Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

PHYSICS **5054/12**

Paper 1 Multiple Choice **October/November 2019**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

8302161100

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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.

Read the instructions on the Answer Sheet very carefully.

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.
Electronic calculators may be used.

This document consists of **16** printed pages.

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1 Which word is the name of a vector quantity?

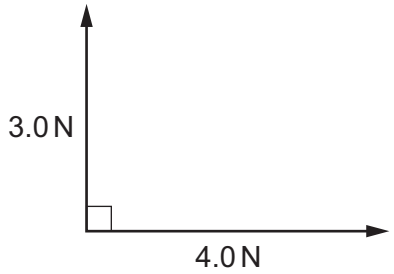
A density

B displacement

C energy

D speed

2 What is the size of the resultant of the two forces shown in the diagram?



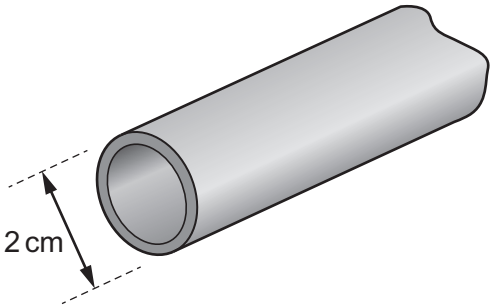
A 1.0 N **B** 3.5 N **C** 5.0 N **D** 7.0 N

3 What is the correct unit for the quantity shown?

	quantity	unit
A	electromotive force (e.m.f.)	N
B	latent heat	J
C	pressure	kg/m^3
D	weight	kg

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4 A length of copper pipe, of uniform cross-section and several metres long, carries water to a tap.



Measurements are taken to determine accurately the volume of copper in the pipe.

Which instruments are used?

A micrometer and rule

B micrometer and calipers

C rule and tape

D tape and calipers

5 Part of a speed–time graph for two runners is shown. They are running along the same track.



Which statement **must** be correct?

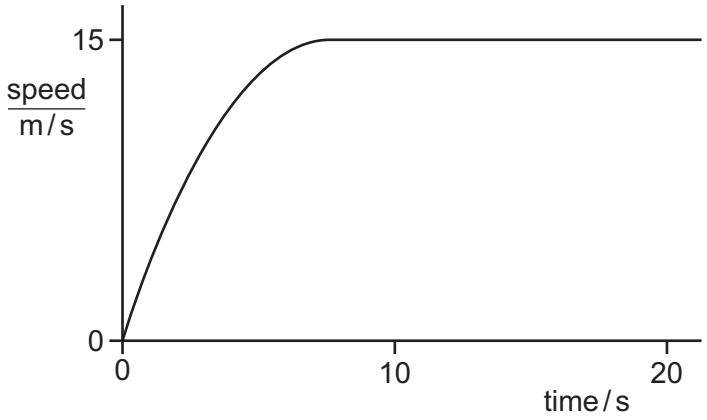
A Both runners started at the same moment.

B Runner 1 has a greater acceleration than runner 2.

C Runner 1 is moving faster than runner 2.

D The distance between the two runners stays constant.

6 The graph shows how the speed of a car varies with time.



Which statement about the acceleration of the car between the times 10 s and 20 s is correct?

A The acceleration decreases.

B The acceleration increases.

C The acceleration is constant, but not zero.

D The acceleration is zero.

7 In which descent is the acceleration equal to the acceleration of free fall *g* at all times?

A a bungee jumper leaping from a bridge

B a feather falling in a vertical tube that contains a vacuum

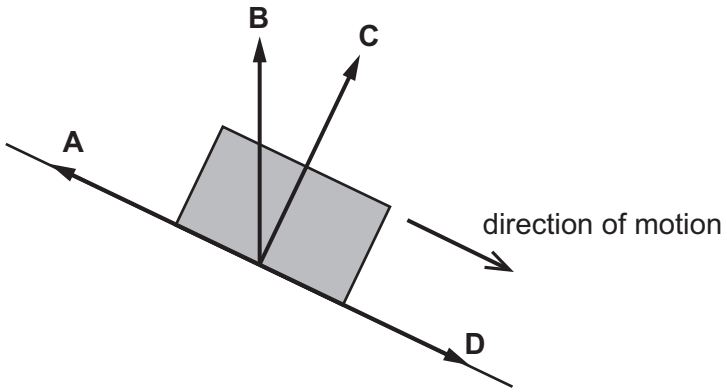
C a hailstone travelling to Earth at terminal velocity

