Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/11**

Paper 1 Multiple Choice **May/June 2022**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

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1 A length of copper wire is labelled: length 0.50 m and diameter 0.50 mm.

Which instruments are most suitable to measure accurately the length and the diameter of the wire?

	length	diameter
A	metre rule	metre rule
B	metre rule	micrometer
C	calipers	metre rule
D	calipers	micrometer

2 A driver drives a car at uniform velocity along a road.

The driver sees a hazard and applies the brakes.

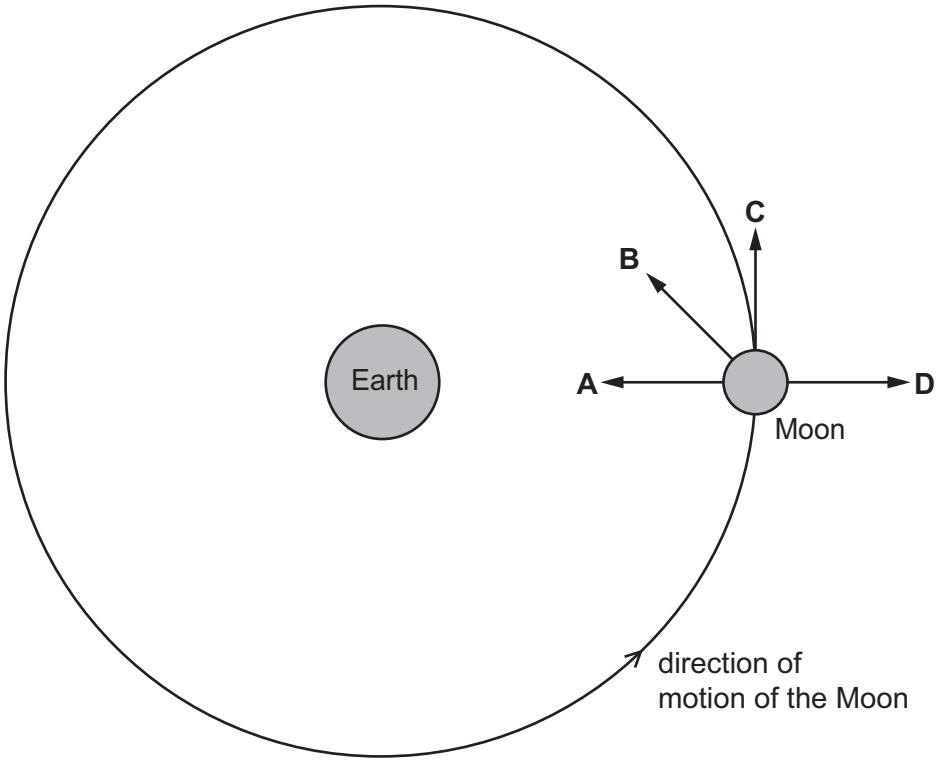
What is the car's motion as it moves through the thinking distance and as it moves through the braking distance?

	motion through the thinking distance	motion through the braking distance
A	deceleration	deceleration
B	deceleration	uniform velocity
C	uniform velocity	deceleration
D	uniform velocity	uniform velocity

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3 The diagram represents the Moon in its orbit around the Earth.

Which arrow represents the direction of the resultant force acting on the Moon at the instant shown?



4 The mass m of an object is related to its weight W and the gravitational field strength g.

Which equation shows the relationship?

A $m = W \times g$ **B** $m = \frac{W}{g}$ **C** $m = \frac{g}{W}$ **D** $m = W - g$

