Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

PHYSICS **5054/12**

Paper 1 Multiple Choice **October/November 2017**

1 hour

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

* 9 4 8 5 2 3 2 3 3 8 *

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.

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1 Which list contains only scalar quantities?

A acceleration, displacement, velocity

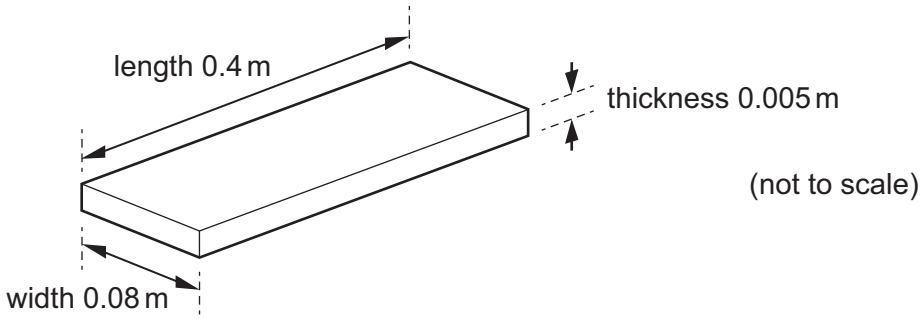
B distance, force, speed

C force, length, time

D length, mass, speed

2 A manufacturer measures the three dimensions of a wooden floor tile using three different instruments.

The approximate dimensions of the tile are shown.

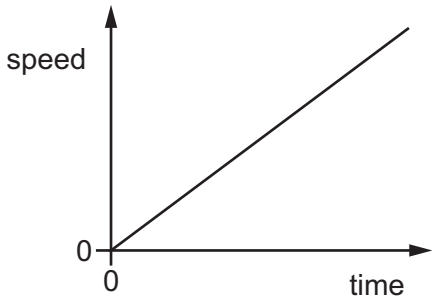


Which instruments are used to measure accurately each of these dimensions?

	length	thickness	width
A	metre rule	micrometer	calipers
B	metre rule	calipers	micrometer
C	micrometer	metre rule	calipers
D	calipers	micrometer	metre rule

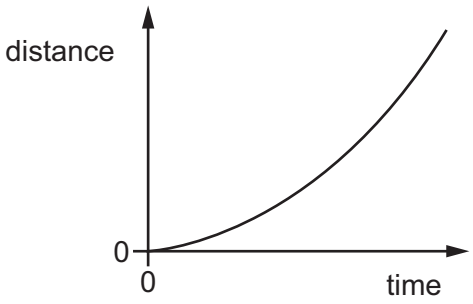
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3 The speed-time graph represents a short journey.

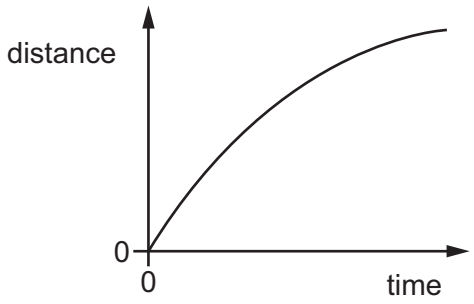


Which distance-time graph represents the same journey?

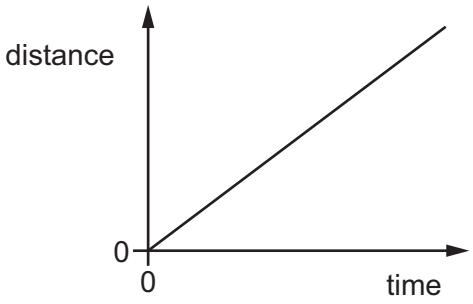
A



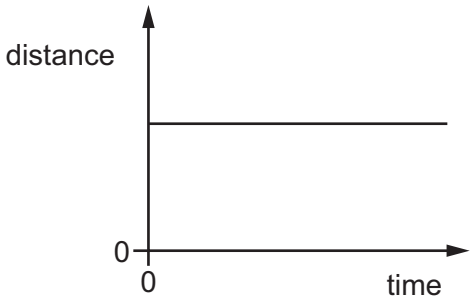
B



C



D

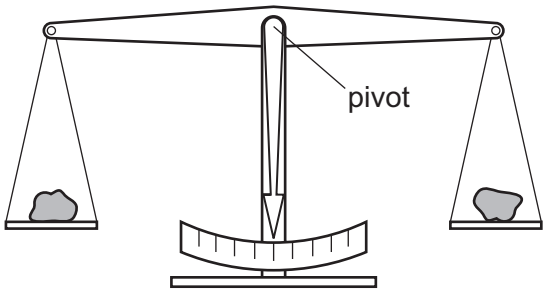


4 A free-fall skydiver jumps from a plane. As he falls there is a force acting upwards and a force acting downwards on his body. These produce a resultant force.

