

Name:..... Register/Index Number: Class:

PRESBYTERIAN HIGH SCHOOL



PHYSICS

6091/1

Paper 1 Multiple Choice

27 August 2024

Tuesday

1 hour

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2024 SECONDARY FOUR EXPRESS PRELIMINARY EXAMINATION

INSTRUCTIONS TO CANDIDATES:

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

Write in soft pencil.

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

Write your name, class and register number on the Answer Sheet in the spaces provided.

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 in this booklet.

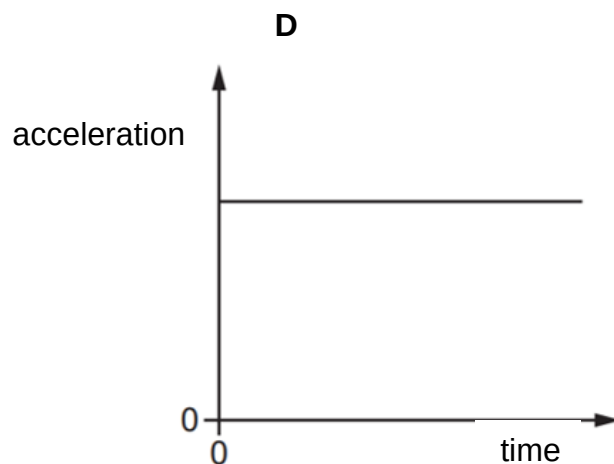
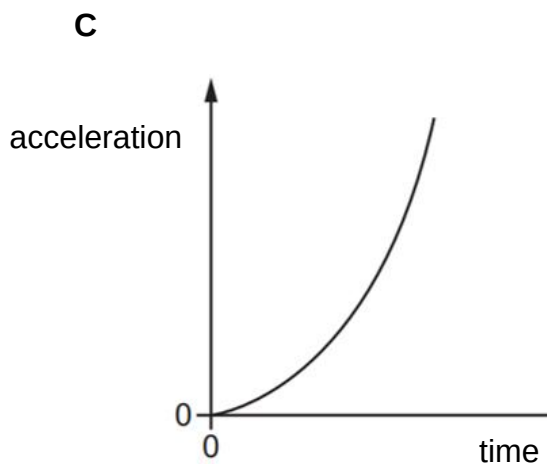
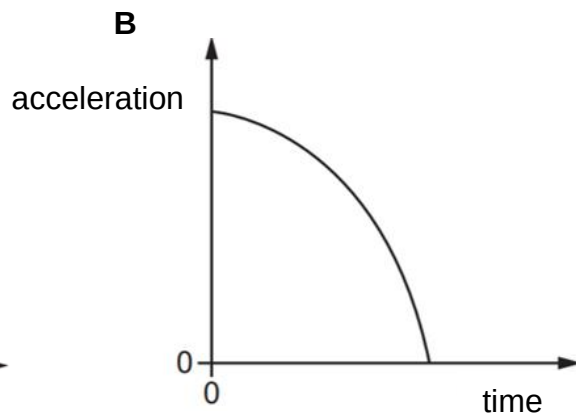
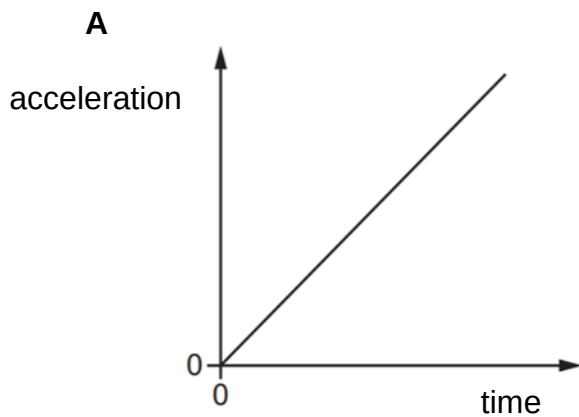
- 1 The magnitudes of three different electric charges are given below.

What is the correct order of size, from largest to smallest?

- A 1 mC $\rightarrow$ 1 MC $\rightarrow$ 1 kC
- B 1 MC $\rightarrow$ 1 mC $\rightarrow$ 1 kC
- C 1 MC $\rightarrow$ 1 kC $\rightarrow$ 1 mC
- D 1 kC $\rightarrow$ 1 mC $\rightarrow$ 1 MC

- 2 A stone falls freely from the top of a cliff. Air resistance may be ignored.

Which graph shows how the acceleration of the stone varies with time as it falls?



- 3 Two objects have the same size and shape but one is heavier than the other. They are each dropped from rest in air.

Comparing the two objects, the heavier object has

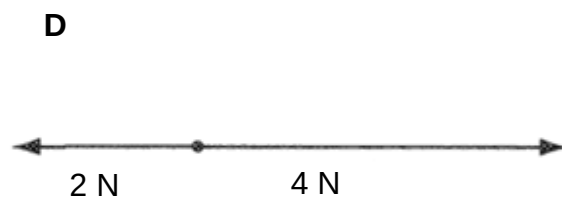
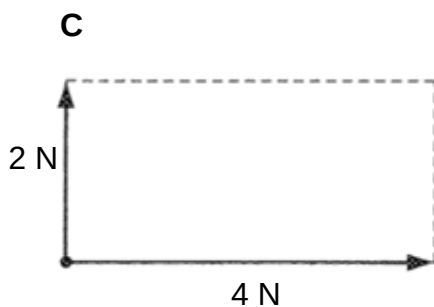
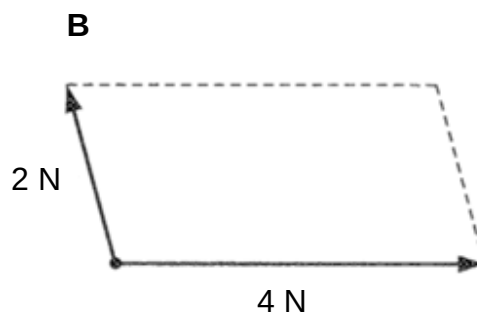
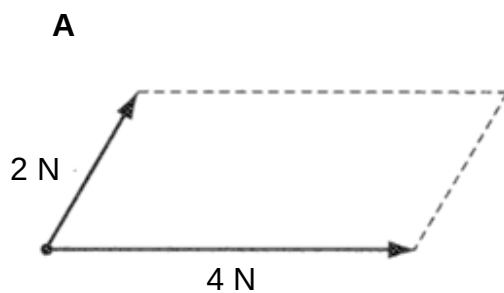
- A higher initial acceleration and higher terminal velocity.
 B higher initial acceleration and same terminal velocity.
 C the same initial acceleration and higher terminal velocity.
 D the same initial acceleration and the same terminal velocity.
- 4 A person of weight 600 N at the bottom of a mountain climbs to the top. The gravitational field strength changes from 9.81 N/kg at the bottom to 9.79 N/kg at the top. His mass is unchanged as he climbs.

