Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/12**

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.

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

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1 A force of 3.0 N and a force of 4.0 N act on an object.

What is the maximum possible resultant of these two forces?

A 1.0 N **B** 5.0 N **C** 7.0 N **D** 12 N

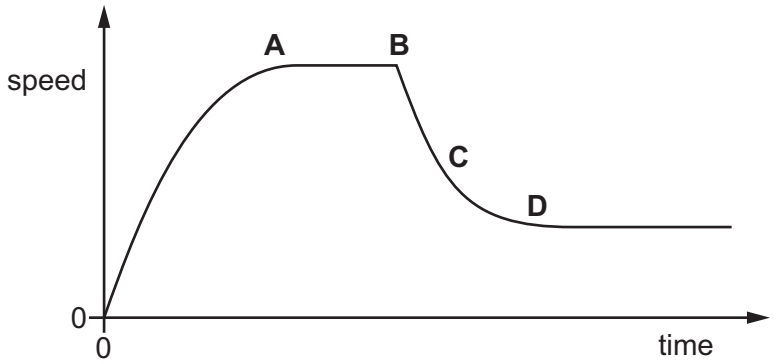
2 A length of copper wire is labelled: length 0.50 m and diameter 0.50 mm.

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

3 The graph shows the speed–time graph for a parachutist who jumps from a plane but does not open his parachute immediately.

At which point does he open his parachute?



4 A 60 kg passenger enters a stationary lift. The gravitational field strength g is 10 N / kg.

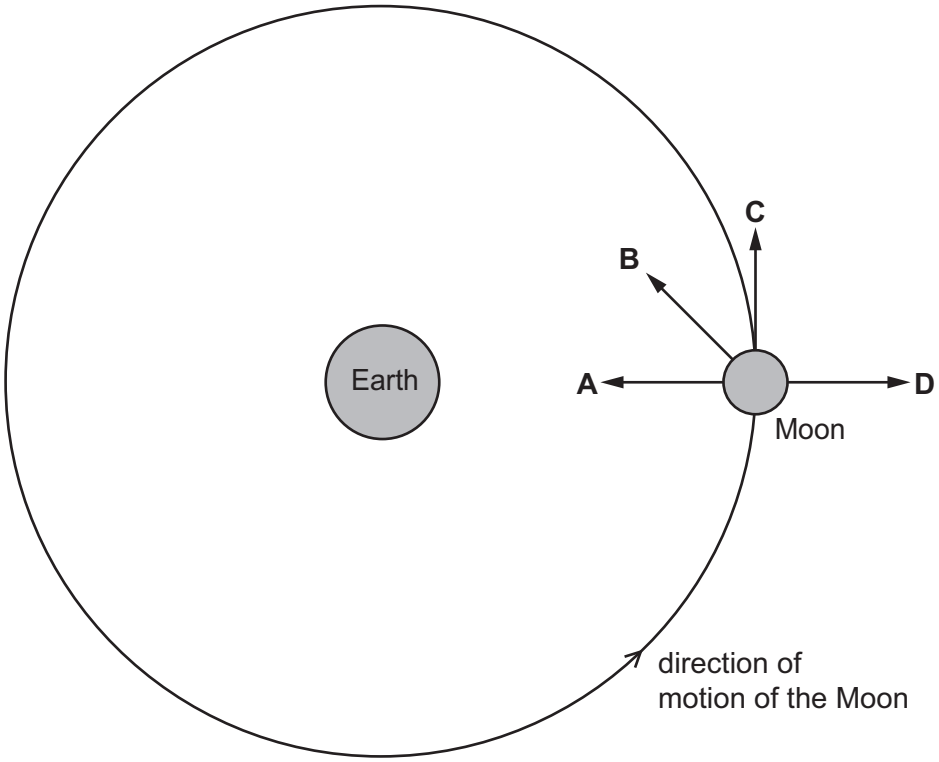
How much force does the floor of the lift exert on the passenger when the lift accelerates upwards at 2.0 m / s^2?