Before he reaches terminal velocity, how do the sizes of the forces change?

	downward force	upward force	resultant force
A	decreases	decreases	stays the same
B	increases	stays the same	decreases
C	stays the same	increases	decreases
D	stays the same	increases	increases

5 The diagram shows two objects on a beam balance.



The beam balance is in equilibrium.

Which quantities may be different?

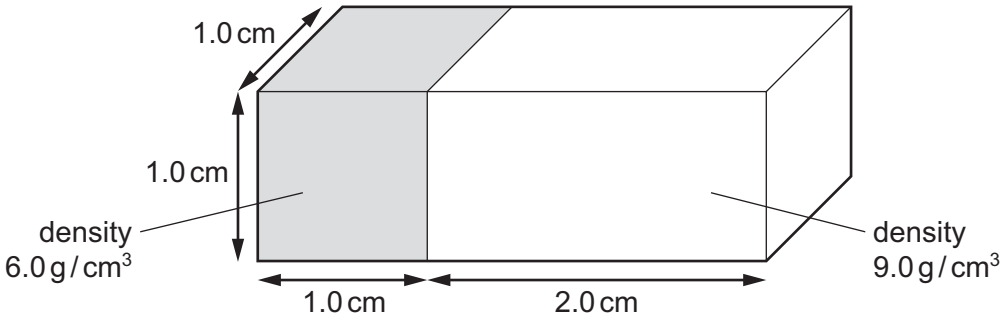
A the masses of the two objects

B the moments about the pivot of the two objects

C the volumes of the two objects

D the weights of the two objects

6 Two blocks are joined together.



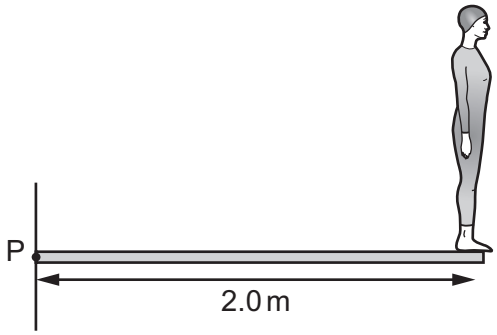
One block has a density of $6.0\,g/cm^3$ and the other has a density of $9.0\,g/cm^3$.

What is the overall density of the two blocks joined together?

A $7.0\,g/cm^3$ **B** $7.5\,g/cm^3$ **C** $8.0\,g/cm^3$ **D** $15\,g/cm^3$

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7 A diver of weight 500 N stands at the end of a springboard that is 2.0 m long and is fixed at point P.



The springboard has a weight of 500 N. The centre of mass of the springboard is in the centre of the board.

What is the total moment about point P of the diver and the board?

A 500 N m **B** 750 N m **C** 1000 N m **D** 1500 N m

8 A tennis ball of mass 56 g is travelling at 1500 metres / minute.

Which expression is equal to the kinetic energy, in joules, of the tennis ball?

A $\frac{1}{2} \times 0.056 \times (25)^2$

B $\frac{1}{2} \times 0.056 \times (1500)^2$

C $\frac{1}{2} \times 56 \times (25)^2$

D $\frac{1}{2} \times 56 \times (1500)^2$

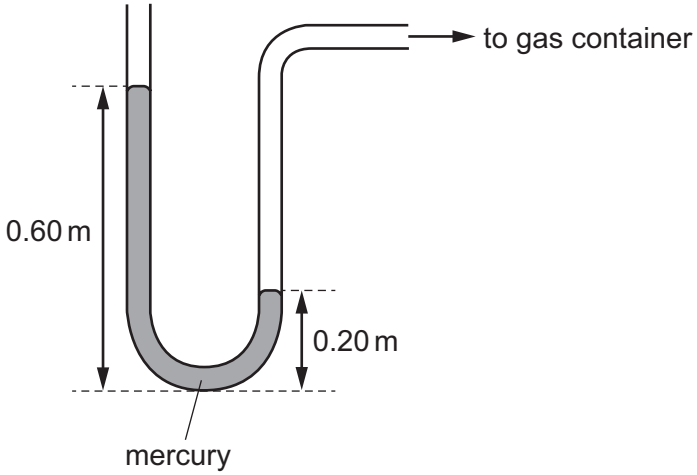
9 In a hydroelectric power station, 4.2×10^5 kg of water passes through the turbines every second. The turbines are at a height of 50 m below the surface of the reservoir. The gravitational field strength g is 10 N / kg.

