

NAME:

NO:

CLASS:

ADMIRALTY SECONDARY SCHOOL



PRELIMINARY EXAMINATION 2025

SUBJECT : Physics
CODE/PAPER : 6091/1
LEVEL/STREAM : Secondary 4 Express
DATE : 1 Sep 2025
TIME : 0800h – 0900h
DURATION : 1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

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

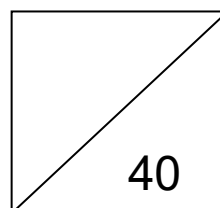
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

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

Fill in the Optical 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 question paper.

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



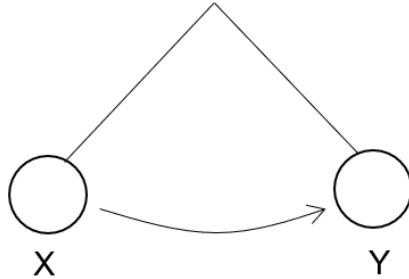
DO NOT TURN OVER THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of **19** printed pages including this cover page.

- 1 Which of the following is a suitable estimate for the average width of a human hair?

A 10^{-2} m **B** 10^{-4} m **C** 10^{-6} m **D** 10^{-8} m

- 2 A pendulum makes 45 complete oscillations in 15 seconds.



What is the frequency of the oscillations?

A 0.333 Hz **B** 0.667 Hz **C** 3.00 Hz **D** 6.00 Hz

- 3 A car is travelling along a straight road. The table shows its speed at successive time intervals.

Time/s	0	1	2	3	4
Speed/ ms^{-1}	0	3	6	9	12

Which of these statements is incorrect?

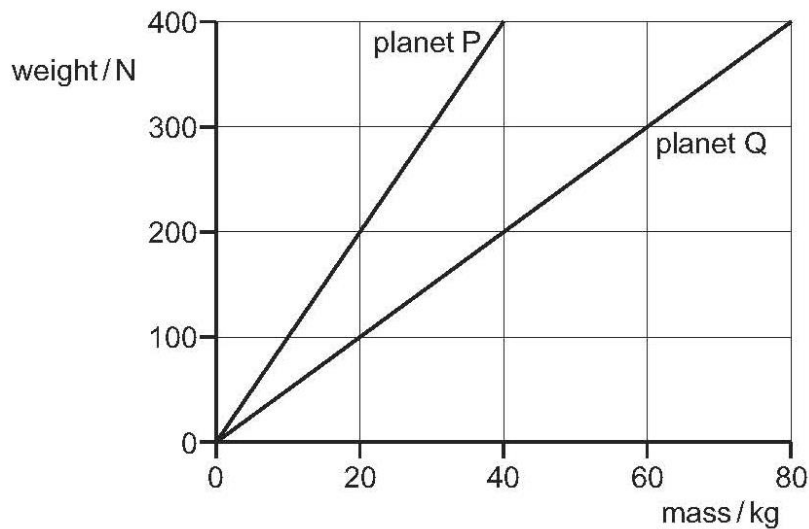
- A** Its average velocity is 6 ms^{-1} .
B It travels a distance of 12 m in 2 s.
C It travels a distance of 24 m in 4 s.
D It travels with a uniform acceleration of 3 ms^{-2} .

- 4 A spacecraft travels from the Earth to the Moon. At a certain point in the journey, it has zero weight.

Why is the weight zero at this point?

- A** The spacecraft leaves the Earth's gravitational field.
B The gravitational fields disappear in space.
C The gravitational fields of the Earth and the Moon cancel each other.
D There is no air resistance on the spacecraft.

- 5 The graph shows how weight varies with mass on planet P and on planet Q.



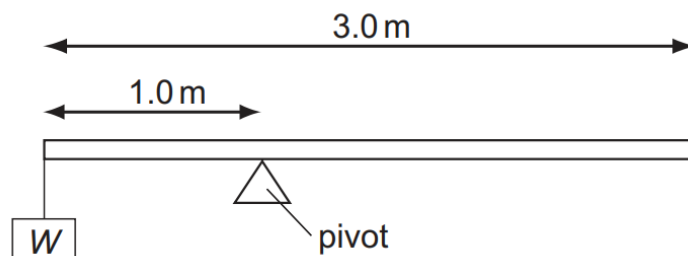
An object weighs 400 N on planet P. The object is taken to planet Q.

Which of the following is correct?

	mass of object on planet Q / kg	weight of object on planet Q / N
A	40	200
B	40	400
C	80	200
D	80	400

- 6 A uniform beam of weight 50 N is 3.0 m long and is supported on a pivot situated 1.0 m from one end.