A 120 N **B** 480 N **C** 600 N **D** 720 N

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

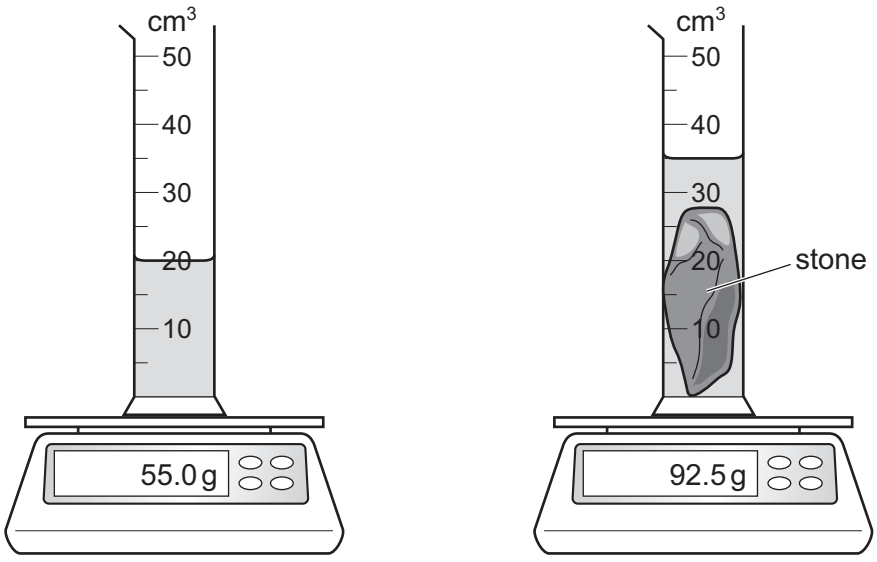
Which arrow represents the direction of the resultant force acting on the Moon at the instant shown?



6 A measuring cylinder containing water is placed on a balance.

A stone is placed into the water.

The diagram shows the readings on the balance and on the measuring cylinder.

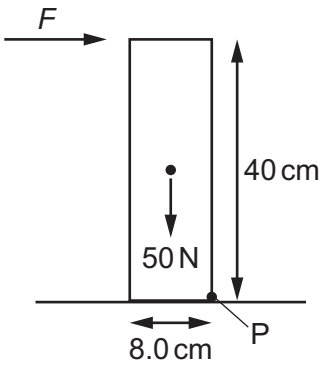


What is the density of the stone?

A $1.1\,g/cm^3$ **B** $1.5\,g/cm^3$ **C** $2.5\,g/cm^3$ **D** $2.6\,g/cm^3$

7 The diagram shows a uniform solid rectangular block of weight 50 N that is pivoted about point P.

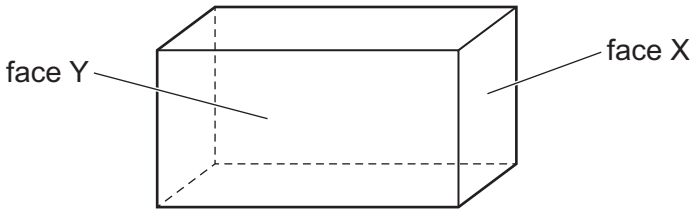
The height of the block is 40 cm. The base of the block is 8.0 cm wide.



Which horizontal force *F* just makes the block start to rotate about P?

A 2.5 N **B** 5.0 N **C** 10 N **D** 160 N

8 The centre of mass of a solid rectangular block is at its centre. A small heavy weight is available.



In which arrangement is the centre of mass the lowest?

A with face X on a table

B with face Y on a table

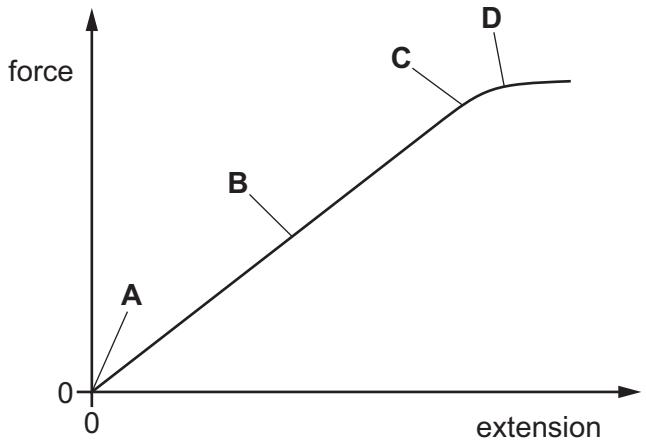
C with face X on a table and the heavy weight attached centrally on top of the block

D with face Y on a table and the heavy weight attached centrally on top of the block

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9 The graph shows how the extension of a spring depends on the force applied.

