

- 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

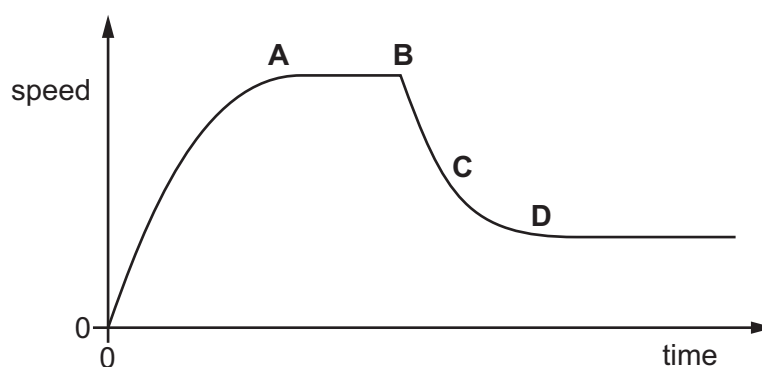
- 2 A length of copper wire is labelled: length 0.50 m and diameter 0.50 mm.

Which instruments are most suitable to measure accurately the length and the diameter of the wire?

|          | length     | diameter   |
|----------|------------|------------|
| <b>A</b> | metre rule | metre rule |
| <b>B</b> | metre rule | micrometer |
| <b>C</b> | calipers   | metre rule |
| <b>D</b> | 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?



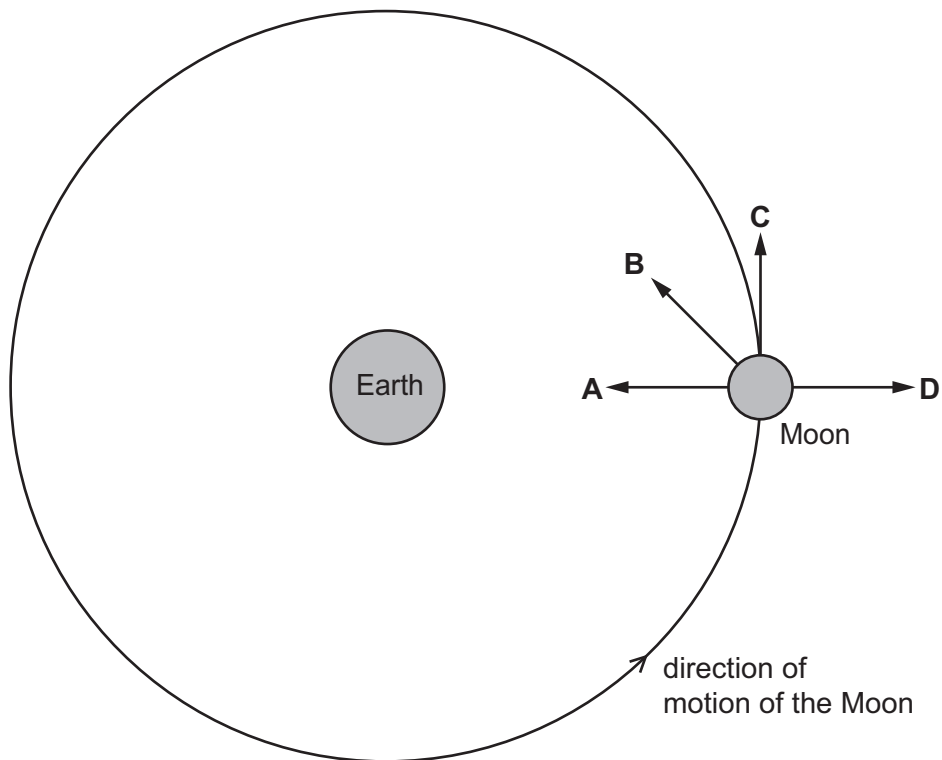
- 4 A 60 kg passenger enters a stationary lift. The gravitational field strength  $g$  is 10 N/kg.