D a sky-diver dropping from an aircraft towards the ground

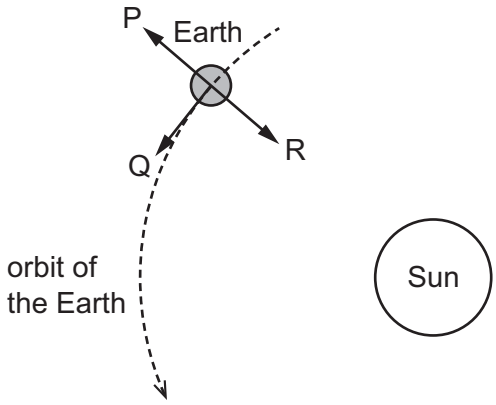
8 A body slides down a frictionless slope, as shown.

As the body presses on the surface, the surface pushes back on the body.

In which direction does the surface push back on the body?



9 The Earth travels at constant speed in a circular orbit around the Sun.

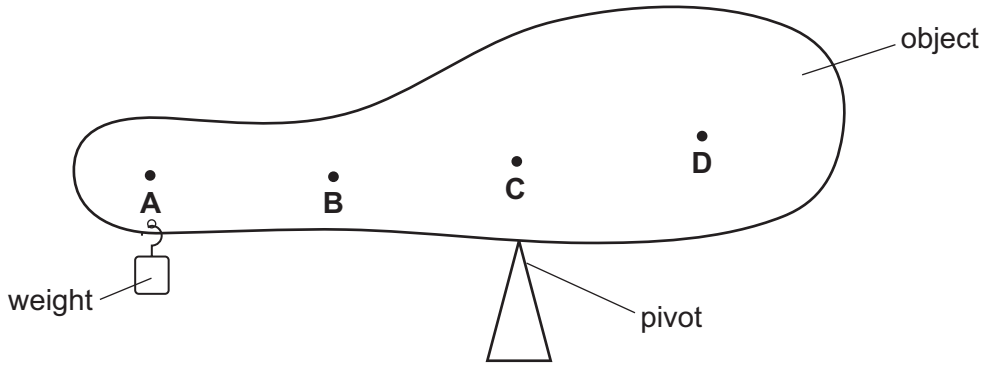


Which arrows show the direction of the acceleration of the Earth and the direction of the velocity of the Earth?

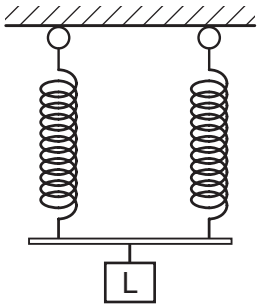
	direction of acceleration	direction of velocity
A	P	Q
B	Q	P
C	Q	R
D	R	Q

10 A student balances a non-uniform object on a pivot. To do this, a weight is suspended near the left-hand end of the object, as shown.

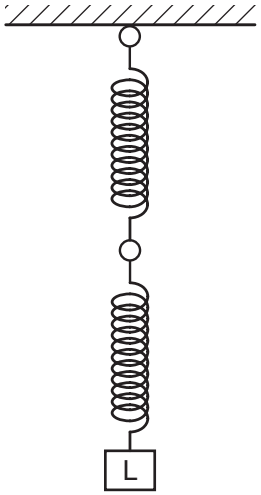
Where is the centre of mass of the object?