Which point is the limit of proportionality?



10 An elastic spring has an unstretched length of 30 cm.

A load of 6.0 N is hung from the spring and the length of the spring is now 66 cm.

The 6.0 N load is removed and the spring returns to its original length. A load of 2.0 N is now hung from the spring.

What is the new length of the spring?

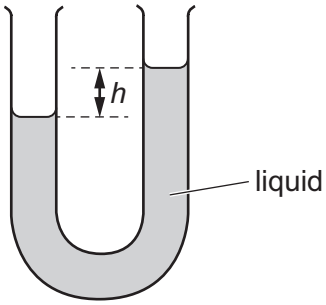
A 22 cm **B** 40 cm **C** 42 cm **D** 52 cm

11 A barometer is an instrument used to measure atmospheric pressure.

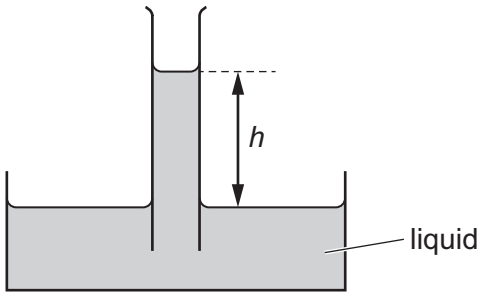
In one type of barometer the height of a liquid in a tube is measured.

In which diagram does the height *h* represent atmospheric pressure?

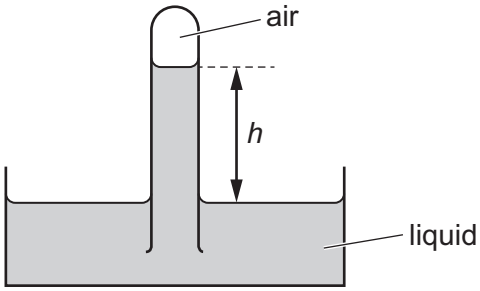
A



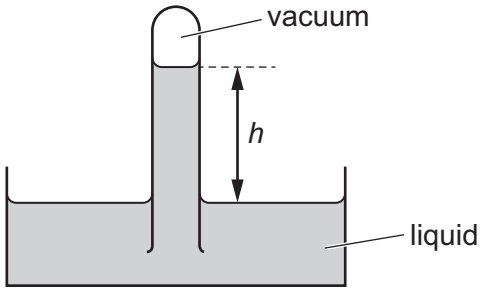
B



C



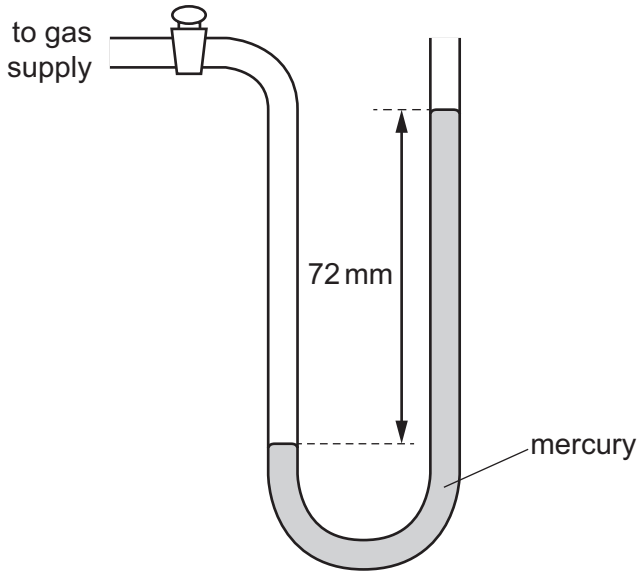
D



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12 A manometer contains mercury of density 14 000 kg / m^3. The manometer is connected to a gas supply and the difference in the height of the mercury levels is 72 mm. The atmospheric pressure is 100 kPa.

The gravitational field strength *g* is 10 N / kg.



What is the pressure of the gas supply?