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

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

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

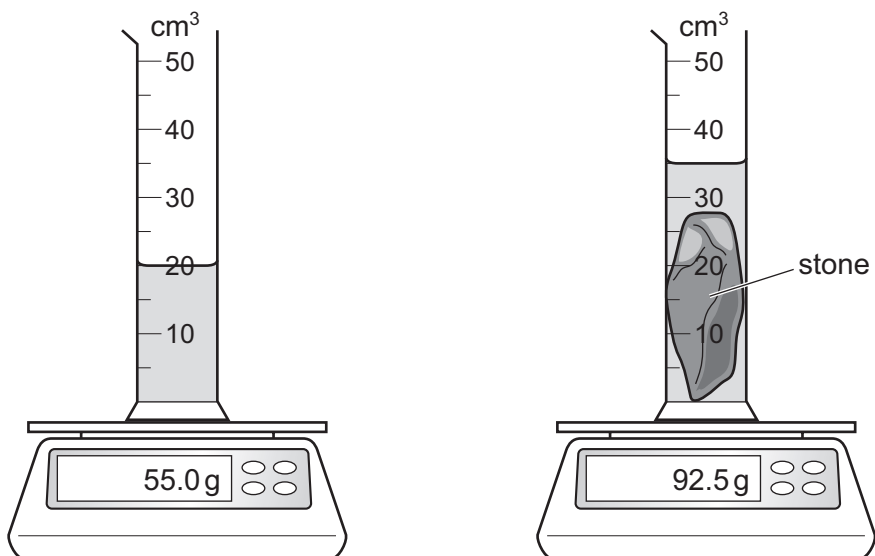
Which arrow represents the direction of the resultant force acting on the Moon at the instant shown?



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

A stone is placed into the water.

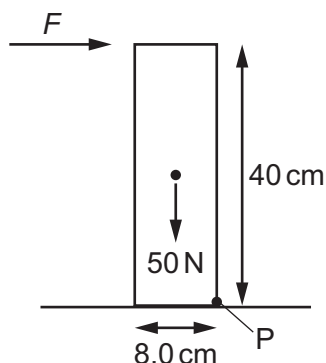
The diagram shows the readings on the balance and on the measuring cylinder.



What is the density of the stone?

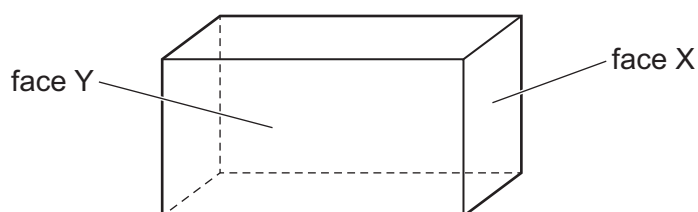
- A**  $1.1 \text{ g/cm}^3$     **B**  $1.5 \text{ g/cm}^3$     **C**  $2.5 \text{ g/cm}^3$     **D**  $2.6 \text{ g/cm}^3$

- 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.

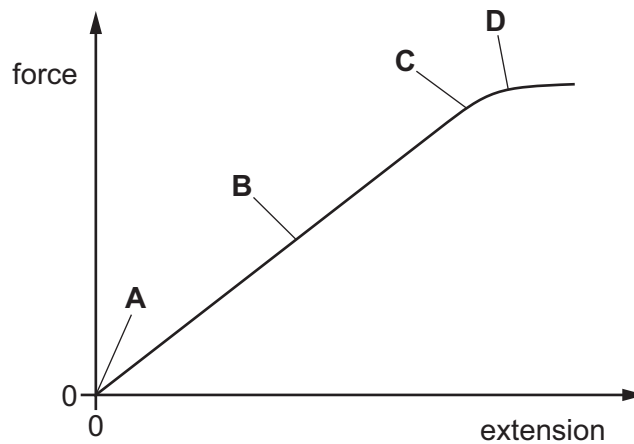


In which arrangement is the centre of mass the lowest?

- 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

- 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.