Assuming there are no energy losses, what is the power output of the power station?

A 8.4×10^3 W **B** 8.4×10^4 W **C** 2.1×10^7 W **D** 2.1×10^8 W

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10 The diagram shows a mercury manometer connected to a gas container.



The density of mercury is 14 000 kg / m^3. The gravitational field strength g is 10 N / kg.

What is the pressure difference between the gas in the container and the atmosphere?

A 28 000 Pa **B** 42 000 Pa **C** 56 000 Pa **D** 84 000 Pa

11 A gas syringe contains a fixed mass of air. The volume of the air is 240 cm^3 and it exerts a pressure of 5.0×10^4 Pa. The air is slowly compressed, keeping the temperature constant, until the pressure is 1.5×10^5 Pa.

What is the final volume of air?

A 72 cm^3 **B** 80 cm^3 **C** 720 cm^3 **D** 800 cm^3

12 An extremely large increase in pressure is needed to compress a liquid. A gas can be compressed by a much smaller increase in pressure.

Which statement explains this?

A Molecules repel each other very strongly when very close.

B The attractive forces between molecules are small at large distances.

C The molecules in the gas collide with the walls of their container and rebound.

D The molecules of a liquid are constantly moving at random.

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13 A dish of liquid is left on a laboratory bench. Some of the liquid evaporates.

What happens and why?

A The liquid cools because liquid molecules have more potential energy than gas molecules.

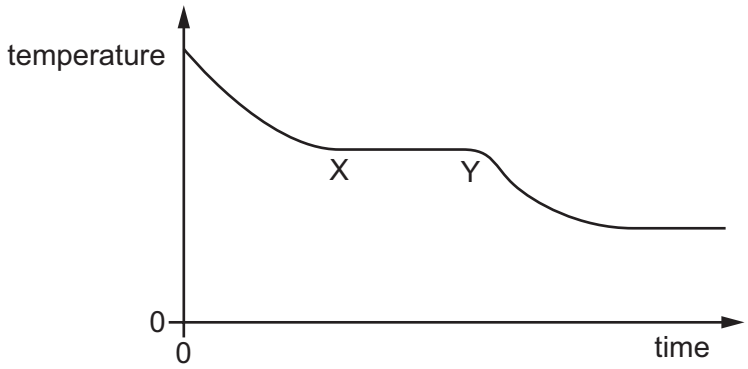
B The liquid cools because faster-moving molecules escape.

C The liquid warms because liquid molecules have less potential energy than gas molecules.

D The liquid warms because slower-moving molecules are left behind.

14 Solid wax is melted in a boiling tube and then allowed to cool.

The graph shows the cooling curve.



What is happening between points X and Y?

A The liquid is at its boiling point.

B The liquid is turning to solid.

C The solid has reached room temperature.

D The solid is turning to liquid.

15 What is meant by the *heat capacity* of a solid object?

A the maximum thermal energy it can store per unit mass

B the maximum thermal energy it can store per unit volume

C the thermal energy required to cause a unit temperature rise

D the thermal energy required to raise its temperature to its melting point

16 The distance between the ice point and the steam point in a liquid-in-glass thermometer is 20 cm.

The top of the liquid thread is 12 cm above the ice point.

What is the temperature?

A 40 °C **B** 60 °C **C** 80 °C **D** 88 °C

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17 A thermocouple is a type of thermometer.

Which statement applies to a thermocouple?

A It can measure rapidly varying temperatures.

B It must be made from three different metals.

C Its resistance decreases when one junction is heated.

D The distance between the two junctions increases as the temperature increases.

18 A heater is designed to radiate thermal energy.

Which change to the design decreases the thermal energy emitted by radiation?

