Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/12**

Paper 1 Multiple Choice **October/November 2025**

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

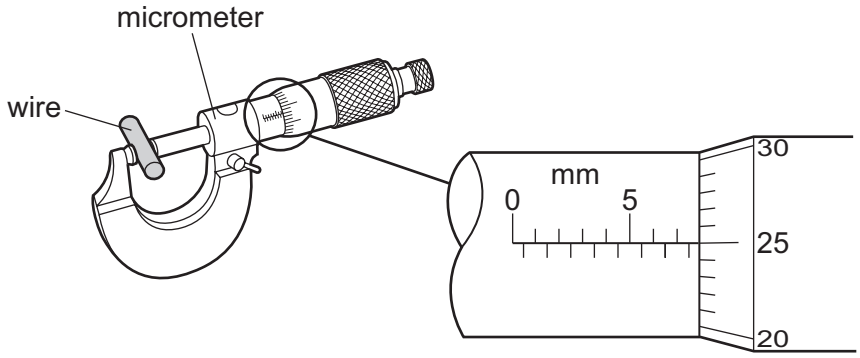
- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the 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.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / s^2).

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.

[Turn over

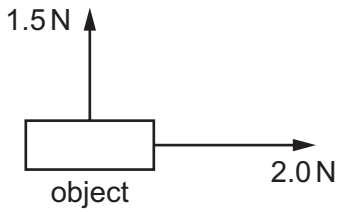
1 A micrometer is used to measure the diameter of a piece of wire.



What is the reading shown on the micrometer?

A 7.25 mm **B** 7.75 mm **C** 10.25 mm **D** 25.77 mm

2 Two forces act on an object. 1.5 N acts vertically upwards and 2.0 N acts horizontally.



What is the magnitude of the resultant force?

A 0.50 N **B** 2.5 N **C** 3.0 N **D** 3.5 N

3 Which equation defines acceleration?

A $\dfrac{\text{change in distance}}{\text{time taken}}$

B $\dfrac{\text{change in distance in a fixed direction}}{\text{time taken}}$

C $\dfrac{\text{change in speed}}{\text{time taken}}$

D $\dfrac{\text{change in velocity}}{\text{time taken}}$

4 The acceleration of free fall on the surface of the Moon is $\frac{1}{6}$ the acceleration of free fall on the surface of the Earth.

What is the approximate weight of a 1 kg mass on the Moon?

A 0.98 N **B** 1.6 N **C** 9.8 N **D** 16 N

5 A ship uses ultrasound to measure the depth of the sea.

There is a time interval of 0.52 s between transmitting and detecting a pulse of ultrasound.

The speed of ultrasound in sea water is 1500 m / s.

What is the depth of the sea?

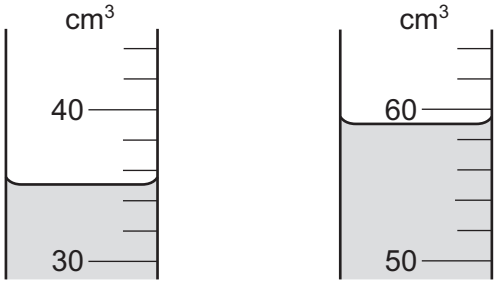
A 390 m **B** 780 m **C** 1600 m **D** 5800 m

6 Which row shows a definition of the mass of an object and an instrument used to measure mass?

	definition of mass	measuring instrument
A	force experienced by an object	electronic balance
B	force experienced by an object	force meter
C	quantity of matter in an object	electronic balance
D	quantity of matter in an object	force meter

7 A quantity of water is poured into a measuring cylinder. A small piece of rock is then added carefully.

The diagrams show the water levels and the measuring cylinder scales.



