Anglican High School
Secondary Four
Preliminary Examination
2024

S4

CANDIDATE NAME

CLASS 4

INDEX NUMBER

PHYSICS 6091/01

Paper 1 Multiple Choice

10 Sep 2023

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

DO NOT TURN OVER THE PAGE UNTIL YOU ARE TOLD TO DO SO.

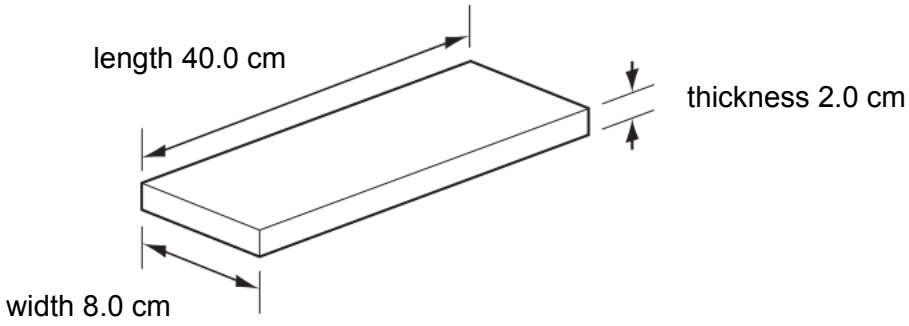
Write in soft pencil.
Write your name, index number and class on all papers you hand in.
Do not use staples, paper clips, highlighters, glue or correction tape.

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 on this question paper.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **14** printed pages.

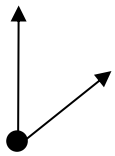
1 The diagram shows the approximate dimensions of a metal sheet.



Which instruments are most suitable to measure accurately each of these dimensions?

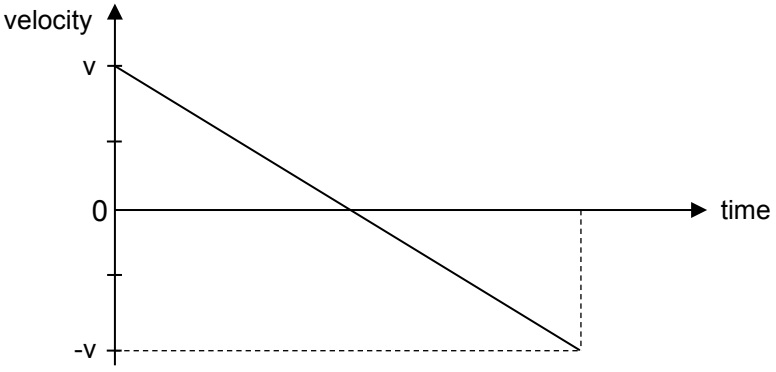
	length	width	thickness
A	digital micrometer	digital calipers	metre rule
B	digital calipers	digital micrometer	metre rule
C	metre rule	digital calipers	digital micrometer
D	metre rule	digital micrometer	digital calipers

2 Two forces act on a point mass in the directions shown in the diagram.



In which direction is the resultant force acting?

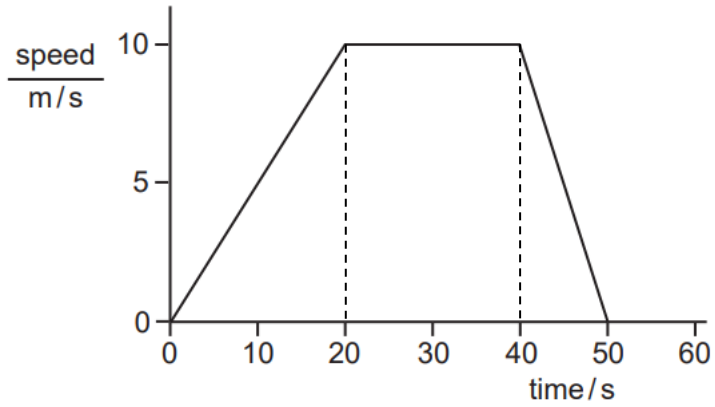
3 The diagram shows how the velocity of a car varies with time.



