

O



BARTLEY SECONDARY SCHOOL PRELIMINARY EXAMINATION

CANDIDATE NAME			
CLASS		INDEX NUMBER	

PHYSICS

6091

Secondary 4
Paper 1 Multiple Choice

27 Aug 2024
1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.

Section A

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 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.

This document consists of **20** printed pages.

Set By: QSR

1 Which quantity is a vector?

- A current
- B displacement
- C speed
- D temperature

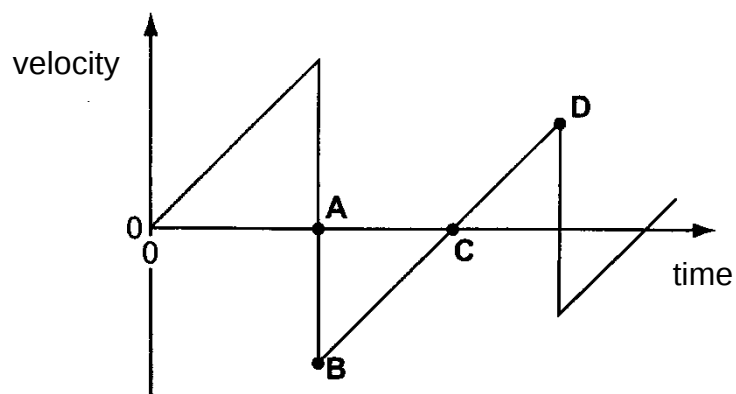
2 A computer memory stick is labelled as having a storage capacity of 128 TB. The letter B stands for byte, which is a unit.

What is the equivalent storage capacity?

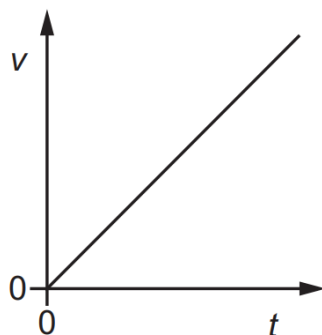
- A 1.28×10^8 B
- B 1.28×10^{11} B
- C 1.28×10^{14} B
- D 1.28×10^{17} B

3 A ball is released from rest above a horizontal surface. The graph shows how the velocity of the bouncing ball varies with time.

At which point on the graph does the ball reach its maximum height after the first bounce?

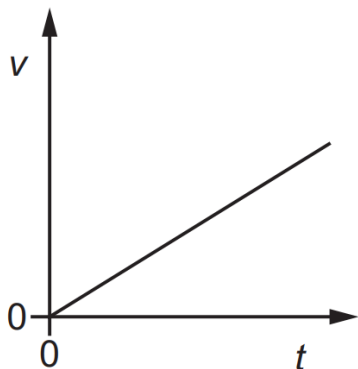


- 4 An object falls freely from rest in a vacuum. The graph shows the variation with time t of the velocity v of the object.

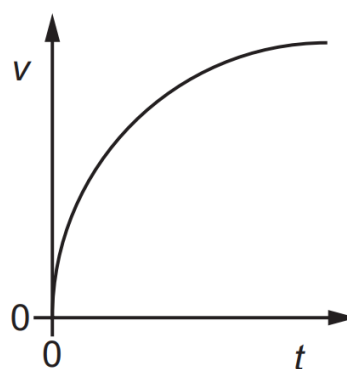


Which graph, **using the same scales**, represents the object falling in air?

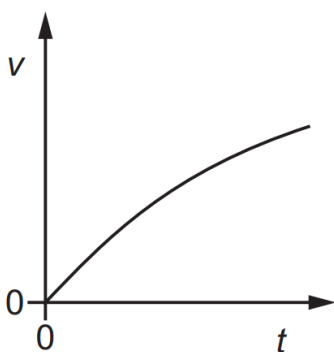
A



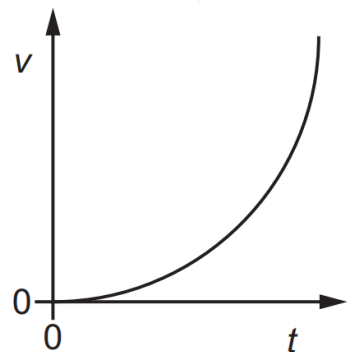
B



C



D



- 5 A car of mass 750 kg has a horizontal driving force of 2.0 kN acting on it. It has a forward horizontal acceleration of 2.0 m/s^2 .



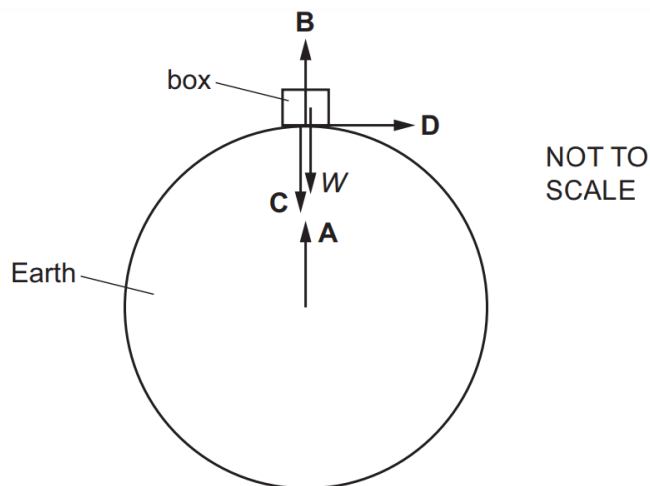
What is the resistive force acting horizontally?