What are the correct values for the volumes of water and rock?

	volume of water / cm^3	volume of rock / cm^3
A	32.5	22.0
B	32.5	54.5
C	35.0	24.0
D	35.0	59.0

8 Which list contains only quantities that can be changed by a force?

A mass, shape, velocity

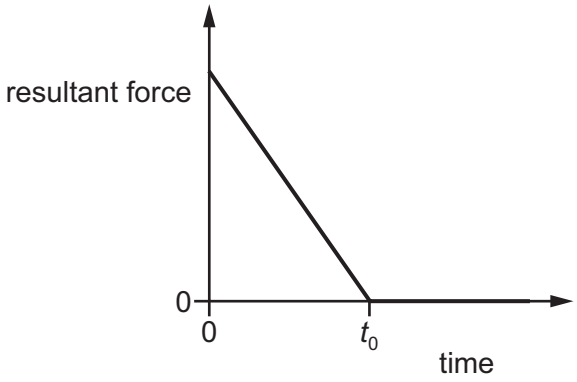
B mass, shape, volume

C mass, velocity, volume

D shape, velocity, volume

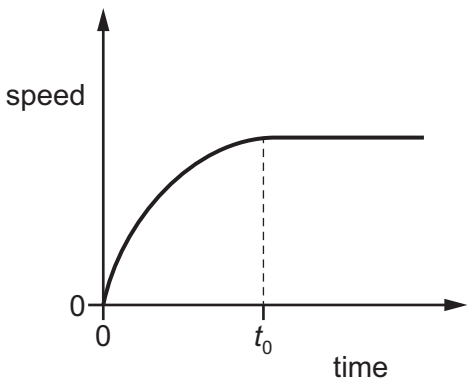
9 A resultant force acts on an object and causes it to move in a straight line.

The graph shows how the resultant force varies with time.



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

A



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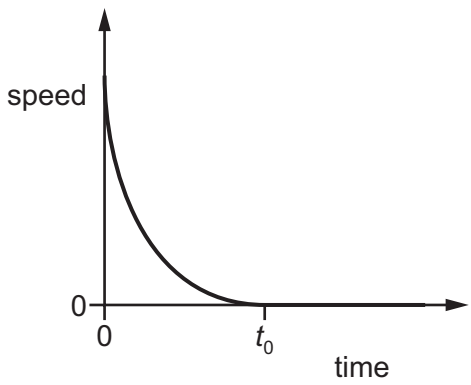

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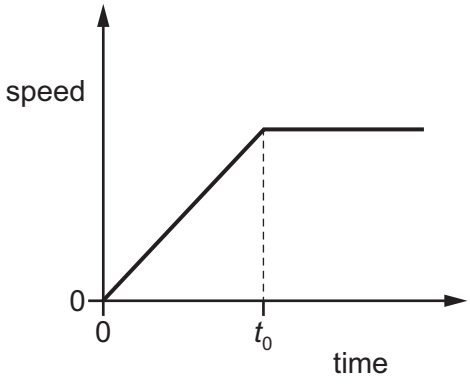

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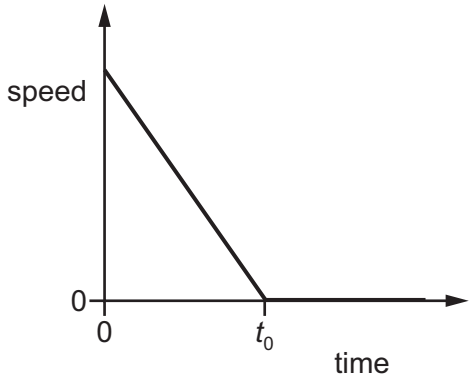
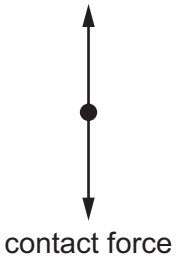


10 An object is at rest on a table.

The length of the arrows in the free-body diagrams represent the magnitude and the direction of the forces acting on the object.

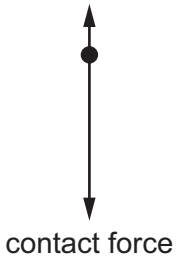
Which diagram shows the free-body diagram for the object?

A



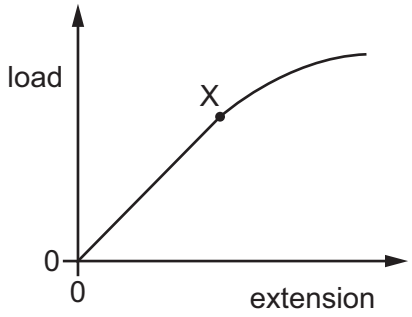
B

C



D

11 The load–extension graph for a spring is shown.



What does point X show?