Which statement best describes the motion of the car throughout the whole journey?

A The velocity of the car is always decreasing.
B The velocity of the car is always increasing.
C The velocity of the car is increasing and then decreasing in the opposite direction.
D The velocity of the car is decreasing and then increasing in the opposite direction.

4 The graph shows how the speed of an object changes with time.



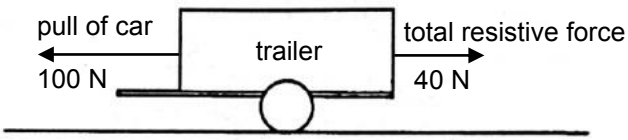
What is the average speed of the car for the whole journey?

A 5.0 m / s **B** 7.0 m / s **C** 7.5 m / s **D** 10 m / s

5 On Earth, an object has a mass of 5.0 kg and a weight of 50 N. It is then taken to the Moon. Are the inertia, mass and weight of the object the same, or less than before?

	inertia	mass	weight
A	less	less	same
B	less	same	same
C	same	less	less
D	same	same	less

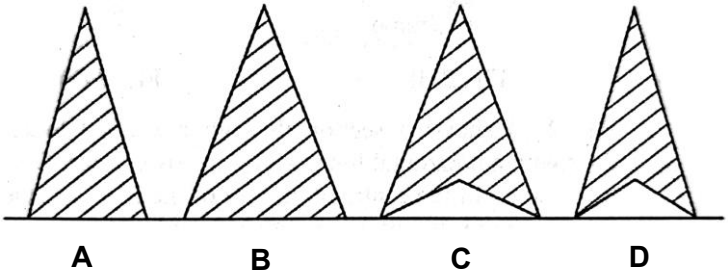
6 A car pulls on a trailer with a force of 100 N. The trailer moves on the level road against a total resistive force of 40 N.



What is the force exerted by the trailer on the car?

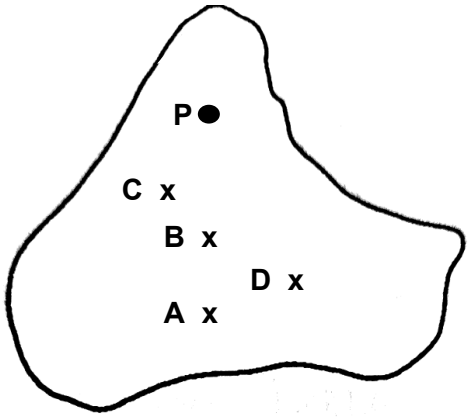
A 40 N **B** 60 N **C** 100 N **D** 140 N

7 The diagrams show the cross-sections of four solid objects.



Which object is the least stable?

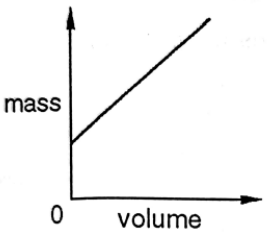
8 A thin metal sheet of uniform density is pivoted freely at P. The sheet is allowed to swing freely and comes to rest as shown in the diagram.



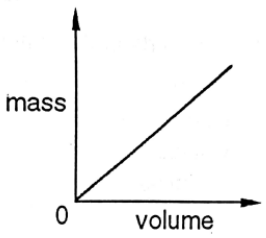
Which point is the most possible centre of gravity?

9 A student wants to determine the relationship between mass and volume of a type of material. He measures the mass and volume of samples of the material with different sizes.

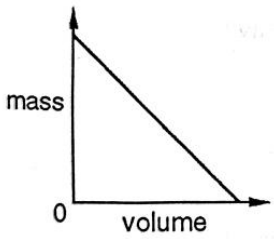
Which graph shows his results?