- | | | | |
|----------|---------|----------|--------|
| A | 0.50 kN | B | 1.5 kN |
| C | 2.0 kN | D | 3.5 kN |

- 6 A box rests on the Earth, as shown.

Newton's third law describes how forces of the same type act in pairs. One of the forces of a pair is the weight W of the box.

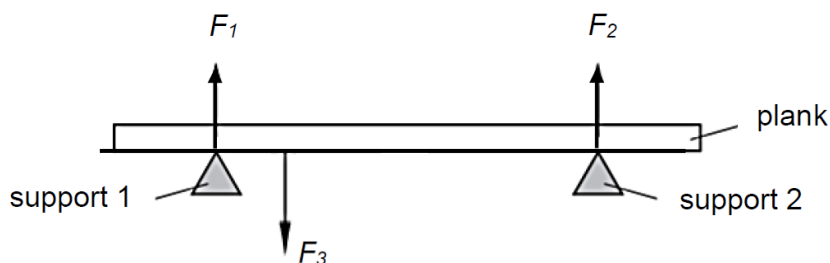
Which arrow represents the other force of this pair?



- 7 Four objects are moving.

Which object has a zero resultant force acting on it?

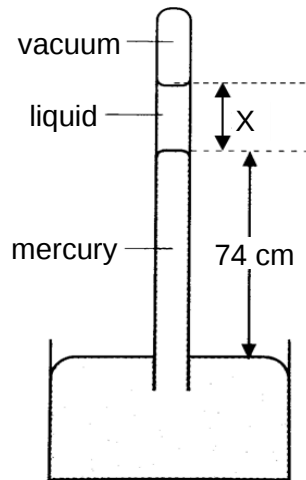
- A the object moving at a decreasing speed
 - B the object moving at an increasing speed
 - C the object moving at a constant speed in a circle
 - D the object moving at a constant speed in a straight line
- 8 The diagram shows a heavy non-uniform wooden plank resting on two supports which act as pivots (not to scale). Three forces F_1 , F_2 and F_3 are acting on the plank. The plank is in equilibrium.



Which statement is correct?

- A F_1 is larger than F_2 .
- B F_2 is larger than F_1 .
- C The sum of F_1 and F_2 is twice of F_3 .
- D F_3 is larger than the sum of F_1 and F_2 .

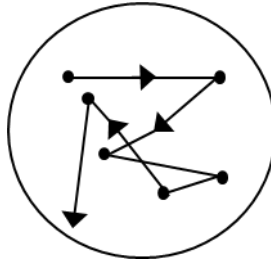
- 9 The diagram shows a mercury barometer. A liquid which is less dense than mercury exists above the mercury column. This liquid does not mix with mercury.



Given that the atmospheric pressure is 76 cm Hg, the density of liquid is 1200 kg/m^3 and the density of mercury is 13600 kg/m^3 , determine height X of the liquid column.

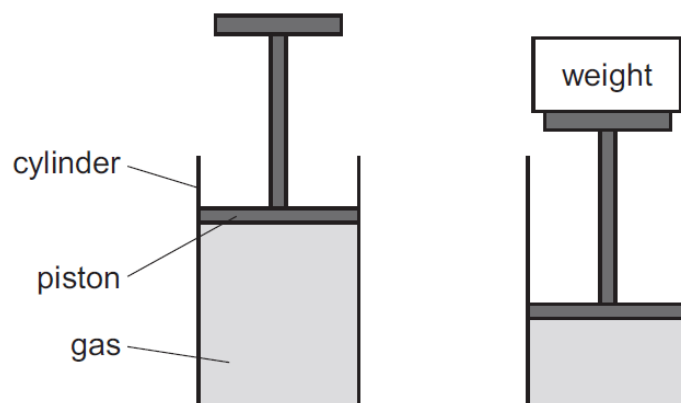
- A** 2.0 cm
B 22.7 cm
C 26.0 cm
D 76.0 cm
- 10 A rock of mass 40 kg is released from rest from a height of 20 m above the surface of a planet. The rock has a kinetic energy of 32 kJ when it hits the surface of the planet. The planet does not have an atmosphere.
- What is the weight of the rock on the surface of the planet?
- A** 1.6 N **B** 400 N **C** 1.6 kN **D** 8.0 kN
- 11 Which two physical quantities must be used to calculate the power developed by a student running up a flight of steps?
- A** force exerted and the vertical height of the steps only
B force exerted and the time taken only
C work done and the vertical height of the steps only.
D work done and the time taken only

- 12** Smoke particles in a transparent box are observed using a microscope. A small point of light is seen to move around as shown.



When the temperature in the box is raised, what change can be observed under the microscope?

- A** The small point of light changes direction more frequently.
 - B** The small point of light glows brighter.
 - C** The small point of light increases in size.
 - D** The small point of light moves slower.
- 13** A piston is supported by gas trapped in a cylinder.

