# FUCHUN SECONDARY SCHOOL
# PRELIMINARY EXAMINATION 2021
# SECONDARY 4 EXPRESS

| Candidate name | |
|---|---|

| Centre number | | | | | |
|---|---|---|---|---|---|

| Index number | | | | |
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| Class: | |
|---|---|

## PHYSICS
Paper 1 Multiple Choice

**6091/01**

**1 September 2021**
**1 hour**

Additional Materials: Multiple Choice Answer Sheet

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**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number, class and index number on the Question Paper and Answer Sheet in the spaces provided unless this has been done for you.

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 Question Paper.
The use of an approved scientific calculator is expected, where appropriate.

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Name of setter: Mdm Rohizan Talib

This document consists of **16** pages and **0** blank page.

**1** An N95 mask is able to remove 95% of particles in the air from passing through it.

What is the average size of these particles?

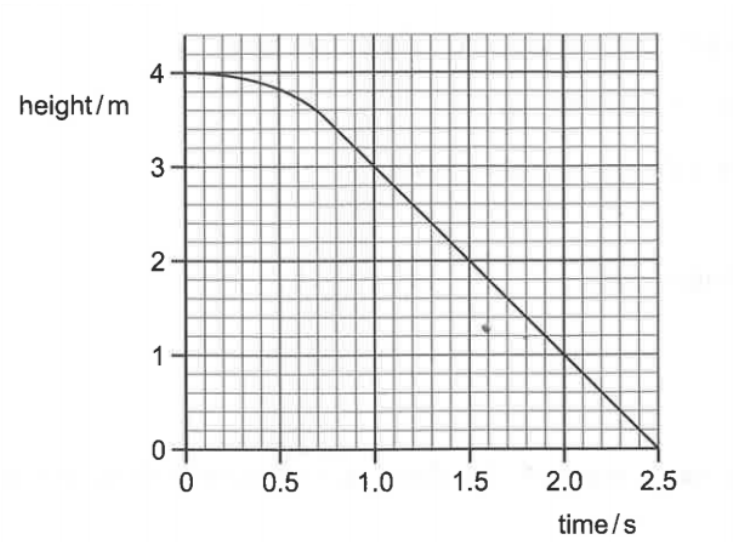
**A** 300 mm **B** 300 μm **C** 300 nm **D** 0.3 nm

**2** A piece of copper pipe has an approximate length of 70 cm and an approximate internal diameter of 1 cm.

Which instruments are most suitable for measuring accurately the internal diameter and the length?

**A** calipers and micrometer
**B** calipers and rule
**C** rule and micrometer
**D** rule and tape

**3** The graph shows how the height of a falling object changes with time.




Which of the following describe the motion of the object in the final 1.5 s?

**A** The speed of the object decreases as it reaches the ground.
**B** The speed of the object increases as it reaches the ground.
**C** The speed of the object remains constant as it reaches the ground.
**D** The acceleration of the object decreases as it reaches the ground.

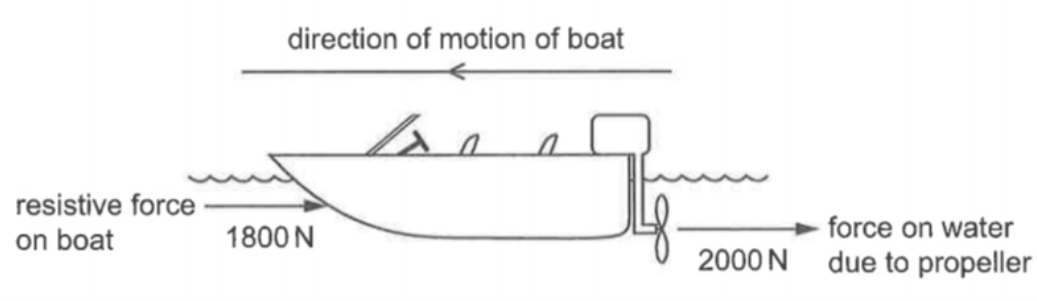
**4** A train travels north at a constant velocity of 20 m/s along a straight, horizontal track.

At time $t$ = 5.0 s, its velocity starts to change and its acceleration is -1.5 m/s$^2$.

How is the train moving at time $t$ = 15.0 s?