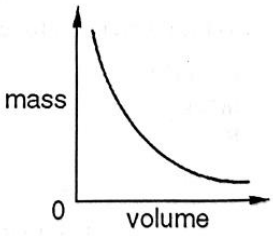
A



B

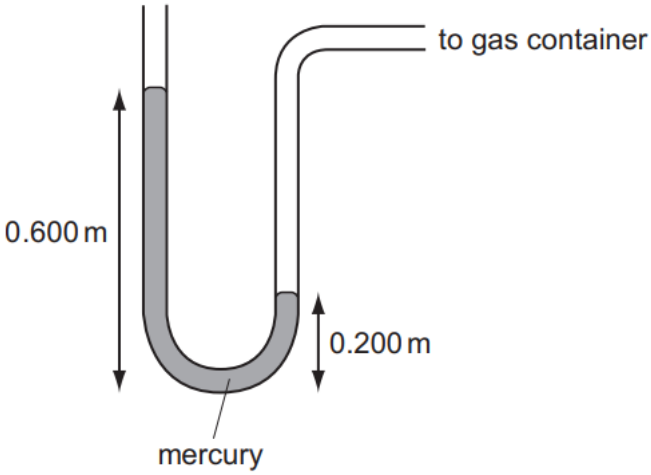


C



D

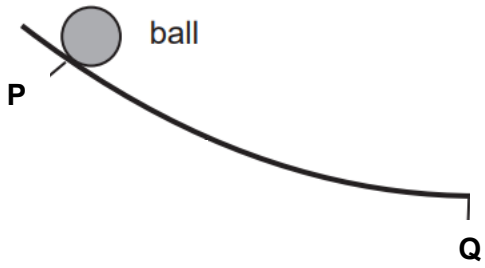
10 The diagram shows a mercury manometer connected to a gas container.



What is the pressure of the gas?

A 80 cm of mercury more than the atmospheric pressure
B 60 cm of mercury more than the atmospheric pressure
C 40 cm of mercury more than the atmospheric pressure
D 20 cm of mercury more than the atmospheric pressure

11 The diagram shows a ball moving on a rough surface from point P to Q.



What is the energy transfer as the ball moves from P to Q?

A gravitational potential store to kinetic store and internal store
B gravitational potential store to kinetic store and then to internal store
C gravitational potential store to internal store and then to kinetic store
D gravitational potential store to internal store

12 A motorcycle is travelling at a constant speed of 72 km / h on a road. The forward force on the motorcycle is 3000 N.

What is the power developed?

A 42 kW **B** 60 kW **C** 150 kW **D** 216 kW

13 What causes Brownian motion of smoke particles?

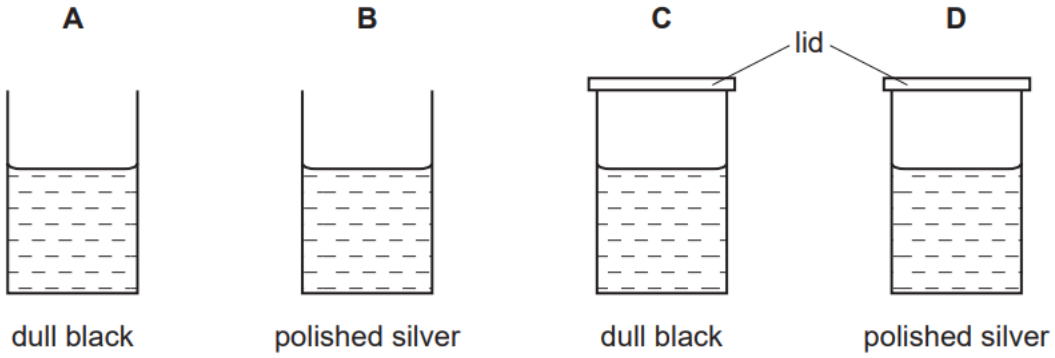
A collision between smoke particles and air molecules
B collision between smoke particles
C collision between air molecules
D convection currents in the air