11 A load L is suspended from two springs that are in parallel. The extension of each spring is x.



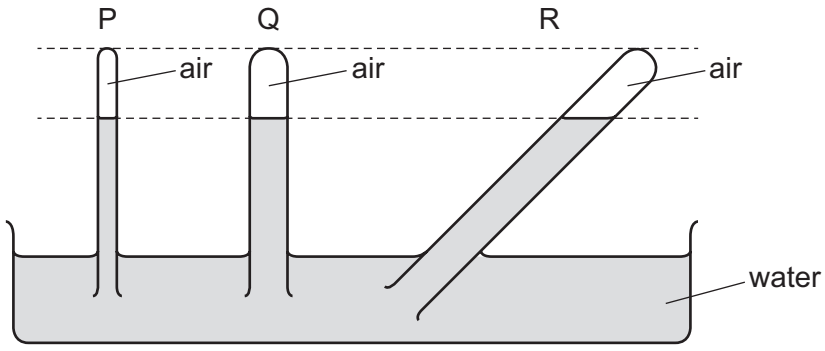
The springs are then arranged to hang vertically, one below the other.



In this new arrangement, what is the total extension of the two springs?

A $\frac{1}{2}x$ **B** x **C** $2x$ **D** $4x$

12 The diagram shows three tubes P, Q and R. Each tube contains air trapped by a water column.



Which statement is correct?

A The pressure of the trapped air is equal in tubes P, Q and R.

B The pressure of the trapped air is greatest in tube Q.

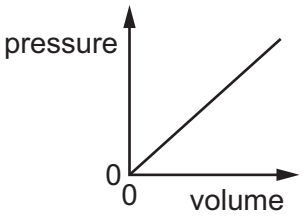
C The pressure of the trapped air is greatest in tube R.

D The pressure of the trapped air is greatest in tube P.

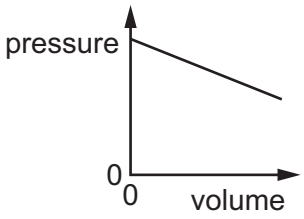
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13 Which graph shows the relationship between the pressure and the volume of a fixed mass of gas at constant temperature?

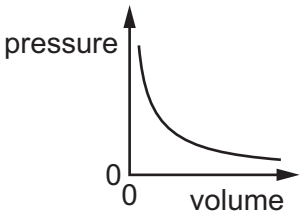
A



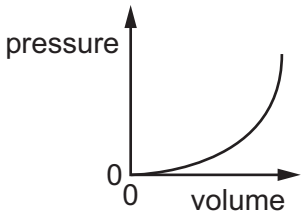
B



C



D



14 An object X has mass m and velocity v.

A second object Y has mass $2m$ and velocity $2v$.

What is the value of the ratio $\frac{\text{kinetic energy of Y}}{\text{kinetic energy of X}}$?

A 1 **B** 2 **C** 4 **D** 8

15 Where is energy released by the fusion of hydrogen nuclei to form helium?

A in a nuclear power station

B in a radioactive isotope emitting alpha-particles

C in the core of the Earth

D in the core of the Sun

16 A student uses a newton meter to pull an object a distance d horizontally along a flat surface in a time of t. The newton meter reading is F.

What is given by the expression $(F \times d) / t$?

A efficiency

B energy

C power

D work

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17 A student is given a thermometer that reads 1 °C in pure melting ice and 101 °C in pure boiling water. She uses it to measure the temperature of some water before and after it is heated.

How does the rise in temperature of the water calculated from her results compare with the correct value?

A It is 1 °C lower.

B It is the same.

C It is 1 °C higher.

D It is 2 °C higher.

18 A student makes four statements about evaporation and boiling.

1 Both involve an increase in molecular separation.

2 Both occur only at a fixed temperature.

3 Both involve the absorption of thermal energy.

4 Both occur throughout the liquid.

Which two statements are correct?