A the elastic deformation

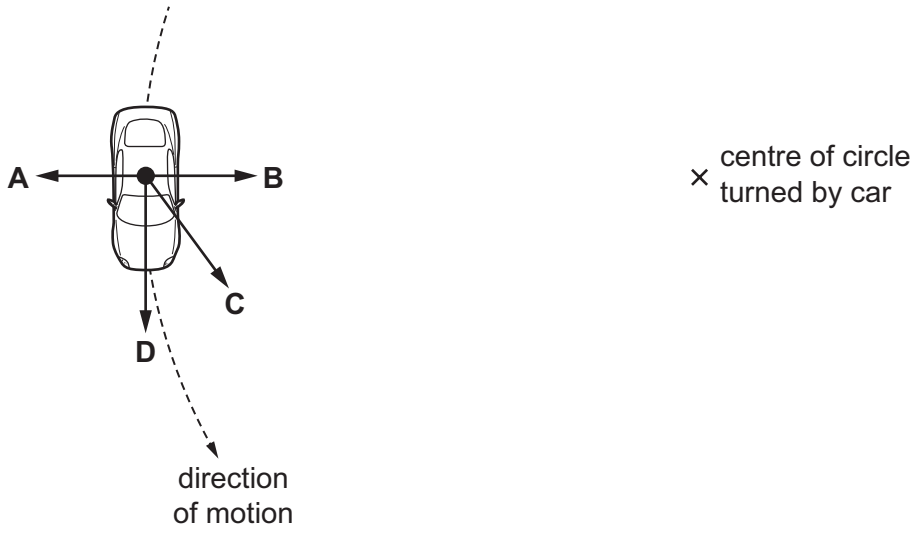
B the limit of proportionality

C the maximum extension

D the spring constant

12 A car moves in a circle at constant speed.

What is the direction of the resultant force acting on the car?



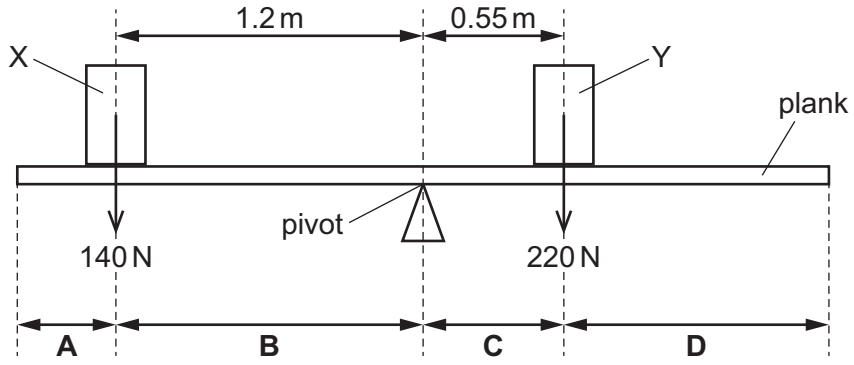
13 A long plank is pivoted at its centre of gravity.

Two objects, X and Y, are then placed on the plank.

X has a weight of 140 N and is 1.2 m to the left of the pivot. Y has a weight of 220 N and is 0.55 m to the right of the pivot.

A third object of weight 110 N is placed on the plank so that the plank is in equilibrium.

On which part of the plank is the object placed?



14 Which statement about centre of gravity is correct?

A Objects with a centre of gravity at the same height are less stable when the base is larger.

B Objects with a centre of gravity at the same height are more stable when the base is larger.

C Objects with higher centres of gravity and smaller bases are more stable.

D Objects with identical bases are more stable when the centre of gravity is higher.

15 Energy is stored in batteries, fuel and food.

What is the name of this energy store?

A chemical

B electrostatic

C nuclear

D thermal

16 A rocket has mass M when empty. The rocket carries an additional mass M of fuel.

The rocket and fuel travel at a speed v. When the engine of the rocket is fired, all of the fuel is expelled and the speed of the rocket increases to $2v$.

What happens to the kinetic energy of the **rocket**?

A It doubles.

B It halves.

C It increases by a factor of four.

D It stays the same.