14 Which row explains why a gas does not have a fixed volume and a fixed shape?

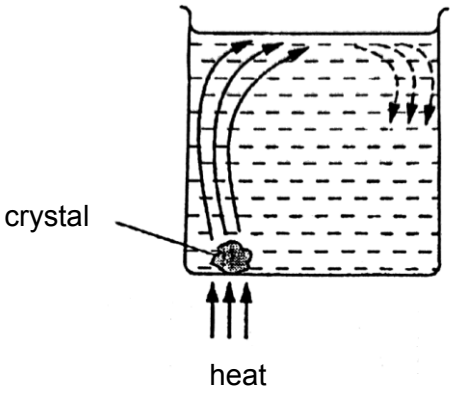
	Force between molecules in the gas	Movement of molecules in the gas
A	large	move throughout the gas
B	large	vibrates about fixed positions
C	small	move throughout the gas
D	small	vibrates about fixed positions

15 The diagram shows four identical cans containing the same volume of water, initially at 80 °C.

After leaving the cans in the open air at room temperature for 10 minutes, which can contains the warmest water?



16 The diagram shows a crystal being heated in a beaker of water. The crystal releases a dye which shows how the water circulates around the beaker.



What causes the water above the crystal to rise?

A The distances between the water molecules increase and the density of the water decreases.

B The distances between the water molecules decrease and the density of the water increases.

C The water molecules expand and the density of the water decreases.

D The water molecules contract and the density of the water increases.

17 Thermal energy is supplied at the same rate to 1.0 kg of copper and 1.0 kg of water. The temperature of the copper rises faster.

Which statement explains why the temperature of the copper rises faster?

A Copper has a higher melting point than water.

B Copper has a higher boiling point than water.

C Copper has a lower specific latent heat than water.

D Copper has a lower specific heat capacity than water.

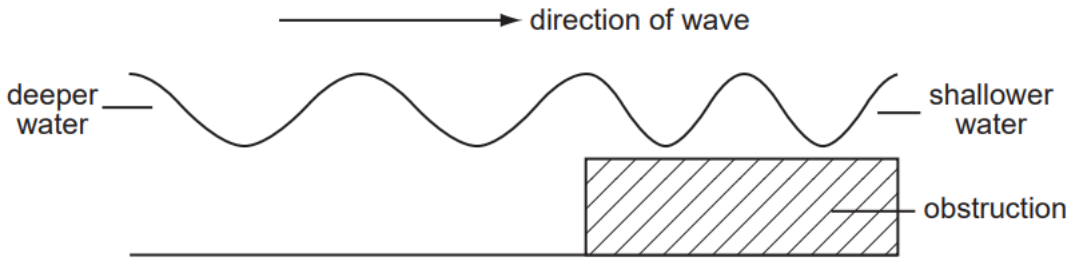
18 A container of boiling water with a mass of 4.0 kg is heated by an immersion heater at a rate of 2000 W for 30 minutes.

The specific latent heat of vaporisation of water is 2260 kJ / kg. You may assume there is no energy transferred to the surrounding.

How much water remains?

A 0 kg **B** 1.6 kg **C** 2.4 kg **D** 3.8 kg

19 A water wave travels from deep water to shallow water in a ripple tank.



What happens when the wave moves into the shallow water?

A The frequency and speed of the wave decreases.
B The frequency and speed of the wave increases.
C The frequency of the wave remains constant and speed of the wave decreases
D The frequency of the wave remains constant and speed of the wave increases

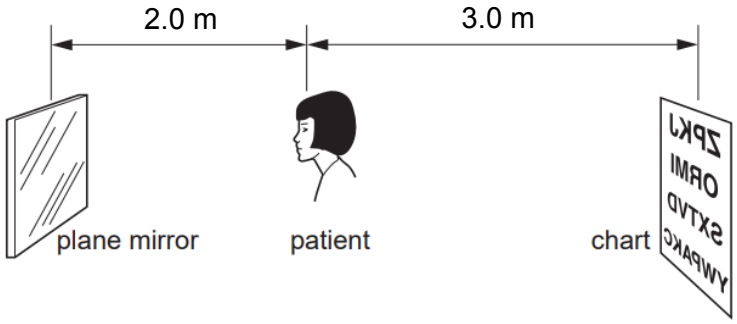
20 Which of the following is the correct example of a transverse wave and a longitudinal wave?

	transverse wave	longitudinal wave
A	ultrasound	light
B	ultrasound	X-ray
C	X-ray	light
D	light	ultrasound

21 Which statement is true for all electromagnetic waves?

A They travel at the same speed in a vacuum.
B They can be seen.
C They have the same frequency in air.
D They are longitudinal.