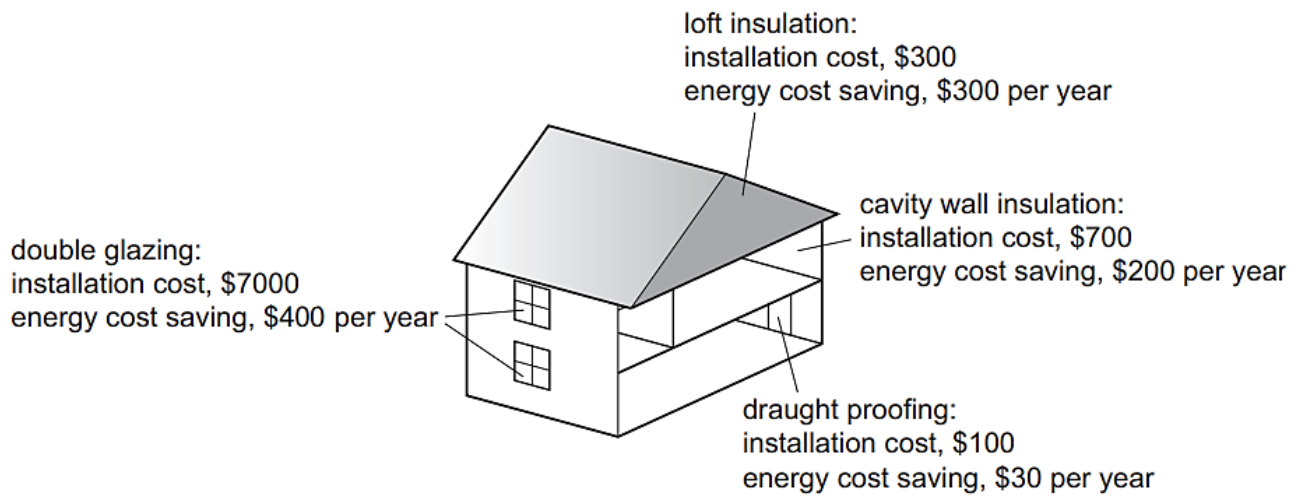


A weight is put on the piston. The volume of gas supporting the piston decreases but the temperature of the gas is unchanged.

What happens to the molecules?

- A** They have more kinetic energy.
- B** They move more slowly.
- C** They hit the piston more frequently.
- D** They will become smaller in size.

- 14** A house designed to keep warm in winter is to be thermally insulated to reduce thermal energy loss and reduce fuel costs.



Which type of thermal insulation pays back the cost of installation in the shortest time?

- A** cavity wall insulation
 - B** double glazing
 - C** draught proofing
 - D** loft insulation
- 15** Cooling fins are used in many devices such as refrigerators and car radiators.

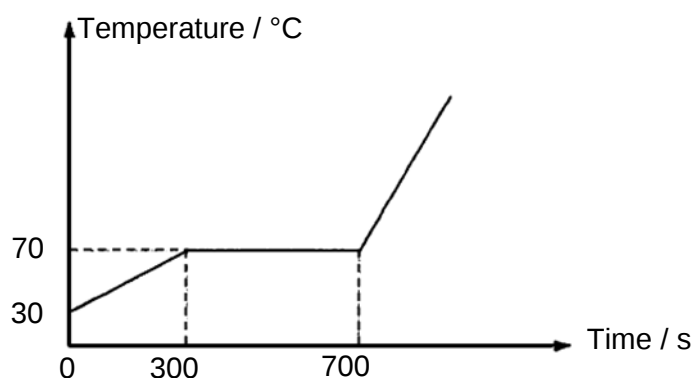
Below are three statements about cooling fins.

statement	
1	The cooling fins are made of metal to ensure that thermal energy is being radiated quickly to the environment.
2	The cooling fins have a large surface area for heat to be dissipated quickly to the environment through convection and radiation.
3	Cooling fins are usually painted white to increase the rate of radiation to the surroundings.

Which statement(s) about the cooling fins is/are correct?

- A** 1 and 2
- B** 2 only
- C** 2 and 3
- D** 1, 2 and 3

- 16** The diagram shows a graph of temperature against time when 0.50 kg of salt is being heated.



If the salt is heated at a constant rate of 175 W, what is the specific latent heat of fusion of the salt?

- | | |
|---|---|
| <p>A $1.4 \times 10^3 \text{ J/kg}$</p> <p>C $8.4 \times 10^4 \text{ J/kg}$</p> | <p>B $2.1 \times 10^4 \text{ J/kg}$</p> <p>D $1.4 \times 10^5 \text{ J/kg}$</p> |
|---|---|
- 17** Which of the following could increase the rate of evaporation of a liquid?
- 1 decreasing the humidity surrounding the liquid
 - 2 decreasing the surface area of the liquid
 - 3 increasing the mass of the liquid
 - 4 increasing the temperature of the liquid
- | | |
|--|--|
| <p>A 1 and 2</p> <p>B 1 and 4</p> <p>C 2 and 3</p> <p>D 1, 3 and 4</p> | |
|--|--|

- 18 A longitudinal wave of period 2.0 s passes along a spring. The diagram below shows the position of coils at a particular time.

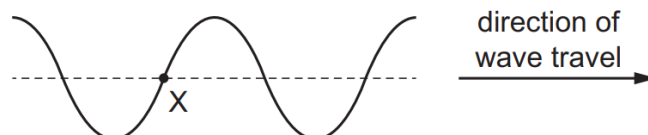


Which of the following shows the wavelength of the wave above and the speed of the wave?