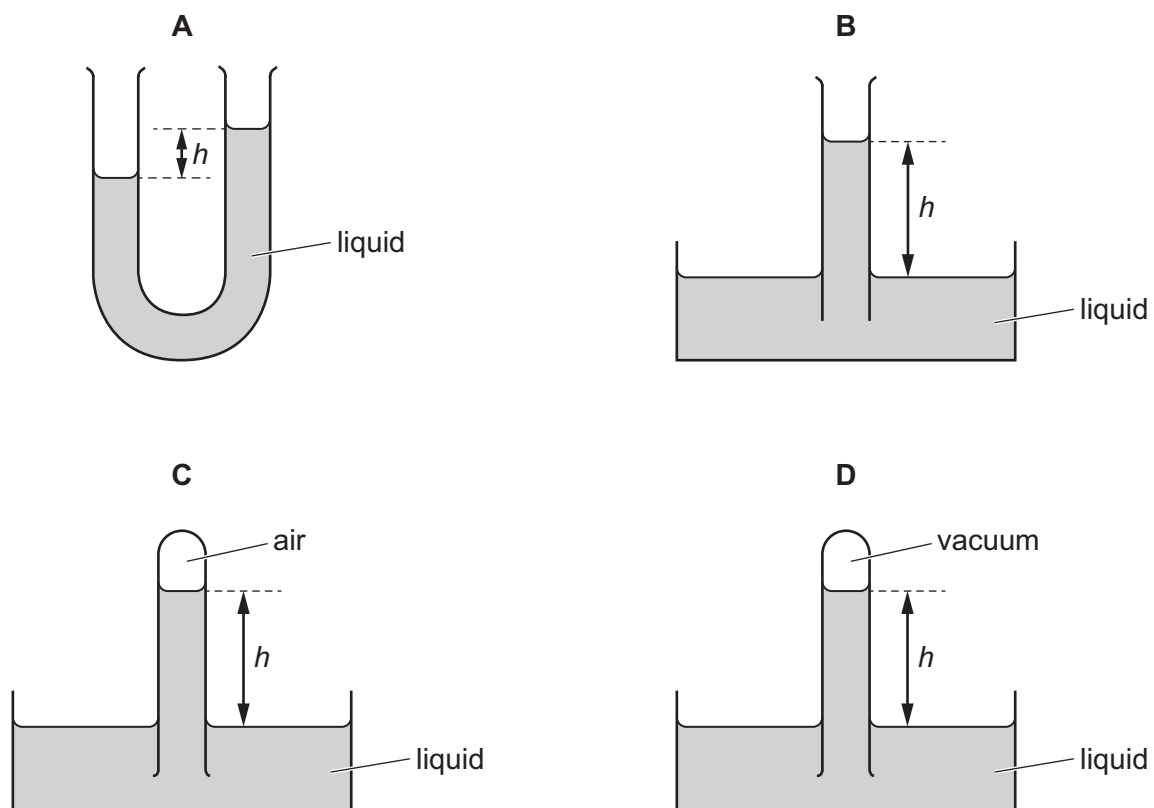
What is the new length of the spring?

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

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

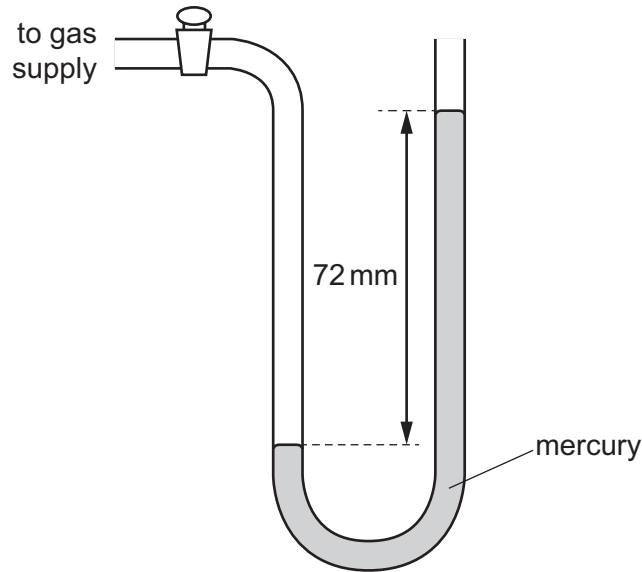
In one type of barometer the height of a liquid in a tube is measured.

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



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

The gravitational field strength  $g$  is  $10\text{ N/kg}$ .



