Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/11**

Paper 1 Multiple Choice **May/June 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

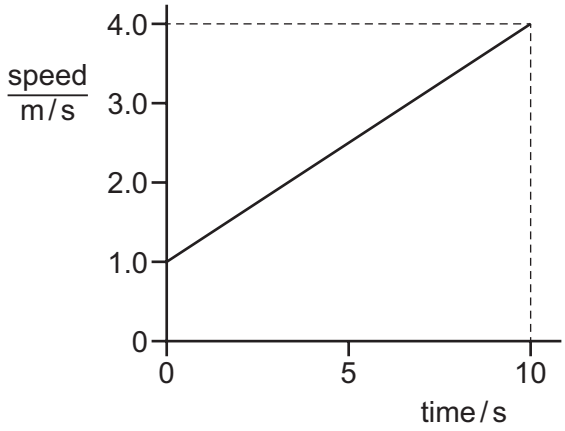
- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **20** pages. Any blank pages are indicated.

1 Which quantity has both magnitude and direction, and is it a scalar quantity or a vector quantity?

	quantity with magnitude and direction	scalar quantity or vector quantity
A	mass	scalar
B	mass	vector
C	weight	scalar
D	weight	vector

2 The speed–time graph shows part of the journey of a bicycle for a time of 10 s.



What is the distance that the bicycle travels in the 10 s?

A 20 m **B** 25 m **C** 30 m **D** 40 m

3 Which statement explains why a heavy coin that falls through a short distance towards the ground does **not** reach terminal velocity?

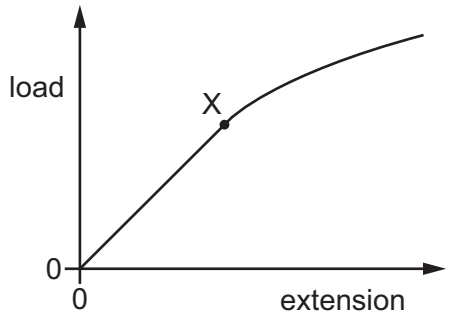
A The coin has **not** hit the ground.

B The weight of the coin equals the air resistance.

C The weight of the coin increases as the air resistance increases.

D The weight of the coin is always more than the air resistance.

4 The diagram shows the load–extension graph for a spring.



What is the name given to point X on the graph?

A limit of force

B limit of proportionality

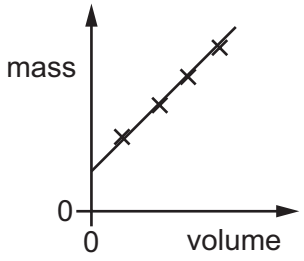
C limit of the extension

D limit of the spring

5 Some students measure the masses and the volumes of differently sized samples of a type of wood.

Which graph shows their results?

A



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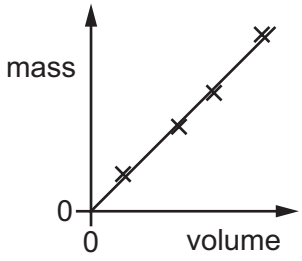

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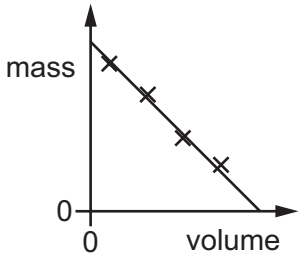
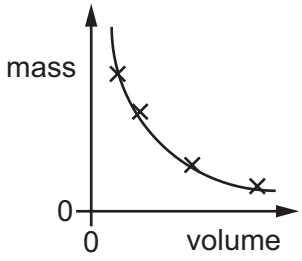


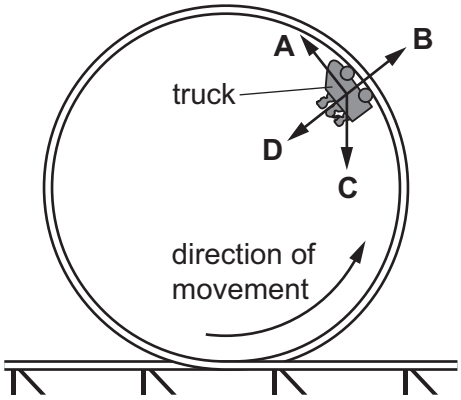
D



6 The diagram shows a section of a roller coaster ride that is a circle arranged vertically.

The truck is moving at constant speed at the position shown.