	wavelength / cm	speed of wave / cm/s
A	7.5	15
B	7.5	30
C	10	5.0
D	10	7.5

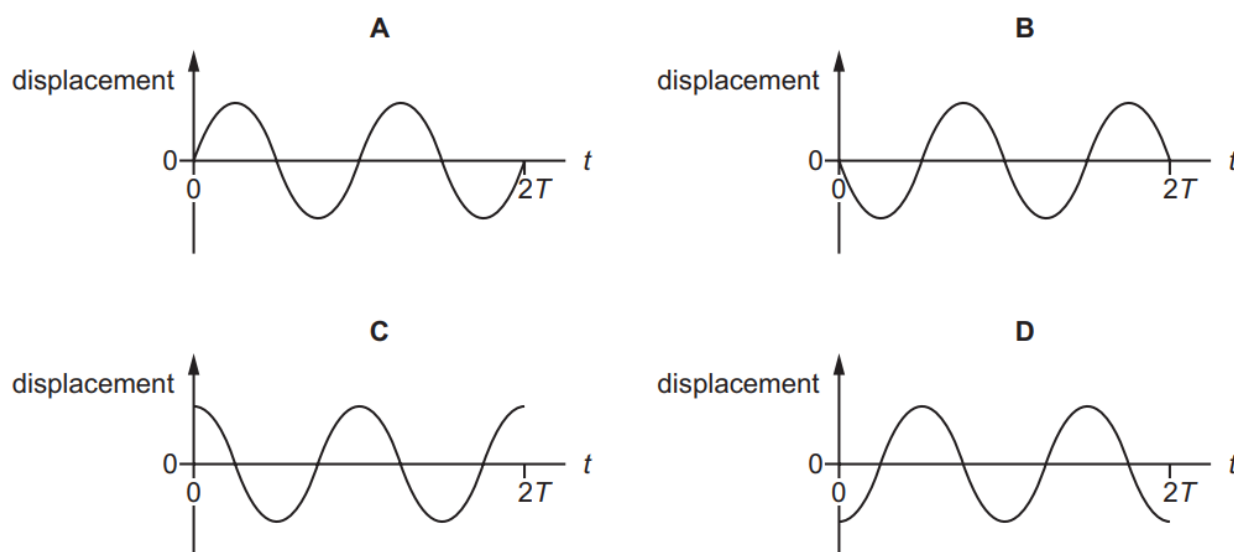
- 19 A transverse wave travels along a rope. The diagram shows the rope at time $t = 0$.

The wave is travelling from left to right. The period of the wave is T .

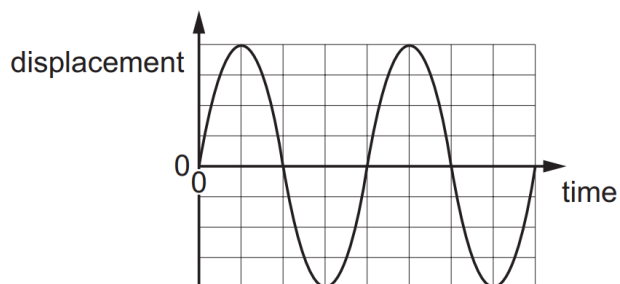


One particle of the rope is labelled X.

Which graph shows the variation with time of the displacement of particle X between $t = 0$ and $t = 2T$?



- 20** The graph shows the variation of the displacement of an air particle with time as a sound wave passes through air.

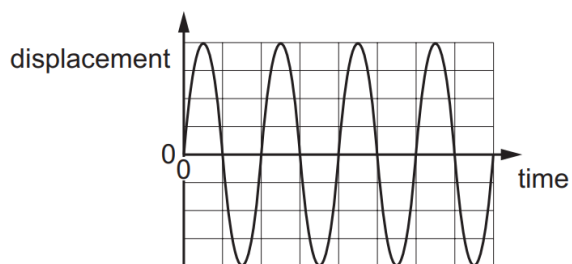


The frequency of the sound is halved while the loudness remains constant.

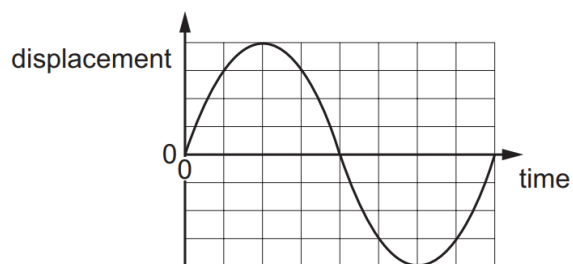
The four graphs below are drawn to the same scale as the graph above.

Which graph shows the displacement of the air particle?

