid.
  - D Evaporation occurs at any temperature.

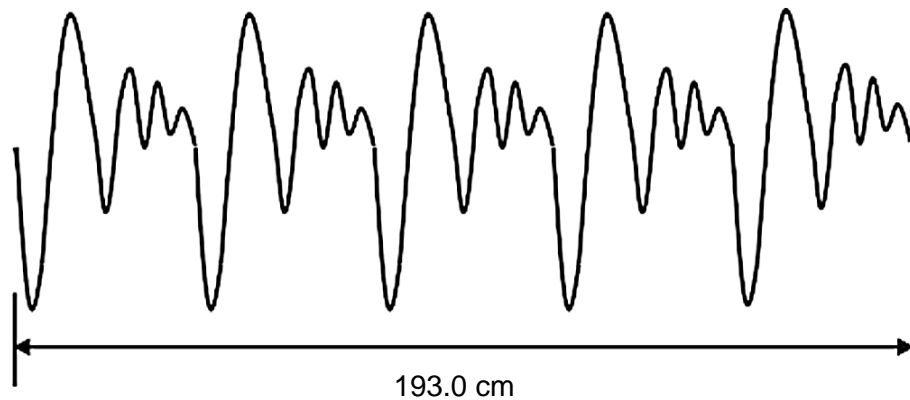
- 17 Two liquids, X and Y are cooled in air. Their cooling curves are shown below.



If X and Y have the same mass, which of the following statements is/are correct?

- I X has a higher melting point than Y.
  - II X has a larger specific latent heat of fusion than Y.
  - III X has a greater specific heat capacity of air than Y.
- A I only
  - B II only
  - C I and II only
  - D I, II and III

- 18 The sound wave produced by a violin in an auditorium is shown in the diagram below.



What is the frequency of the sound made by the violin if the speed of sound in the auditorium is 340 m/s?

- A** 176 Hz                      **B** 352 Hz                      **C** 528 Hz                      **D** 881 Hz

- 19 Which of the following correctly describes the changes in the loudness and pitch of the sound heard by an observer when the amplitude and frequency of the sound wave produced by a speaker are increased?

	loudness	pitch
<b>A</b>	increases	increases
<b>B</b>	increases	decreases
<b>C</b>	decreases	increases
<b>D</b>	decreases	decreases

- 20 A man stands in front of a large wall. He claps two pieces of wood together regularly at 0.5 s interval such that the echo of the first clap coincides with the second clap. The speed of sound in air is 340 m/s.

What is the approximate distance between the man and the wall?

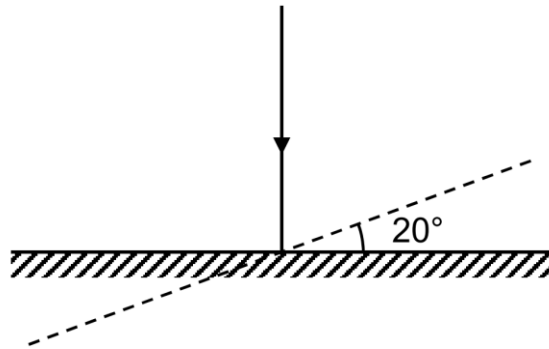
- A** 85 m  
**B** 170 m  
**C** 255 m  
**D** 340 m



21 Which statement is correct?

- A All electromagnetic waves can ionise and damage living cells.
- B All electromagnetic waves travel at the same speed in a vacuum.
- C All transverse waves are electromagnetic waves.
- D All transverse waves travel parallel to the direction of vibrations.

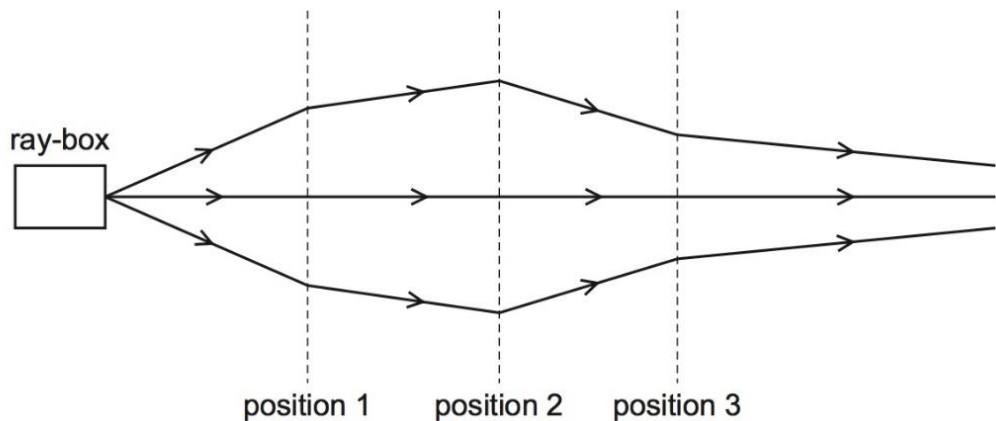
22 A ray strikes a plane mirror perpendicularly as shown in the diagram below.