Which arrow shows the direction of the resultant force acting on the truck?



7 What is a unit for momentum?

A kg m / s **B** kg m / s^2 **C** N m **D** N / m^2

8 In a safety test, a car collides with a concrete block.

The impulse exerted by the block on the car is 14 000 N s.

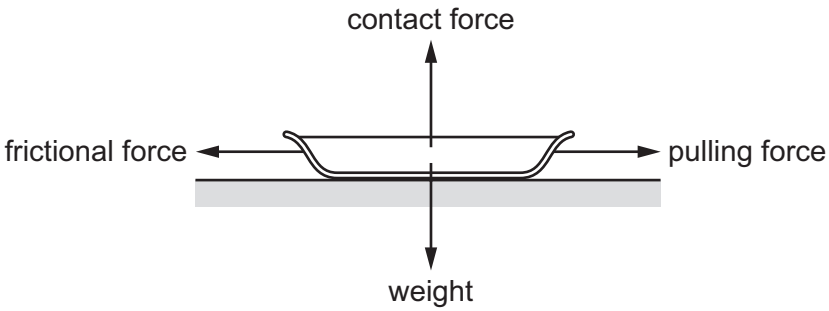
The collision with the block lasts for 70 ms.

What is the force exerted on the car?

A 200 N **B** 14 000 N **C** 200 000 N **D** 980 000 N

9 An object pulled along horizontal ground accelerates to the right.

The diagram shows the directions of the forces acting on the object.



Which force is multiplied by the distance moved to calculate the work done to increase the kinetic energy store?

A contact force

B frictional force

C pulling force

D weight

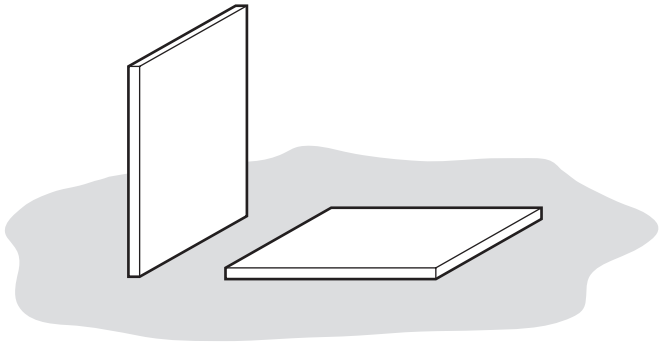
10 The mass of object P is greater than the mass of object Q.

The objects contain different amounts of matter and have a different resistance to change of motion.

Which row is correct?

	greater amount of matter	greater resistance to change of motion
A	P	P
B	P	Q
C	Q	P
D	Q	Q

11 A builder leaves two identical, heavy, stone tiles resting on soft earth. One is vertical and the other is horizontal.



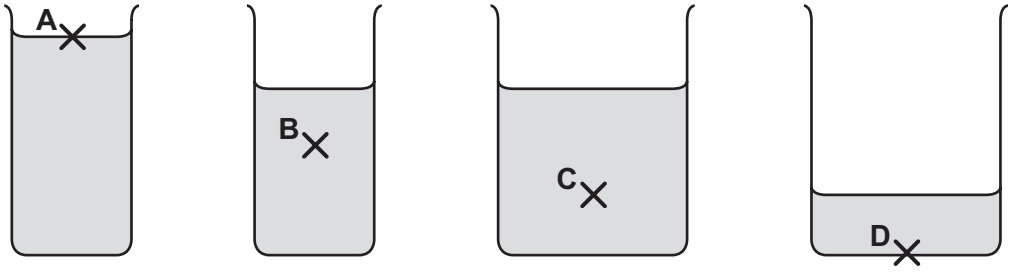
After a few hours, the vertical tile has started to sink into the soft earth. The horizontal one has **not** started to sink.

Which row correctly compares the forces and the pressures that the tiles exert on the earth?

	forces	pressures
A	different	different
B	different	same
C	same	different
D	same	same

12 Four beakers contain the same liquid.

At which point is the pressure the greatest?