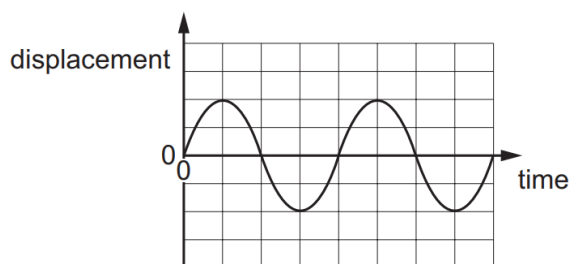
A



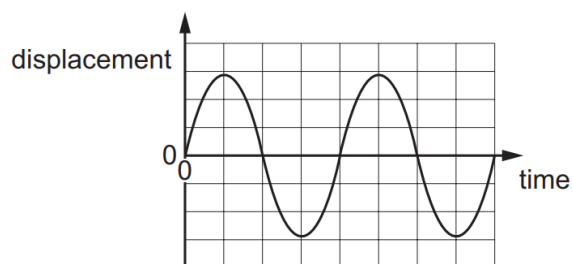
B



C



D

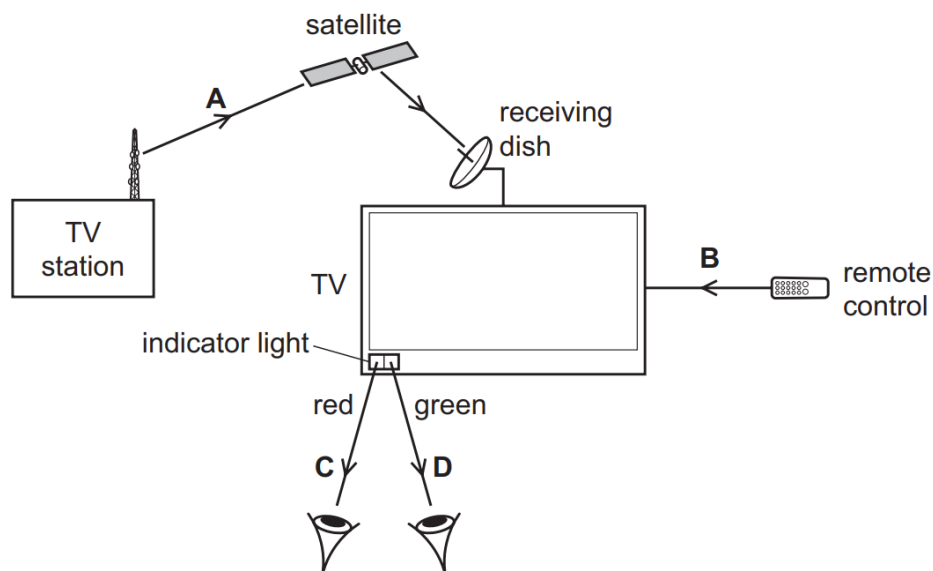


- 21 A television (TV) station transmits a signal to a television receiving dish.

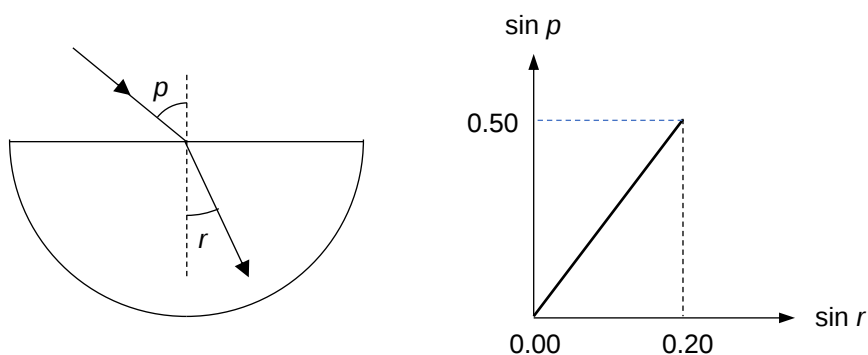
The television has an on/off indicator light.

The television is switched on by a remote control which changes the indicator from red to green.

Which electromagnetic wave used in all these actions has the longest wavelength?



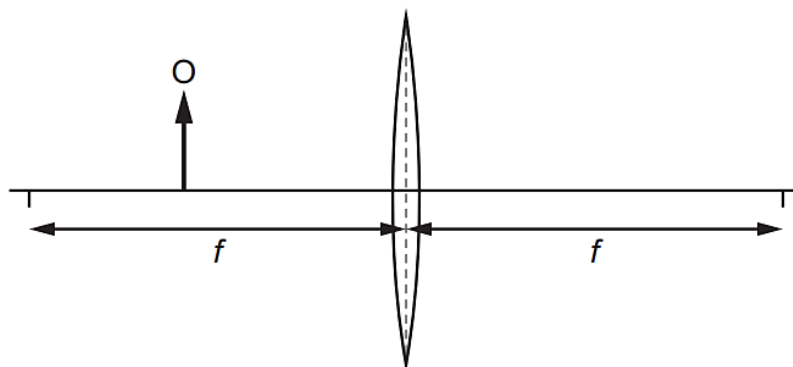
- 22 A light ray is refracted as it enters a semi-circular glass block as shown. A graph of $\sin p$ against $\sin r$ is plotted as shown.



What is the critical angle of the glass?

- A 11.5°
- B 23.6°
- C 30.0°
- D 41.8°

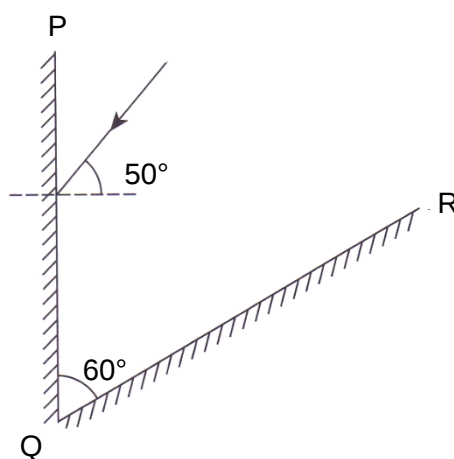
- 23 A thin converging lens has a focal length f . An object O is placed to the left of the lens, as shown.



Where is the image formed and how does its size compare to the object?

	image position	image size
A	on the opposite side of the lens to the object	larger than the object
B	on the opposite side of the lens to the object	smaller than the object
C	on the same side of the lens as the object	larger than the object
D	on the same side of the lens as the object	smaller than the object

- 24 A ray of light is incident at an angle of 50° to a mirror PQ. Another mirror QR is arranged at an angle of 60° to PQ.