**A** travelling north with decreasing speed
**B** travelling north with increasing speed
**C** travelling south with decreasing speed
**D** travelling south with increasing speed

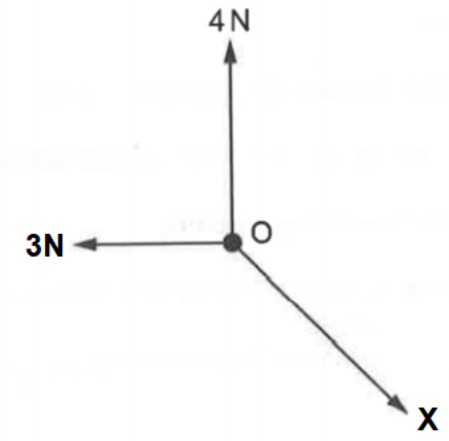
**5** The propeller of a boat pushes water backwards with a force of 2000 N. The boat moves through the water against a total resistive force of a 1800 N.




What is the magnitude of the resultant force on the boat?

**A** 200 N **B** 1800 N **C** 2000 N **D** 3800 N

**6** A stationary object O is acted upon by three forces.



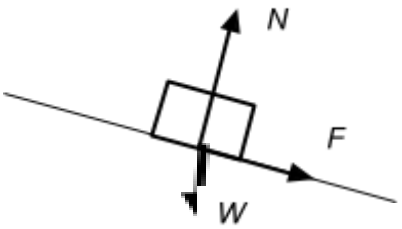

What is the value of force X?

**A** 1 N **B** 3.5 N **C** 5 N **D** 7 N

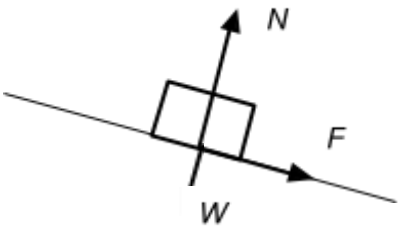
**7** A block of wood is at rest on a sloping ramp. The force acting on the block are the weight *W* of the block, the friction *F* between the block and the ramp and the normal force *N* exerted by the ramp.

Which free-body diagram is correct?

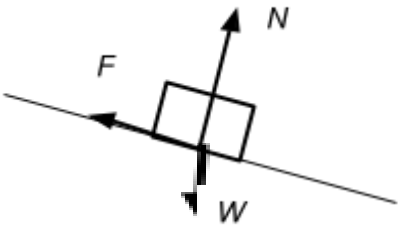
**A**



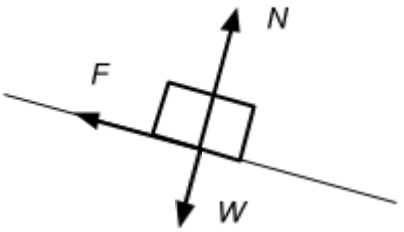

**B**




**C**




**D**




**8** Two glass marbles P and Q are at rest on a frictionless surface.

The same force *F* acts on P and on Q for the same time *t*.

The volume of Q is more than that of P.

Which quantity is the same for both objects?

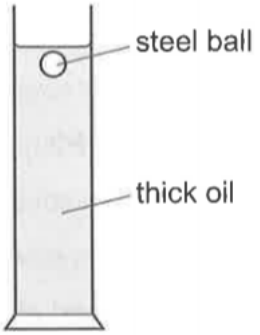
**A** density

**B** kinetic energy gained

**C** mass

**D** weight

**9** A steel ball is released from rest just below the surface of thick oil in a cylinder.

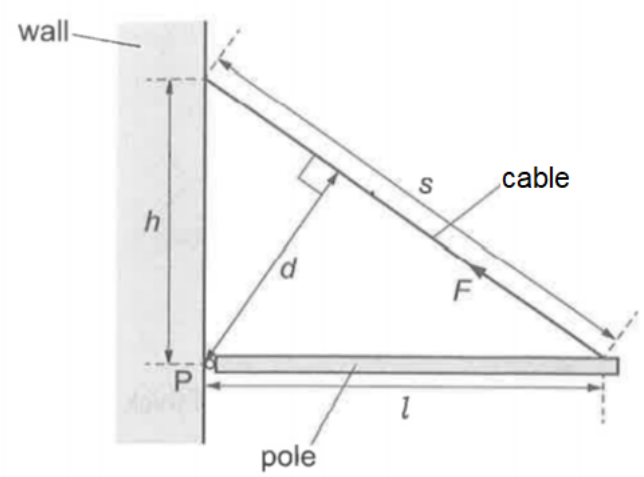



The ball falls with terminal velocity before it reaches the bottom of the cylinder.

What happens to the weight of the ball and the resultant force on the ball as it approaches terminal velocity?

| | weight | resultant force |
|---|---|---|
| **A** | increases | decreases |
| **B** | increases | increases |
| **C** | stays the same | decreases |
| **D** | stays the same | increases |

**10** A horizontal pole is attached to the wall of a building. There is a pivot P at the wall and a cable is connected from the end of the pole to a point higher up the wall.