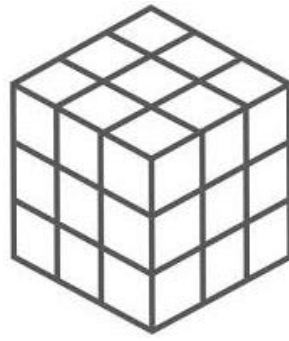
When a load of weight W is hung from that end, the beam is in equilibrium, as shown in the diagram.



What is the value of W ?

- A** 25 N **B** 50 N **C** 75 N **D** 100 N

- 7 27 identical small cubes are arranged in a $3 \times 3 \times 3$ block to form a big cube.

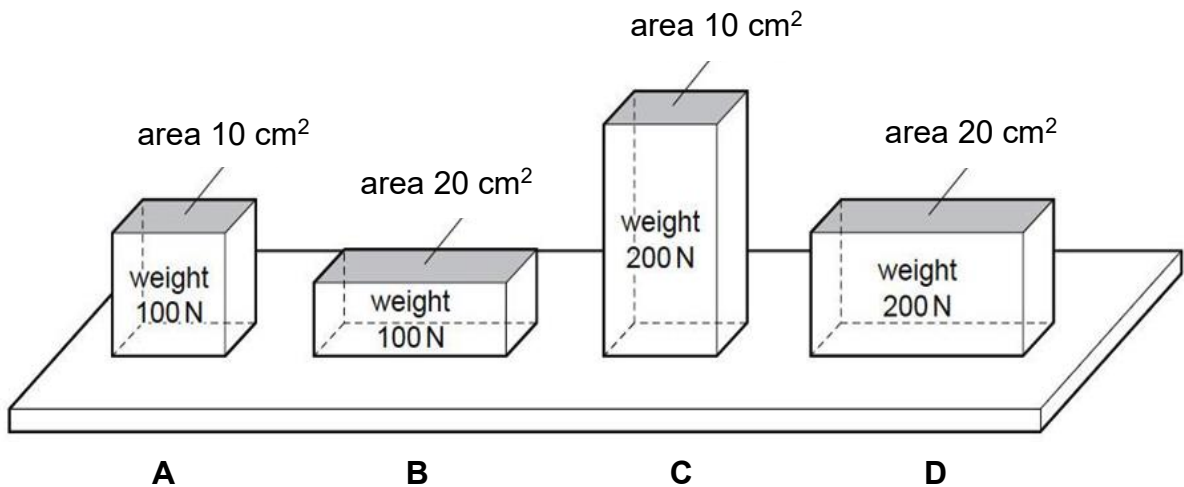


Each small cube has a density of ρ .

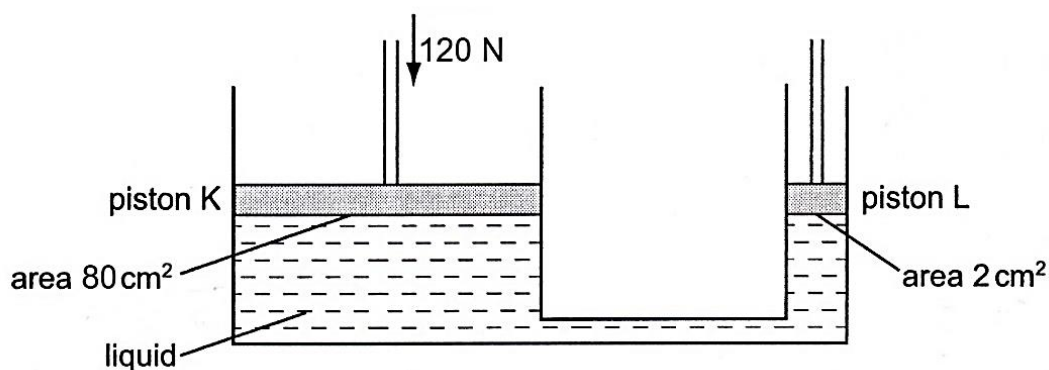
If one small cube is removed from the big cube, what is the density of the remaining big cube of 26 small cubes?

- A** $\frac{26}{27} \rho$
 B ρ
 C $\frac{27}{26} \rho$
 D $\frac{28}{27} \rho$

- 8 Which block exerts the greatest pressure on the surface below it?



- 9 The system shown in the diagram contains a liquid.

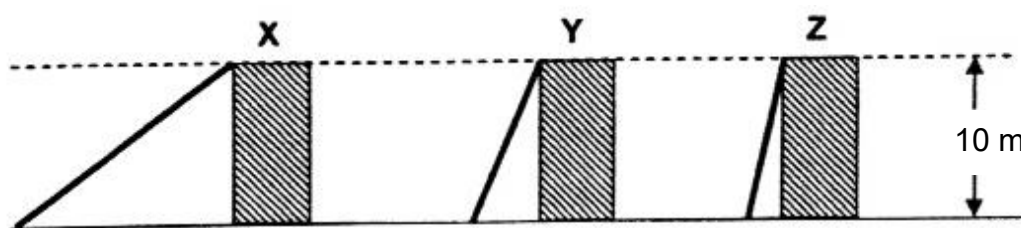


A downward force of 120 N is exerted on the piston K and the liquid is displaced by 0.4 cm .