What are his mass and his weight at the top of the mountain?

	mass at the top of mountain /kg	weight at the top of mountain /N
A	61.2	599
B	61.2	600
C	61.3	599
D	61.3	600

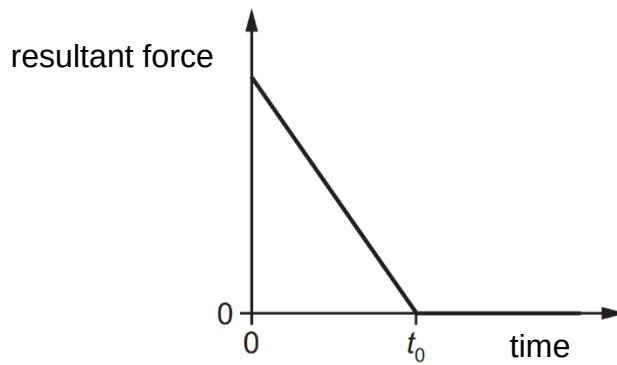
- 5 Forces of 4 N and 2 N act at a point.

Which scale diagram shows the forces that have a resultant of 4 N?

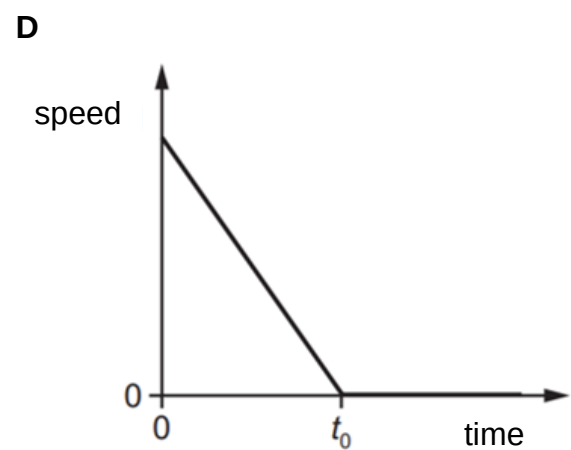
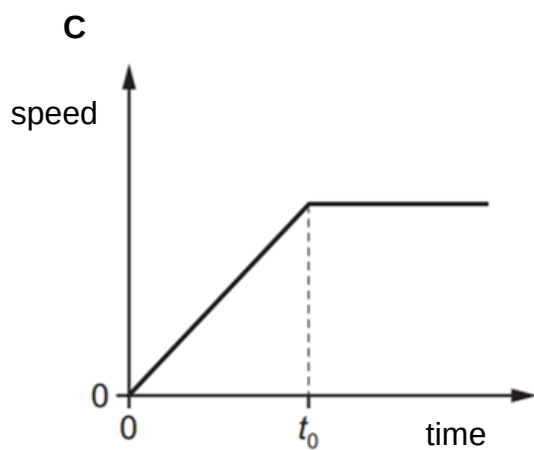
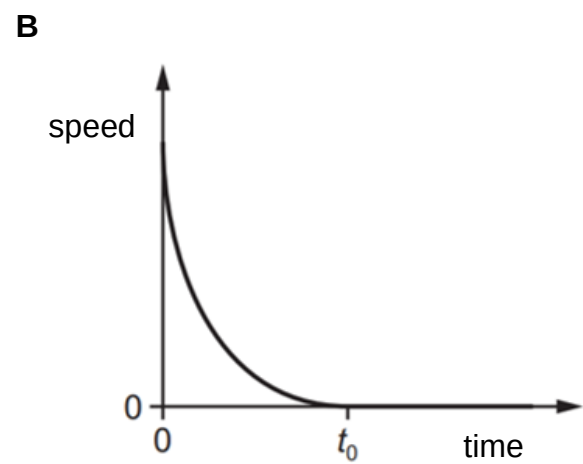
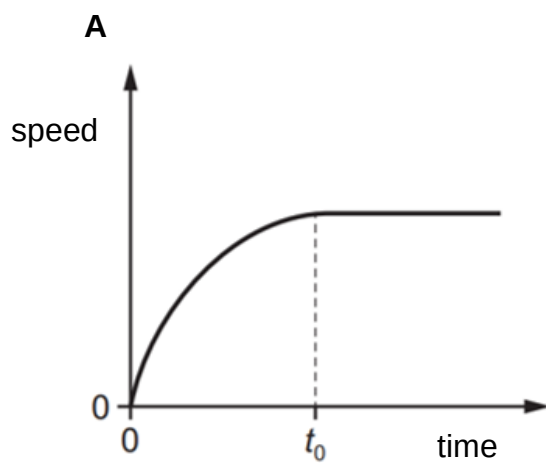


- 6 A resultant force acts on an object and causes it to move in a straight line.

The graph shows how the resultant force varies with time.



Which graph is the speed-time graph for the object?

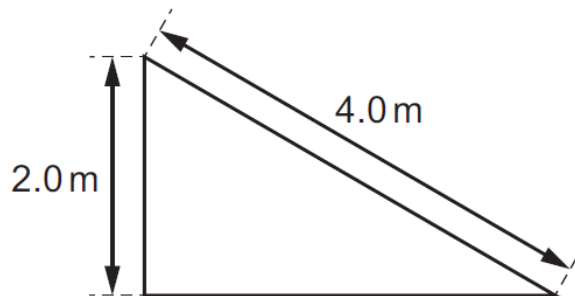


- 7 Water is added to a measuring cylinder containing 100 cm^3 of liquid paraffin. The density of paraffin is 0.80 g/cm^3 and that of the water is 1.0 g/cm^3 .

As the water is added, the level of the paraffin rises to 150 cm^3 . The paraffin and water do **not** mix.

What is the total mass of liquid in the measuring cylinder?

- A 130 g
B 140 g
C 167 g
D 175 g
- 8 A box is initially at rest at the top of a rough slope. The box slides down the slope. The mass of the box is 2.0 kg and gravitational field strength, g is 10 N/kg . The slope is 4.0 m long and 2.0 m high.



The frictional force acting on the box is 2.6 N .

What is the speed of the box as it reaches the bottom of the slope?