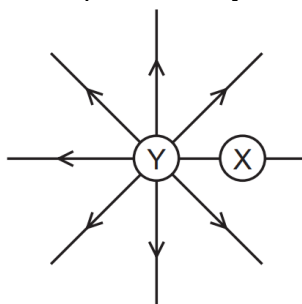
After reflection from PQ, the ray is incident on QR.

What is the angle of incidence of the ray at the mirror QR?

- A** 10° **B** 30° **C** 50° **D** 60°

- 25** Object X is stationary and negatively charged. It experiences a force due to the field produced by object Y.

The arrows show the direction of the field produced by Y.



Which statement about the direction of the force on X is correct?

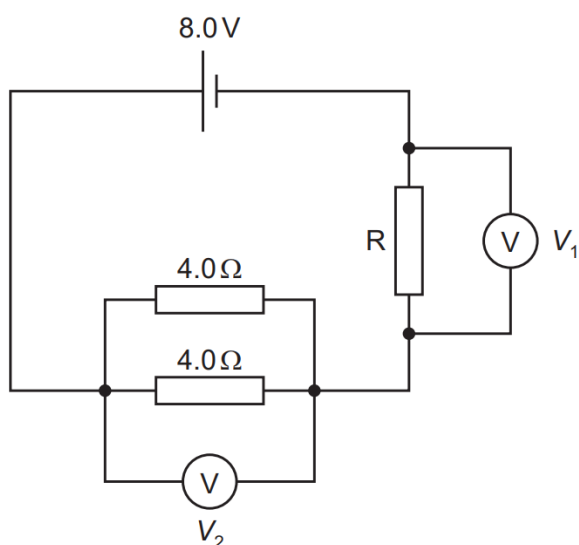
- A** It is towards the right because it is in an electric field.
- B** It is towards the left because it is in an electric field.
- C** It is towards the right because it is in a magnetic field.
- D** It is towards the left because it is in a magnetic field.
- 26** Which of the following statements is correct?
- A** An uncharged object always contains no charges.
- B** The direction of an electric field at any point is the direction of the force on a small positive charge placed at the point.
- C** The force acting on an electron is perpendicular to the electric field.
- D** The electric field lines are further apart when the electric field is stronger.
- 27** Wires of various lengths and circular cross-sectional areas are made of the same material.

The lengths and diameters of the wires are as shown below.

Which of the following wires (**A**, **B**, **C** or **D**) would provide the highest resistance?

	length / cm	diameter / cm
A	1.0	2.0
B	2.0	3.0
C	3.0	1.0
D	4.0	2.0

- 28** A cell has an electromotive force (e.m.f.) of 8.0 V and forms part of a circuit, as shown.



The reading V_1 is 6.0 V and the reading V_2 is 2.0 V.

What is the resistance of resistor R ?

- A** 0.50 Ω **B** 2.0 Ω **C** 6.0 Ω **D** 8.0 Ω
- 29** 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 25 hours.

What is the amount of the charge that passes through the lamp in this time?

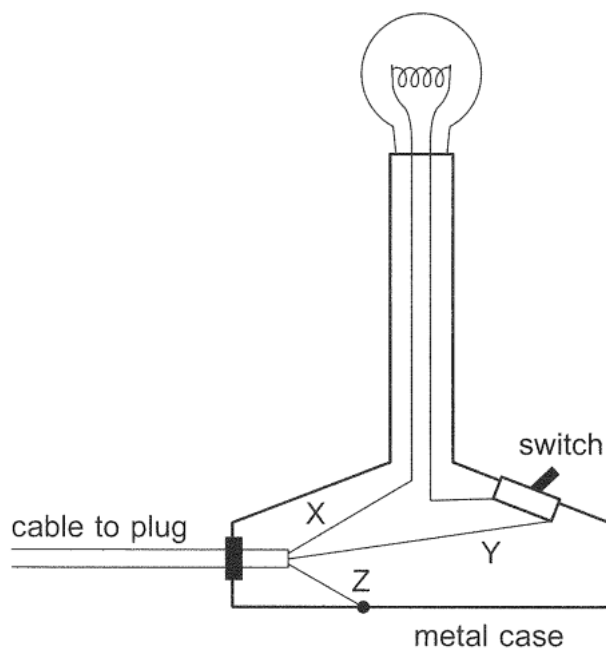
- A** 3000 C **B** 45 000 C **C** 180 000 C **D** 1 100 000 C
- 30** A current of 9 A flows through the electric iron when it is working normally.

The cable of an electric iron is damaged due to wear and tear. The live wire subsequently makes contact with the metal case. The case is connected to the earth wire and the plug to the electric iron contains a 10 A fuse.

What will happen?

- A** The current will flow to the earth and the fuse will not blow.
- B** The fuse will melt and the current to the electric iron will be cut off.
- C** The metal case is now at a high voltage and someone touching it may get electrocuted.
- D** The metal case will overheat due to the high current flowing through it and become a fire hazard.

- 31** The diagram shows the wiring of a mains electric lamp. The lamp has a metal case and a switch. There are three wires X, Y and Z in the mains cable connected to the plug.



What is the correct arrangement of wires in the lamp?

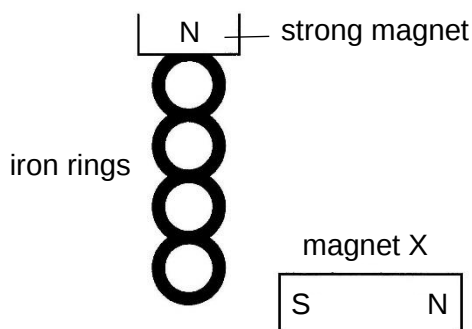
	wire X	wire Y	wire Z
A	live	earth	neutral
B	live	neutral	earth
C	neutral	earth	live
D	neutral	live	earth

- 32** The cost of turning on a 500 W computer for 30.0 minutes and 1800 W air conditioner for 210 minutes is \$1.57.