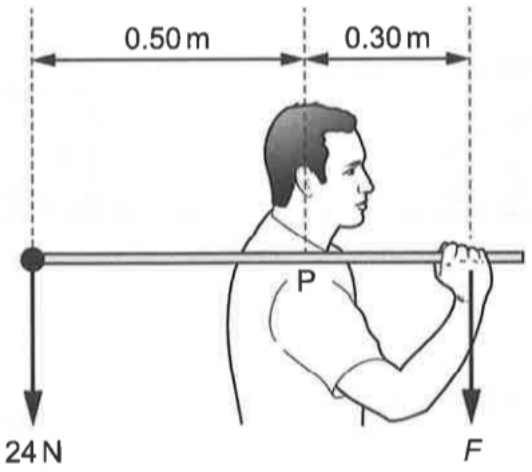



There is a tension force *F* in the cable.

What is the moment of the force *F* about the pivot P?

**A** *F* x *d* **B** *F* x *h* **C** *F* x *l* **D** *F* x *s*

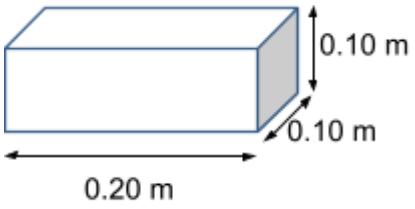
**11** A man is carrying a load on the end of a uniform pole of length 0.90 m of weight 10 N. He rests the pole on his shoulder at point P which acts as a pivot. He keeps the pole in balance with a downward force *F* with his hand, as shown.



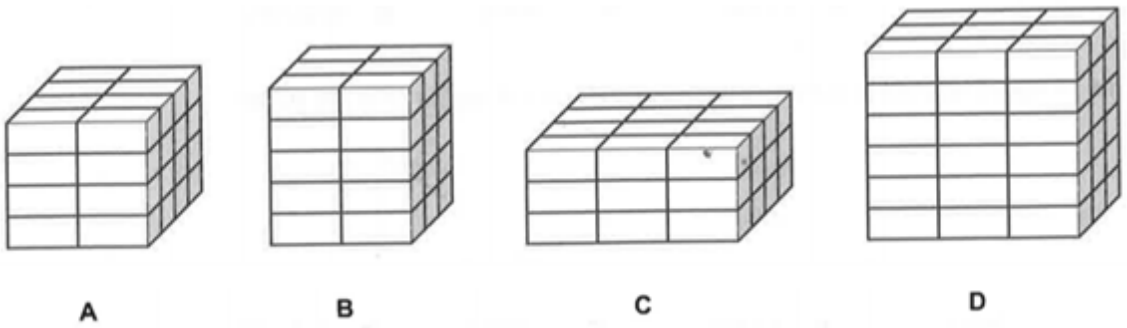

What is the force *F* applied by the man to balance the pole?

**A** 34 N **B** 40 N **C** 42 N **D** 50 N

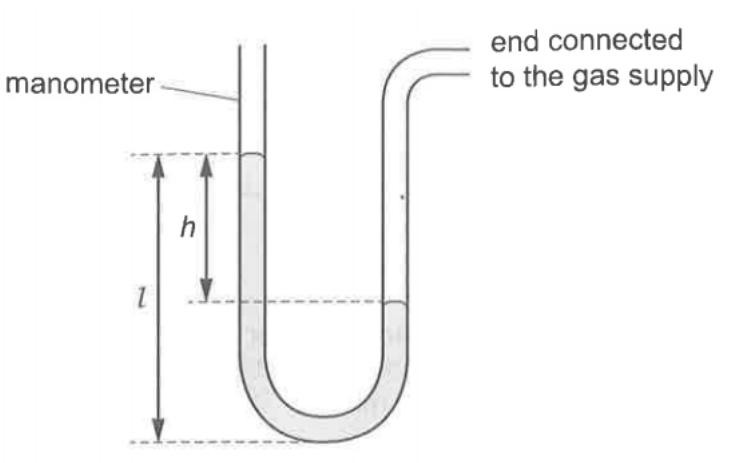
**12** A builder has four piles of bricks. Each brick has a weight of 10 N. The dimension of each brick is as shown.




Which pile of bricks produces a pressure of 2500 Pa on the ground?



**13** The diagram shows the difference in liquid levels in a manometer that is connected to a gas.




Which two quantities need to be known in order to calculate the excess pressure of the gas supply compared to atmospheric pressure?

**A** the height *h* and the density of the gas

**B** the height *h* and the density of the liquid

**C** the length *l* and cross-sectional area of the tube

**D** the length *l* and the density of the liquid

**14** A crane uses a petrol engine to lift a heavy rock.

What is the overall energy conversion in the system when the rock is moving at a steady rate?