What will be the upward force exerted on piston L and the distance moved by piston L?

	upward force on piston L	distance moved by piston L
A	4800N	0.01 cm
B	3N	16.0 cm
C	3N	0.01 cm
D	4800N	16.0 cm

- 10 A load is to be lifted on three different lengths of ramps from ground level to a height 10 m above the ground. All the ramps are of the same material.



Which path requires the most amount of work? Assume that the surface is frictionless and the load moves at constant speed.

- A** Path X
- B** Path Y
- C** Path Z
- D** Equal amount of work is done for every path

- 11** A system with an efficiency of 74 % wastes 230 W of power.

What is the useful output power of the system?

- A** 170 W **B** 310 W **C** 650 W **D** 880 W

- 12** Particles of dust, suspended in water, are viewed through a microscope. The particles can be seen to move irregularly.

This movement is due to

- A** convection currents in the water.
B evaporation of the water near the dust particles.
C gravitational forces acting on the particles of dust.
D water molecules hitting the dust particles in a random way.

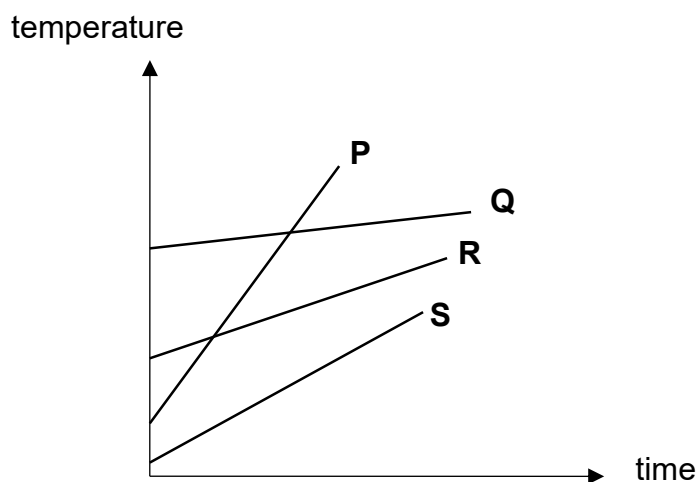
- 13** In terms of the kinetic particle model of matter, why does temperature increase as a liquid is heated?

- A** The average spacing between the molecules becomes larger.
B The average speed of the molecules increases.
C The collision rate of molecules increases.
D The interaction between the molecules becomes stronger.

- 14** What is the internal energy of an object?

- A** It is the energy associated with the object's movement through space.
B It is the energy associated with the random movement of the molecules in the object.
C It is the energy due to the attractions between the molecules within the object.
D It is the sum of all the microscopic potential and kinetic energies of the molecules.

- 15** Four blocks of metals P, Q, R and S with equal masses are heated by identical heaters. The variations of the temperatures of the blocks with time are shown in the graph below.



Which of the following shows the correct sequence of the metals in increasing order of magnitude of specific heat capacity?

- A** P, Q, R, S
 - B** Q, R, S, P
 - C** P, S, R, Q
 - D** S, R, Q, P
- 16** A heater supplying energy at a constant rate of 0.5 kW is completely immersed in a large block of ice at 0 °C.