17 What is the definition of efficiency?

A $\text{efficiency} = \dfrac{\text{useful energy input}}{\text{total energy output}}$

B $\text{efficiency} = \dfrac{\text{total energy input}}{\text{total energy output}}$

C $\text{efficiency} = \dfrac{\text{useful energy output}}{\text{total energy input}}$

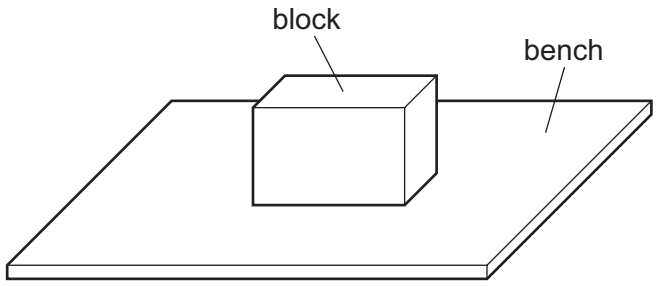
D $\text{efficiency} = \dfrac{\text{total energy output}}{\text{total energy input}}$

18 An object of mass m is lifted through a vertical distance d in time t.

Which equation is used to calculate the power P required to lift the object?

A $P = \dfrac{md}{gt}$ **B** $P = \dfrac{mgd}{t}$ **C** $P = \dfrac{dt}{mg}$ **D** $P = \dfrac{m}{gdt}$

19 A block of wood is placed on a bench.



The pressure exerted on the bench due to the block is 1.0 Pa.

The area of the block in contact with the base is *A*.

Which statement is possible?

A The mass of the block is 1.0 kg and *A* is 1.0 cm^2.

B The mass of the block is 1.0 kg and *A* is 1.0 m^2.

C The weight of the block is 1.0 N and *A* is 1.0 cm^2.

D The weight of the block is 1.0 N and *A* is 1.0 m^2.

20 Different liquids are poured into four different containers.

In which container is the force exerted by the liquid on the bottom of the container the greatest?

	area of base / cm^2	$\frac{\text{density of liquid}}{\text{g/cm}^3}$	depth of liquid / cm
A	10	1.3	50
B	20	0.80	80
C	40	1.0	60
D	50	0.92	75

21 A student compares the properties of the three states of matter.

The partially completed table in the student's notebook for one of the states is shown.

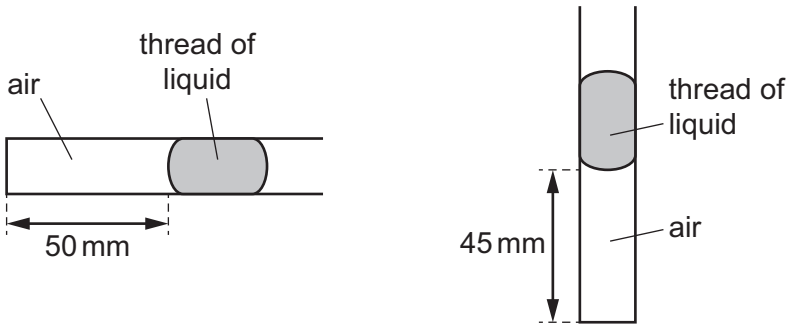
state	1
arrangement of particles	random
motion of particles	moving freely
forces between particles	2
expansion when heated	3

Which words complete the table?

	1	2	3
A	gas	weakest	smallest
B	gas	weakest	greatest
C	gas	strongest	greatest
D	liquid	strongest	smallest

22 Air is trapped in a glass tube by a liquid.

When the tube is horizontal, the length of the trapped air is 50 mm and its pressure is 1.0×10^5 Pa.



When the tube is vertical, with the closed end downwards, the length of the trapped air is 45 mm.

The temperature of the air remains constant.

What is the pressure of the trapped air when the tube is vertical?

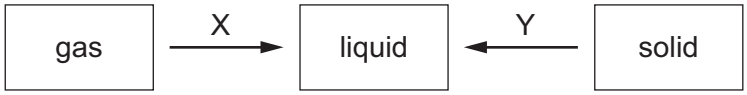
A 0.50×10^5 Pa

B 0.90×10^5 Pa

C 1.1×10^5 Pa

D 1.9×10^5 Pa

23 The diagram shows two changes of state, X and Y.



Which row gives the names of the two changes of state?

	X	Y
A	boiling	freezing
B	boiling	melting
C	condensation	freezing
D	condensation	melting

24 Energy can be transferred by thermal radiation.

Four surfaces have different colours and textures. The surfaces are at equal temperatures and have equal surface areas.