If the mirror is then turned by  $20^\circ$ , what is the new angle between the incident and the reflected rays?

- A  $0^\circ$                       B  $20^\circ$                       C  $40^\circ$                       D  $80^\circ$

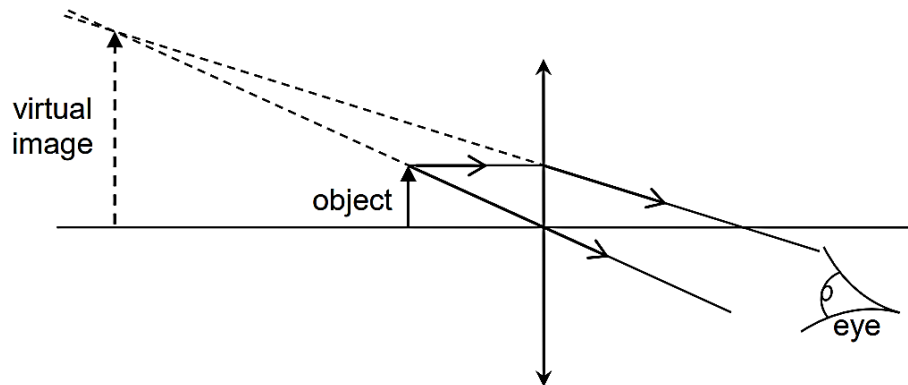
23 The rays of light from a ray-box pass through three lenses placed at positions 1, 2 and 3.



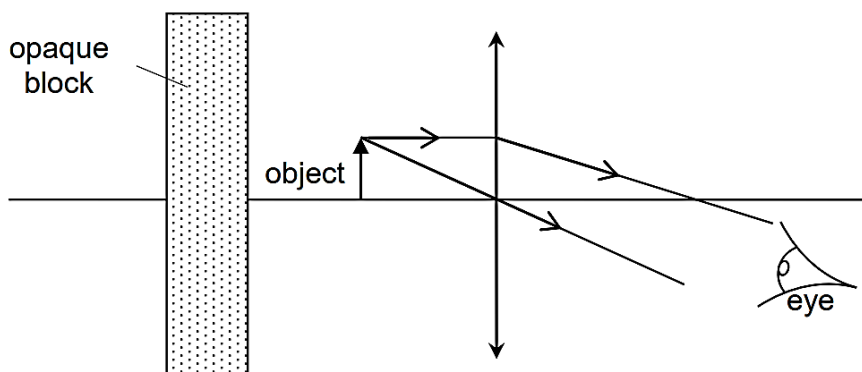
What type of lens is used at each position?

	position 1	position 2	position 3
A	converging	converging	converging
B	converging	converging	diverging
C	diverging	converging	diverging
D	diverging	diverging	converging

- 24 A thin converging lens is used to form a virtual image observed by an eye as shown below.



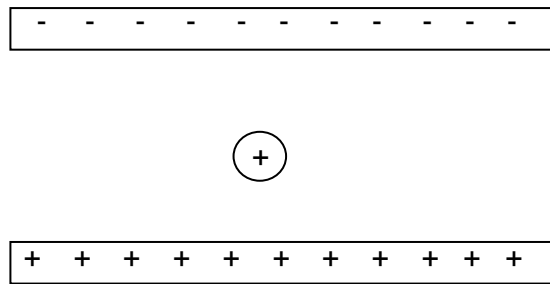
An opaque block is then placed behind the object as shown below.



What will be the image observed by the eye?

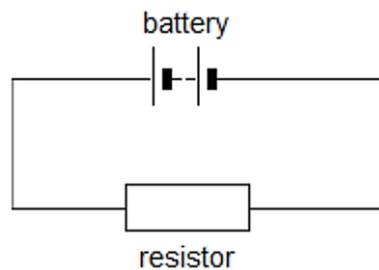
- A A real image will be observed.
- B A virtual image will be observed but less sharp.
- C No image will be observed.
- D The same virtual image will be observed with no changes.