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

19 How is *specific latent heat* defined?

A the heat absorbed or emitted by unit mass during a change of a state without a temperature change

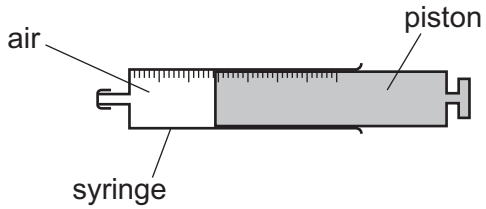
B the heat absorbed or emitted by unit mass during unit temperature change

C the heat absorbed or emitted during a change of a state without a temperature change

D the heat absorbed or emitted during unit temperature change

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20 A syringe containing air is sealed at one end. The piston is free to move.



The air is heated.

What happens to the average distance between air molecules and the density of the air?

	average distance between air molecules	density of the air
A	increases	decreases
B	increases	stays the same
C	stays the same	decreases
D	stays the same	stays the same

21 A metal disc is heated to 600 °C and then lowered into a beaker of water.

What happens to the mass of the metal disc and to the mass of the water in the beaker?

	mass of metal disc	mass of water in beaker
A	increases	decreases
B	increases	no change
C	no change	decreases
D	no change	increases

22 Which description defines the amplitude of a water wave in a ripple tank?

A half of the vertical distance between a trough and a peak

B the horizontal distance between adjacent peaks

C the horizontal distance between a trough and an adjacent peak

D the vertical distance between a trough and a peak

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[Turn over

23 Here are four statements about wavefronts.

1 Wavefronts from a point source are straight lines.

2 Wavefronts from a point source are circular.

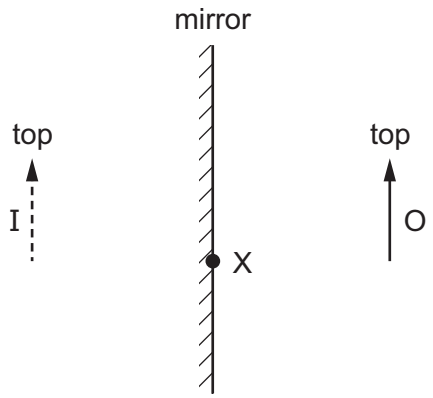
3 Wavefronts are parallel to the direction of energy movement.

4 Wavefronts are perpendicular to the direction of energy movement.

Which two statements are correct?

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

24 An object O is placed in front of a plane mirror. I is the image formed.



A ray from the top of the object is incident on the mirror at X.

What happens to this ray?

A It reflects and passes through the bottom of O.

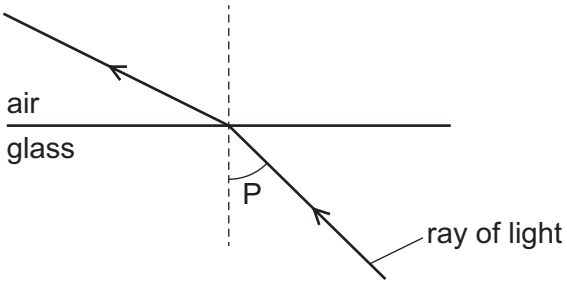
B It reflects and passes through the top of O.

C It reflects as though it came from the bottom of I.

D It reflects as though it came from the top of I.

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25 The diagram shows light passing from glass into air.



What is the name of angle P?