A 90 kPa **B** 99 kPa **C** 110 kPa **D** 200 kPa

13 Which device provides a continuous, steady energy output for the longest time?

A a nuclear reactor

B a solar panel

C a 1.5 V cell

D a wind generator

14 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.

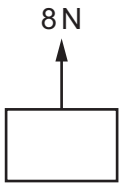
In each diagram, the load moves in the direction of the force shown and takes 10 s to travel 1.0 m.

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

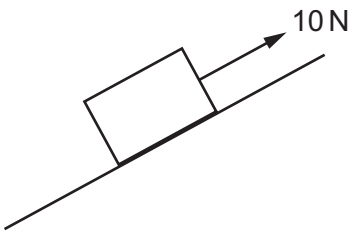
A



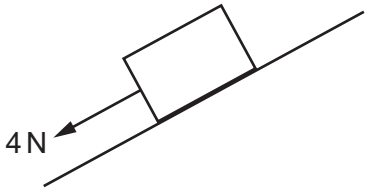
B



C



D



15 The electrical energy supplied to a kettle is 600 kJ.

Of this energy, 45 kJ is transferred to the surroundings and 15 kJ is used to heat the casing of the kettle.

The remaining energy is used to heat the water.

What is the efficiency of the kettle?

A 0.10 **B** 0.90 **C** 0.925 **D** 0.975

16 How is heat energy transferred through the vacuum of space from the Sun to the Moon's surface?

A conduction only

B convection only

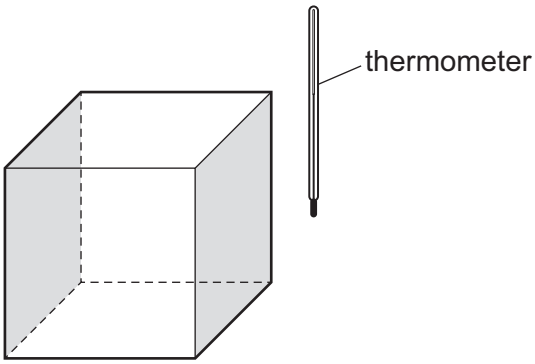
C radiation only

D conduction, convection and radiation

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17 A metal cube contains boiling water.

Each vertical face of the cube is painted a different colour or has a different texture.



Identical thermometers are held at equal distances from each vertical face.

Near which face does a thermometer read the greatest temperature?

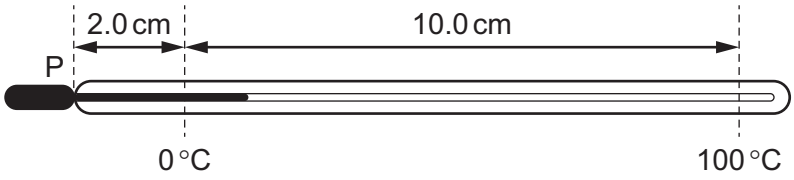
A dull black

B dull white

C shiny black

D shiny white

18 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.

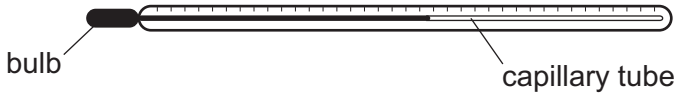


Measuring from P, how long is the liquid column at 30 °C?

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

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19 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.

20 Steam at 110 °C condenses on a surface to form water droplets at 100 °C.

What happens after the steam comes into contact with the surface?

A The molecules slow down and absorb energy from the surroundings.

B The molecules slow down and emit energy to the surroundings.

C The molecules stay at the same speed and absorb energy from the surroundings.

D The molecules stay at the same speed and emit energy to the surroundings.

21 Which list shows the states of matter in order of expansion from smallest to greatest for the same temperature rise?

A gas → liquid → solid

B liquid → solid → gas

C solid → gas → liquid

D solid → liquid → gas

22 Which row describes the boiling and the evaporation of a liquid?

	boiling	evaporation
A	bubbles form throughout the liquid	only occurs at one temperature
B	bubbles form throughout the liquid	produces cooling
C	occurs at any temperature	only occurs at one temperature
D	occurs at any temperature	produces cooling

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23 A hairdryer is used to blow air across the surface of water in a beaker so that the water evaporates.