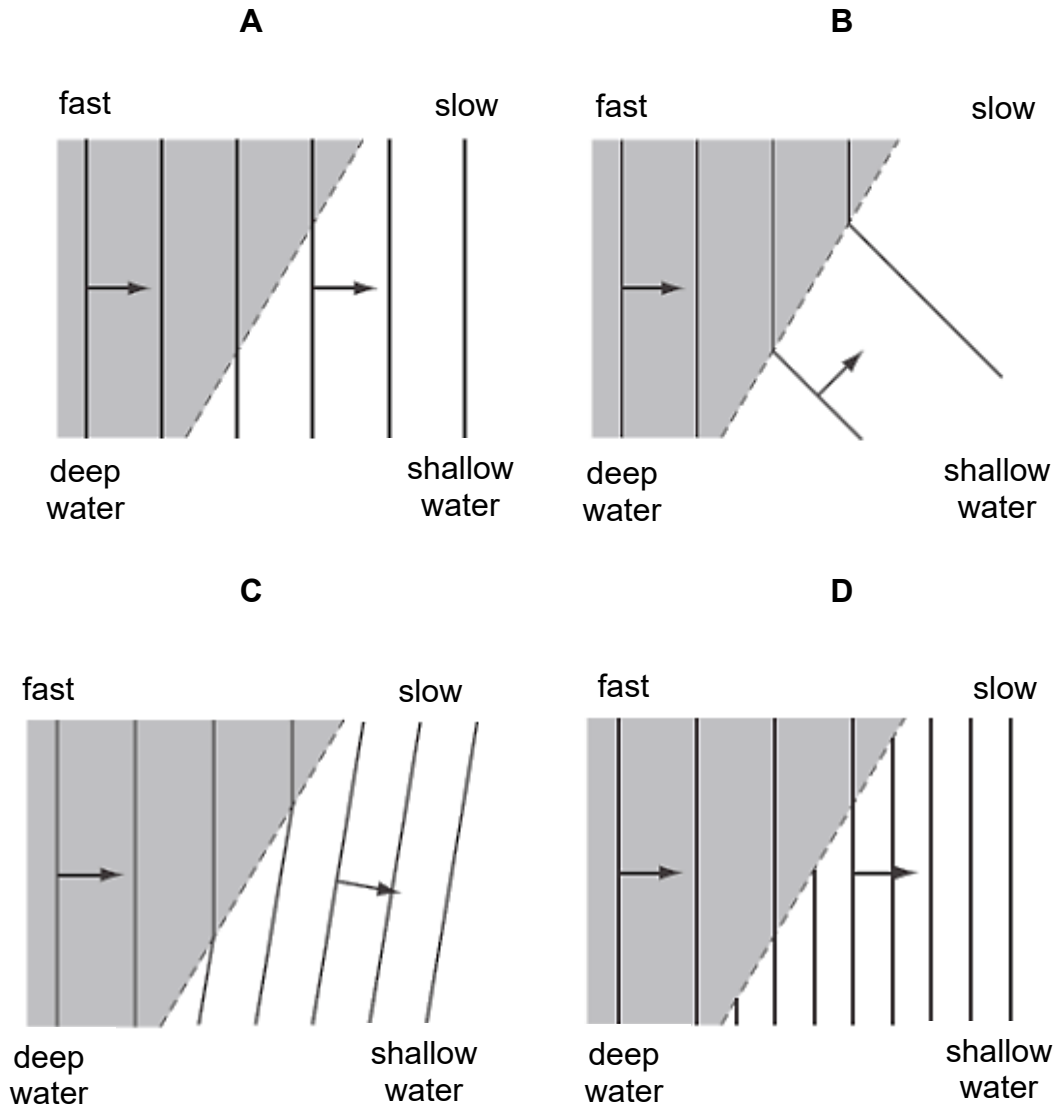
In 22 minutes, 2.0 kg of water at 0 °C are produced.

What is the specific latent heat of fusion of ice?

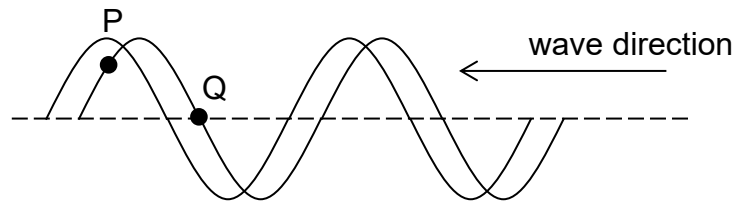
- A** 5.5 J kg⁻¹
- B** 330 J kg⁻¹
- C** 5500 J kg⁻¹
- D** 330 000 J kg⁻¹

- 17 The diagrams show water waves in a ripple tank. The water waves move more slowly after passing into shallow water at the broken line.

Which diagram correctly shows what happens to the waves?



- 18** The diagram below shows a wave on a string with two points P and Q marked. The wave is moving in the direction shown.



What will happen next?

- A** P will move up.
 - B** P will move down.
 - C** Q will move up.
 - D** Q will not move.
- 19** Part of the electromagnetic spectrum is shown below.

radio wave	P	infra-red	visible light
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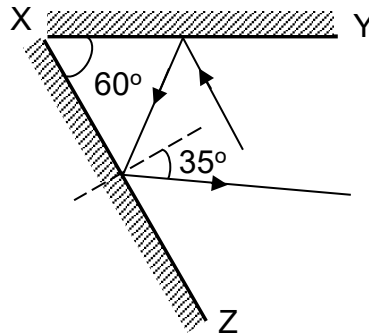
What is a possible application of P?

- A** cancer treatment
 - B** radar communication
 - C** intruder alarm
 - D** sterilisation of medical equipment
- 20** Electromagnetic waves of wavelength λ and frequency f travel at speed c in a vacuum.

Which of the following describes the wavelength and speed of electromagnetic waves of frequency $f/2$?