**A** chemical potential energy into gravitational potential energy

**B** chemical potential energy into kinetic energy

**C** gravitational potential energy into kinetic energy

**D** kinetic energy into gravitational potential energy

**15** A truck is travelling at a steady speed along an expressway.

The forward force is 4000 N and the power produced is 100 kJ/s.

What is the speed at which the truck is travelling?

**A** 0.4 m/s **B** 4 m/s **C** 2.5 m/s **D** 25 m/s

**16** What happens to molecules of carbon dioxide gas when dry ice is formed?

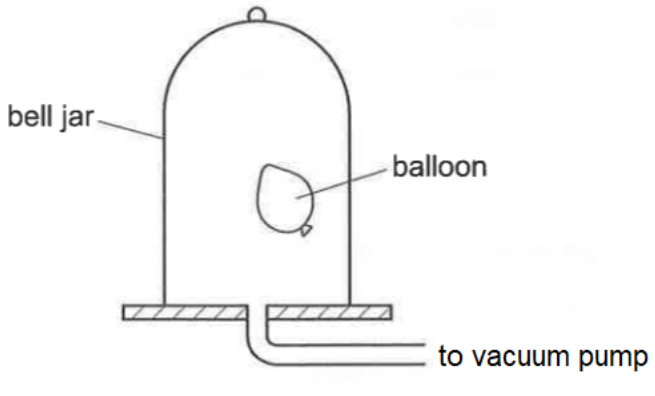
**A** They attract each other more strongly.

**B** They get smaller.

**C** They stop moving.

**D** They expand.

**17** A partially inflated balloon is placed inside a bell jar. The bell jar is connected to a vacuum pump.

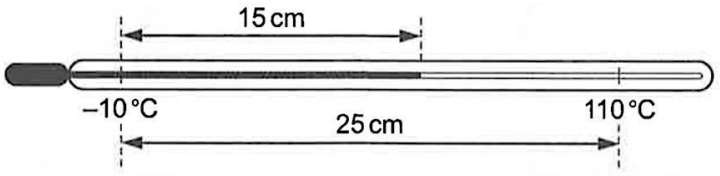



The vacuum pump is switched on and air is pumped out of the bell jar. The pressure in the bell jar is decreased.

What happens to the pressure and to the volume of the gas inside the balloon?

| | pressure | volume |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | increases |
| **C** | increases | decreases |
| **D** | increases | increases |

**18** The diagram shows a mercury-in-glass thermometer. The distance between the – 10 ºC and the 110 ºC markings is 25 cm.




At which temperature is the end of the mercury thread a distance of 15 cm from the – 10 ºC mark?

**A** 50 ºC **B** 60 ºC **C** 62 ºC **D** 82 ºC

**19** The houses in temperate countries have radiator units. The radiator units are switched on during winter.

The radiator units are always placed on the floor in the rooms.

Which statement explains why radiator units are placed on the floor?

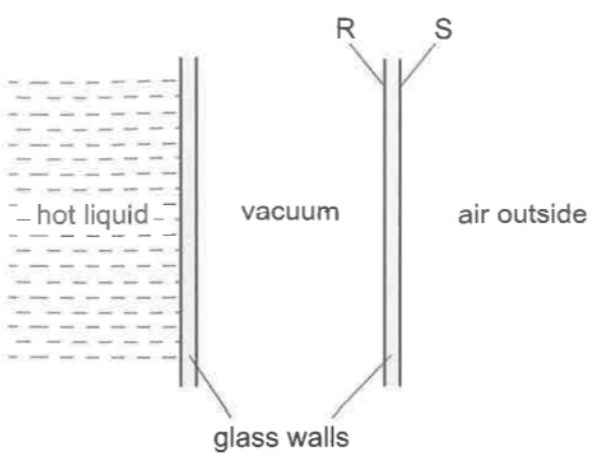
**A** Heated air becomes denser and sinks.

**B** Heated air becomes denser and rises.

**C** Heated air becomes less dense and sinks.

**D** Heated air becomes less dense and rises.

**20** A vacuum flask contains hot liquid. The diagram shows a section of the double wall of a vacuum flask.




What colour for surface R and for surface S most reduces the heat loss from the flask?

| | R | S |
|---|---|---|
| **A** | black | black |
| **B** | black | silver |
| **C** | silver | black |
| **D** | silver | silver |