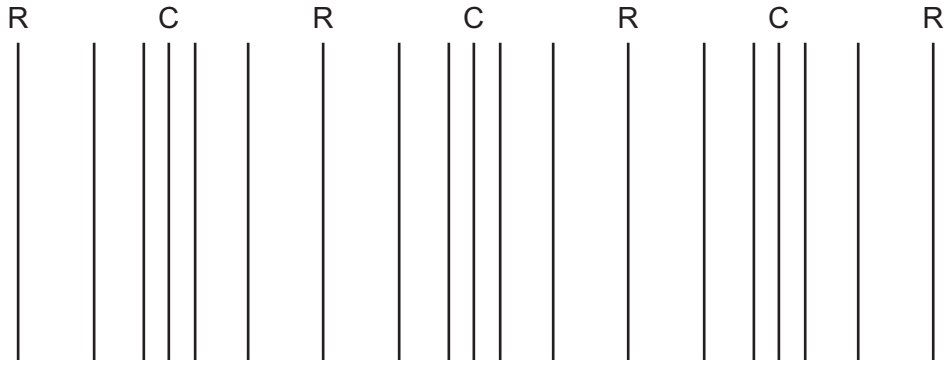
A a darker coloured surface

B a higher surface temperature

C a larger surface area

D a shinier surface

19 A sound wave in a solid is represented by a series of lines. The diagram shows compressions C and rarefactions R at one instant in time.



Which statement is correct?

A All particles on one line move in the same direction at the same time.

B The direction of travel of the sound wave is parallel to the lines.

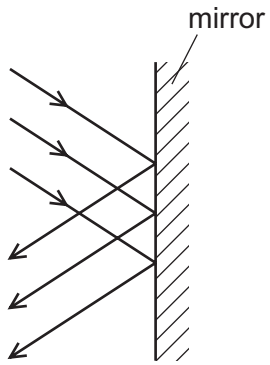
C The distance between a compression and its adjacent rarefaction is a wavelength.

D The pattern of lines represents a transverse wave.

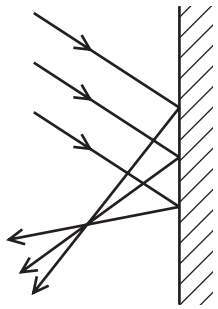
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20 Which diagram shows reflection by a plane mirror?

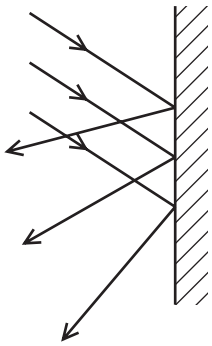
A



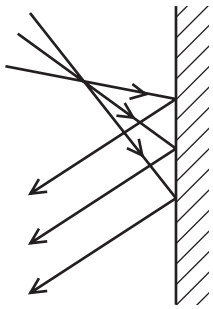
B



C



D



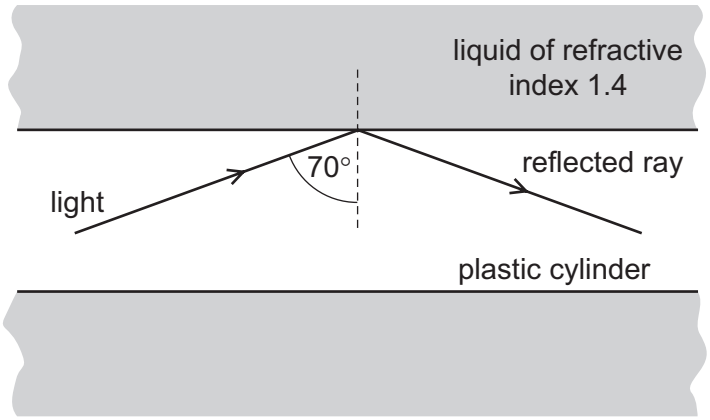
21 Light is incident on a plastic block of refractive index 1.5.

The angle of incidence is 50°.

What is the angle of refraction?

A 31° **B** 33° **C** 40° **D** 75°

22 A solid plastic cylinder is immersed in a liquid of refractive index 1.4. Light travelling in the plastic cylinder strikes the inside surface at an angle of incidence of 70°. The light undergoes total internal reflection.

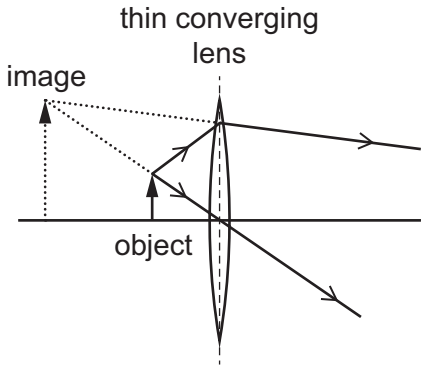


What are the values of the critical angle in the plastic and the refractive index of the plastic?