A the angle of incidence

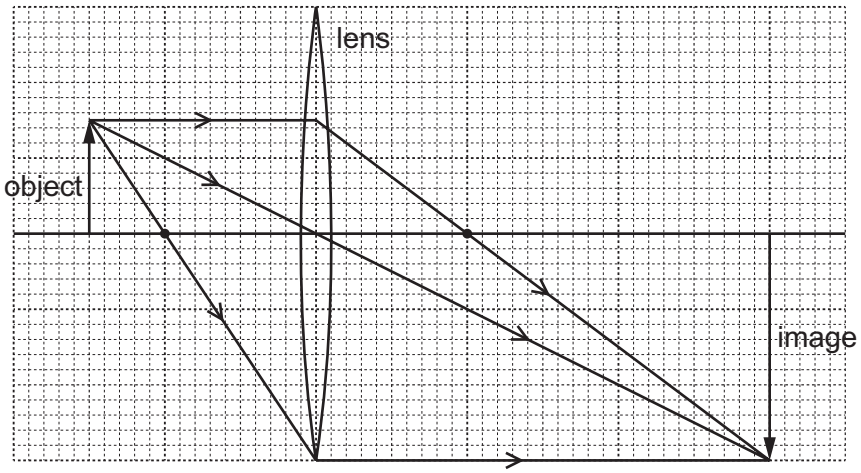
B the angle of reflection

C the angle of refraction

D the critical angle

26 An object is placed in front of a converging lens of focal length 4.0 cm. The height of the image is 6.0 cm.

The arrangement is shown on the scale diagram.



What is the linear magnification produced by the lens?

A 0.50 **B** 1.5 **C** 2.0 **D** 6.0

27 Which row shows the speed of sound in air (c_a), liquid (c_L) and solid (c_s) in order from slowest to fastest?

	slowest →		fastest
A	c_L	c_s	c_a
B	c_L	c_a	c_s
C	c_a	c_L	c_s
D	c_s	c_L	c_a

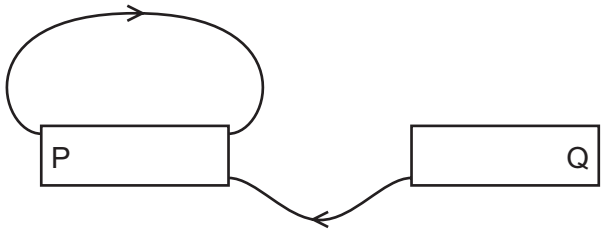
28 A man stands 80 m in front of a cliff face. He makes a loud bang and listens for the echo.

He makes a loud bang once every second. He hears an echo exactly halfway between the bang that caused it and the next bang.

What is the speed of sound?

A 40 m/s **B** 80 m/s **C** 160 m/s **D** 320 m/s

29 The diagram shows two magnetic field lines of the magnetic field around two bar magnets.



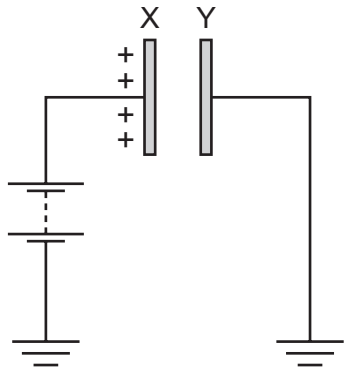
Which row shows the magnetic poles at end P and end Q of the two magnets?

	P	Q
A	N	N
B	N	S
C	S	N
D	S	S

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30 A metal plate X is attached to earth by a battery. The plate has a positive charge.

A second metal plate Y is initially uncharged and connected to earth. This plate is positioned parallel to X.



What happens as Y is brought closer to X?

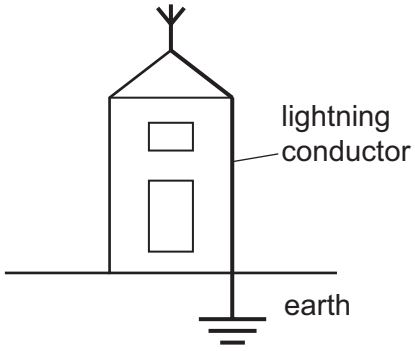
A Electrons flow from Y to earth only.

B Electrons flow to Y from earth only.

C Protons flow from Y to earth and electrons flow to Y from earth.

D Protons flow to Y from earth and electrons flow from Y to earth.

31 The diagram shows a metal lightning conductor attached to a building.



Why is the lightning conductor made of copper?

A Both positive and negative charges can flow through copper.