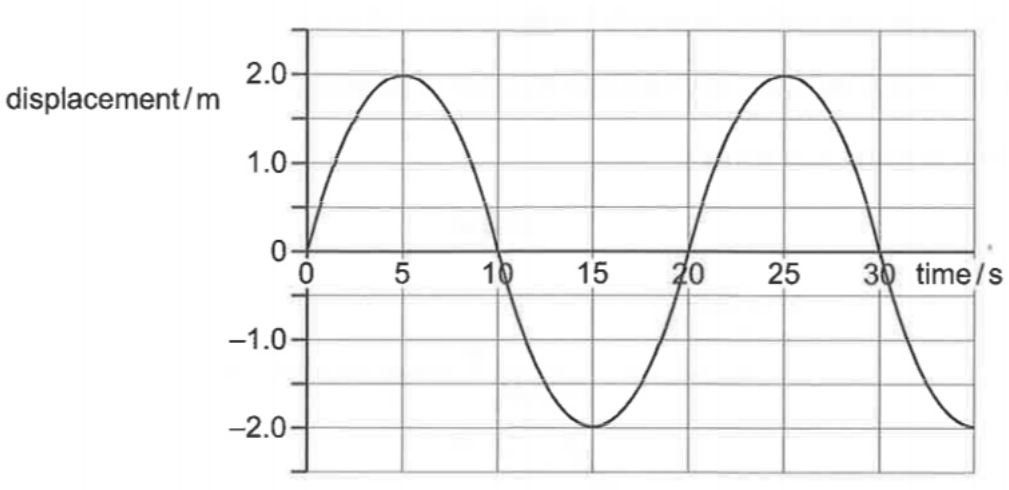
**21** A block of iron of mass 50 g is at a room temperature of 25 $^{0}$C.

Which row describes another block of iron of mass 100 g at the same temperature?

| | specific heat capacity | heat capacity | internal energy |
|---|---|---|---|
| **A** | more | same | more |
| **B** | same | more | more |
| **C** | more | same | same |
| **D** | same | more | same |

**22** A buoy oscillates vertically as a water wave passes.

The graph shows how the displacement of the boat from its equilibrium position varies time




Which characteristics of the wave can be deduced from this graph?

**A** Its amplitude is 2.0 m and its frequency is 0.05 Hz.

**B** Its amplitude is 2.0 m and its wavelength is 20 m.

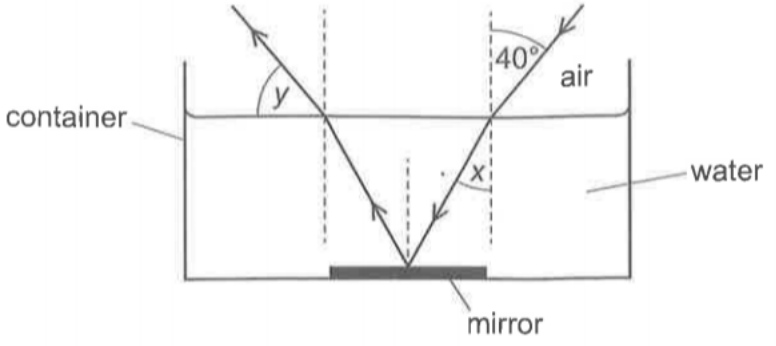
**C** Its amplitude is 2.0 m and its frequency is 20 s.

**D** Its amplitude is 4.0 m and its period is 20 s.

**23** Which row gives an example of a transverse wave and a longitudinal wave?

| | transverse wave | longitudinal wave |
|---|---|---|
| **A** | light | ultrasound |
| **B** | microwaves | radio waves |
| **C** | radio waves | microwaves |
| **D** | ultrasound | light |

**24** The diagram shows a ray of light passing from air into water. The angle of incidence is $40^0$. The ray of light reflects off a mirror that has been placed at the bottom of the container.

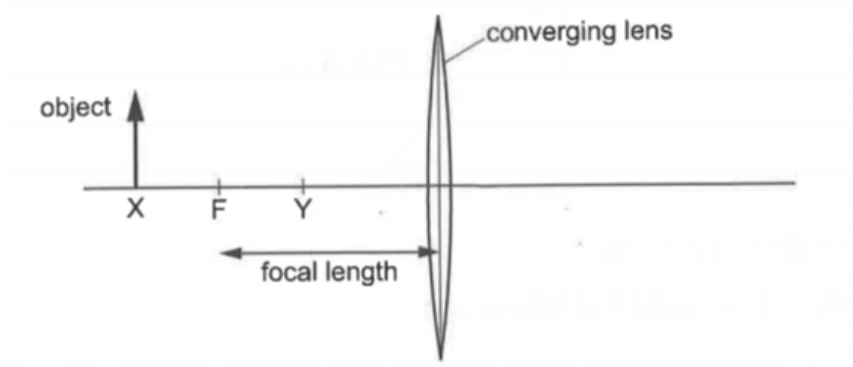



The refractive index of water is 1.33.

What are the angles *x* and *y*?

| | *x* /$^0$ | *y* /$^0$ |
|---|---|---|
| **A** | 29 | 40 |
| **B** | 29 | 50 |
| **C** | 30 | 40 |
| **D** | 30 | 50 |

**25** An object is placed in front of a thin converging lens at position X. The distance between the centre of the lens and point F is the focal length, as shown.