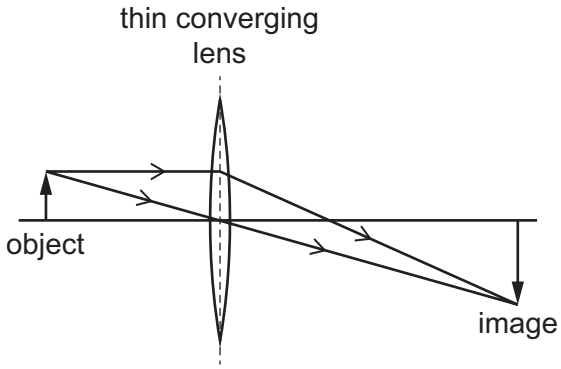
	critical angle in plastic	refractive index of plastic
A	greater than 70°	greater than 1.4
B	greater than 70°	less than 1.4
C	less than 70°	greater than 1.4
D	less than 70°	less than 1.4

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23 The ray diagrams, X and Y, show two ways in which a thin converging lens produces an image that is larger than the object.



X



Y

Which devices use a lens as shown in diagram X and in diagram Y?

	X	Y
A	camera	magnifying glass
B	magnifying glass	projector
C	photographic enlarger	camera
D	photographic enlarger	projector

24 The diagram shows the electromagnetic spectrum with three components named. The spectrum is in order from long wavelength to short wavelength.

Which component of the spectrum is used in a sunbed to produce a suntan?

long wavelength → short wavelength

radio waves	**A**	**B**	visible light	**C**	**D**	gamma rays

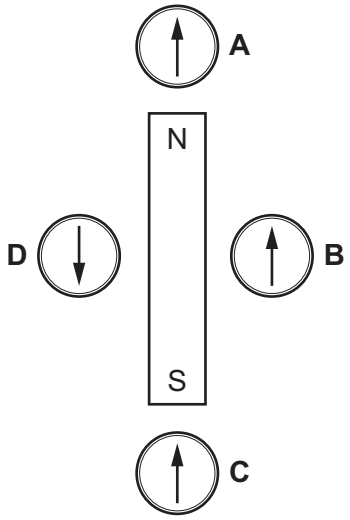
25 Which row gives the speed of sound in air, in water and in steel?

	speed in air m/s	speed in water m/s	speed in steel m/s
A	330	1500	6000
B	330	6000	1500
C	6000	330	1500
D	6000	1500	330

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26 A compass needle is moved to different places around a strong bar magnet.

Which position shows **incorrectly** the direction of the compass needle?



27 A plastic block is rubbed with a silk handkerchief and the block becomes charged.

What causes the block to become charged?

A Negative electrons flow from the handkerchief and positive electrons flow from the block.

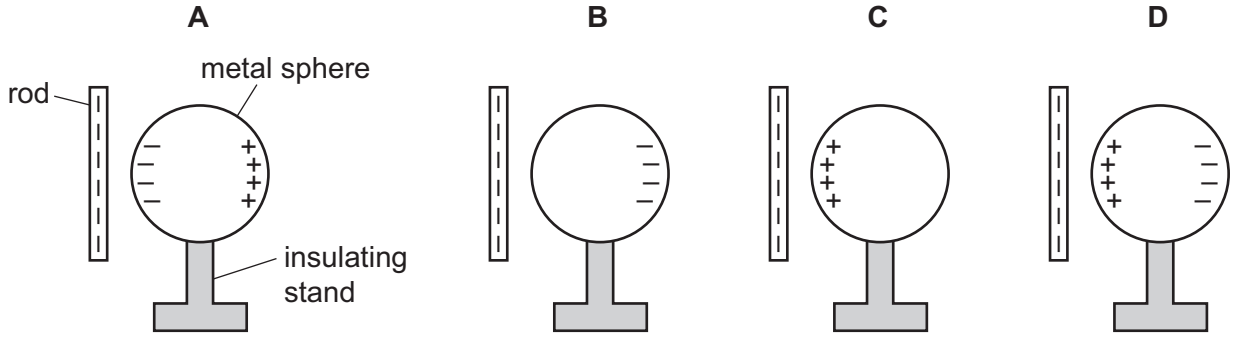
B Negative electrons flow from the handkerchief to the block.