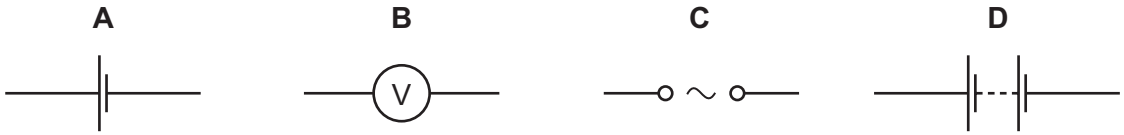
B Copper can be electrostatically charged.

C So the lightning conductor has a low electrical resistance.

D So the heat is conducted away quickly.

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32 Which symbol does **not** represent a power source?



33 Resistors of different resistances are connected to a power supply in either a parallel circuit or a series circuit. Which statement is correct?

A The current is the same in all resistors connected in parallel.

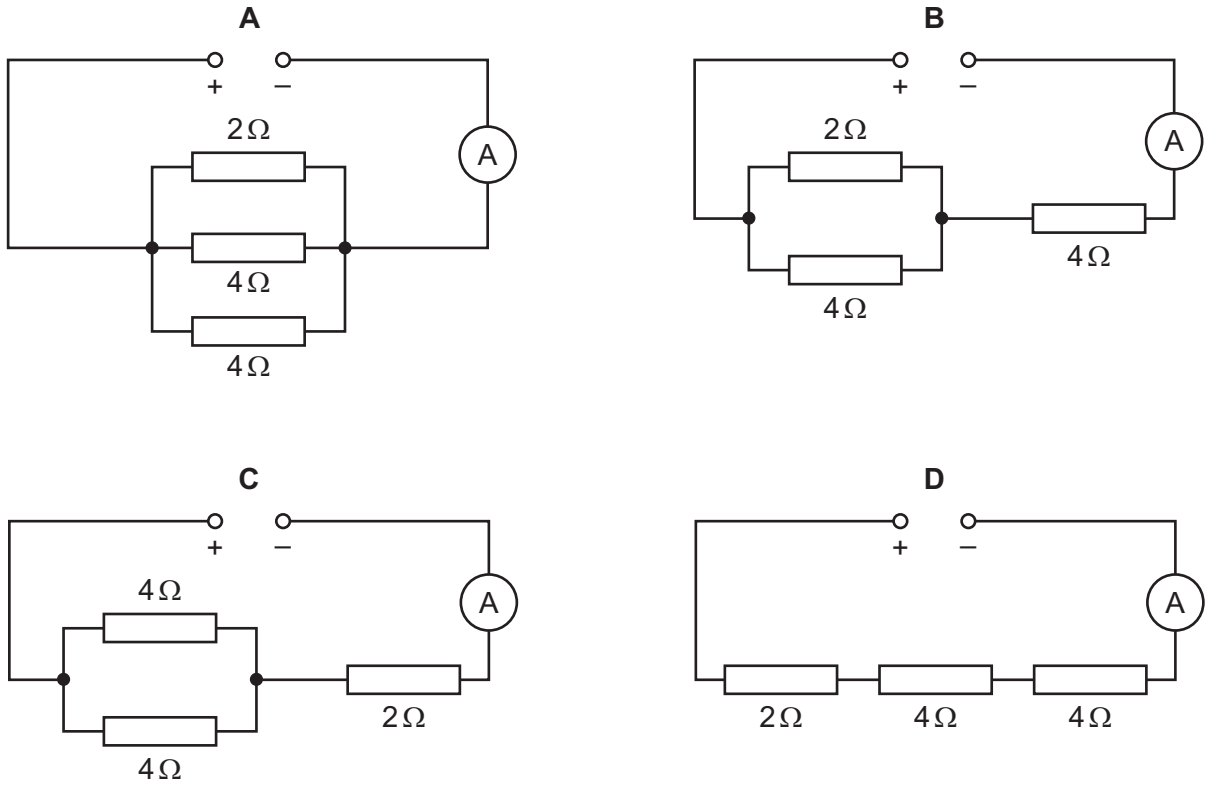
B The current is the same in all resistors connected in series.