13 The strength of the forces between the particles of a solid determines how much the solid expands when heated.

Which statement about these forces is correct?

A The forces are strong so solids expand less than liquids and gases.

B The forces are strong so solids expand more than liquids and gases.

C The forces are weak so solids expand less than liquids and gases.

D The forces are weak so solids expand more than liquids and gases.

14 Air is heated in a sealed container with constant volume.

Why does the air pressure increase when the temperature increases?

A The air molecules expand.

B The air molecules bounce off each other more frequently.

C The air molecules bounce off the walls more frequently.

D The number of air molecules increases.

15 A student determines the specific heat capacity of a metal by carrying out an experiment.

The list shows the apparatus that the student has available.

1 electronic balance

2 ruler

3 thermometer

4 heater operating at a power of 50 W

5 stopwatch

6 ammeter

7 voltmeter

Which apparatus does the student use?

A 1, 3, 4 and 5

B 1, 3, 6 and 7

C 2, 3, 4 and 6

D 3, 4, 5, 6 and 7

16 When a liquid evaporates, molecules escape from its surface.

Which molecules escape, and what happens to the average kinetic energy of the molecules remaining in the liquid?

A The less energetic molecules escape and the average kinetic energy decreases.

B The less energetic molecules escape and the average kinetic energy increases.

C The more energetic molecules escape and the average kinetic energy decreases.

D The more energetic molecules escape and the average kinetic energy increases.

17 A sample of water in a beaker is at a temperature T.

The surface area of the water is A and an electric fan blows air across the top of the beaker at a speed v.

For which values of T, A and v does the water evaporate the most rapidly?

	T / °C	A / cm^2	$\frac{v}{\text{m/s}}$
A	18	45	0.1
B	24	50	1.9
C	38	70	5.0
D	38	45	4.7

18 Thermal energy passes quickly from hot regions of a metal to cold regions of the metal.

Why are metals good conductors of thermal energy?

A Electrons in the metal vibrate about fixed points and quickly pass energy from one electron to the next.

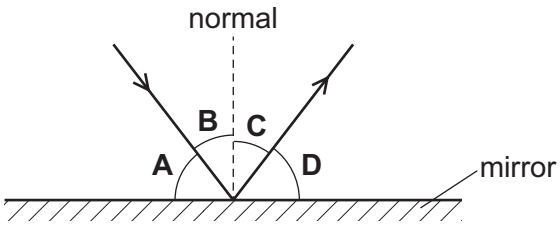
B Electrons move quickly from ions in hot regions to ions in cold regions.

C Protons in the metal are close together and move quickly from hot to cold regions.

D Small ions of the metal move quickly from hot to cold regions through spaces in the metal lattice.

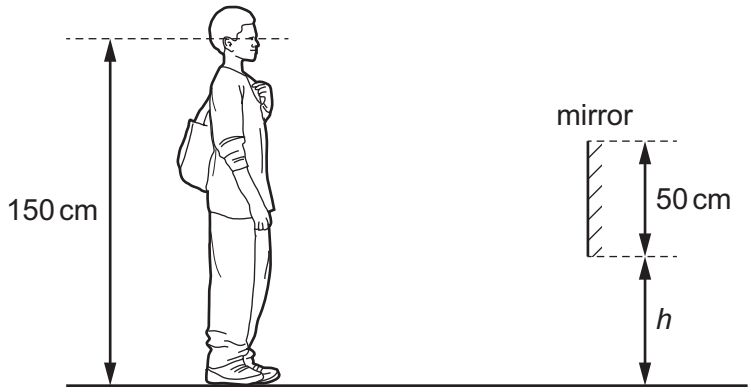
19 The diagram shows light striking a plane mirror and reflecting.

Which angle is the angle of incidence?



20 A shoe shop puts a mirror on the wall so that customers can look at their shoes.

The length of the mirror is 50 cm. A customer has eyes 150 cm above ground level.



The bottom of the mirror is at height *h* above the ground.

What is the smallest value of *h* that allows the customer to see an image of his shoes in the mirror?