What is the cost of a unit (kW h) of electricity?

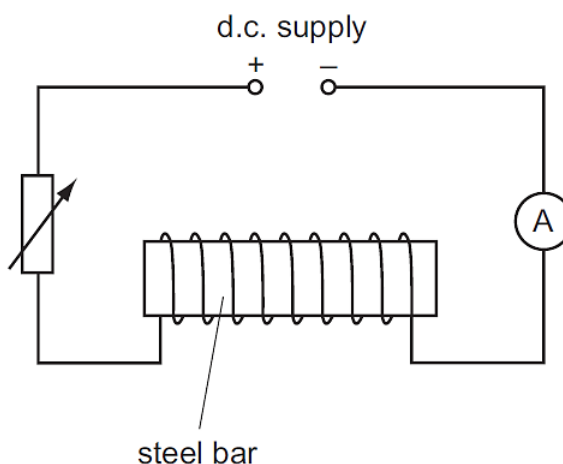
- A** \$ 0.17
B \$ 0.24
C \$ 17.07
D \$ 23.97

- 33** A strong permanent magnet attracts a chain of iron rings. A weaker permanent magnet, X, is moved near to the right side of the lowest iron ring.



What will happen to the chain of iron rings?

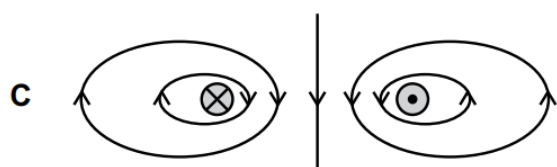
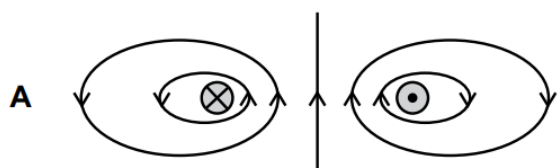
- A** It will move away from magnet X.
 - B** It will move into the plane of the paper.
 - C** It will move out of the plane of the paper.
 - D** It will move towards magnet X.
- 34** The diagram shows how a steel bar can be magnetised.



Which statement describes how the steel bar can be demagnetised?

- A** Reverse the d.c. supply and gradually decrease the current in the circuit.
- B** Reverse the d.c. supply and gradually increase the current in the circuit.
- C** Use an a.c. supply and gradually decrease the current in the circuit.
- D** Use an a.c. supply and gradually increase the current in the circuit.

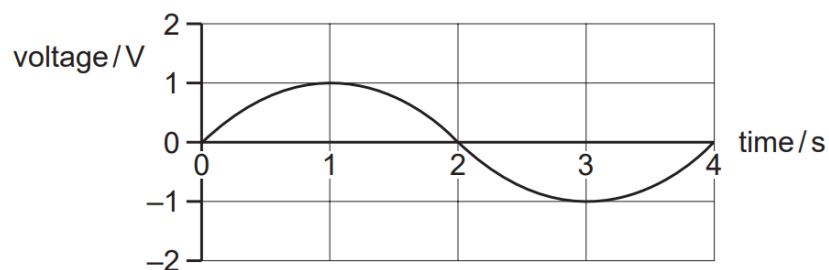
- 35 Each of the diagrams below is a cross-section through two parallel current-carrying conductors. Which diagram shows the magnetic field pattern formed by the currents in the two conductors?



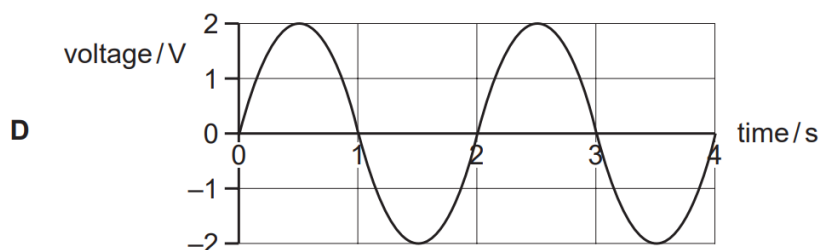
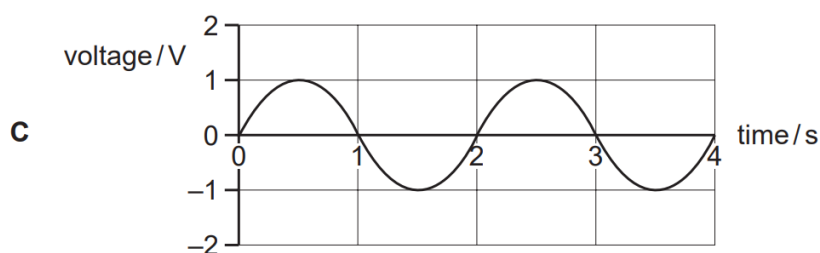
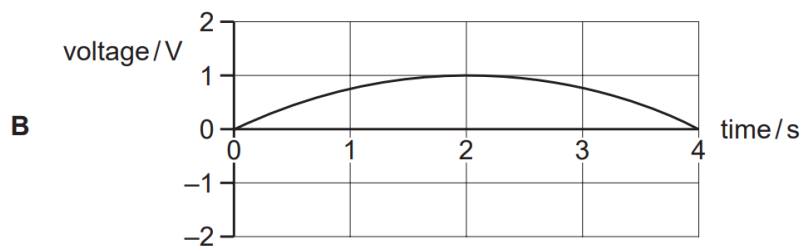
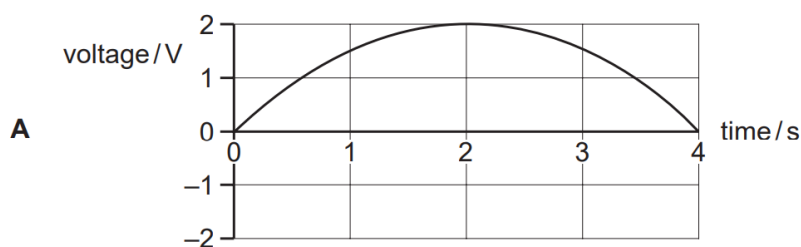
⊗ current into the page