The object is then moved towards the lens from position X to position Y.

Which row describes the images formed with the object placed at position X and at position Y?

| | image with object at X | image with object at Y |
|---|---|---|
| **A** | inverted | inverted |
| **B** | inverted | upright |
| **C** | upright | inverted |
| **D** | upright | upright |

**26** Below are four statements about the uses of electromagnetic radiation.

Gamma rays are used in cancer treatment.
Infra-red waves are used in thermal imaging cameras.
Microwaves are used in satellite TV.
X-rays are used for checking bone fractures.

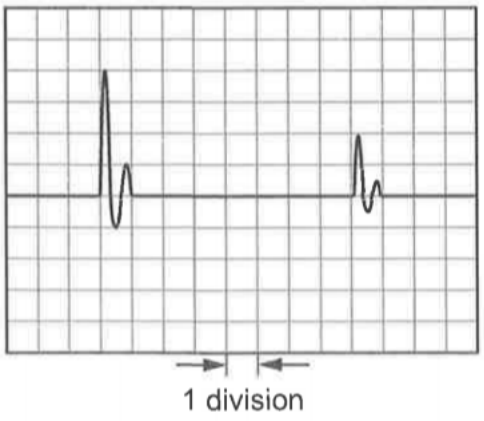
How many of these statements are correct?

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

**27** Fishermen in a fishing boat use SONAR generator to detect presence of a shoal of fish in the sea.

SONAR generator sends out the ultrasound waves into the sea. It is connected to a cathode-ray oscilloscope (c.r.o.) which shows the outgoing sound pulse and the incoming echo from the shoal of fish.

The diagram shows what is seen on the screen of the c.r.o.




Each division on the screen represents 10 ms and the speed of sound in water is 1500m/s.

How far in the water is the shoal of fish from the fishing boat?

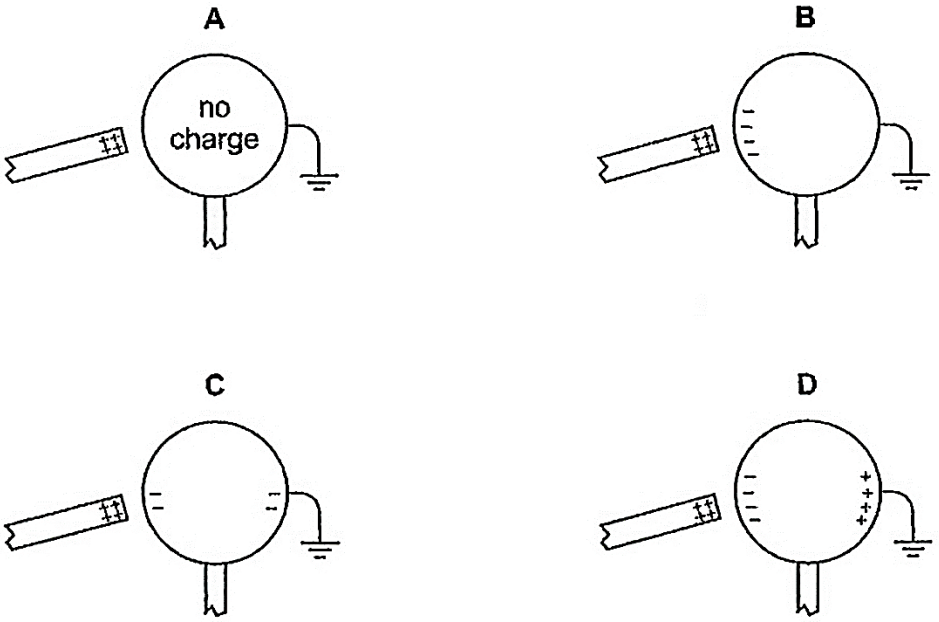
**A** 30 m **B** 60 m **C** 68 m **D** 150 m

**28** Which statement about electric current is correct?

**A** It is the rate of flow of charge and its unit is the ampere.
**B** It is the rate of flow of charge and its unit is the coulomb.
**C** It is the rate of flow of electrons and its unit the ampere
**D** It is the rate of flow of electrons and its unit is the coulomb.

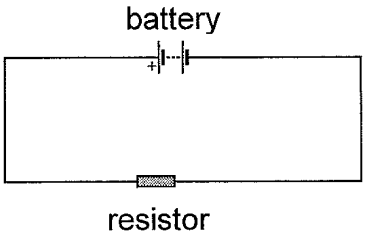
**29** A charged rod is held close to one side of a metal ball and other side is earthed.