What increases the rate of evaporation of the water?

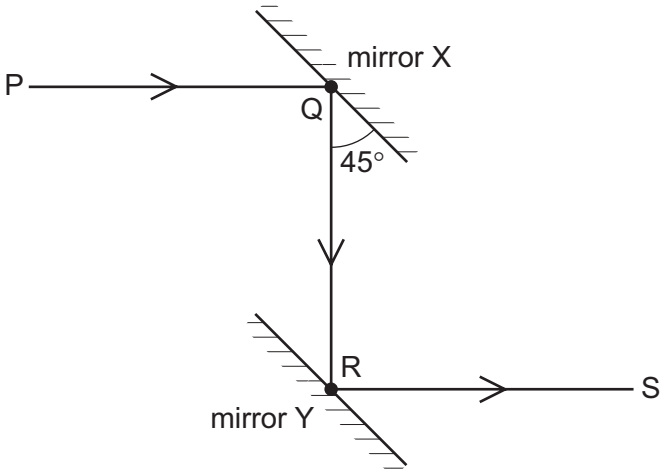
A decreasing the speed of the air from the hairdryer

B decreasing the mass of the water in the beaker

C increasing the surface area of the water by using a wider beaker

D increasing the volume of the water in the beaker

24 The diagram shows a ray PQ reflected by mirror X to a parallel mirror Y. The reflected ray along RS is parallel to PQ.



Which statement is correct?

A The angle between PQ and QR is 45°.

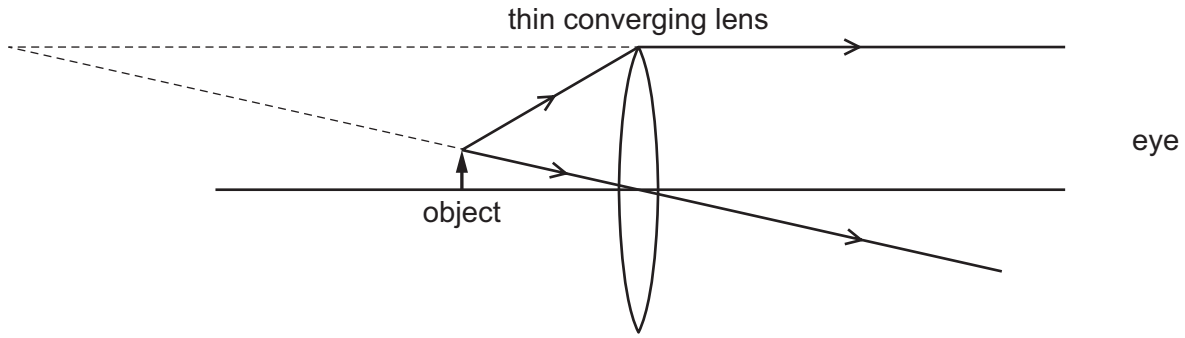
B The angle between QR and RS is 180°.

C The angle of incidence of PQ on mirror X is 60°.

D The angle of incidence of QR on mirror Y is 45°.

25 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.

26 Violet and indigo light have the shortest wavelengths in the spectrum of visible light.

Which three colours, in order of increasing wavelength, immediately follow indigo?

A blue → green → orange

B blue → green → yellow

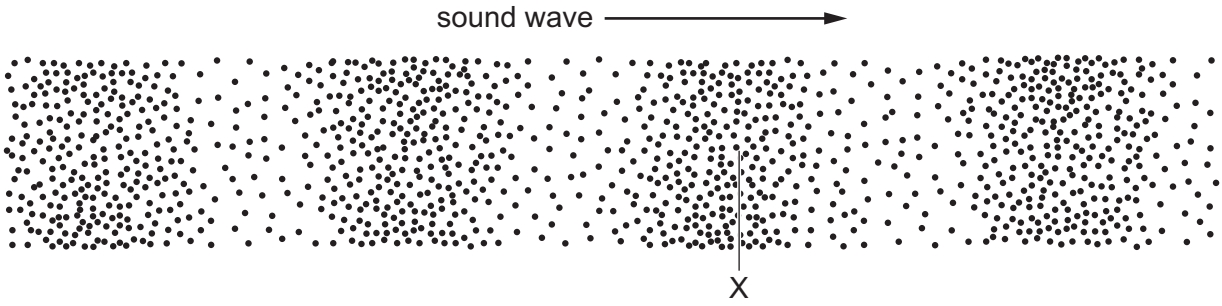
C green → blue → yellow

D yellow → green → orange

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27 A sound wave passes through a substance.