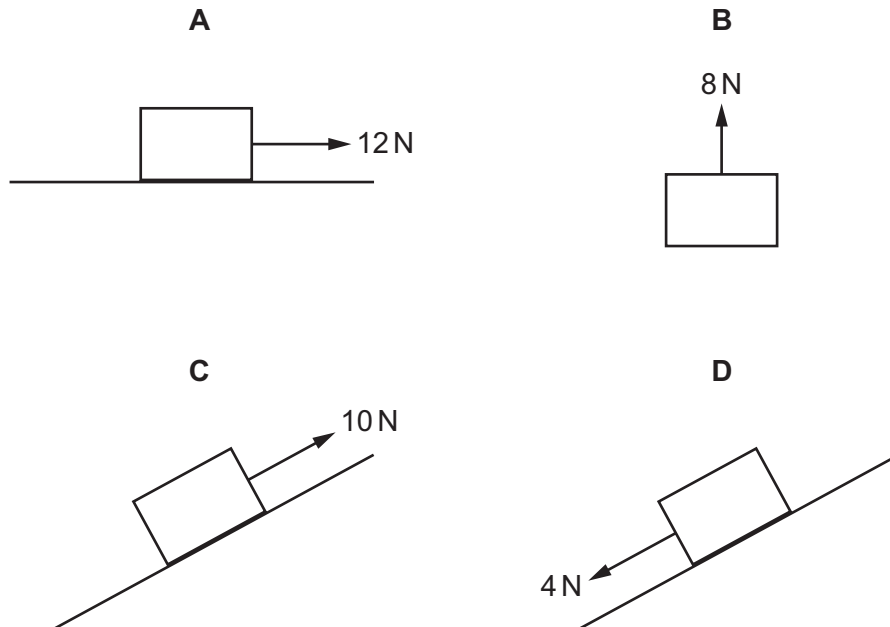
What is the pressure of the gas supply?

- 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?



- 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.

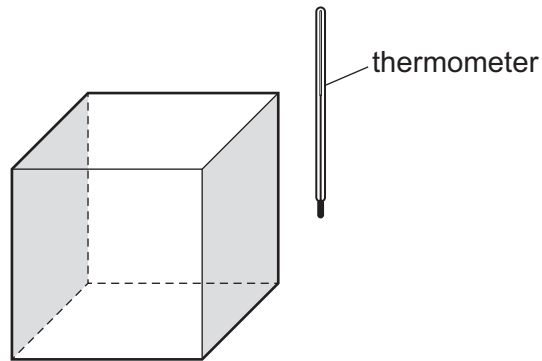
The remaining energy is used to heat the water.

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

- 17 A metal cube contains boiling water.

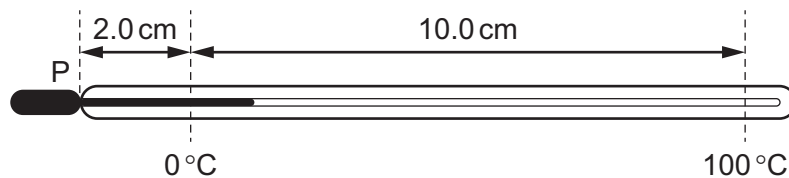
Each vertical face of the cube is painted a different colour or has a different texture.



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  $0^{\circ}\text{C}$ . The column expands by 10.0 cm when heated to  $100^{\circ}\text{C}$ .

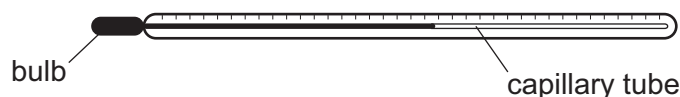


Measuring from P, how long is the liquid column at  $30^{\circ}\text{C}$ ?

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



- 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?