A 0 **B** 25 cm **C** 50 cm **D** 75 cm

21 Which description of a dull black surface is correct?

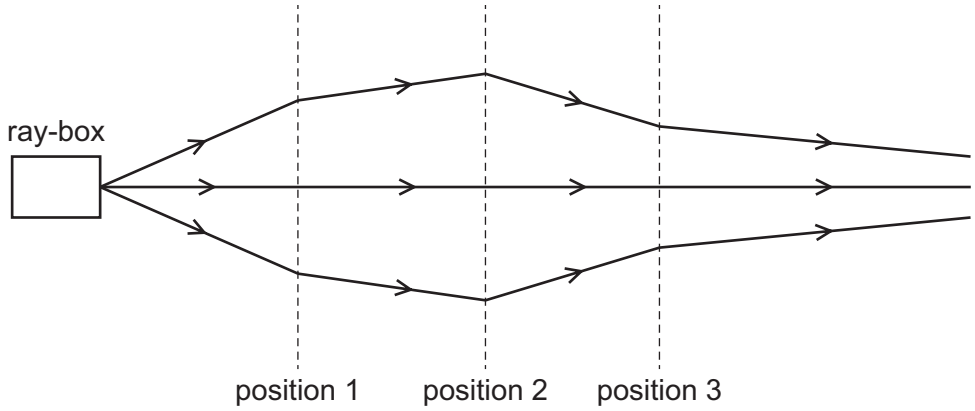
A good emitter, good absorber and good reflector of radiation

B good emitter, poor absorber and poor reflector of radiation

C good emitter, good absorber and poor reflector of radiation

D poor emitter, poor absorber and poor reflector of radiation

22 The rays of light from a ray-box pass through three lenses placed at positions 1, 2 and 3.



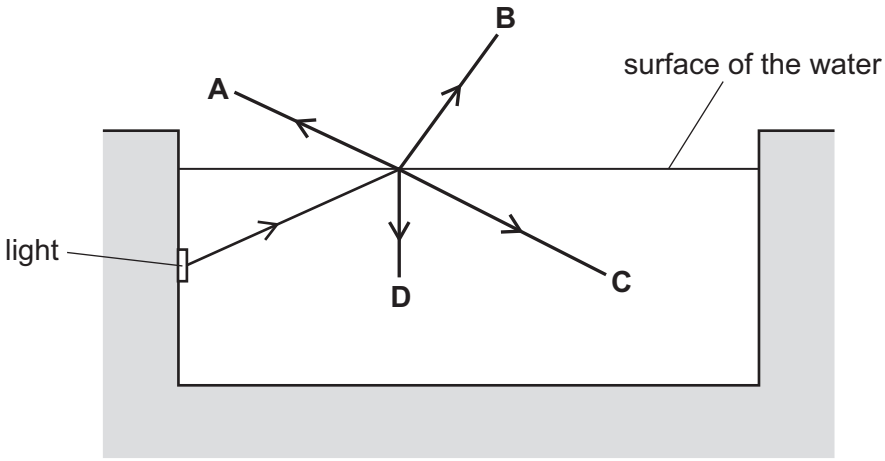
Which type of lens is used at each position?

	position 1	position 2	position 3
A	converging	converging	converging
B	converging	converging	diverging
C	diverging	converging	diverging
D	diverging	diverging	converging

23 A swimming pool is lit by an underwater light.

A ray of light is incident on the surface of the water.

What is the path for the ray of light?



24 When a converging lens is used as a magnifying glass, what is the nature of the image?

A real and inverted

B real and upright

C virtual and inverted

D virtual and upright

25 A sound wave consists of compressions and rarefactions.

Which type of wave is sound and how does the pressure in a rarefaction compare with the pressure in a compression?

	type of wave	pressure in a rarefaction
A	longitudinal	smaller
B	longitudinal	greater
C	transverse	smaller
D	transverse	greater

26 What happens to a sound wave when the note heard gets louder?

A Its amplitude increases.