The diagram shows the position of molecules of the substance at one point in time.

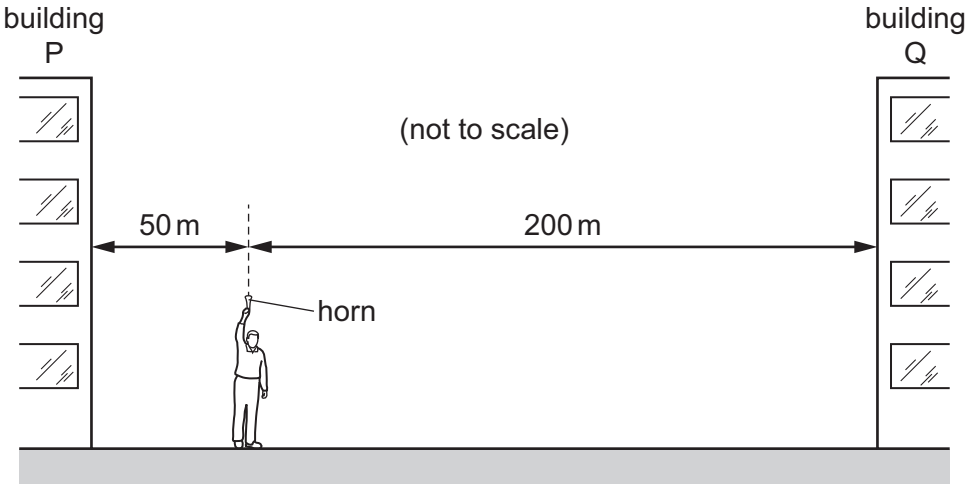


Which type of wave is a sound wave and what is at X?

	type of wave	at X
A	longitudinal	compression
B	longitudinal	rarefaction
C	transverse	compression
D	transverse	rarefaction

28 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

29 What is one of the uses of ultrasound?

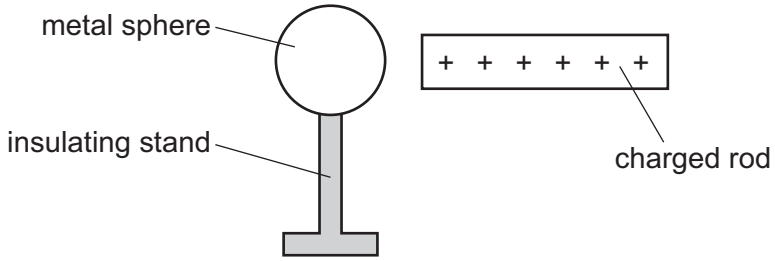
A cleaning jewellery

B fluorescent tubes

C optical fibres

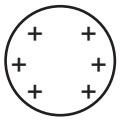
D sunbeds

30 A positively charged rod is held near an uncharged metal sphere on an insulating stand.

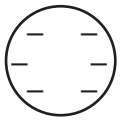


What is the distribution of charge on the sphere?

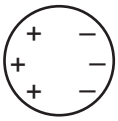
A



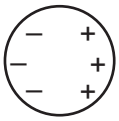
B



C

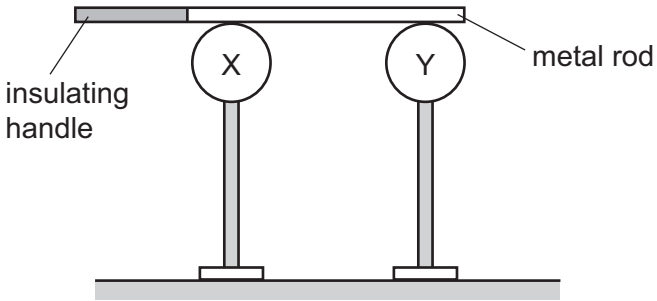


D



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

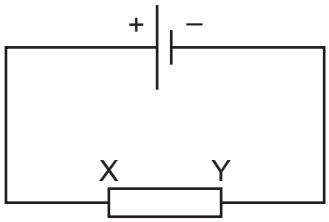
A metal rod, held by an insulating handle, is placed in contact with X and Y as shown.