C The voltage across each resistor is different for all resistors connected in parallel.

D The voltage across each resistor is the same for all resistors connected in series.

34 An ammeter is connected to three resistors and a power supply.

Which arrangement of resistors gives the greatest ammeter reading?



35 A hotplate on an electric cooker contains two identical resistors.

The switch has three positions.

position 1 The two resistors are connected in series to the mains supply.

position 2 The two resistors are connected in parallel to the mains supply.

position 3 Just one resistor is connected to the mains supply.

Which positions correspond to the low, the medium and the high power settings?

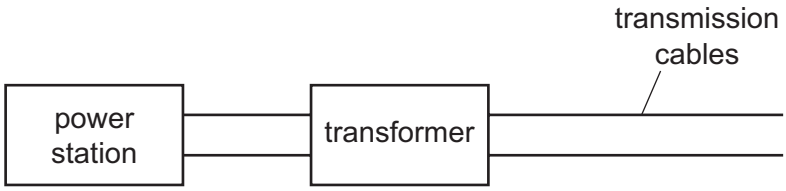
	low power	medium power	high power
A	1	2	3
B	1	3	2
C	3	1	2
D	3	2	1

36 A mains electric circuit is fitted with a circuit breaker rather than a fuse.

Where is the circuit breaker connected and what happens when the current is too large?

	A circuit breaker is connected in…	When the current is too large…
A	the live wire.	a thin wire melts and breaks the circuit.
B	the live wire.	an electromagnet opens a switch.
C	the neutral wire.	a thin wire melts and breaks the circuit.
D	the neutral wire.	an electromagnet opens a switch.

37 Transformers are used to transmit electrical energy between power stations and transmission cables, as shown.



What is the purpose of the transformer in the diagram?

A to decrease the current and the potential difference from the power station

B to decrease the current and increase the potential difference from the power station

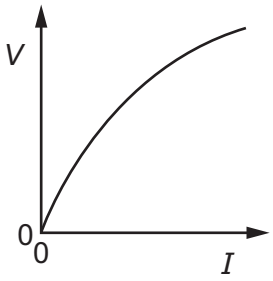
C to increase the current and the potential difference from the power station

D to increase the current and decrease the potential difference from the power station

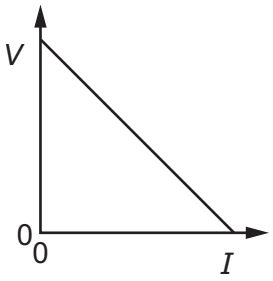
38 A thermistor warms up as the current in it increases.

Which graph shows how the voltage V across the thermistor changes as the current I through it is increased?

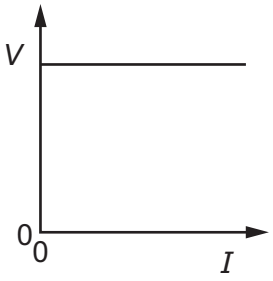
A



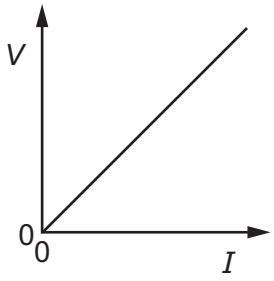
B



C



D



39 Radioactive substances are used as tracers in medical examinations.

A liquid tracer is injected into a patient. A detector 20 cm above the patient shows where the radioactive substance is in the body.

What is the best radioactive substance to use?

A an alpha-particle emitter with a half-life of a few hours

B an alpha-particle emitter with a half-life of a few years

C a gamma ray emitter with a half-life of a few hours

D a gamma ray emitter with a half-life of a few years

40 An isotope of lead, $^{212}_{82}\mathrm{Pb}$, is radioactive. After three decays, two beta-particles and an alpha-particle have been emitted. Another radioactive isotope of lead is formed.

What is the mass number (nucleon number) of the new isotope of lead?

A 200 **B** 208 **C** 212 **D** 216

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