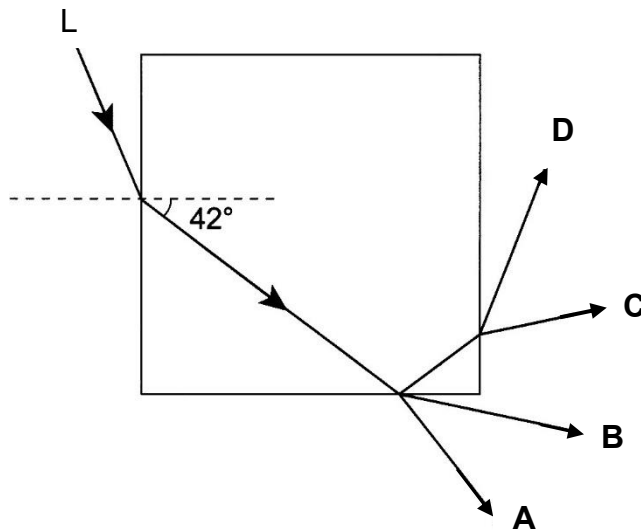
	wavelength	speed in a vacuum
A	$\lambda / 2$	$c / 2$
B	$\lambda / 2$	c
C	2λ	c
D	2λ	$2c$

- 21** Plane mirrors XY and XZ are arranged at an angle of 60° to each other. A ray of light is reflected from the plane mirror XZ with an angle of reflection of 35° , this ray was previously reflected from the plane mirror XY.



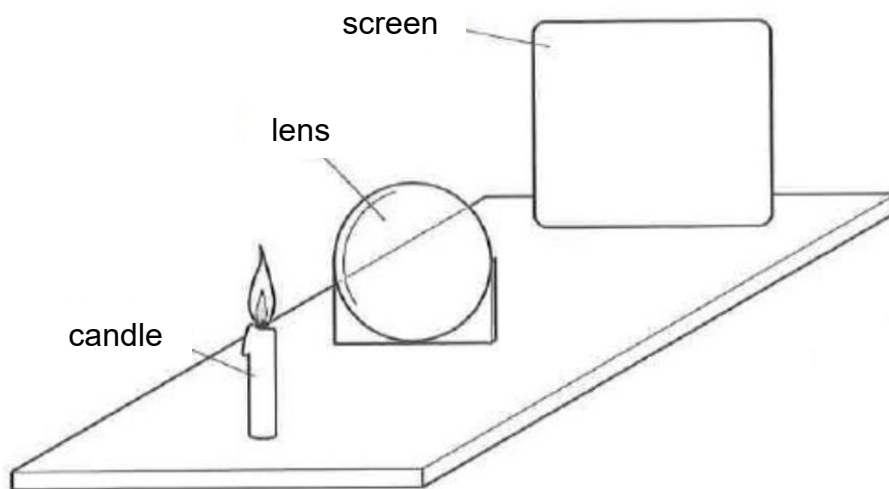
What is the angle of incidence at mirror XY?

- A** 25° **B** 35° **C** 55° **D** 65°
- 22** A light ray L enters a glass block as shown below.



Given that the critical angle of the glass is 45° , which of the rays (**A**, **B**, **C** or **D**) correctly shows the path of L when it exits the glass block?

- 23 The diagram below shows a thin converging lens used to produce a focused image of a candle on a screen.



Various focused images are produced on the screen by moving the lens and the screen back and forth.

Which statement is **always** correct?

- A The image is inverted.
 - B The image is bigger than the object.
 - C The distance between the image and lens is less than the distance between the object and lens.
 - D The image is formed at the focal point of the lens.
- 24 The table shows the properties of two different wires, P and Q.

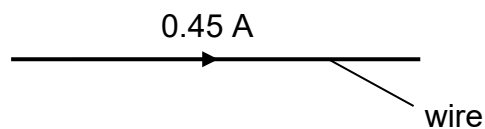
	resistance	length	resistivity of material
wire P	R	l	ρ
wire Q	$\frac{1}{4} R$	$2l$	$\frac{1}{3} \rho$

Wire P has a cross-section diameter d .

What is the diameter of the cross-section diameter of wire Q?

- A $0.41 d$
- B $1.6 d$
- C $2.7 d$
- D $7.1 d$

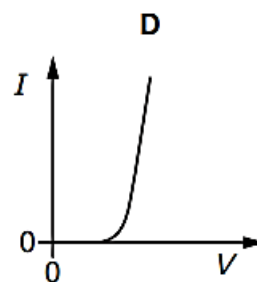
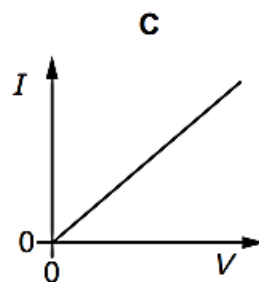
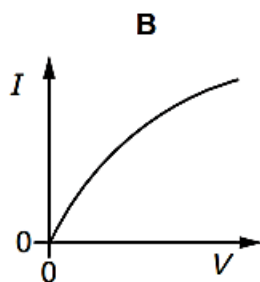
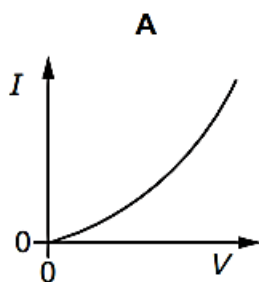
- 25** A current of 0.45 A flows in a wire as shown.