⊙ current out of the page

- 36 A simple a.c. generator produces a voltage that varies with time as shown.

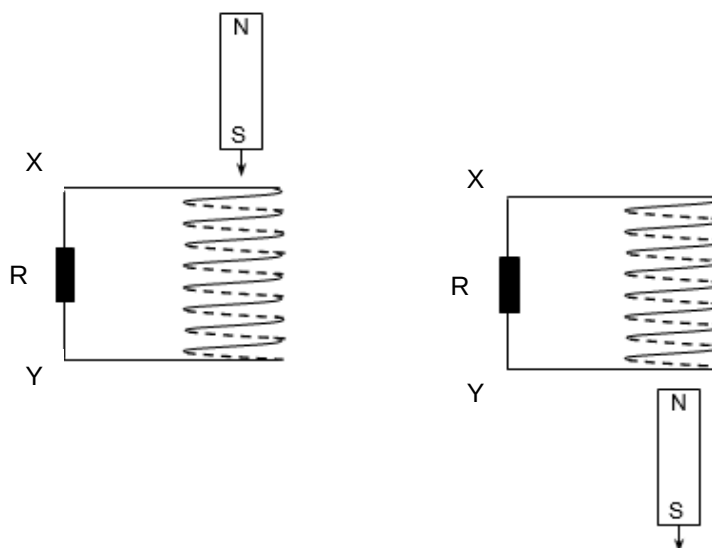


Which graph shows how the voltage varies with time when the generator rotates at twice the original speed?



- 37** A bar magnet is dropped through a coil of wire. The coil is connected to a resistor R.

Fig. 37.1 shows the bar before it enters the coil. Fig. 37.2 shows the bar after it leaves the coil.

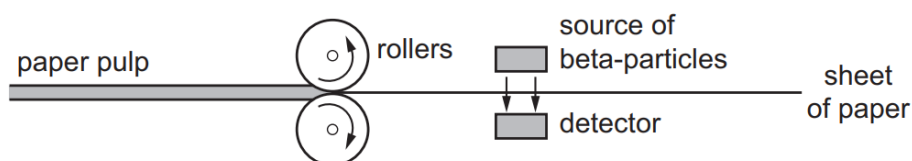


Which row shows the direction of the induced current in the resistor R?

	magnet entering coil	magnet leaving coil
A	X to Y	X to Y
B	X to Y	Y to X
C	Y to X	X to Y
D	Y to X	Y to X

- 38** The diagram shows how the thickness of paper is measured during manufacturing process.

If the sheet is too thick, fewer beta-particles can reach the detector.

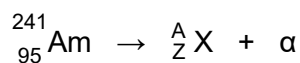


Why are beta-particles used for this purpose?

- A** Alpha-particles are all stopped by the paper.
- B** Alpha-particles make the paper radioactive.
- C** Gamma radiation is all stopped by the paper.
- D** Gamma radiation is only produced by sources with a short half-life.

- 39** Americium-241 is a radioactive nuclide used in smoke detectors. It undergoes α -decay to form nuclide X.

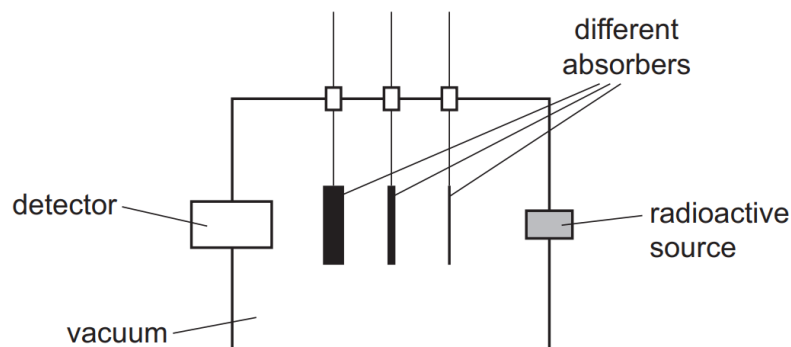
This decay may be represented by the equation shown.



What are the values of A and Z?

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

- 40** The diagram shows a piece of apparatus used to determine the nature of the emissions from a radioactive source. The absorbers can be raised out of or lowered into the path of the radiation from the source to the detector.



The table gives a set of results for a particular radioactive source.

absorber in use	count rate on detector/ counts per second
none	350
thin paper	350
1.0 mm aluminium	180
1.0 cm lead	20

Which types of radiation are being emitted by the radioactive source?

- A** α -particles and β -particles
- B** α -particles only
- C** β -particles and γ -rays
- D** β -particles only