Name: _____ (  )  Class : Sec 4 / (  )

南 华 中 学

# NAN HUA HIGH SCHOOL

## PRELIMINARY EXAMINATION 2024

**Subject : Physics**

**Paper : 6091/1**

**Level : Secondary Four**

**Date : 28 August 2024**

**Duration : 1 hour**

**Additional Materials:** Multiple Choice Answer Sheet

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and index number on the separate Answer Sheet in the spaces provided.

There are **forty** questions in 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.

**INFORMATION FOR CANDIDATES**

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.

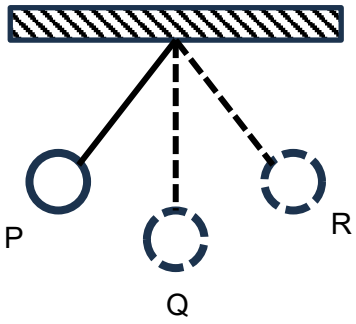
The use of an approved scientific calculator is expected, where appropriate.

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

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**1** The diagram shows a simple pendulum




Using a stopwatch, which would be the most accurate way to measure the period of the pendulum?

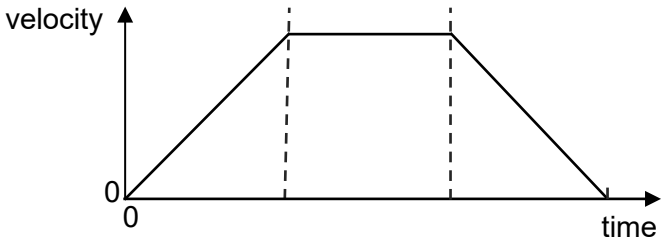
**A** time the motion from P to Q to R and back P

**B** time the motion from P to Q to R and back to P again for 20 cycles and multiply by 20

**C** time the motion from P to Q to R and back to P again for 20 cycles and divide by 20

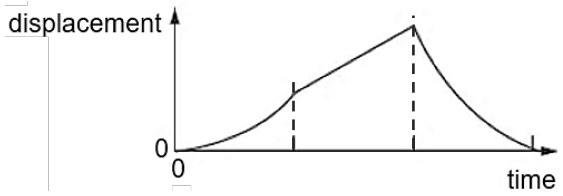
**D** time the motion from P to Q and multiply by 4

**2** The diagram shows the graph of velocity against time for an object moving in a straight line.

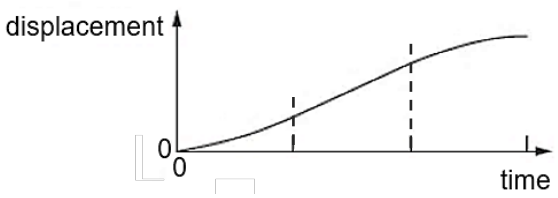



Which of the following is the corresponding graph of displacement against time?

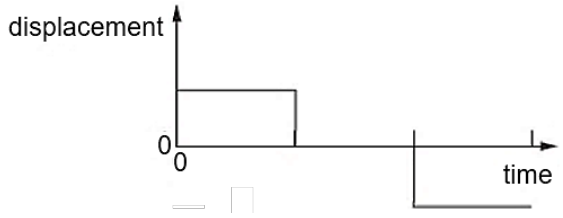
**A**



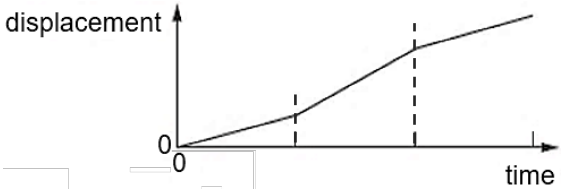

**B**




**C**




**D**

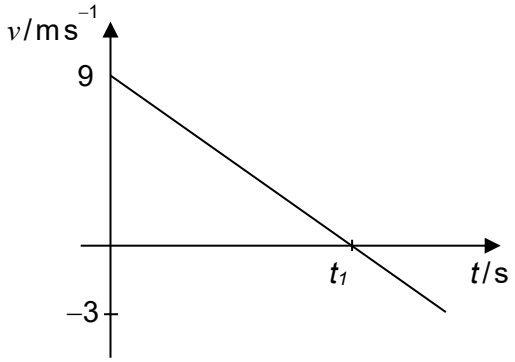





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**3** A sandbag is projected vertically upwards.