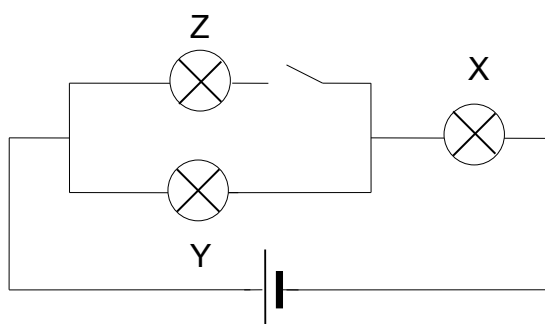
The charge on an electron is $1.6 \times 10^{-19} \text{ C}$.

What is the rate of flow of electrons along the wire and in which direction do they move?

- A** 2.8×10^{18} per second from left to right
B 2.8×10^{18} per second from right to left
C 7.2×10^{-20} per second from left to right
D 7.2×10^{-20} per second from right to left
- 26** Which graphs represents the way the current I through a filament lamp varies with the potential difference V across it?



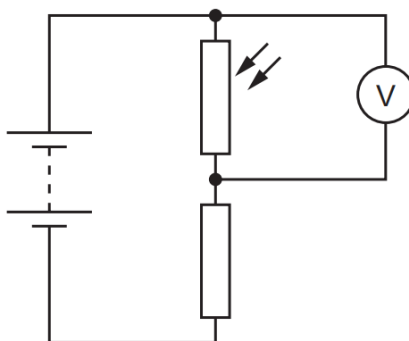
- 27** Three identical lamps, X, Y and Z are connected as shown.



What happens to the brightness of X and Y when the switch is closed?

	brightness of X	brightness of Y
A	dimmer	brighter
B	brighter	brighter
C	brighter	dimmer
D	same as before	dimmer

- 28** The diagram shows a light-dependent resistor (LDR) connected in a potential divider circuit.

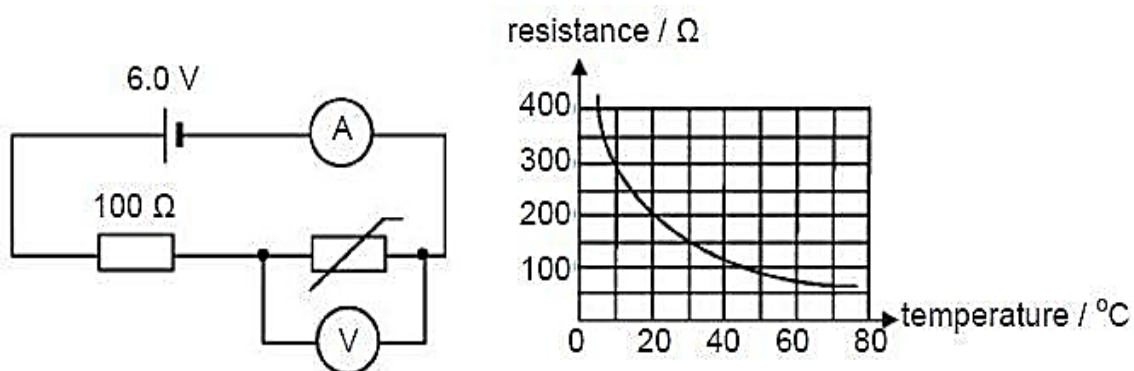


The brightness of the light falling on the LDR is increased.

Which row shows what happens to the resistance of the LDR and what happens to the reading on the voltmeter?

	resistance of LDR	reading on voltmeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 29 The diagram shows the resistance–temperature graph of a thermistor in a circuit.

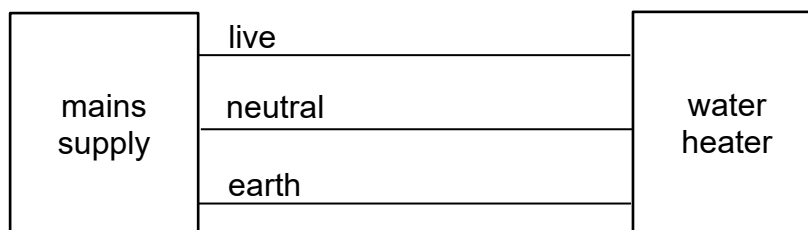


What are the current and voltage when the temperature of the thermistor is 30 $^{\circ}\text{C}$?

	current / A	voltage / V
A	0.024	2.4
B	0.024	3.6
C	0.040	2.4
D	0.040	3.6

- 30 Which example of incorrect practice is **least** likely to cause a hazard of electrical shock or fire?
- A** operating an indoor light switch with wet hands
 - B** leaving the earth wire unconnected in a three-pin-plug connected to an appliance with a metal case
 - C** reversing the live wire and neutral wires in a plug connected to a double-insulated appliance
 - D** leaving a few loose copper strands of the live wire unconnected to the terminal in a three-pin-plug

- 31** The diagram shows three wires of an electrical mains supply connected to a water heater.