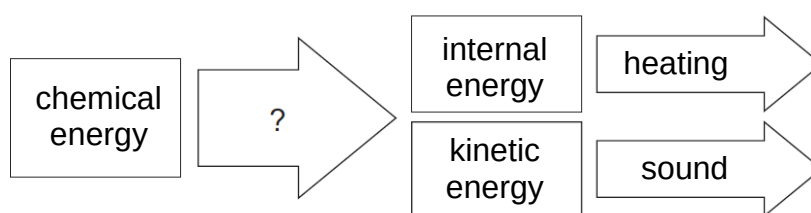
- A 5.4 m/s
B 6.3 m/s
C 7.1 m/s
D 9.5 m/s

- 9 Three solar panels have a total area of 7.2 m^2 . Together, they produce 1.0 kW of power.

An area of 1.0 m^2 of each panel receives 0.80 kJ of energy from the Sun in 1.0 s .

What is the efficiency of the solar panels?

- A 11%
B 17%
C 52%
D 80%
- 10 The diagram shows the energy stores for a mobile (cell) phone and how the energy is transferred between stores.



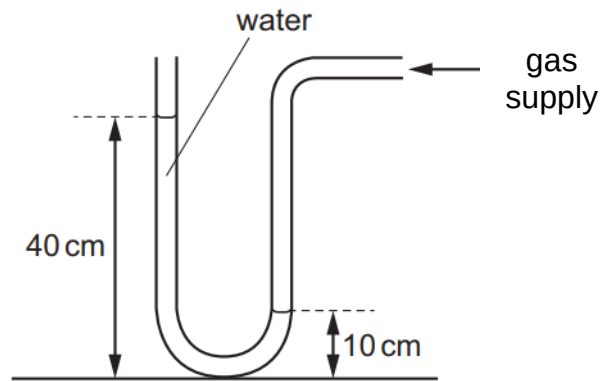
What describes how the chemical energy is transferred?

- A electrical work done
B mechanical work done
C electromagnetic waves
D sound waves
- 11 Small pollen particles are suspended in water. When viewed with a microscope, the pollen particles can be seen to be moving about irregularly.

What causes this movement?

- A The pollen particles are being bombarded by the heavier particles of the water.
B The pollen particles are being bombarded by the lighter particles of the water.
C The temperature of the water is higher than that of the pollen particles.
D The temperature of the water is lower than that of the pollen particles.

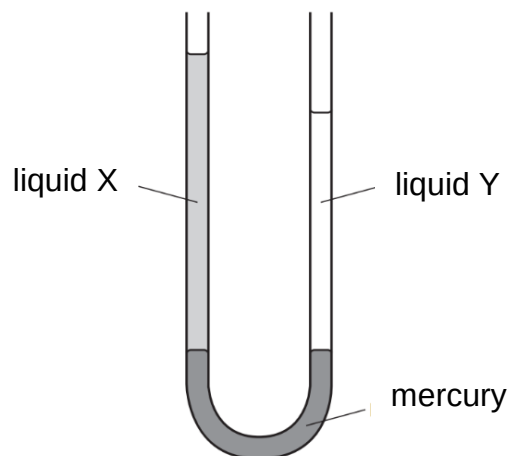
- 12** A manometer containing water is used to measure the pressure of a gas supply, as shown. The gravitational field strength, g is 10 N/kg .



The atmospheric pressure is 76 cm Hg .

The density of mercury is $13\,600 \text{ kg/m}^3$ and density of water is 1000 kg/m^3 .
What is the pressure of the gas supply?

- A** $100\,000 \text{ Pa}$ **B** $104\,000 \text{ Pa}$ **C** $106\,000 \text{ Pa}$ **D** $144\,000 \text{ Pa}$
- 13** The diagram shows a U-tube manometer containing three liquids: mercury, liquid X and liquid Y. Neither liquid X nor liquid Y mixes with mercury.



Which row compares the pressure exerted by liquid X and by liquid Y on the mercury, and the density of liquid X and the density of liquid Y?

	pressure exerted by X and by Y on the mercury	densities of X and Y
A	pressure by X is greater than Y	density of X is greater than Y
B	pressure by Y is greater than X	density of Y is greater than X
C	pressure by X and of Y is the same	density of X is greater than Y
D	pressure by X and of Y is the same	density of Y is greater than X

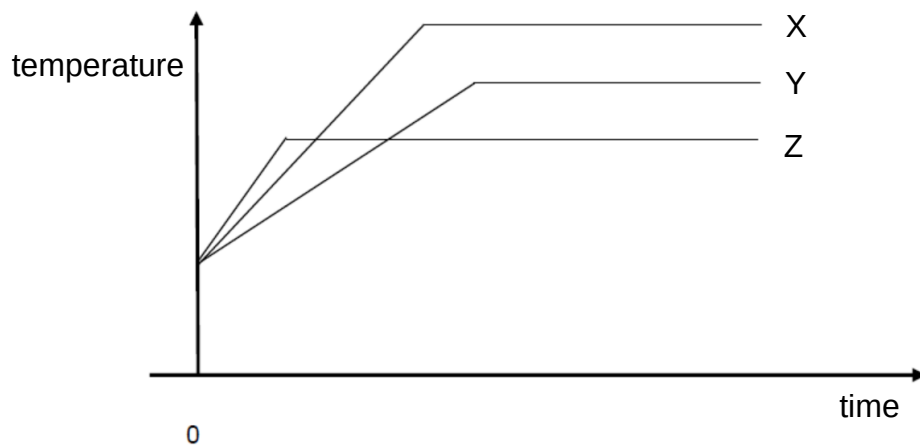
- 14** The following objects all lose energy in the internal store.

Which object loses its energy in the internal store by radiation **only**?

- A** a concrete block with white surfaces at 100 °C, in air
- B** a metal block with black surfaces at 40 °C, in air
- C** a shiny metal satellite at 30 °C, in space
- D** the heating element of a kettle at 150 °C, in water

- 15** Equal masses of three liquids X, Y and Z are heated from room temperature. Energy is supplied by heating at the same rate to each liquid.

The graph shows how the temperature of each liquid varies with time after heating starts.



What can be deduced from the graph?

- A** X has the highest melting point.
 - B** X gains the most internal energy.
 - C** Y has the largest specific heat capacity.
 - D** Z has the smallest specific latent heat of vaporisation.
- 16** The water from two buckets is mixed together. One bucket contains 5 kg of water at 20 °C and the other contains 1 kg of water at 80 °C.

What is the final temperature of the mixture, assuming no heat is lost to the surroundings?

- A** 30 °C
- B** 50 °C
- C** 60 °C
- D** 70 °C

- 17** Which row shows an example of a transverse wave and a longitudinal wave?

	transverse wave	longitudinal wave
A	infra-red radiation	X-ray
B	visible light	radio wave
C	ultrasound wave	ultra-violet radiation
D	gamma ray	ultrasound wave

- 18** A wave of frequency 6600 Hz travels 1320 m in 4.0 s.