- 25** The diagram below shows a side view of a charged oil droplet at rest between two charged metal plates.



The voltage across the charged plates is doubled. What will happen to the oil droplet?

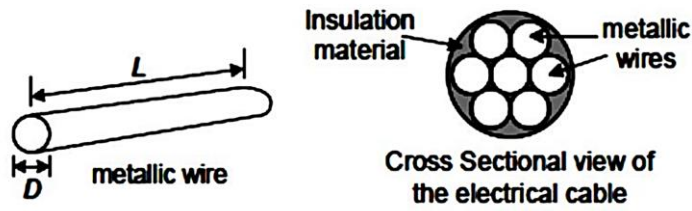
- A** The oil droplet rises a little.
  - B** The oil droplet rises all the way until it touches the negative plate.
  - C** The oil droplet moves parallel to the plates.
  - D** The oil droplet remains stationary.
- 26** The diagram shows a resistor connected to a battery.
- 40 J of energy are delivered by the battery to the resistor. 5 C of charge flow through the resistor in 1.25 s.



Which statement is correct?

- A** The current flowing through the battery is 6.25 A.
- B** The electromotive force is 8 V.
- C** The power dissipated by the resistor is 50 W.
- D** The resistance of the resistor is 32  $\Omega$ .

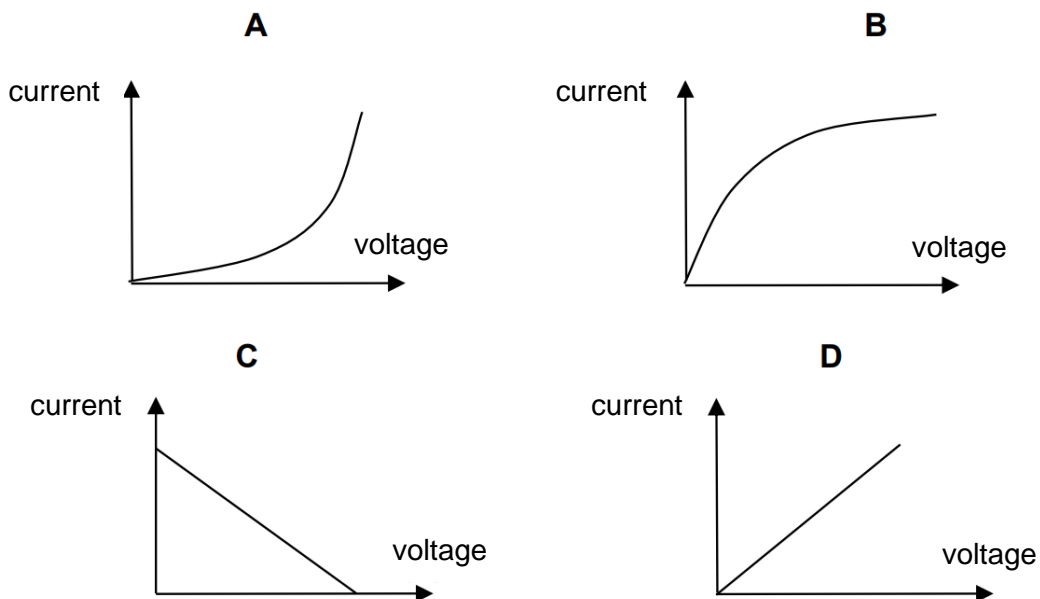
- 27 A metallic wire of resistivity  $\rho$  has a length  $L$  and a diameter  $D$ . Seven strands of this wire is bundled together to create an electrical cable as shown.



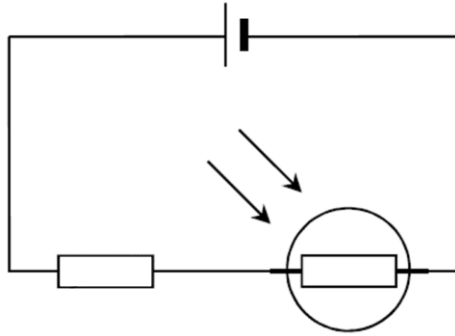
Which of the following is true?

- A The electrical cable has resistance about 7 times that of the original wire.
  - B The electrical cable has resistance about  $1/7$  times that of the original wire.
  - C The resistance of the electrical cable is equivalent to a single wire of diameter  $7D$ .
  - D The resistance of the electrical cable is equivalent to a single wire with diameter  $3D$ .
- 28 An electrical component has a variable resistance such that its resistance decreases with increasing current flowing through it.