If the heater draws a current of 4 A from the mains supply, what is the current flowing in the live, neutral and earth wires?

	live	neutral	earth
A	4 A	0 A	0 A
B	4 A	0 A	4 A
C	4 A	4 A	0 A
D	0 A	4 A	4 A

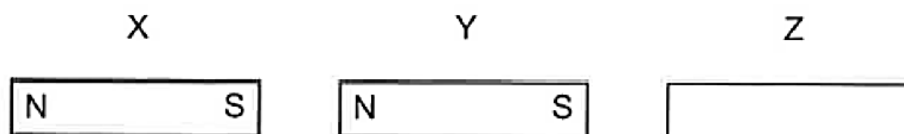
- 32** The cost of 1 kWh of electricity is 20 cents.

appliance	time used	power rating
heater	3 h	2 kW
lamp	50 mins	120 W

What is the total cost when both appliances are used for the times shown?

- A** 122 cents **B** 163 cents **C** 610 cents **D** 2120 cents

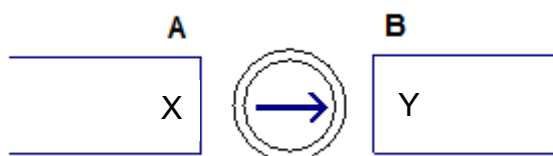
- 33** The diagram shows three bars placed along a line. X and Y are magnets. Z is soft iron.



What are the magnetic forces on X and Z due to magnet Y?

	Force on X	Force on Z
A	repulsion	repulsion
B	attraction	repulsion
C	repulsion	attraction
D	attraction	attraction

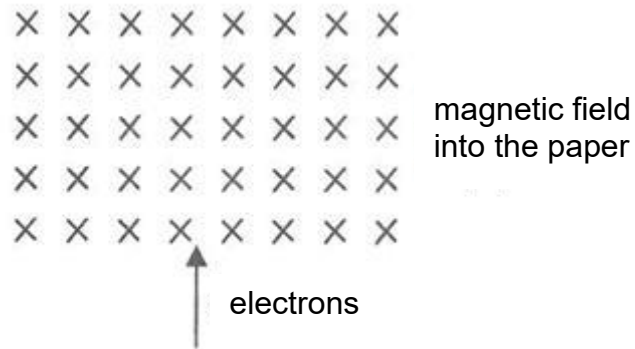
- 34** The diagram shows a small compass placed between two bar magnets with the ends X and Y nearest to the compass.



What are the polarities of ends X and Y?

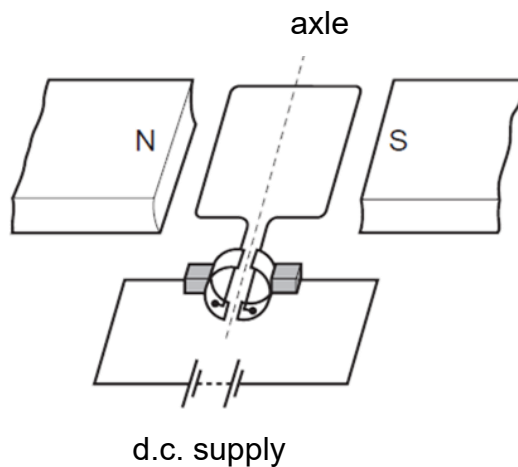
	X	Y
A	North pole	South pole
B	South pole	North pole
C	South pole	South pole
D	North pole	North pole

- 35** In the diagram below, a beam of electrons is moving across a magnetic field. The direction of the magnetic lines of force is going into the paper.



How would the electron beam be affected?

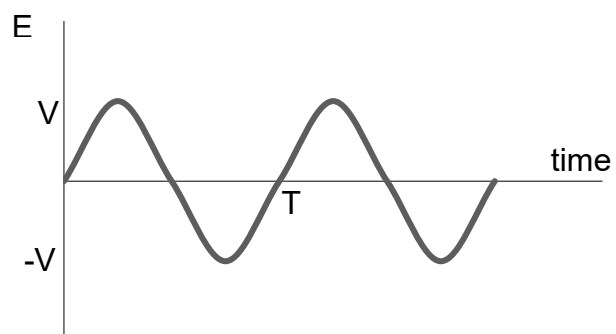
- A** It will deflect to the left.
 - B** It will deflect to the right.
 - C** It will deflect out of the plane of the paper.
 - D** It will slow down but will not change direction.
- 36** The diagram shows a simple d.c. motor with its coil horizontal.