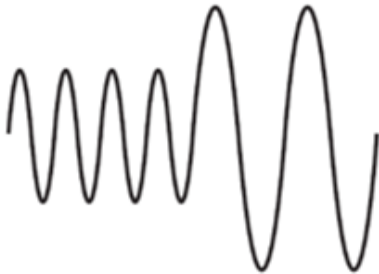
What is the wavelength?

- A** 0.050 m **B** 0.80 m **C** 1.3 m **D** 20 m

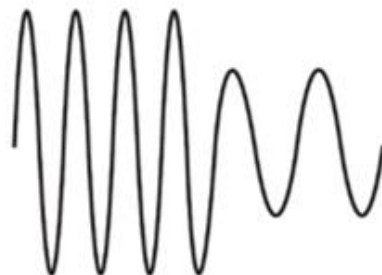
- 19** Sound waves are displayed as a trace on the screen of an oscilloscope.

Which trace shows a sound that becomes quieter with a higher pitch?

A



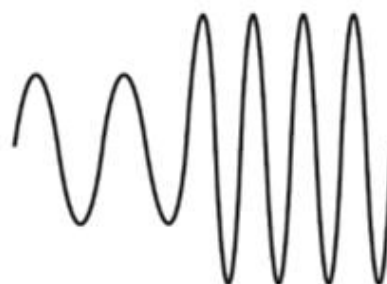
B



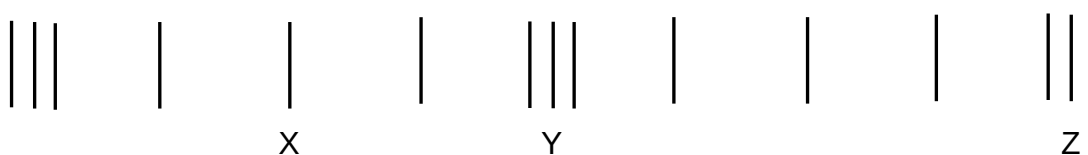
C



D



- 20** A longitudinal wave travels along a spring.
The diagram represents the position of the coils of the spring at one particular instant.



The coils vibrate from side to side. Each coil completes 4.0 oscillations in 2.0 s.

Which row shows the correct frequency and wavelength of the wave?

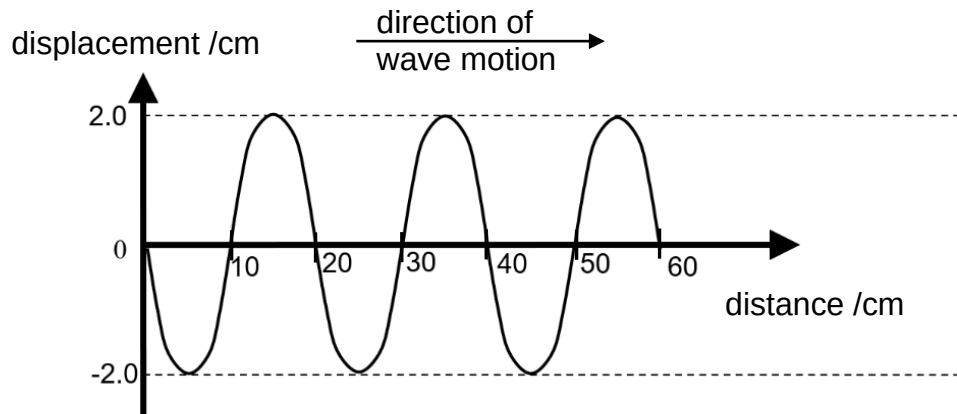
	frequency / Hz	wavelength / m
A	0.5	XY
B	2.0	XY
C	0.5	YZ
D	2.0	YZ

- 21** Many devices produce electromagnetic waves when operating.

Which device produces electromagnetic waves of the highest frequency?

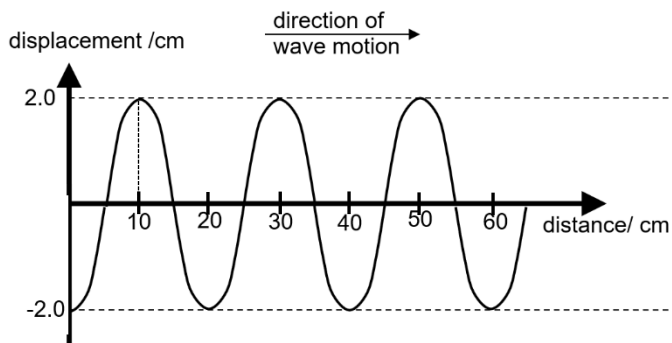
- A** mobile phone
- B** sunbed
- C** television controller
- D** toaster

- 22 A transverse wave travels along a string with a speed of 50 cm/s. The graph shows the shape of the string at a certain instant.

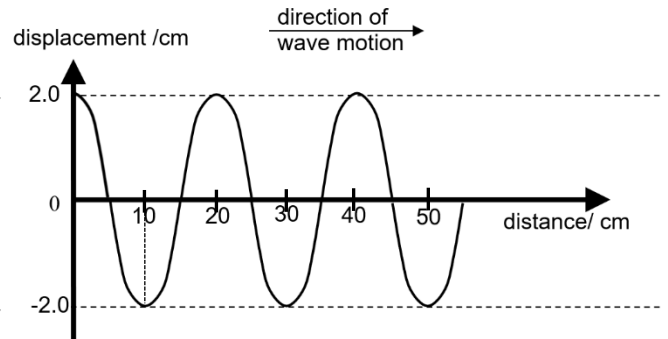


Which of the following graphs shows the shape of the string 0.3 s later?