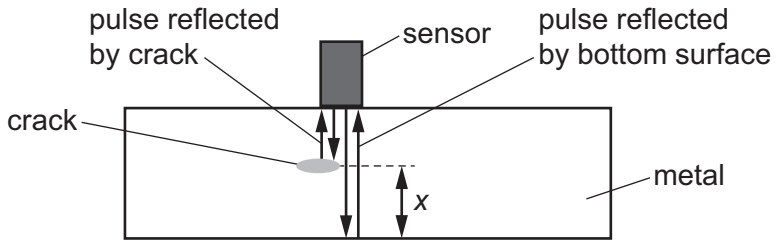
B Its frequency increases.

C Its speed increases.

D Its wavelength increases.

[Turn over

27 A pulse of ultrasound from a sensor is reflected back to the sensor by a crack in a piece of metal and by the bottom surface of the metal.



The reflection from the crack is received back at the sensor 1.0×10^{-5} s after the pulse is sent out.

The reflection from the bottom surface is received back at the sensor 1.5×10^{-5} s after the pulse is sent out.

The speed of ultrasound in the metal is 5200 m / s.

What is the distance *x* between the crack and the bottom surface of the metal?

A 0.013 m **B** 0.026 m **C** 0.052 m **D** 0.078 m

28 A 12 V battery is connected to a resistor of resistance 100 Ω.

How much charge passes through the resistor in 30 minutes?

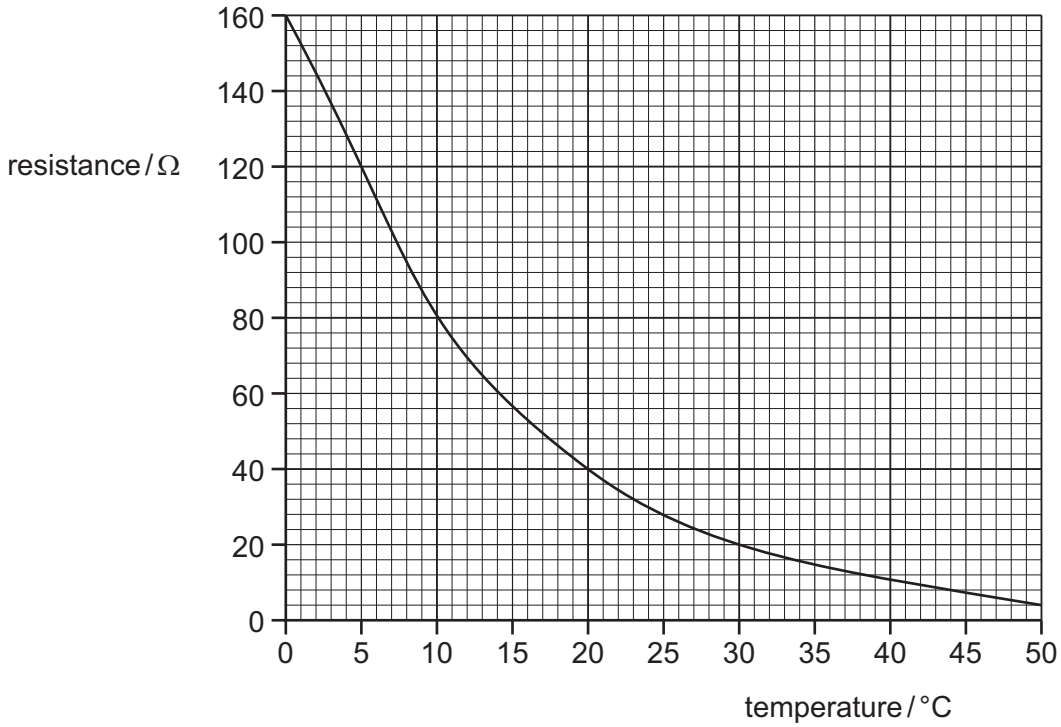
A 3.6 C **B** 220 C **C** 250 C **D** 15 000 C

29 A circuit consists of a resistor connected between the positive terminal and the negative terminal of a power supply.

Which row describes the direction of conventional current and the direction of flow of free electrons in the resistor?

	direction of conventional current	direction of flow of free electrons
A	from negative to positive	from negative to positive
B	from negative to positive	from positive to negative
C	from positive to negative	from negative to positive
D	from positive to negative	from positive to negative

30 The graph shows how the resistance of a thermistor varies with temperature.

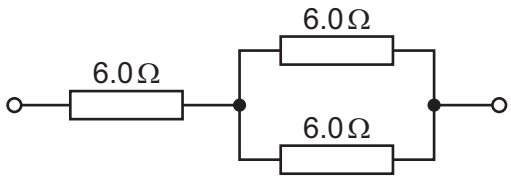


The thermistor is at a temperature of 10 °C and is connected in series with a fixed resistor of resistance 20 Ω.