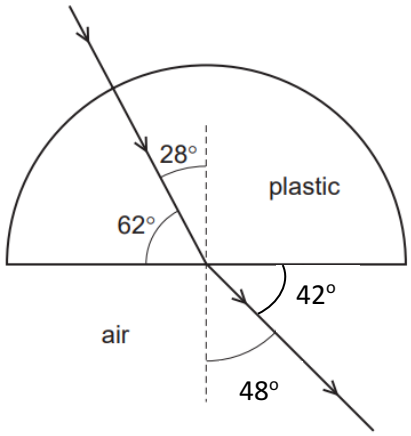
22 The diagram shows a patient having her eyes tested. A chart with letters on it is placed behind her and she sees the chart reflected in a plane mirror.



How far away from the patient is the image of the chart?

A 2.0 m **B** 4.0 m **C** 5.0 m **D** 7.0 m

23 A semi-circular block is made from a plastic. A ray of light passes through it at the angles shown.



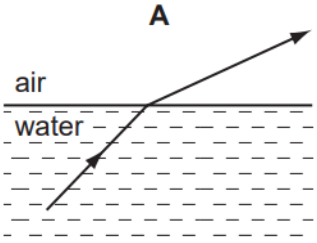
Not drawn to scale

What is the refractive index of the plastic?

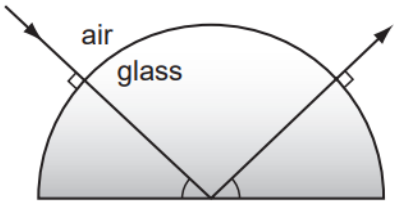
A 1.2 **B** 1.3 **C** 1.4 **D** 1.6

24 In which diagram is the path of the light ray **not** correct?

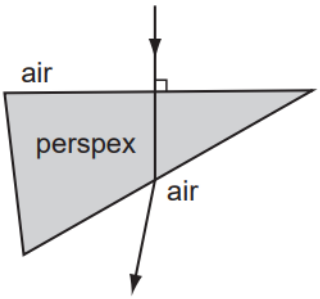
A



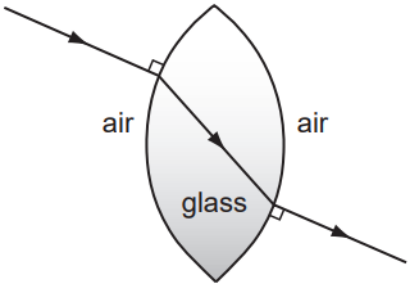
B



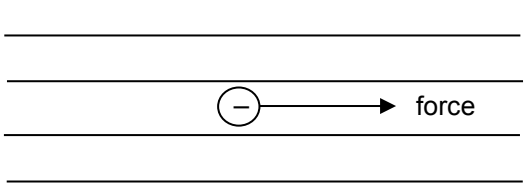
C



D

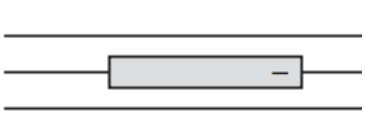


25 A negative charge is placed in a uniform electric field *E* and it experiences an electric force in the direction shown.

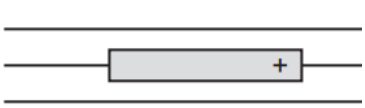


An initially uncharged copper rod is then placed in the same electric field *E*.
The rod is parallel to the field.
Which diagram shows the charges induced on the rod?