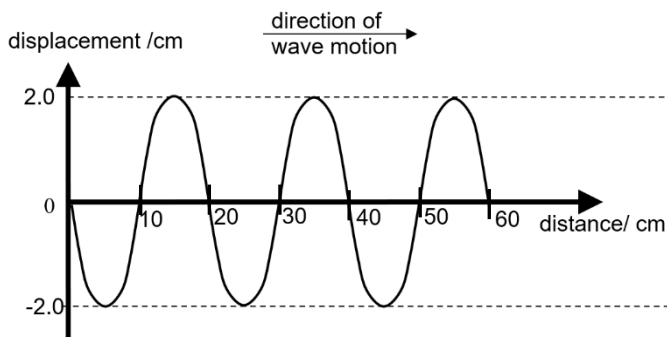
A



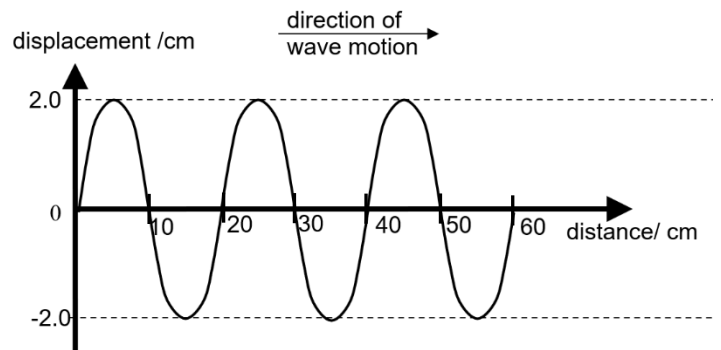
B



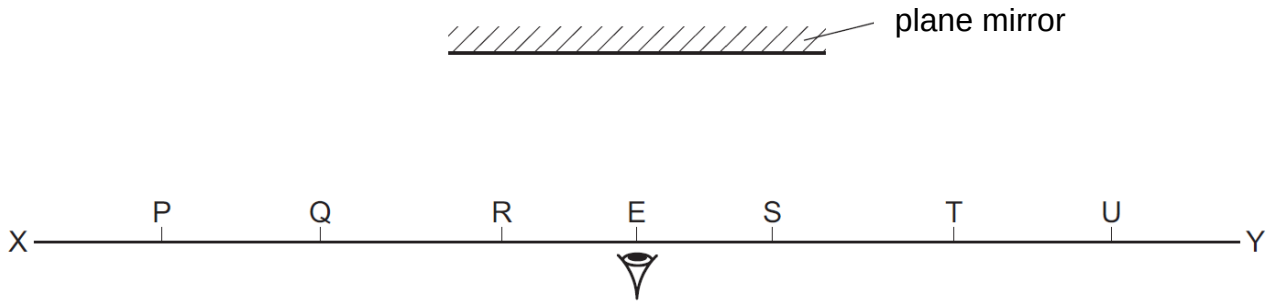
C



D



- 23** A student uses one eye to look at images in a plane mirror.

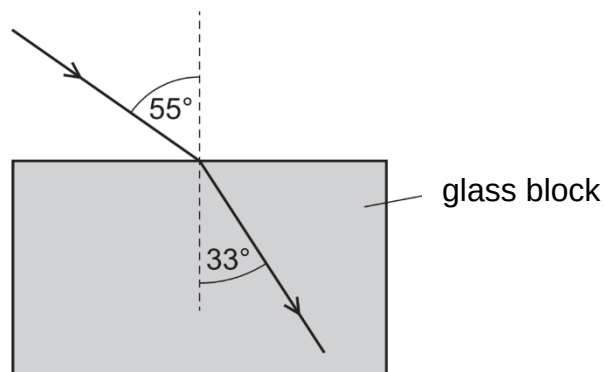


Objects are placed on the line XY.

Which objects give rise to images that can be seen by the eye at E?

- A** P, Q, R, S, T and U
 - B** Q, R, S and T only
 - C** P and U only
 - D** R and S only
- 24** Light travelling at a speed of 3.0×10^8 m/s strikes the surface of a glass block and undergoes refraction as it enters the block.

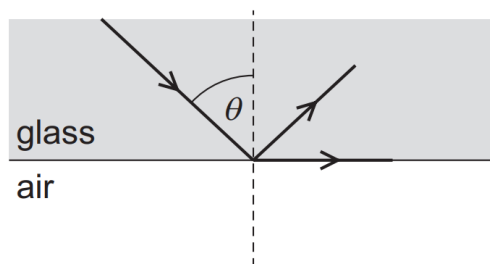
The diagram shows a ray of this light before and after it enters the block.



What is the speed of light in the glass?

- A** 1.5×10^8 m/s
- B** 1.8×10^8 m/s
- C** 2.0×10^8 m/s
- D** 4.5×10^8 m/s

- 25 The diagram shows a narrow beam of light incident on a glass-air boundary. Some of the light emerges along the surface of the glass and some is reflected back into the glass.

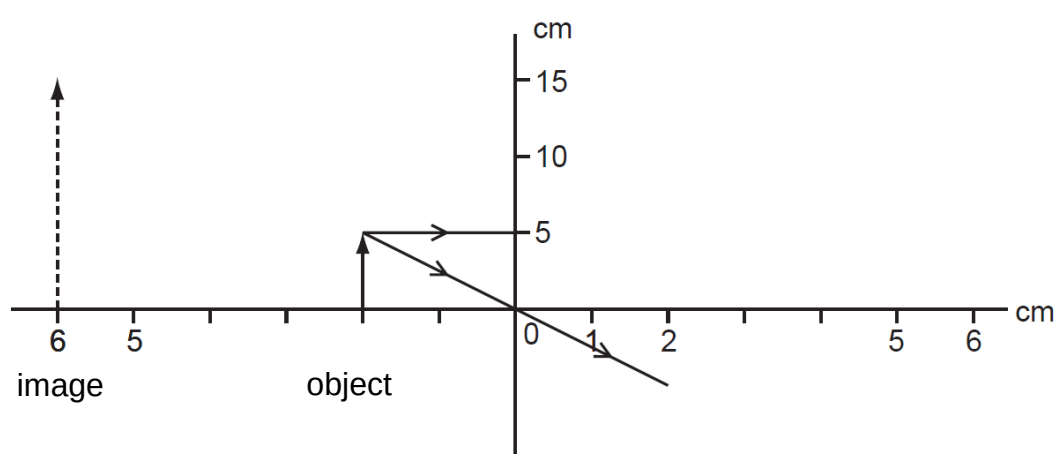


Which row is correct?

	this is an example of total internal reflection	angle θ is the critical angle
A	no	yes
B	no	no
C	yes	no
D	yes	yes

- 26 An object 5.0 cm high is placed 2.0 cm from a converging (convex) lens which is being used as a magnifying glass.

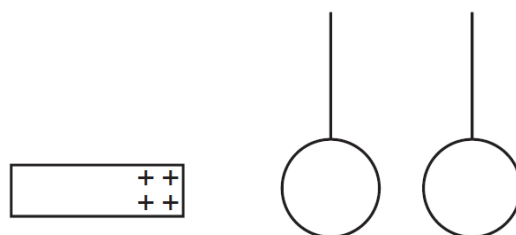
The image produced is 6.0 cm from the lens and is 15 cm high.



What should be the distance between the object and the convex lens to produce a real image that is the same size as the object?