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

32 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

33 Charge of 0.40 C passes through a resistor in 1.0 s.

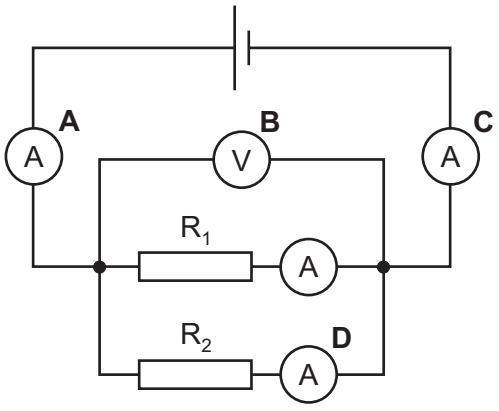
In 2.0 s, 20 J of thermal energy is produced in the resistor.

What is the potential difference across the resistor?

A 0.020 V **B** 0.040 V **C** 25 V **D** 50 V

34 The diagram shows a simple electric circuit.

Which meter measures the current in resistor R_2?



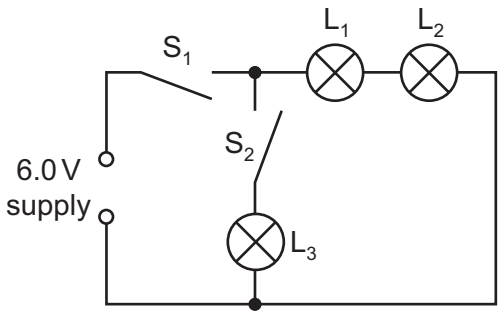
35 When the flash on a camera is used, a charge of 1.5 C flows for 0.0030 s through the flash lamp.

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

36 The diagram shows an electric circuit.



Which lamps light when switch S_1 is closed and S_2 is open?

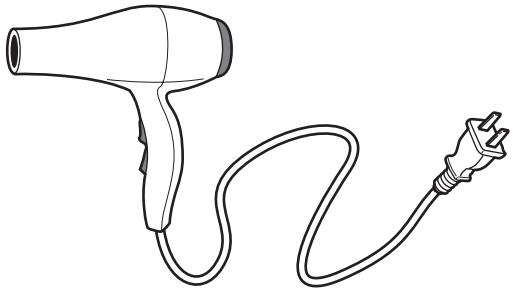
A L_1 only

B L_3 only

C L_1 and L_2 only

D L_1, L_2 and L_3

37 The diagram shows a hairdryer.



Which statement explains why the hairdryer does **not** need an earth wire?

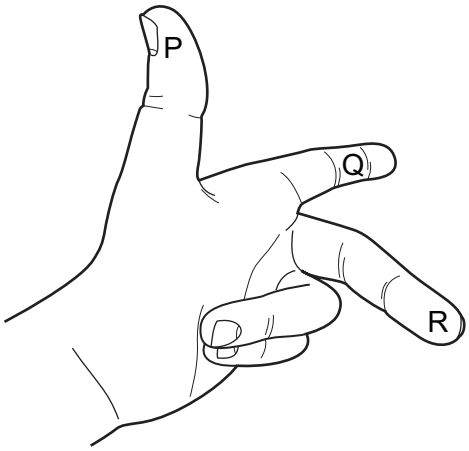
A It has a live wire.

B It has a neutral wire.

C It has double insulation.

D The cable is insulated.

38 A left hand can be used to determine the direction of the force when a current-carrying conductor is perpendicular to a magnetic field.

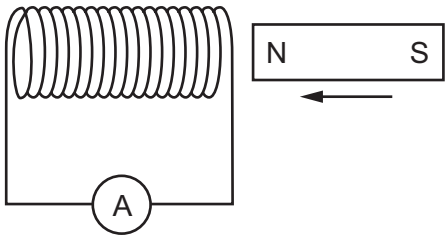


Which quantities are represented by the direction of fingers P, Q and R?

	P	Q	R
A	current	field	force
B	field	force	current
C	force	current	field
D	force	field	current

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39 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

40 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

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