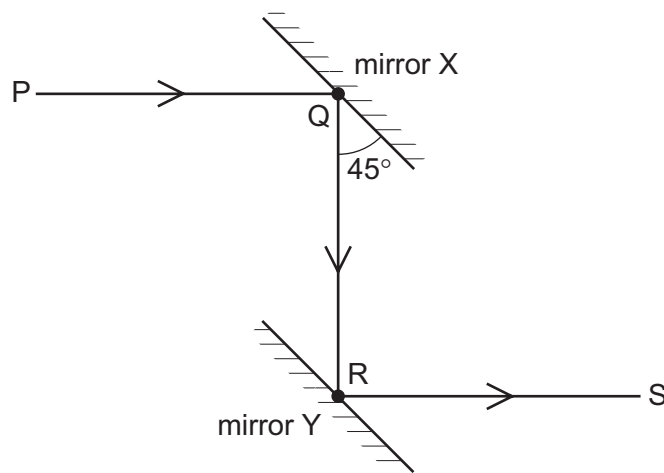
- A It has greater sensitivity and a greater range.
  - B It has greater sensitivity but a smaller range.
  - C It has the same sensitivity and the same range.
  - D It has the same sensitivity but a greater range.
- 20 Steam at  $110^{\circ}\text{C}$  condenses on a surface to form water droplets at  $100^{\circ}\text{C}$ .
- 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  $\rightarrow$  liquid  $\rightarrow$  solid
  - B liquid  $\rightarrow$  solid  $\rightarrow$  gas
  - C solid  $\rightarrow$  gas  $\rightarrow$  liquid
  - D solid  $\rightarrow$  liquid  $\rightarrow$  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               |

- 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.

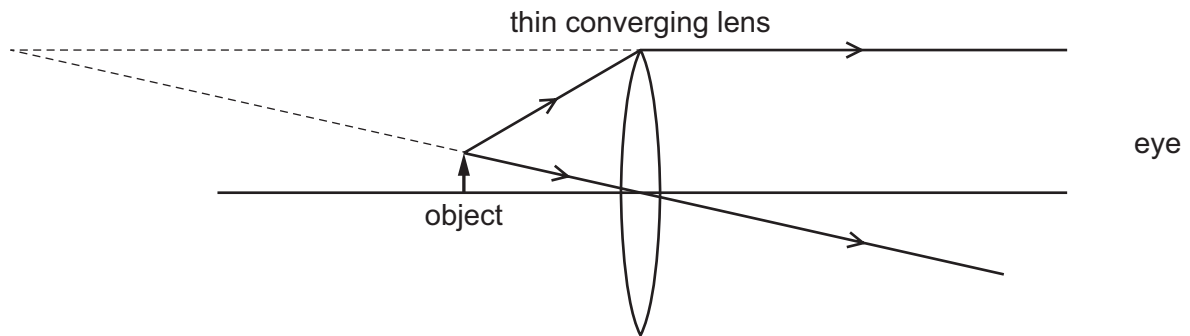


Which statement is correct?

- A** The angle between PQ and QR is  $45^\circ$ .
- B** The angle between QR and RS is  $180^\circ$ .
- C** The angle of incidence of PQ on mirror X is  $60^\circ$ .
- D** The angle of incidence of QR on mirror Y is  $45^\circ$ .

- 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?

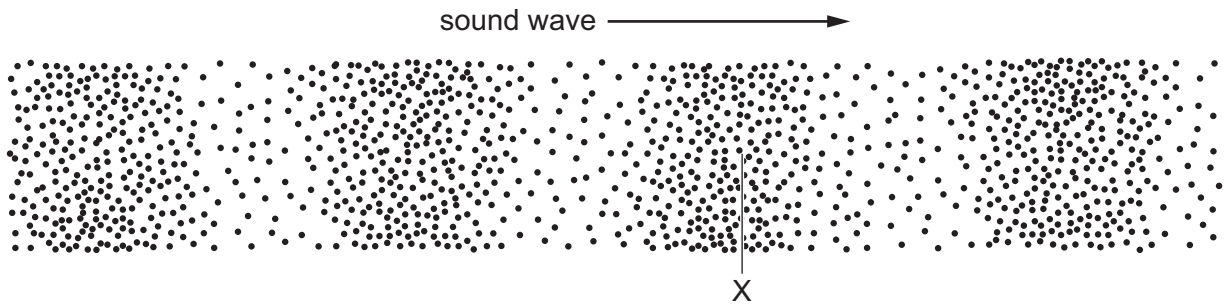
- A** It is larger and inverted.
  - B** It is larger and upright.
  - C** It is smaller and inverted.
  - D** It is smaller and upright.
- 26** Violet and indigo light have the shortest wavelengths in the spectrum of visible light.