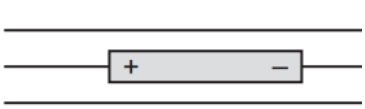
A



B

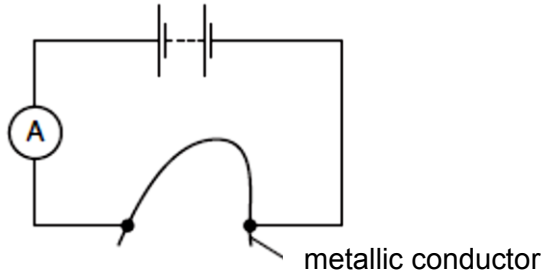


C



D

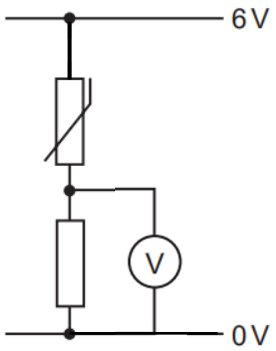
26 A length of a metallic conductor is used as a resistor in a simple circuit.



Four separate changes are made to the metallic conductor.
Which change will reduce the resistance of the metallic conductor?

A Its temperature is increased.
B Its cross-sectional area is increased.
C Its length is increased.
D It is replaced with a material of higher resistivity.

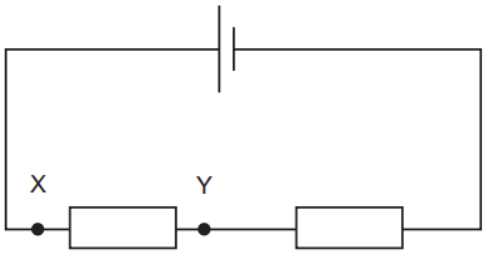
27 The diagram shows a negative temperature coefficient (NTC) thermistor connected in a potential divider circuit.



The thermistor is heated. What happens to the potential difference across the fixed resistor?

A It increases but not to 6 V.
B It increases to 6 V.
C It decreases.
D It stays the same.

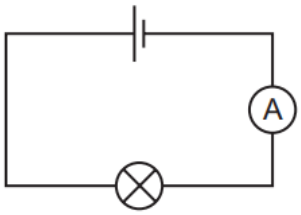
28 The diagram shows two resistors connected in series with a cell.



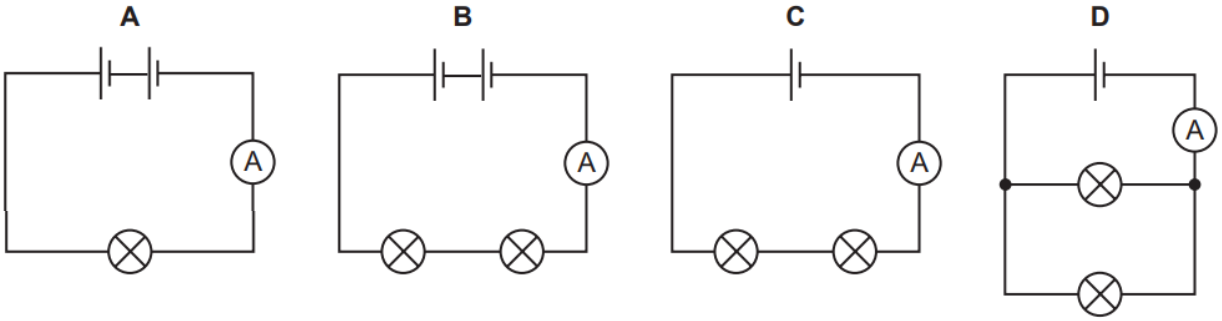
Which statement defines the potential difference across XY?

A the power needed to drive a unit charge between X and Y
B the power needed to drive a unit charge through the cell
C the work done in driving a unit charge between X and Y
D the work done in driving a unit charge through the cell

29 A cell is connected in series with an ammeter and a lamp. The current is 2.0 A.



In which circuit, using identical cells, lamps and ammeters, is the current reading 1.0 A?