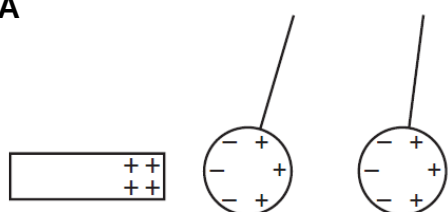
- A** 2.0 cm **B** 3.0 cm **C** 4.0 cm **D** 6.0 cm

- 27 Two uncharged metal spheres, not touching one another, are suspended by means of cotton thread. A positively charged rod is brought near.

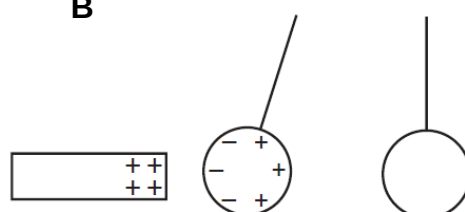


Which diagram shows what happens to the spheres?

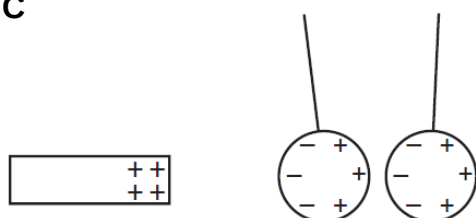
A



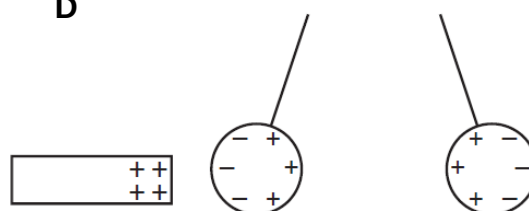
B



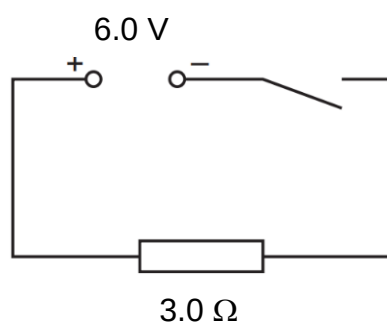
C



D



- 28 The circuit shown is switched on for 1.0 minute.

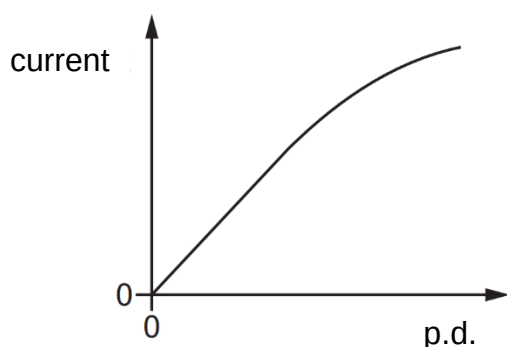


How much charge passes through the $3.0\ \Omega$ resistor?

- A** 2.0 C **B** 12 C **C** 120 C **D** 720 C

- 29** The graph shows the relationship between the current in a circuit component and the potential difference (p.d.) across it.

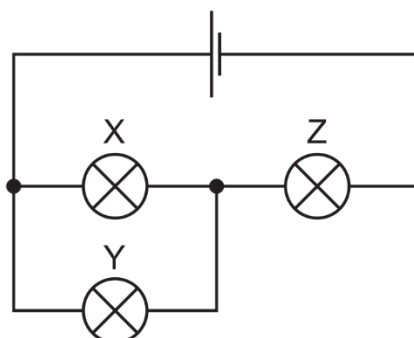
The graph has a straight section and a curved section.



What happens to the resistance of the component in these two sections as the current increases?

	straight section	curved section
A	resistance increases	resistance decreases
B	resistance increases	resistance increases
C	no change in resistance	resistance decreases
D	no change in resistance	resistance increases

- 30** The circuit diagram shows a cell connected to three identical lamps X, Y and Z. All the lamps are lit.

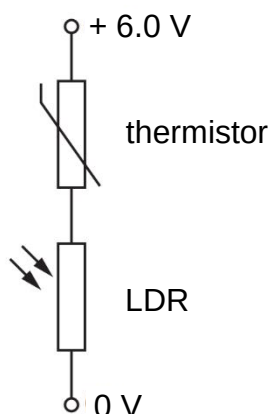


Lamp Y is removed by unscrewing it from its holder.

What happens to lamp Z?

- A** It goes out completely.
- B** It becomes dimmer but stays lit.
- C** It stays the same brightness.
- D** It becomes brighter.

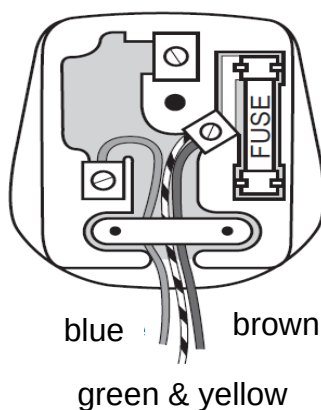
- 31 A thermistor and a light-dependent resistor (LDR) are connected in series. A potential difference (p.d.) of 6.0 V is applied across them as shown.



The thermistor has a resistance of $6000\ \Omega$ in a cold room and $1000\ \Omega$ in a warm room. The LDR has a resistance of $2000\ \Omega$ in dim light and $500\ \Omega$ in bright light.

When is the p.d. across the LDR equal to 2.0 V?

- A in a cold room with bright light
 - B in a cold room with dim light
 - C in a warm room with bright light
 - D in a warm room with dim light
- 32 A plug is wrongly wired as shown. It is connected to an old vacuum cleaner, which has a metal case.