Which one of the following graphs best represents how the current varies with the voltage of the electrical component?



- 29** The circuit diagram below shows a fixed resistor and a LDR connected in series in a circuit.



What happen to the resistance of the LDR and the potential difference across it when the circuit is placed in a dark place?

	resistance	potential difference
<b>A</b>	decrease	increase
<b>B</b>	decrease	decrease
<b>C</b>	increase	increase
<b>D</b>	increase	decrease

- 30** A 240 V electrical appliance is used for 5.0 minutes. The current in the appliance is 4.0 A.

How much electrical energy is used?

- A** 3.2 J
- B** 190 J
- C** 4800 J
- D** 288 000 J

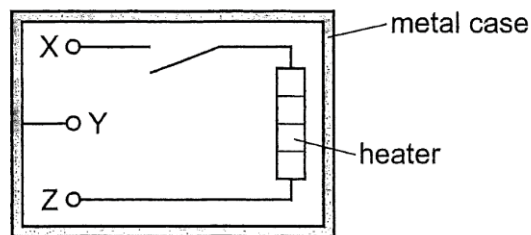
- 31** Four 200 W lamps and two 120 W fans are switched on in a house. The unit cost for electricity is 15 cents per kWh.

What is the total cost of using all the lamps and fans for 8 hours?

- A** \$0.38
- B** \$0.53
- C** \$1.25
- D** \$1.10

- 32** A fuse should not be placed in the neutral wire. Which of the following best explains why?
- A** The fuse cannot melt as the current does not flow through the neutral wire.
  - B** The fuse cannot melt as the neutral wire has zero voltage.
  - C** When the fuse melts, current can still flow through the live wire.
  - D** When the fuse melts, the live wire will still be at a high voltage.

- 33** The diagram shows the wiring of a heater in a metal case.



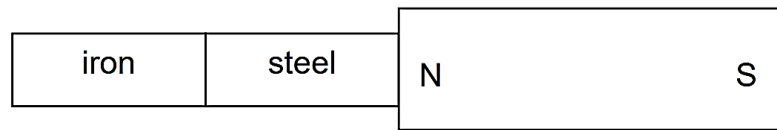
The terminals X, Y and Z are connected to the wires from a mains plug.

Which wire is connected to each terminal?

	X	Y	Z
<b>A</b>	live	earth	neutral
<b>B</b>	live	neutral	earth
<b>C</b>	neutral	earth	live
<b>D</b>	neutral	live	earth

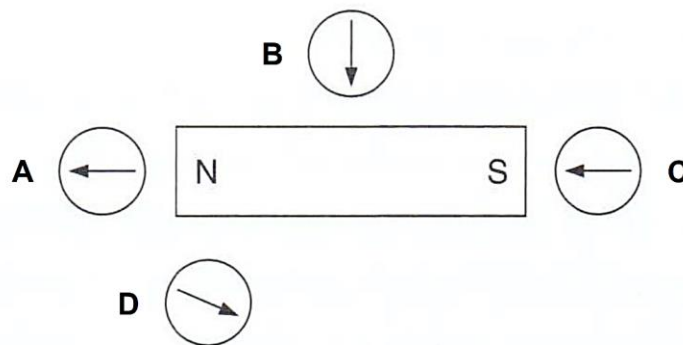
- 34** Which statement best describes an example of induced magnetism?
- A** A bar magnet attracts a piece of soft iron.
  - B** A bar magnet loses its magnetism if it is repeatedly dropped.
  - C** A bar magnet, swinging freely, comes to rest pointing North-South.
  - D** Two North poles repel each other but a North pole attracts a South pole.

- 35** A light steel bar and a light iron bar are attracted to a magnet as shown.