30 When the flash on a camera is used, a charge of 1.5 C flows for 0.0030 s through the flash lamp. The average voltage across the flash lamp is 3600 V. What is the electrical energy supplied to the flash lamp and what is the average power supplied?

	energy / J	power / W
A	2400	16.2
B	2400	1.8×10^6
C	5400	16.2
D	5400	1.8×10^6

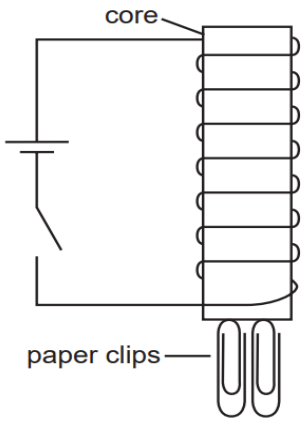
31 Which quantity is measured in kilowatt-hours?

A charge **B** current **C** energy **D** power

32 End X of a metal rod attracts the N-pole of a compass needle. What does this show about the rod?

A It could be made of steel but is not permanently magnetised.
B It could be made of steel with a N-pole at X.
C It could be made of copper but is not permanently magnetised.
D It could be made of copper with a S-pole at X.

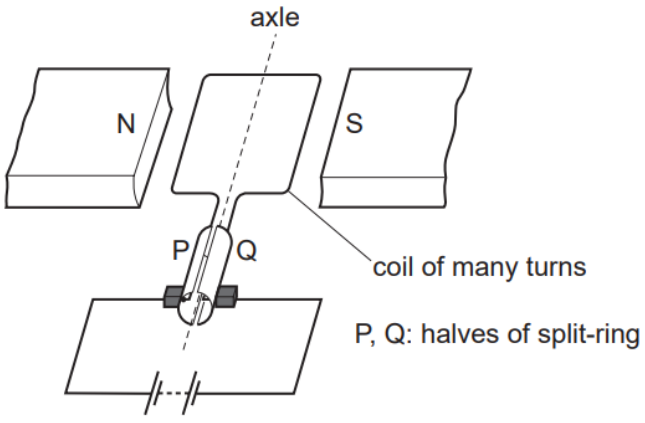
33 Four different substances are tested by using each as the core of an electromagnet. The number of paper clips each holds is recorded when there is a current in the electromagnet and when the current is switched off.



Which substance is the best for making the core of a transformer?

	number of paper clips held when there is a current in the electromagnet	number of paper clips held when current is switched off
A	8	4
B	6	0
C	5	1
D	4	0

34 A d.c. motor consists of a coil of many turns rotating in a fixed magnetic field. The coil is connected to a d.c. supply through a split-ring commutator.



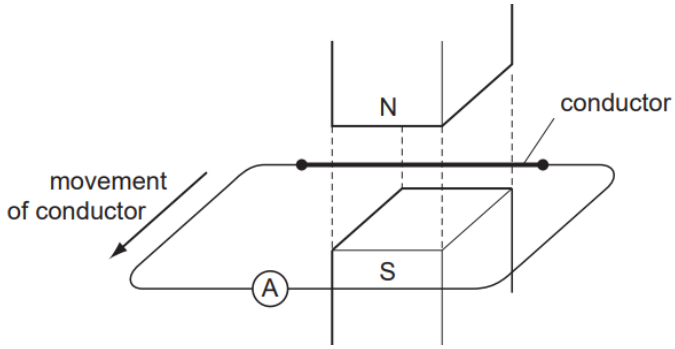
Some changes are made, one at a time.

- The d.c. supply is reversed.
- The coil is turned before switching on, so that P starts on the right and Q on the left.
- The poles of the magnet are reversed.
- The turns on the coil are increased in number.

How many of these changes make the coil rotate in the opposite direction?