5 A plastic cube, of density ρ, is compressed so that each of its sides becomes one-half of its original length.

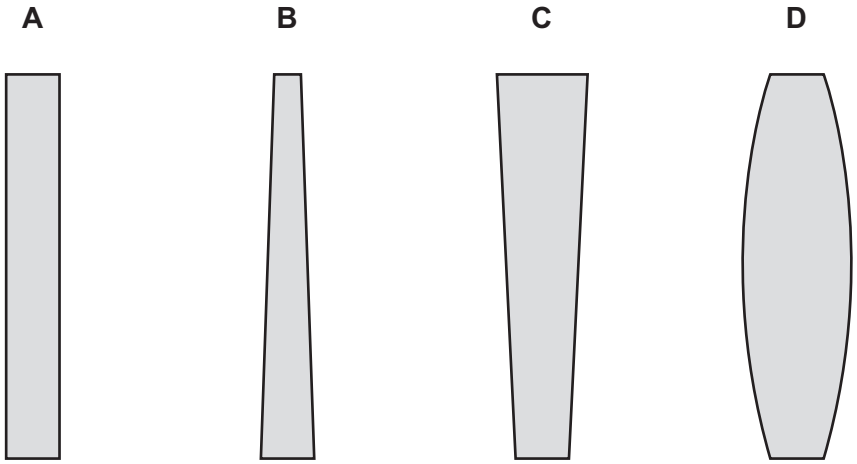
What is the new density of the material of the cube?

A 0.125ρ **B** 0.50ρ **C** 2.0ρ **D** 8.0ρ

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6 Four glass objects have square bases of equal area.

Which object is the least stable?



7 The initial pressure of a volume V_1 of a fixed mass of gas is p_1. The gas expands at a constant temperature until it has volume V_2 and pressure p_2.

Which statement about the pressure and volume of the gas is **not** correct?

A Pressure is measured in N/m^3.

B Pressure multiplied by volume is a constant.

C Pressure is directly proportional to $\frac{1}{\text{volume}}$.

D The ratio of V_1 to V_2 is equal to the ratio of p_2 to p_1.

8 A stone falls at terminal velocity in air.

What is equal to the change in gravitational potential energy of the stone?

A the change in kinetic energy

B the change in temperature of the stone

C the friction between the stone and the air

D the thermal energy produced

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9 Water in a river is used to turn a turbine as the water flows downstream.

How is this type of power source described?

A hydroelectric

B tidal

C geothermal

D nuclear

10 A load is pulled by a rope attached to a motor. The resultant force exerted by the rope on the load is shown in the diagrams.

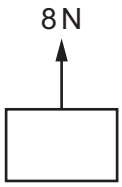
In each diagram, the load moves in the direction of the force shown and takes 10 s to travel 1.0 m.

In which diagram does the motor work with the greatest power?

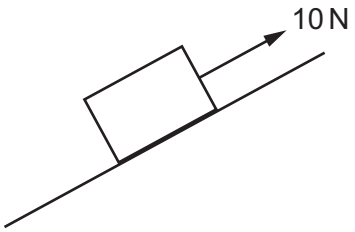
A



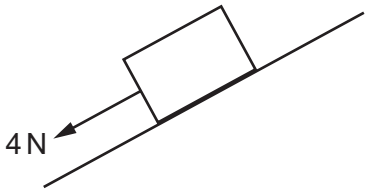
B



C



D



11 The total energy incident in 1.0 s on a group of solar panels is 120 J / m^2.

The group of solar panels converts 720 J of light energy to 120 J of useful electrical energy in 1.0 s.

What is the total surface area of the panels and what is the efficiency of the system?

	total surface area of solar panels / m^2	efficiency / %
A	6.0	17
B	0.17	6.0
C	6.0	6.0
D	0.17	17

12 A 1000 W, 240 V electrical device is switched on.

How much energy does it use in 5.0 minutes?

A 5000 J **B** 12 000 J **C** 72 000 J **D** 300 000 J

13 A building has walls made from wood and steel.

What describes the way in which thermal energy is transferred through the walls?