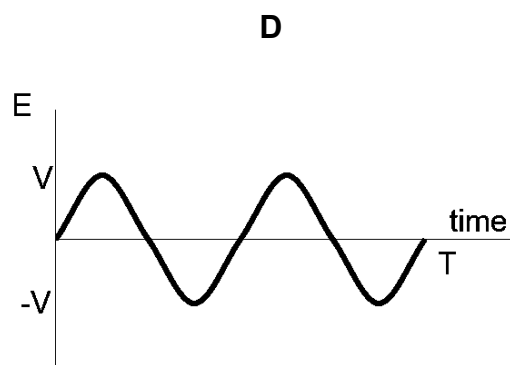
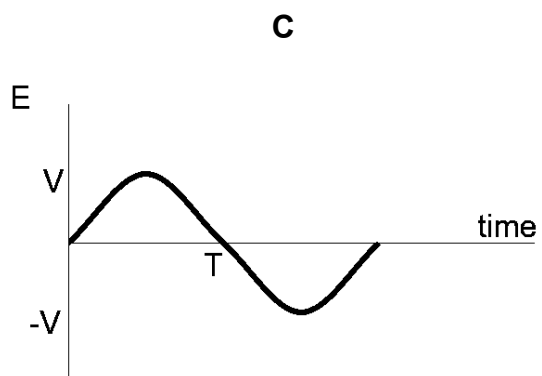
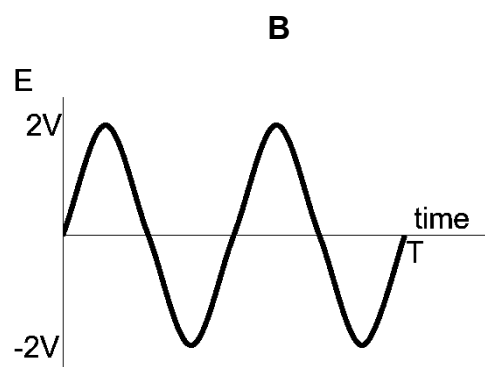
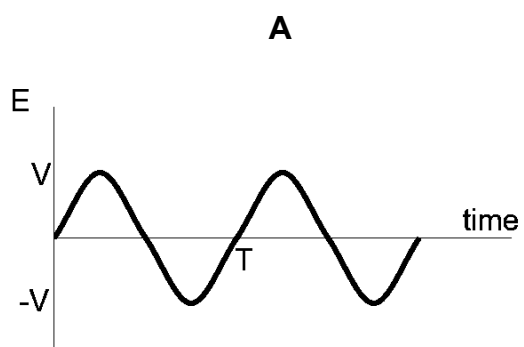
What is the main function of the split ring commutator?

- 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 as the coil passes the horizontal position.
- D** To reverse the current direction in the coil as the coil passes the vertical position.

- 37 When a coil is rotated in a magnetic field, the induced e.m.f. E varies as shown on the diagram below.



Which of the following graphs would be obtained if the speed of rotation is doubled and the number of turns is halved?

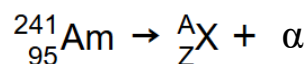


- 38** 150 kW of power is to be delivered from a power station at 25 kV via supply lines to a factory. The supply lines carry a total resistance of $8.0\ \Omega$.

What is the power loss in the supply lines?

- A** 25.0 W **B** 48.0 W **C** 78.1 W **D** 288 W

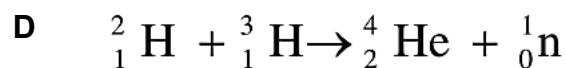
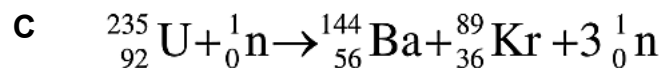
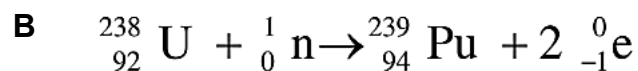
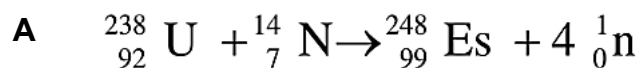
- 39** Americium-241 is a radioactive nuclide used in smoke detectors. It undergoes α -decay to form nuclide X. This decay may be represented by the equation shown.



What are the values of A and Z?

	A	Z
A	237	93
B	239	91
C	241	94
D	241	96

- 40** Which of the following nuclear reactions is a fission?



END OF PAPER