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

- 27 A sound wave passes through a substance.

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

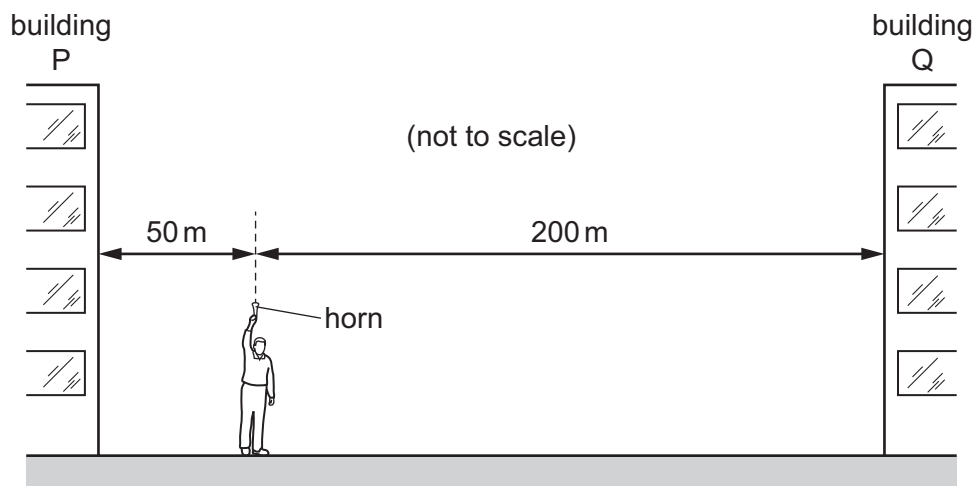


Which type of wave is a sound wave and what is at X?

|          | type of wave | at X        |
|----------|--------------|-------------|
| <b>A</b> | longitudinal | compression |
| <b>B</b> | longitudinal | rarefaction |
| <b>C</b> | transverse   | compression |
| <b>D</b> | 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.

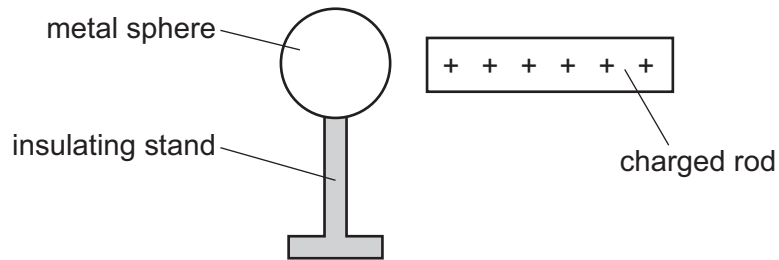
What is the speed of sound calculated using this information?

- 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.

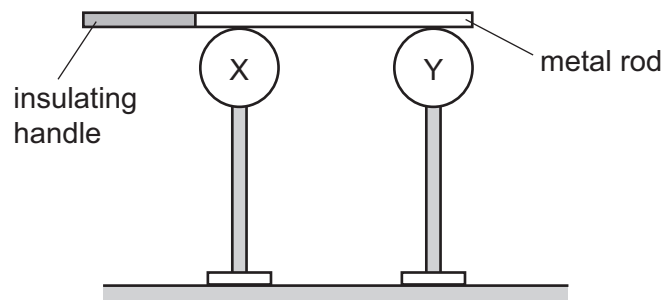


What is the distribution of charge on the sphere?



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

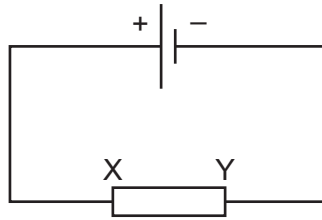
A metal rod, held by an insulating handle, is placed in contact with X and Y as shown.