Which diagram shows the charge distribution?




**30** 9 J of energy is supplied by a battery when 3 C of charge passes through it.

The battery is connected to a resistor as shown.




Which statement gives the correct value of the electrical quantities based on the information and the circuit diagram provided?

**A** The electromotive force of the battery is 3 V.

**B** The electromotive force of the battery is 27 V.

**C** The current flowing in the circuit is 1 A.

**D** The resistance in the circuit is 3 Ω.

**31** Which unit measures the energy input to an electrical appliance?

**A** ampere

**B** coulomb

**C** joules per hour

**D** kilowatt-hour

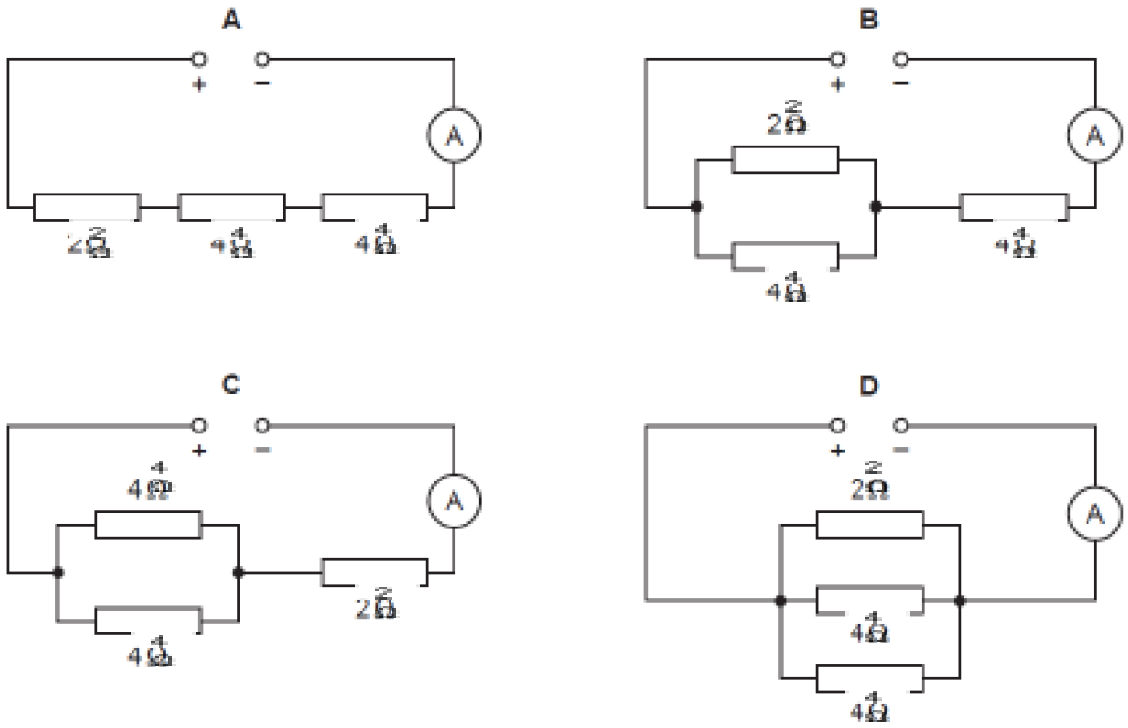
**32** A 3 m long wire with cross-sectional area of 2 $mm^2$ has a resistance of 9 Ω.

What is the resistance of the same type of wire that is 9 m long and has a cross-sectional area of 3 $mm^2$?

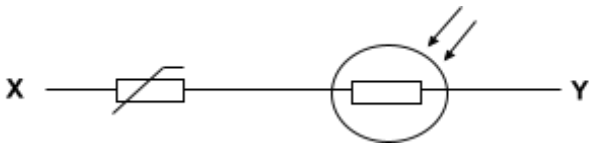
**A** 4.5 Ω **B** 9 Ω **C** 18 Ω **D** 36 Ω

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

Which arrangement of resistors gives the greatest ammeter reading?




**34** The diagram shows a thermistor and a light dependent resistor in series.




Which of the following conditions will make the total resistance between **X** and **Y** the lowest?

| | lighting | temperature |
|---|---|---|
| **A** | bright | cold |
| **B** | bright | hot |
| **C** | dark | cold |
| **D** | dark | hot |

**35** A 100 W light bulb is lit for 1 hour.

How long will it take a 2 kW heater to use the same amount of energy?

**A** 0.05 hours **B** 3 hours **C** 20 hours **D** 180 hours

**36** In which of the following situations will a fuse possibly melt?

1 The live wire touches the metal casing of the appliance.
2 The neutral wire touches the live wire due to damaged insulation in the wires.
3 The fuse is fixed along the neutral wire instead of the live wire.