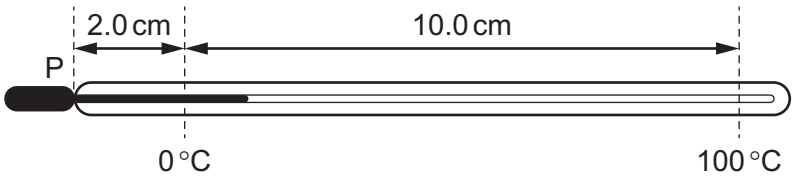
A conduction through the wood by movement of molecules through the wood only

B conduction through the metal by both the vibration of particles and movement of electrons through the steel

C conduction through the wood by both the vibration and movement of molecules through the wood

D convection through the metal by movement of electrons through the steel only

14 A liquid column in a liquid-in-glass thermometer is 2.0 cm long at 0 °C. The column expands by 10.0 cm when heated to 100 °C.



Measuring from P, how long is the liquid column at 30 °C?

A 2.3 cm **B** 3.0 cm **C** 5.0 cm **D** 7.0 cm

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15 In many applications, a thermocouple is used to measure temperature instead of a liquid-in-glass thermometer.

Which property of a thermocouple is a major advantage?

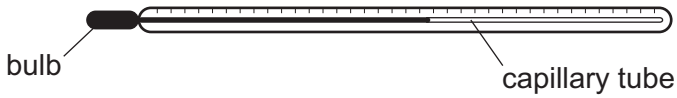
A its greater heat capacity

B its smaller temperature range

C its quicker response time

D it has a non-linear output

16 A liquid-in-glass thermometer consists of a bulb containing a liquid which expands into a thin capillary tube.



The liquid in the thermometer is replaced by the same volume of a different liquid that expands more for the same temperature rise. The length of the capillary tube remains the same.

How does the new thermometer compare with the old thermometer?

A It has greater sensitivity and a greater range.

B It has greater sensitivity but a smaller range.

C It has the same sensitivity and the same range.

D It has the same sensitivity but a greater range.

17 What is the usual symbol and what is the unit for the heat capacity of an object?

	symbol	unit
A	*C*	J / °C
B	*C*	J / (kg °C)
C	*H*	J / °C
D	*H*	J / (kg °C)

18 Which row describes the arrangement of particles and the forces between particles in a solid?

	arrangement of particles	forces between particles
A	regular	strong
B	regular	weak
C	irregular	strong
D	irregular	weak

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19 A wave in the sea collides with a cliff.

A crest of the wave hits the cliff once every 6.0 s.

The horizontal distance between a crest and the adjacent trough of the wave is 4.5 m.

What is the speed of the wave?

A 0.67 m / s **B** 0.75 m / s **C** 1.3 m / s **D** 1.5 m / s

20 A sound wave refracts as it passes from air to water.

Which quantities change?

A speed and frequency only

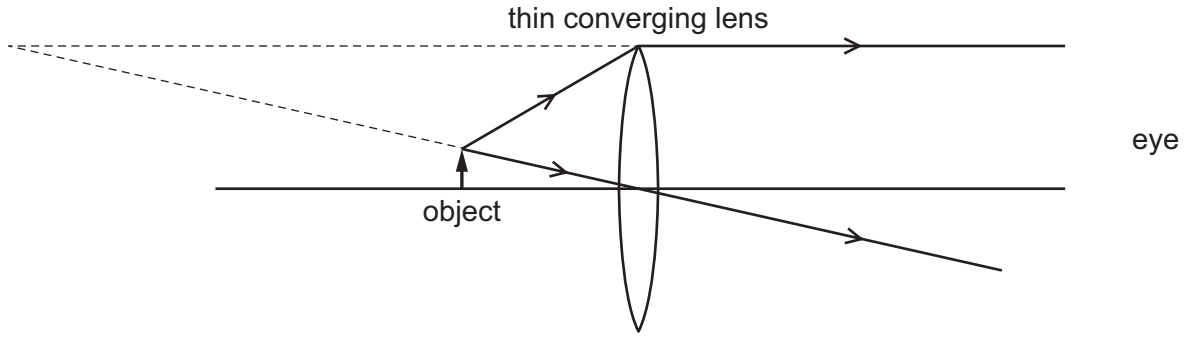
B speed and wavelength only

C wavelength and frequency only

D speed, frequency and wavelength

21 An object is viewed through a thin converging lens.

The diagram shows the paths of two rays from the top of the object to an eye.