What are the charges on X and on Y after the rod is placed in contact with them?

|          | charge on X | charge on Y |
|----------|-------------|-------------|
| <b>A</b> | positive    | positive    |
| <b>B</b> | positive    | uncharged   |
| <b>C</b> | uncharged   | positive    |
| <b>D</b> | 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 |
|----------|-----------------------|----------------------------|
| <b>A</b> | negative              | X to Y                     |
| <b>B</b> | negative              | Y to X                     |
| <b>C</b> | positive              | X to Y                     |
| <b>D</b> | positive              | Y to X                     |

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

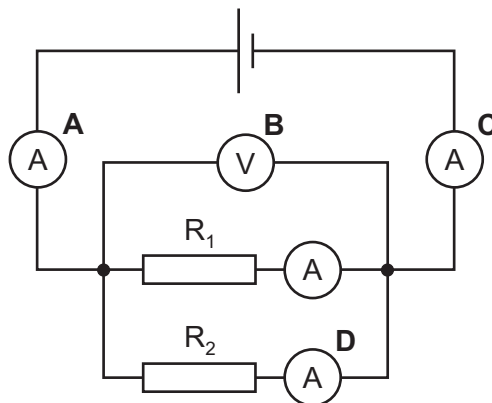
In 2.0 s, 20 J of thermal energy is produced in the resistor.

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  $R_2$ ?



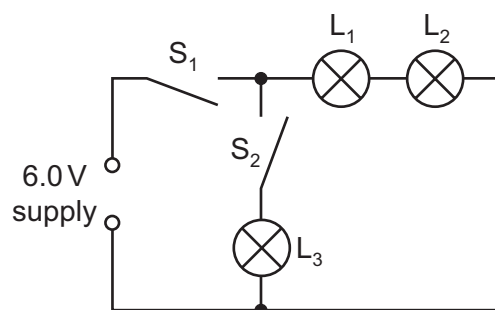
- 35** When the flash on a camera is used, a charge of 1.5 C flows for 0.0030 s through the flash lamp.

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         |
|----------|------------|-------------------|
| <b>A</b> | 2400       | 7.2               |
| <b>B</b> | 2400       | 800 000           |
| <b>C</b> | 5400       | 16.2              |
| <b>D</b> | 5400       | $1.8 \times 10^6$ |

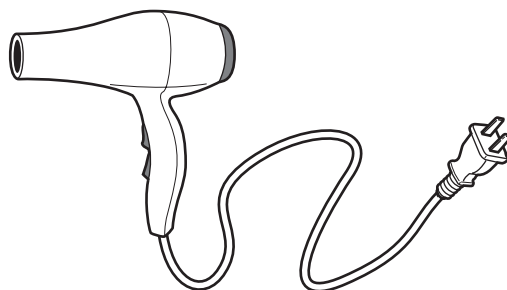
- 36** The diagram shows an electric circuit.



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  $L_3$

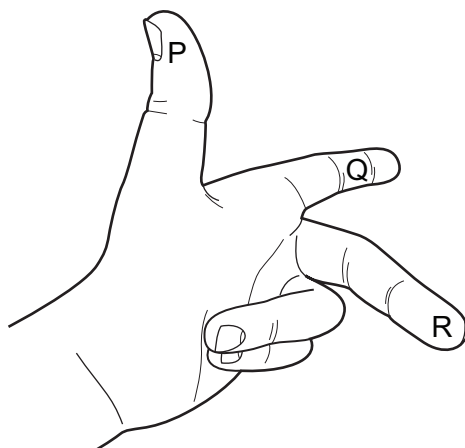
37 The diagram shows a hairdryer.



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.

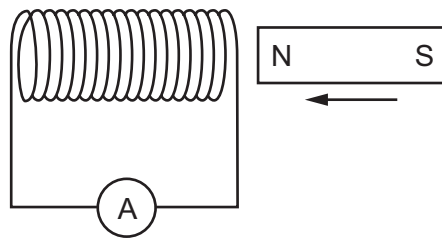


Which quantities are represented by the direction of fingers P, Q and R?

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



- 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 |
|----------|--------------------------|-----------------------|
| <b>A</b> | high                     | high                  |
| <b>B</b> | high                     | low                   |
| <b>C</b> | low                      | high                  |
| <b>D</b> | low                      | low                   |