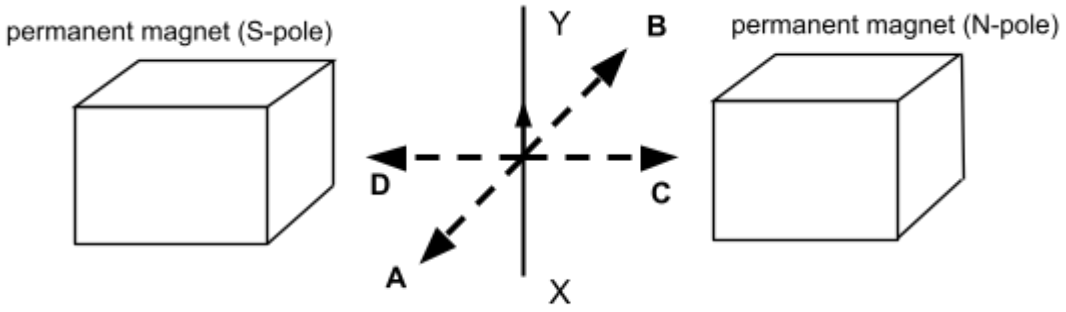
**A** 1 only
**B** 1 and 2 only
**C** 1 and 3 only
**D** 1, 2 and 3

**37** Which statement about magnets is correct?

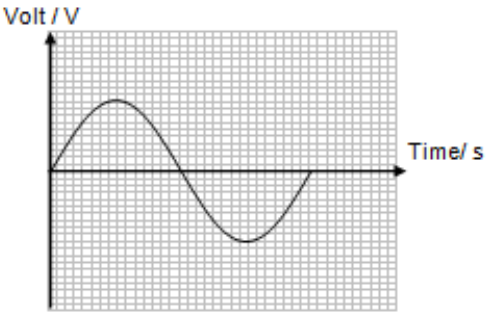
**A** Magnets sometimes have an N-pole without an S-pole.
**B** Temporary magnets are made of steel.
**C** The N-pole of a magnet points towards the Earth's geographic north pole.
**D** There is a force of attraction between two N-poles.

**38** A current flows upwards in a vertical wire XY between two magnetic poles.

Which direction shows the force on XY that is due to the current in the magnetic field?

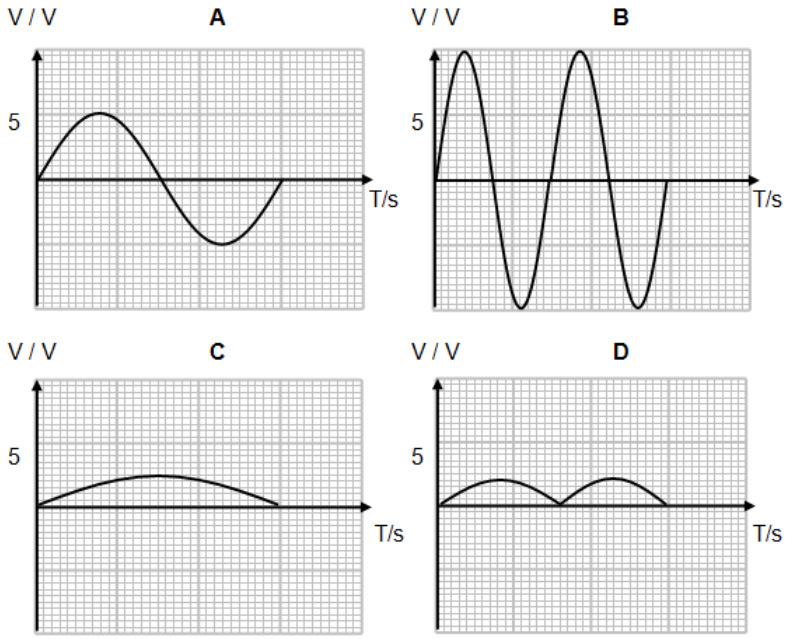


**39** A simple a.c. generator produces a voltage which varies with time as shown.




The speed of rotation of the coil is increased to double the original speed.

Which graph below shows the new output graph after this change?




**40** Electric power cables transmit electric energy over large distances using high-voltage, alternating current, a.c.

What are the advantages of using a high voltage and of using an a.c.?

| | advantage of using high voltage | advantage of using an a.c. |
|---|---|---|
| **A** | high current is produced in the cables | the resistance of the cables is reduced |
| **B** | high current is produced in the cables | the voltage can be changed using a transformer |
| **C** | less energy is wasted in the cables | the resistance of the cables is reduced |
| **D** | less energy is wasted in the cables | the voltage can be changed using a transformer |

**– End of Paper 1 –**