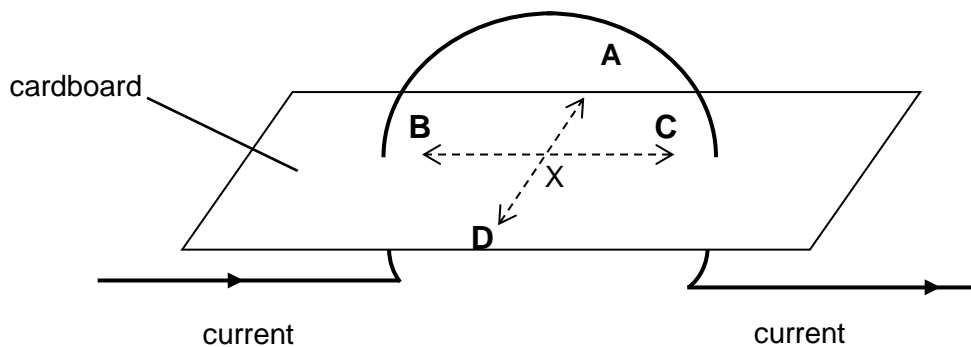
What will happen when the magnet is removed?

- A** Both steel and iron bars lose their magnetism.  
**B** The iron bar retains its magnetism and steel bar loses its magnetism.  
**C** The steel and iron bars remain attracted to each other.  
**D** The steel and iron bars repel each other.
- 36** The diagram shows four compasses placed around a bar magnet.
- Which compass is pointing in the wrong direction?

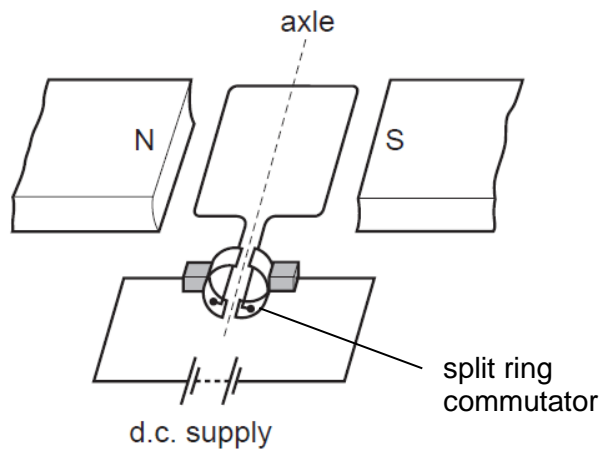


- 37** An electric current flows through a wire from left to right as shown. A compass is placed at X on the cardboard.

In which direction will the compass needle points?



- 38 The diagram shows a simple d.c. motor with its coil horizontal.

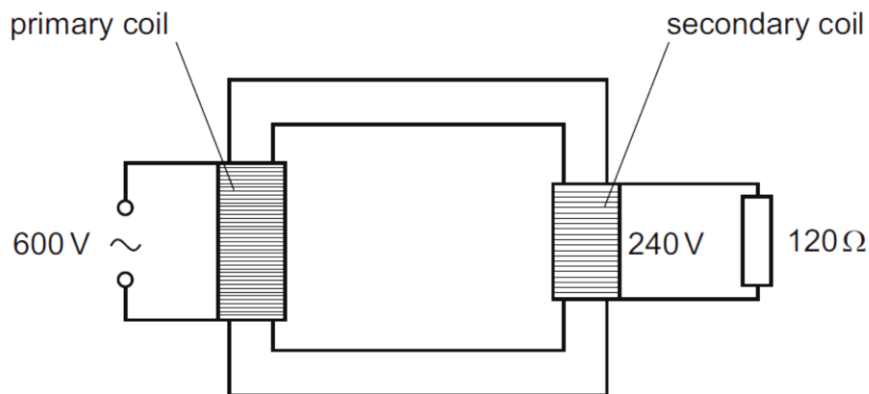


What is the main function of the split ring commutator?

- A To allow current to flow in the coil.
- B To prevent the wires from twisting.
- C To reverse the current direction in the coil after every half rotation.
- D To split the current direction in the coil after every half rotation.



- 39** An ideal transformer has a primary voltage of 600 V and a secondary voltage of 240 V.  
The secondary coil is attached to a resistor of resistance  $120\ \Omega$ .



What is the power dissipated in the resistor and the current in the primary coil?

	power / W	current / A
<b>A</b>	120	0.20
<b>B</b>	120	5.00
<b>C</b>	480	0.80
<b>D</b>	480	1.30

- 40** Electric power cables transmit electrical energy over large distances using high-voltage, alternating current.

What are the advantages of using a high voltage and of using an alternating current?

	advantage of using a high voltage	advantage of using an alternating current
<b>A</b>	high current is produced in the cables	the resistance of the cables is reduced
<b>B</b>	high current is produced in the cables	the voltage can be changed using a transformer
<b>C</b>	less energy is wasted in the cables	the resistance of the cables is reduced
<b>D</b>	less energy is wasted in the cables	the voltage can be changed using a transformer