How does the image compare with the object?

A It is larger and inverted.

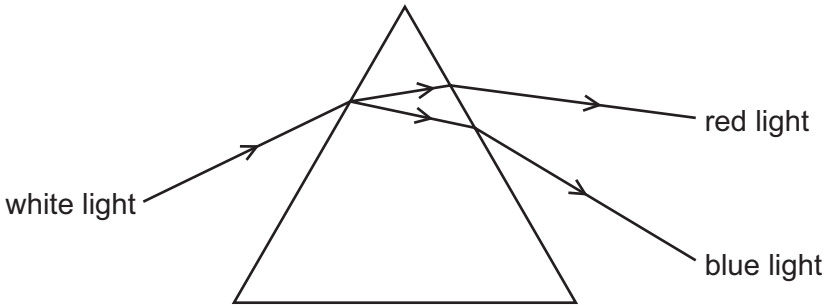
B It is larger and upright.

C It is smaller and inverted.

D It is smaller and upright.

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22 A ray of white light enters a prism as shown.



Which row is correct?

	wave properties observed	frequency of red light compared with frequency of blue light
A	dispersion only	smaller
B	refraction only	greater
C	dispersion and refraction	smaller
D	dispersion and refraction	greater

23 Which waves are **not** part of the electromagnetic spectrum?

A radio waves

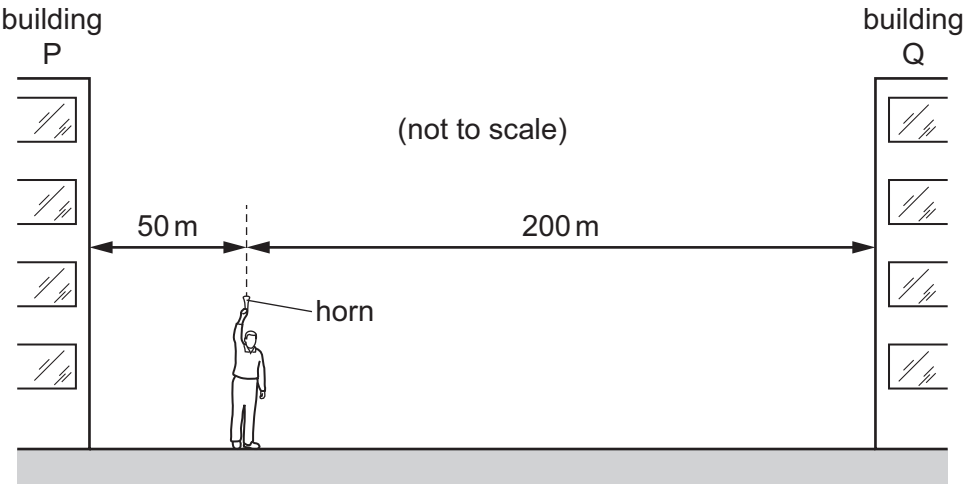
B television signals

C ultrasound

D ultraviolet

24 A man stands between two tall buildings, P and Q.

He is 50 m from P and 200 m from Q.



He sounds a horn.

He hears the first echo from building P and 1.0 s later he hears the first echo from building Q.

What is the speed of sound calculated using this information?

A 250 m / s **B** 300 m / s **C** 330 m / s **D** 500 m / s

25 Sound travels at different speeds in each of the three states of matter, solid, liquid and gas.

Which row shows where sound travels fastest and where sound travels slowest?

	state where sound travels fastest	state where sound travels slowest
A	gas	liquid
B	gas	solid
C	liquid	gas
D	solid	gas

26 What is one of the uses of ultrasound?

A cleaning jewellery

B fluorescent tubes

C optical fibres

D sunbeds

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27 Which material is used for the core of an electromagnet?