Which surface transfers energy by thermal radiation at the fastest rate?

A black and dull surface

B black and shiny surface

C white and dull surface

D white and shiny surface

25 Four copper spheres have identical surface colours and identical surface textures. They have different surface temperatures and surface areas.

Which sphere emits infrared radiation at the greatest rate?

	surface temperature / °C	surface area / cm^2
A	500	120
B	500	480
C	1000	120
D	1000	480

26 The table shows the speed and the wavelength for different sound waves in four different materials.

wave	$\frac{\text{speed of sound}}{\text{m/s}}$	wavelength / m
1	340	0.19
2	1500	0.050
3	4000	0.23
4	6700	0.31

Which waves are ultrasound waves?

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

27 Light passes into a transparent material that has a refractive index n.

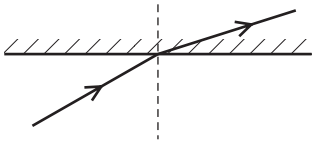
The angle of incidence at the surface of the transparent material is i.

Which equation is used to calculate the angle of refraction r?

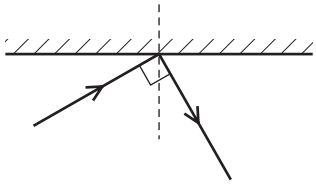
A $r = n \sin i$ **B** $i = n \sin r$ **C** $\sin r = \frac{n}{\sin i}$ **D** $\sin r = \frac{\sin i}{n}$

28 Which diagram shows a ray of light that is reflected by a plane mirror?

A



B



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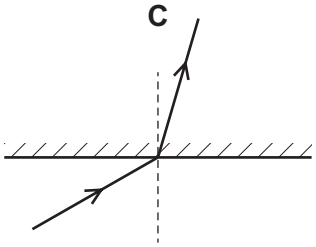
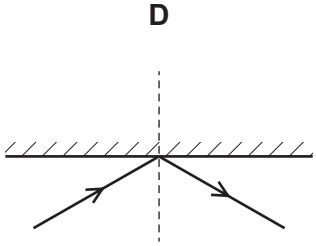


D



29 An object is placed in front of a plane mirror.

Which statement describes the image produced?

A real and smaller than the object

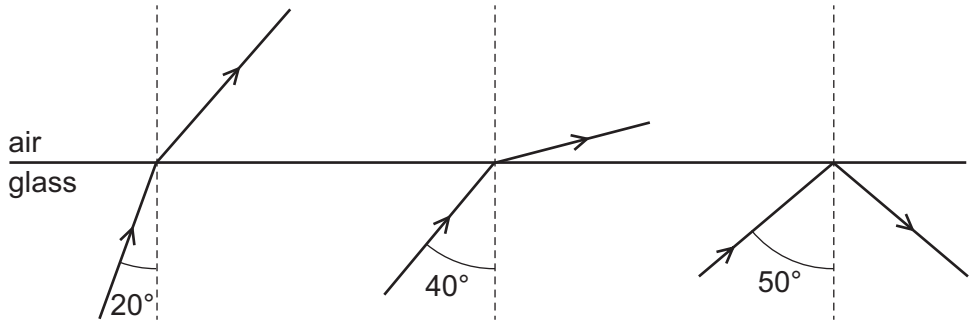
B real and the same size as the object

C virtual and smaller than the object

D virtual and the same size as the object

30 Three rays of light are incident on the boundary between a glass block and air.

The angles of incidence are different.



What is a possible critical angle for light in the glass?

A 15° **B** 30° **C** 45° **D** 60°

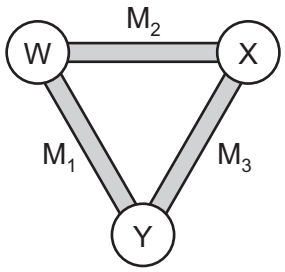
31 A student does an investigation using four thin lenses. The lenses are used to produce focused images of four different objects.

The student measures the length of the image and the length of the object. The results are shown in the table.

In which case is the magnification produced the greatest?