C Positive electrons flow from the block to the handkerchief.

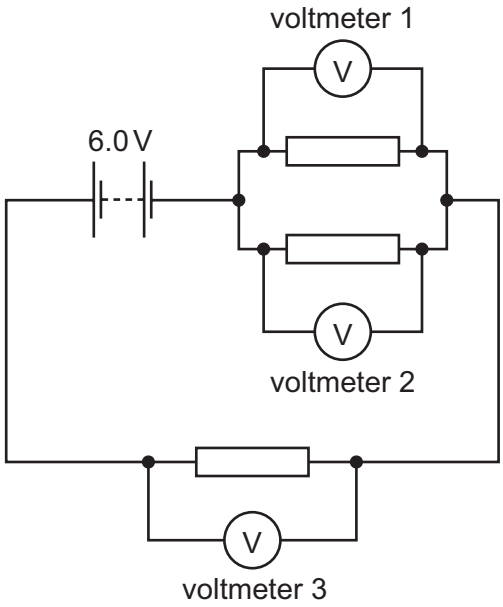
D Positive electrons flow to the handkerchief and negative electrons flow to the block.

28 A negatively-charged rod is brought near to an uncharged metal sphere on an insulating stand.

Which diagram shows the charge distribution on the sphere?



29 A 6.0 V battery, three resistors and three voltmeters are connected in the circuit shown.



The reading on voltmeter 1 is 2.0 V.

What is the reading on voltmeter 2 and what is the reading on voltmeter 3?

	reading on voltmeter 2 / V	reading on voltmeter 3 / V
A	2.0	4.0
B	2.0	8.0
C	4.0	4.0
D	4.0	8.0

30 A piece of wire has a resistance of 16 Ω.

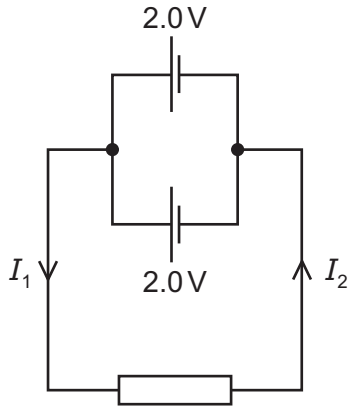
The wire is 20 cm long and has a cross-sectional area of 2.0 mm^2.

Which wire of the same material has a resistance of 8.0 Ω?

	length / cm	cross-sectional area / mm^2
A	10	1.0
B	10	4.0
C	20	1.0
D	20	4.0

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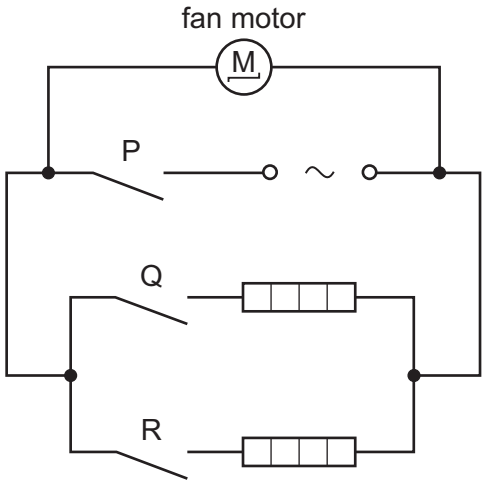
31 The battery in a circuit contains two identical cells connected in parallel.



Which row shows the relationship between currents I_1 and I_2 and gives the electromotive force (e.m.f.) of the battery?

	relationship	e.m.f. / V
A	$I_1 > I_2$	2.0
B	$I_1 > I_2$	4.0
C	$I_1 = I_2$	2.0
D	$I_1 = I_2$	4.0

32 The diagram shows the circuit for a hair-dryer.



The fan motor has a power rating of 0.10 kW and the heaters each have a rating of 0.40 kW. The cost of electricity is 8.0 cents / kW h.

What is the cost of running the hair-dryer for two hours with switches P and Q closed and switch R open?

A 1.6 cents **B** 4.0 cents **C** 6.4 cents **D** 8.0 cents

33 Why is the coil of an electric motor wound on a soft-iron cylinder?

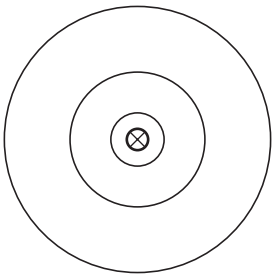
A to decrease the electric current

B to increase the electric current

C to reverse the magnetic field

D to strengthen the magnetic field

34 A straight wire carries a current into the paper. The diagram shows three magnetic field lines around the wire.



key

⊗ current into paper

The current in the wire increases.