A aluminium

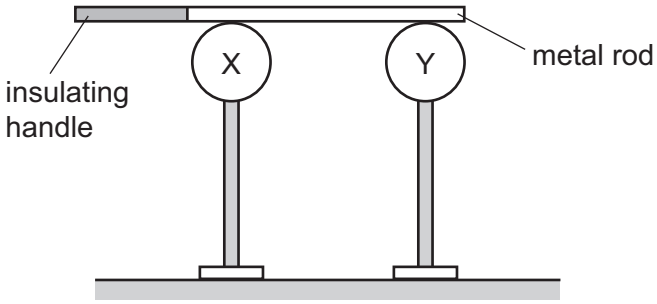
B copper

C iron

D steel

28 Two metal spheres are mounted on insulating stands. Sphere X is initially uncharged and sphere Y is initially positively charged.

A metal rod, held by an insulating handle, is placed in contact with X and Y as shown.



What are the charges on X and on Y after the rod is placed in contact with them?

	charge on X	charge on Y
A	positive	positive
B	positive	uncharged
C	uncharged	positive
D	uncharged	uncharged

29 Which device involves the use of static electrical charges?

A a computer hard disk drive

B a motor

C a photocopier

D a transformer

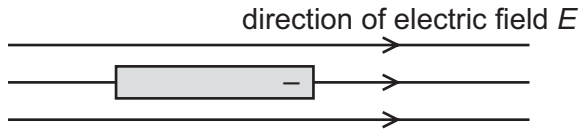
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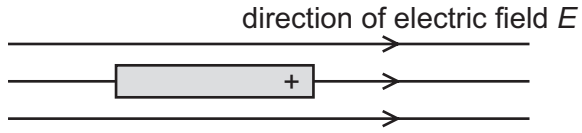
30 An initially uncharged copper rod is placed in a uniform electric field *E*. The rod is parallel to the field.

Which diagram shows the charges induced on the rod?

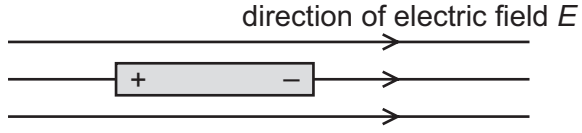
A



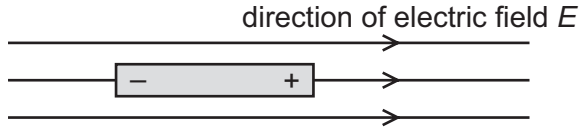
B



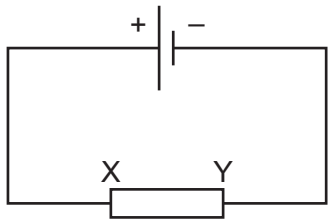
C



D



31 The diagram shows a simple electric circuit.



Which row describes the charge on an electron and the direction of electron flow through the resistor?

	charge on an electron	direction of electron flow
A	negative	X to Y
B	negative	Y to X
C	positive	X to Y
D	positive	Y to X

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32 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	7.2
B	2400	800 000
C	5400	16.2
D	5400	1.8×10^6

33 What is the unit of potential difference (p.d.) and which measuring instrument is used to measure p.d.?

	unit	instrument
A	ampere	ammeter
B	ampere	voltmeter
C	volt	ammeter
D	volt	voltmeter

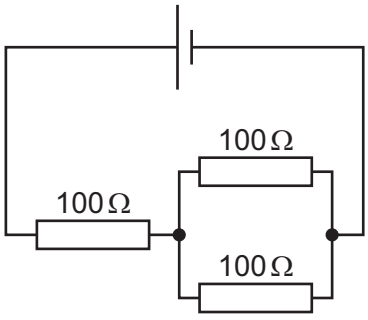
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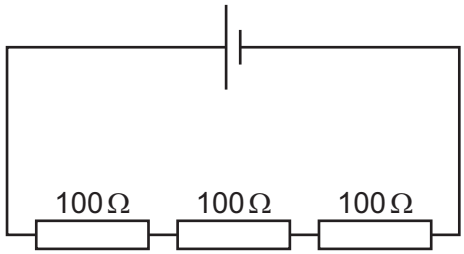
34 The diagrams show four circuits. Each circuit contains three 100 Ω resistors.