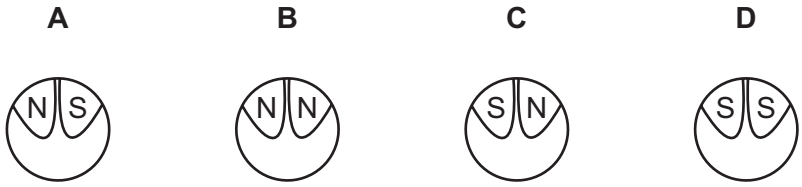
	image length / cm	object length / cm
A	3.5	0.80
B	4.7	0.60
C	4.8	0.70
D	5.2	0.90

32 Magnets M_1, M_2 and M_3 are joined by iron balls W, X and Y as shown.



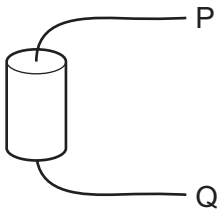
Magnetic poles are induced in the iron balls W and X as shown.

Which diagram shows the poles induced in ball Y?



33 A cardboard tube has two wires, P and Q, connected to its ends. Inside the tube, wire P and wire Q are connected to two resistors.

The potential difference (p.d.) between wire P and wire Q is 9.0 V and the current in the wires is 0.75 A.



Which combination of resistors is inside the tube?

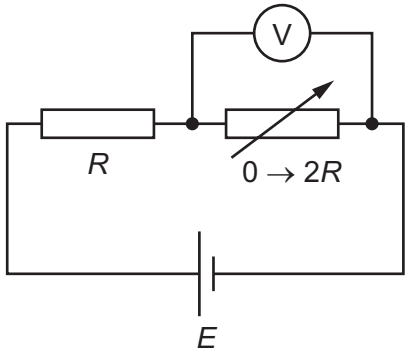
A a 0.75 Ω resistor and a 6.0 Ω resistor in parallel

B a 0.75 Ω resistor and a 6.0 Ω resistor in series

C a 20 Ω resistor and a 30 Ω resistor in parallel

D a 20 Ω resistor and a 30 Ω resistor in series

34 A resistor of resistance R is connected to a variable resistor, a voltmeter and a power supply of electromotive force (e.m.f.) E.



The resistance of the variable resistor increases from 0 to $2R$.

What happens to the reading on the voltmeter?

A It increases from 0 to $\frac{1}{3}E$.

B It increases from 0 to $\frac{1}{2}E$.

C It increases from 0 to $\frac{2}{3}E$.

D It increases from 0 to E.

35 Which device works due to electromagnetic induction?

A a battery

B an electromagnet

C a motor

D a transformer

36 A beta-particle (β-particle) travels to the right at a constant speed.

Which field deflects the particle towards the top of the page?

A a horizontal magnetic field directed out of the page

B a horizontal magnetic field directed into the page

C a horizontal electric field directed to the left

D a horizontal electric field directed to the right

37 Which nuclide is produced when thorium-223, $^{223}_{90}\text{Th}$, emits an alpha-particle?

A $^{219}_{88}\text{Ra}$ **B** $^{219}_{92}\text{U}$ **C** $^{227}_{88}\text{Ra}$ **D** $^{227}_{92}\text{U}$

38 A radioactive source is placed 2.0 cm away from a Geiger–Müller (G.M.) tube that is connected to a counter.

A sheet of paper is placed between the source and the G.M. tube. The count rate measured by the counter decreases to a value greater than the background radiation count rate.

A sheet of aluminium replaces the paper and the count rate decreases to the background radiation count rate.

What is the radiation emitted by the source?

A alpha-particles (α-particles), beta-particles (β-particles) and gamma radiation (γ-radiation)

B alpha-particles (α-particles) and beta-particles (β-particles) only

C alpha-particles (α-particles) and gamma radiation (γ-radiation) only

D beta-particles (β-particles) and gamma radiation (γ-radiation) only

39 Which statement about the Earth is correct?

A It has an elliptical orbit around the Sun.

B It is a star that takes approximately 365 days to orbit the Sun.

C It rotates on its axis once every 28 hours.

D It orbits the Moon exactly once a year.

40 A teacher asks two students to describe redshift.

Student 1 says: It is a decrease in the observed wavelength of electromagnetic radiation from stars.

Student 2 says: It occurs because stars and galaxies move away from the Earth.

Which students are correct?

A both student 1 and student 2

B student 1 only

C student 2 only

D neither student 1 nor student 2

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