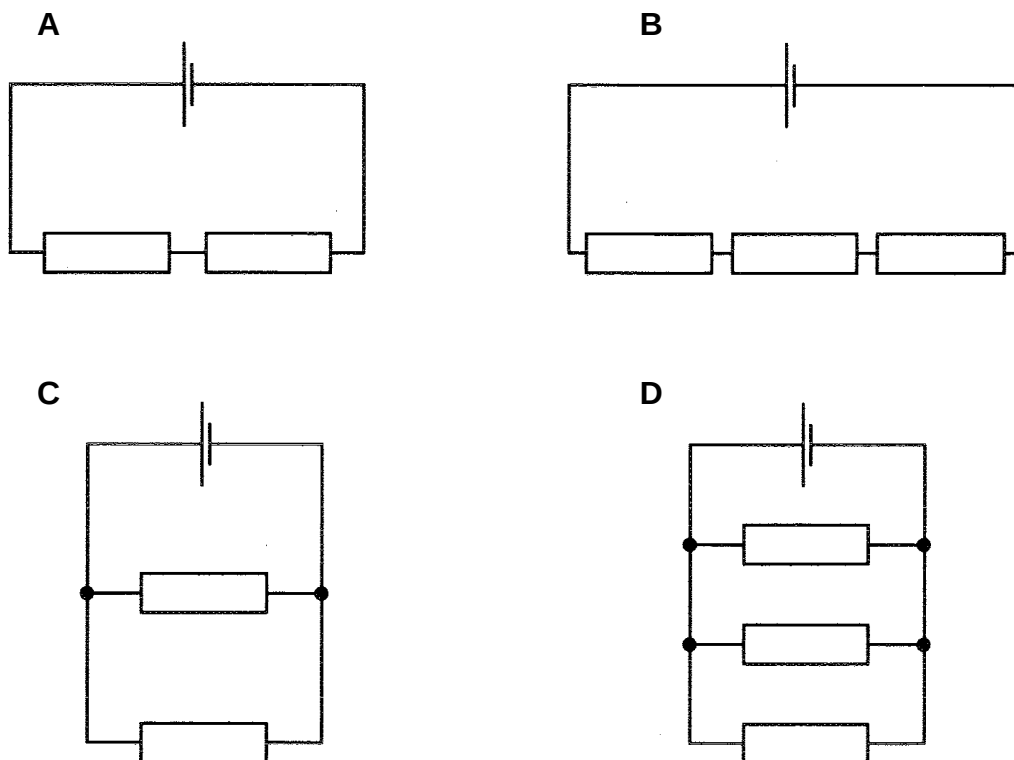


What is the effect of using the plug wired in this way?

- A The fuse in the plug blows.
- B The metal case is live.
- C The neutral wire melts.
- D The vacuum cleaner catches fire.

- 33** The circuits show a cell joined to different combinations of identical resistors.

In which circuit is the energy transferred electrically at the greatest rate?



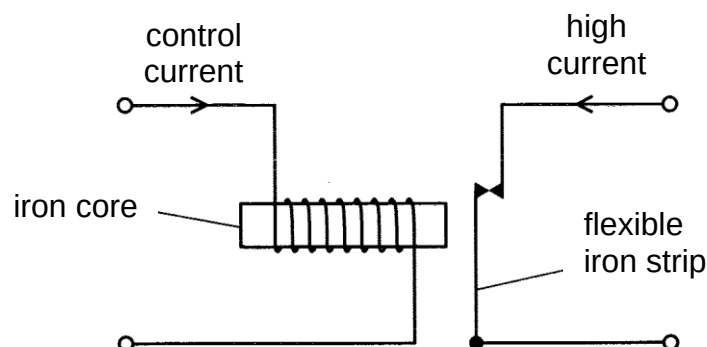
- 34** The metal case of an electric heater is earthed. The plug to the heater contains a 5 A fuse. There is a current of 4 A when the heater works normally.

The cable to the heater becomes so worn that the live wire makes electrical contact with the case.

What happens?

- A** The current flows to earth and the fuse is not affected.
- B** The fuse melts and switches off the circuit.
- C** The metal case becomes live and dangerous.
- D** The metal case becomes very hot.

- 35 In the circuit shown, a control current is used to switch off a high current.

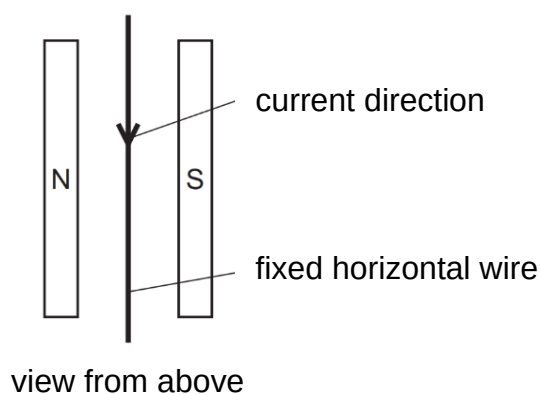
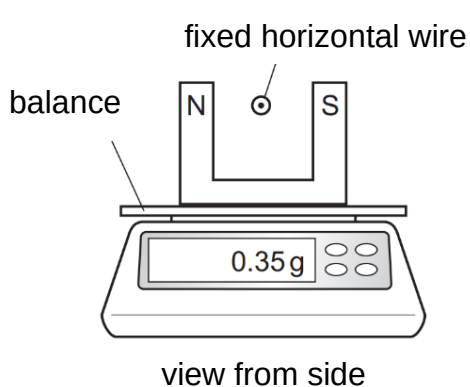


When the control current is switched on, the high current does not switch off.

Which change might switch off the high current?

- A moving the strip further away from the iron core
 - B reducing the number of turns around the iron core
 - C replacing the iron core by a steel core
 - D using a larger control current
- 36 The diagrams show a horizontal wire in a magnetic field. The horizontal wire is firmly held at each end (not shown) and cannot move. The magnets and holder are on a balance.

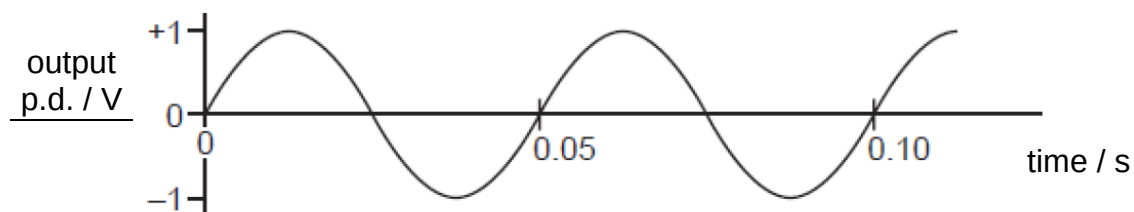
When there is no current in the wire, the reading on the balance is 0.35 g.



There is a d.c. current in the wire, as shown. What happens to the reading on the balance?