What is the combined resistance of both components?

A 16 Ω **B** 20 Ω **C** 80 Ω **D** 100 Ω

31 Each of the resistors in the circuit shown has a resistance of 6.0 Ω.

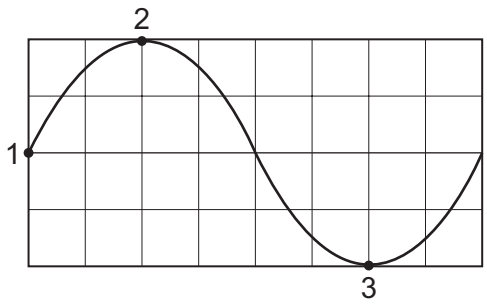


What is the total resistance of the circuit?

A 2.0 Ω **B** 4.0 Ω **C** 9.0 Ω **D** 18 Ω

32 An alternating current (a.c.) generator is connected to an oscilloscope.

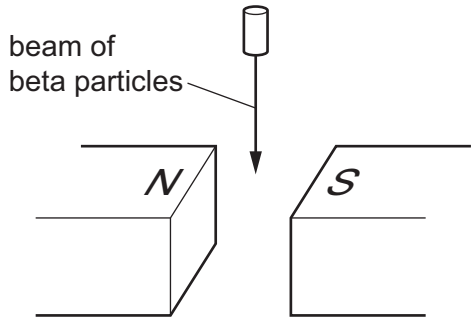
The diagram shows the trace produced on the oscilloscope screen.



What are possible angles between the plane of the coil and the magnetic field direction at the times represented by points 1, 2 and 3?

	1	2	3
A	0°	90°	180°
B	0°	90°	270°
C	90°	180°	0°
D	90°	270°	0°

33 A beam of beta particles travelling vertically downwards enters the magnetic field between two magnetic poles.



The beta particles experience a force due to the magnetic field.

What is the direction of the force on a beta particle as it enters the magnetic field?

A towards the top of the page

B towards the bottom of the page

C into the page

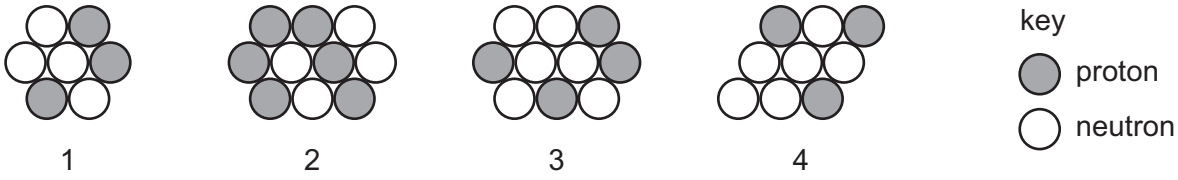
D out of the page

34 A step-up transformer is connected between a power station and a long-distance electricity transmission cable.

What is the purpose of the step-up transformer, and does it operate using alternating current (a.c.) or using direct current (d.c.)?

	purpose of a step-up transformer	current used
A	to decrease the current in the cable	d.c.
B	to decrease the current in the cable	a.c.
C	to increase the current in the cable	d.c.
D	to increase the current in the cable	a.c.

35 Each diagram shows the nucleus of an atom.



1 2 3 4

Which diagrams show isotopes of the same element?

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

36 A radioactive nucleus X decays to another radioactive nucleus. After a number of decays, a stable nucleus Q is produced.

The proton number (atomic number) of X is equal to that of Q. The nucleon number (mass number) of X is four more than that of Q.

Which radiations are emitted to produce Q?