A 1 **B** 2 **C** 3 **D** 4

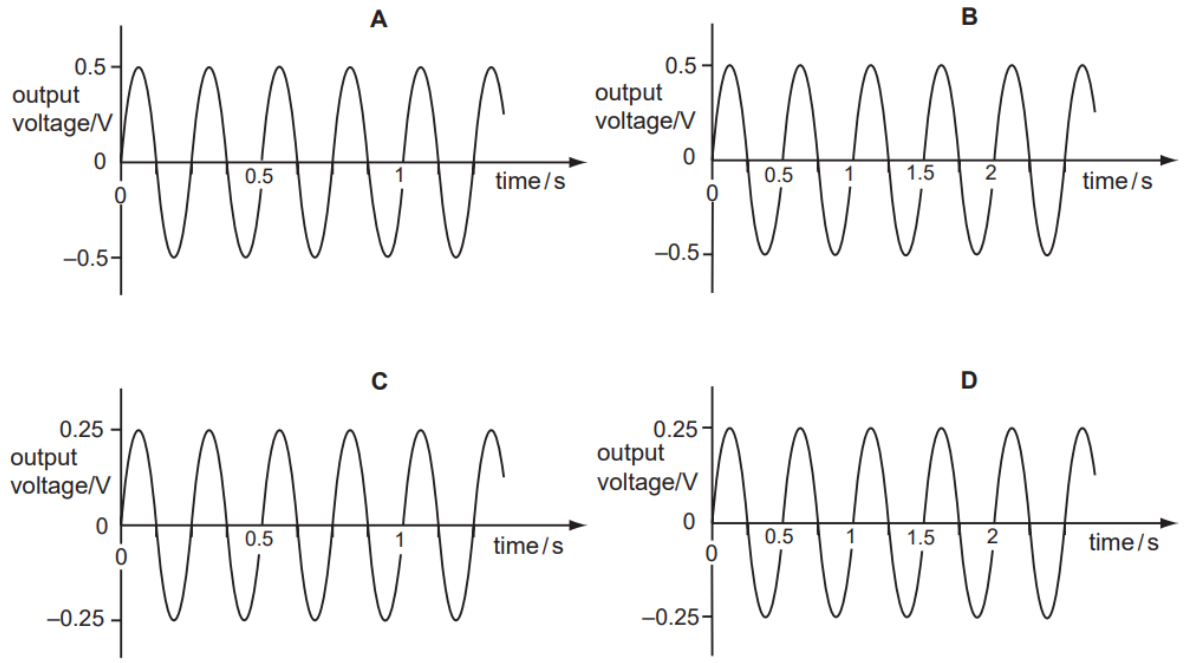
35 A conductor is moving horizontally across a vertical magnetic field.



An e.m.f. is induced in the conductor. No deflection is seen on the ammeter. What is the reason for this?

A The ammeter is not between the magnetic poles.
B The conductor is moving too slowly.
C The conductor is not cutting the magnetic field lines.
D The magnetic poles are too close together.

36 A girl turns the handle of a small a.c. generator four times each second.
The generator produces a maximum output voltage of 0.5 V.
Which of the following graphs best shows this?



37 A step-down transformer changes 240 V a.c. to 12 V a.c. There are 600 turns on the primary coil. How many turns are on the secondary coil?

A 20 **B** 30 **C** 600 **D** 12 000

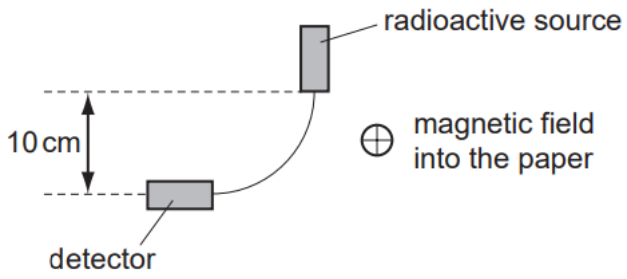
38 Electrical energy is transmitted at high alternating voltages.
What is not a valid reason for doing this?

A At high voltage, a.c. is safer than d.c.
B For a given power, there is a lower current with a higher voltage.
C There is a smaller power loss at higher voltage and lower current.
D The transmission lines can be thinner with a lower current.

39 A radioactive isotope has a half-life of 2.0 minutes. What can be deduced from this statement?

A After 0.50 minute, 0.25 of the isotope remains.
B After 1.0 minute, 0.25 of the isotope remains.
C After 4.0 minutes, 0.25 of the isotope remains.
D After 4.0 minutes, none of the isotope remains.

40 In a laboratory experiment, particles from a radioactive source are deviated by a magnetic field and reach a detector.



Which particles are deviated and reach the detector?

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

End of paper