What is the direction of the field lines and which change occurs to the field lines as the current increases?

	direction	change
A	clockwise	the lines move closer together
B	clockwise	the lines move further apart
C	anticlockwise	the lines move closer together
D	anticlockwise	the lines move further apart

35 Which particles are emitted by a hot metal filament?

A alpha-particles

B electrons

C neutrons

D protons

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36 A circuit includes a thermistor and a light-dependent resistor (LDR).

The resistance of the thermistor and the resistance of the LDR both increase.

Which changes cause this?

	change to thermistor	change to LDR
A	decrease in temperature	decrease in brightness
B	decrease in temperature	increase in brightness
C	increase in temperature	decrease in brightness
D	increase in temperature	increase in brightness

37 A sample contains atoms of an isotope that has a half-life of 7.2 years.

Which quantity halves every 7.2 years?

A the mass of the sample

B the nucleon (mass) number

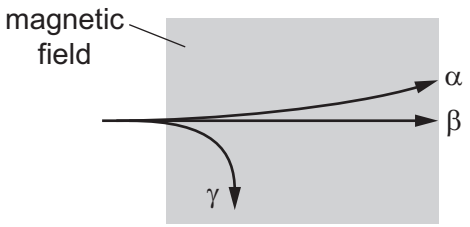
C the number of atoms of the isotope

D the proton (atomic) number

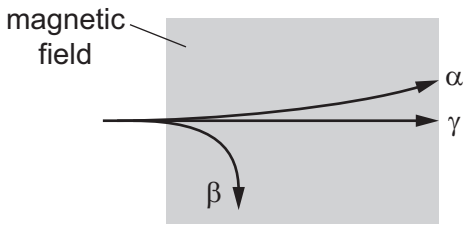
38 A beam, consisting of alpha-particles (α), beta-particles (β), and gamma rays (γ), passes into a magnetic field.

Which diagram shows their paths in the magnetic field?

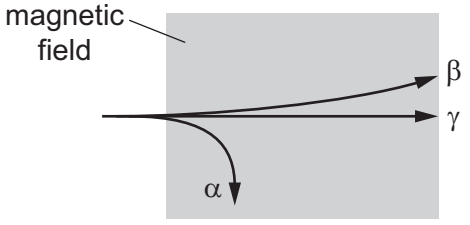
A



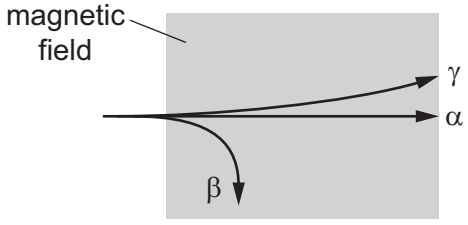
B



C

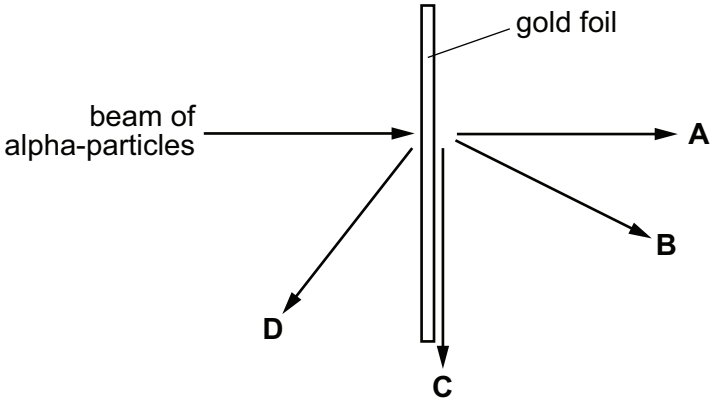


D



39 A narrow beam of alpha-particles is fired at a thin piece of gold foil.

What is the final direction of the largest number of alpha-particles?



40 A nucleus of phosphorus $^{32}_{15}P$ emits a beta-particle to form a new nucleus.

What is the nucleon number and what is the proton number of the new nucleus?

	nucleon number (mass number)	proton number (atomic number)
A	28	13
B	31	14
C	31	15
D	32	16

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