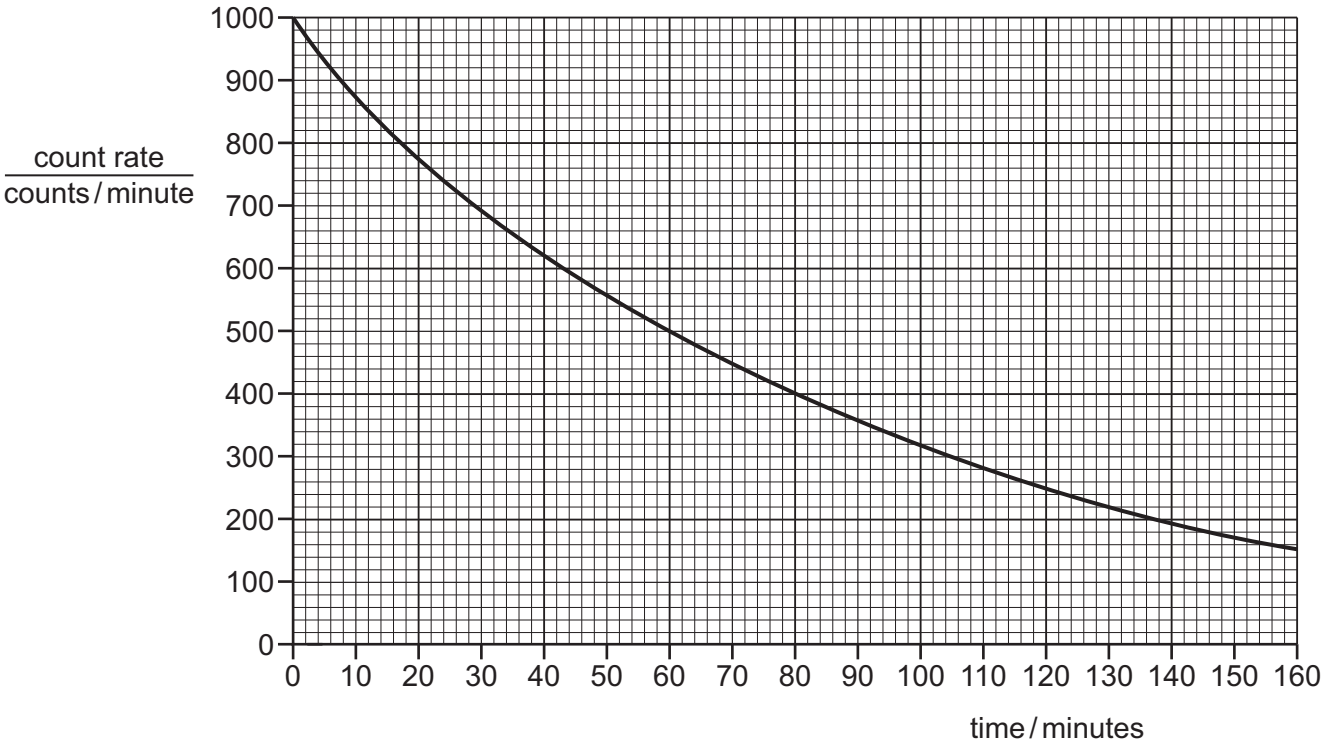
A two alpha-particles

B one alpha-particle and one beta-particle

C two alpha-particles and one beta-particle

D one alpha-particle and two beta-particles

37 The graph shows the results of an experiment to measure the count rate of a radioactive isotope.



What is the half-life of the isotope?

A 60 minutes

B 80 minutes

C 100 minutes

D 160 minutes

38 During fission, a nucleus of uranium-235 (U-235) absorbs one neutron to produce two daughter nuclei and three neutrons.

Krypton-92 (Kr-92) is one of the daughter nuclei and it contains 92 nucleons.

How many nucleons does the other daughter nucleus contain?

A 92 **B** 141 **C** 144 **D** 327

39 The orbital speed of a planet around the Sun is v and its orbital period is T.

Jupiter is further from the Sun than the Earth.

Which planet has the greater value for v and which planet has the greater value for T?

	greater orbital speed v	greater orbital period T
A	Earth	Earth
B	Earth	Jupiter
C	Jupiter	Jupiter
D	Jupiter	Earth

40 What is the Earth's position in the order of planets from the Sun?

A closest planet to the Sun

B second closest planet to the Sun

C third closest planet to the Sun

D fourth closest planet to the Sun

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