Which circuit has the smallest total resistance?

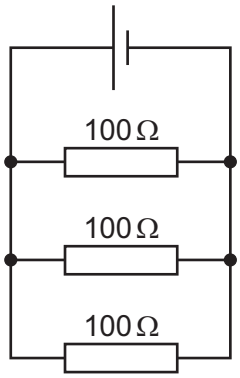
A



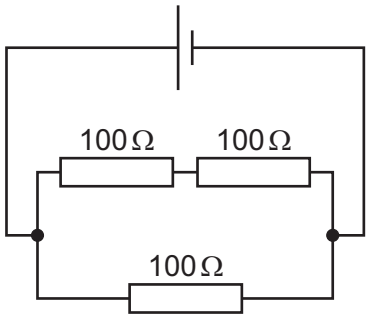
B



C



D



35 A metal kettle is plugged into a mains socket. The plug contains a suitable fuse.

The kettle's cable is damaged and the fuse blows.

Why does the fuse blow?

A The bare earth wire in the cable touches the bare live wire.

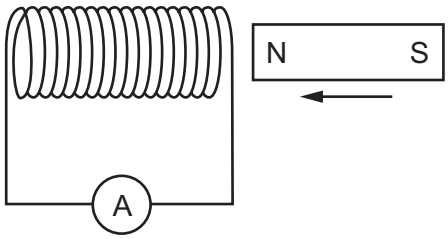
B The metal casing of the kettle touches the bare earth wire.

C The bare neutral wire in the cable touches the bare earth wire.

D The live wire breaks without touching any other wire.

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36 As a magnet is moved into the coil of wire as shown, there is a small positive reading on the sensitive ammeter.



Which change **must** increase the size of the reading?

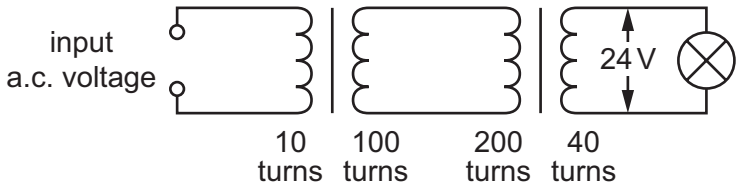
A moving the opposite pole into the coil

B pulling the magnet out of the coil

C pushing the magnet in faster

D unwinding some of the turns of wire

37 The diagram shows the circuit for a model power line with two transformers and a lamp at the output.



What is the input voltage?

A 0.12 V **B** 6.0 V **C** 12 V **D** 96 V

38 Electrical power is transmitted by cables over long distances at very high voltages.

What are the effects of using a high voltage transmission system?

	power loss in the cables	current in the cables
A	high	high
B	high	low
C	low	high
D	low	low

39 The diagram shows a beam of electrons about to enter a magnetic field. The magnetic field is directed into the page.



What is the direction of the deflection of the electrons as they enter the magnetic field?

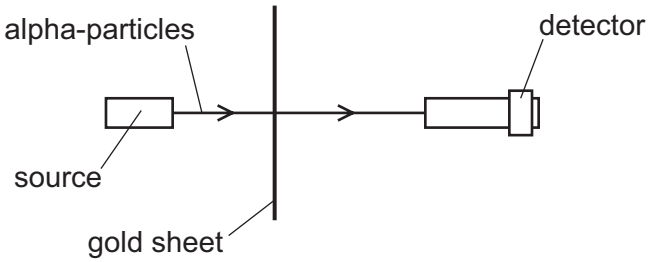
A into the page

B out of the page

C up the page

D down the page

40 In the Geiger-Marsden experiment, alpha-particles are fired at a thin gold sheet.



Most alpha-particles pass straight through the thin gold sheet.

A few are deflected.

What can be deduced from this experiment?

A The nucleus is very small.

B The nucleus has no charge.

C Electrons surround the nucleus.

D Electrons have a negative charge.

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