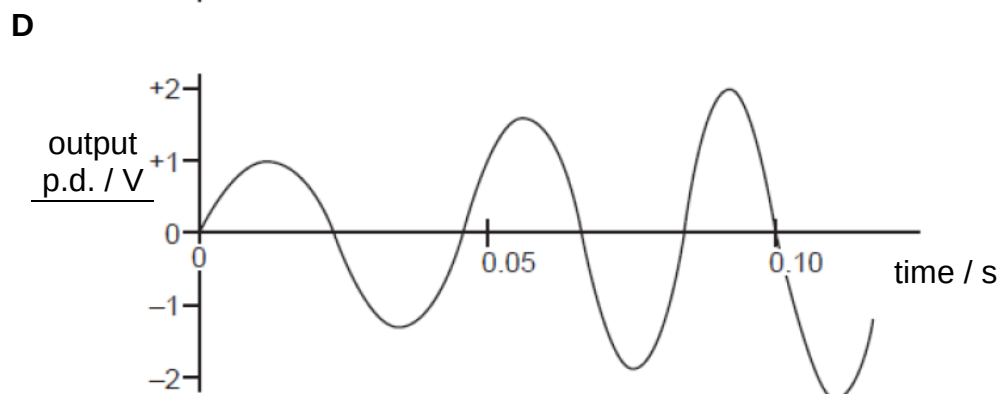
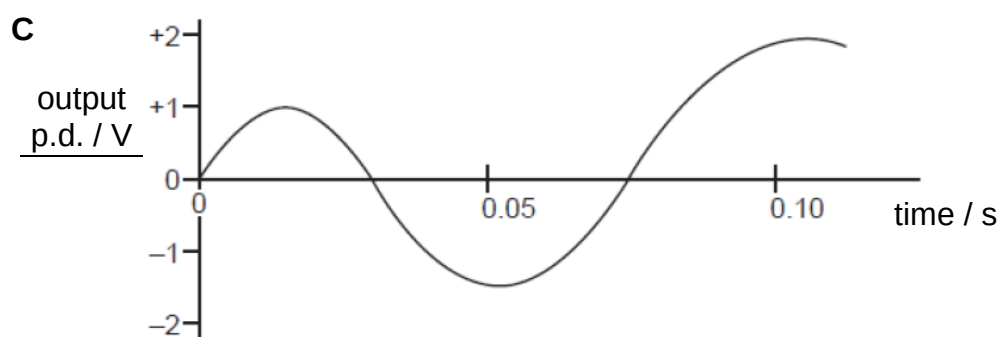
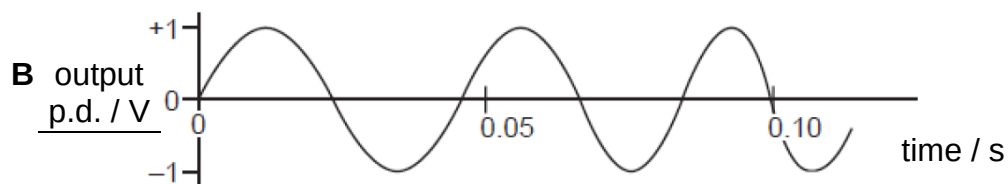
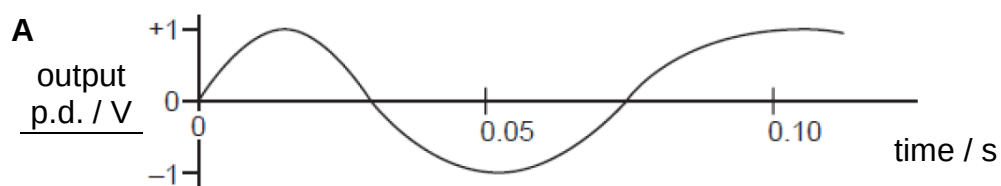
- A smaller than 0.35 g
- B no change
- C changing from smaller to larger than 0.35 g repeatedly
- D larger than 0.35 g

- 37 The graph shows the output of an a.c. generator. The coil in the generator rotates 20 times in one second.

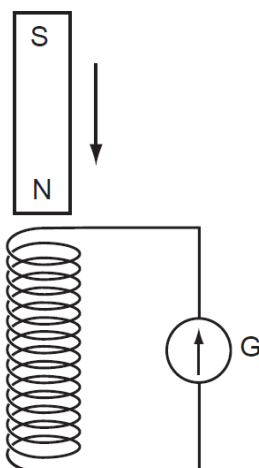


The speed of rotation of the coil steadily increases.

Which graph best shows how the output changes?



- 38** A small coil is connected to a galvanometer G, as shown.



When a magnet is allowed to fall towards the coil, the galvanometer pointer gives a momentary deflection to the right of the zero position.

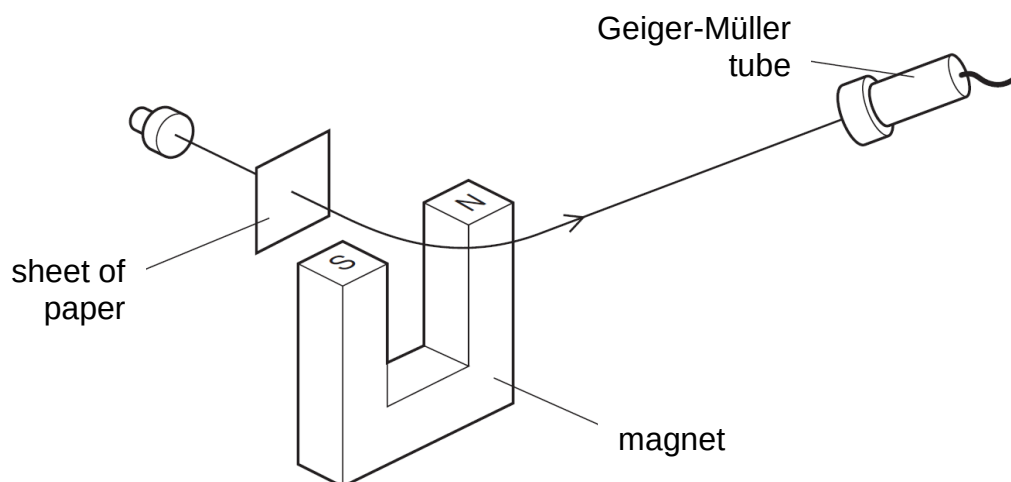
The magnet moves through the coil.

What happens to the galvanometer pointer as the magnet falls away from the coil?

- A** It gives a continuous reading to the left.
- B** It gives a momentary deflection to the left.
- C** It gives a continuous reading to the right.
- D** It gives a momentary deflection to the right.

- 39** A radioactive source emits alpha-particles, beta-particles and gamma-rays.

A Geiger-Müller tube and counter detect the emissions, which pass through a thin sheet of paper and a strong magnetic field.



What is detected by the Geiger-Müller tube?

- A** alpha-particles and beta-particles
 - B** alpha-particles only
 - C** beta-particles and gamma-rays
 - D** beta-particles only
- 40** In nuclear1....., hydrogen nuclei2..... to form helium nuclei, releasing energy.

Which words correctly complete gaps 1 and 2?

	1	2
A	fission	join together
B	fission	split apart
C	fusion	join together
D	fusion	split apart

END OF PAPER

[Turn over