The diagram shows how its velocity $v$ changes with time $t$. The upward direction is taken as positive.




Which of the following statement is correct?

**A** the time $t_1$ is 0.90 s

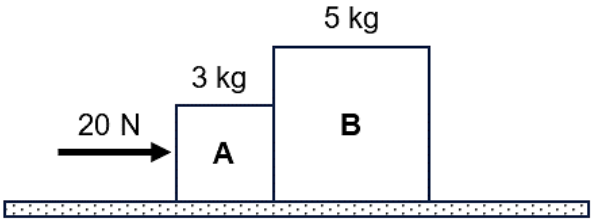
**B** the displacement of the sandbag at $t = t_1$ is 8.1 m

**C** the acceleration of the sandbag at $t = t_1$ is 0 m s$^{-2}$

**D** the velocity of the sandbag is decreasing at a decreasing rate

**4** Two blocks A and B are placed side by side on a smooth horizontal ground.

A horizontal force of 20 N is applied on block A as shown in the diagram. Blocks A and B have mass of 3 kg and 5 kg respectively.




Which following statement is correct?

**A** The force exerted on A by B is smaller than the force exerted on B by A.

**B** The force exerted on A by B is the same as the force exerted on B by A.

**C** The force exerted on A by B is larger than the force exerted on B by A.

**D** The acceleration of block B is 4 m s$^{-2}$.



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**5** A mechanical frog jumps vertically upwards on Moon with same initial speed as it did on the Earth.

Acceleration due to gravity on Moon is approximately one-six of that on Earth.

Which following statement is correct?

**A** The mechanical frog will take a longer time to reach the top and a longer time to come down as compared to jumping on the Earth.

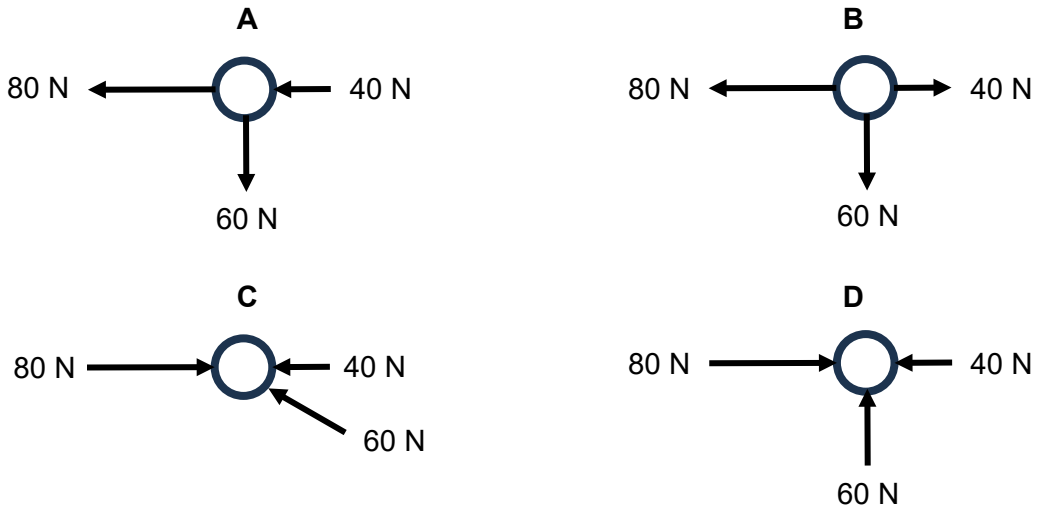
**B** The mechanical frog will take a longer time to reach the top and a shorter time to come down as compared to jumping on the Earth.

**C** The mechanical frog will take a shorter time to reach the top and a longer time to come down as compared to jumping on the Earth.

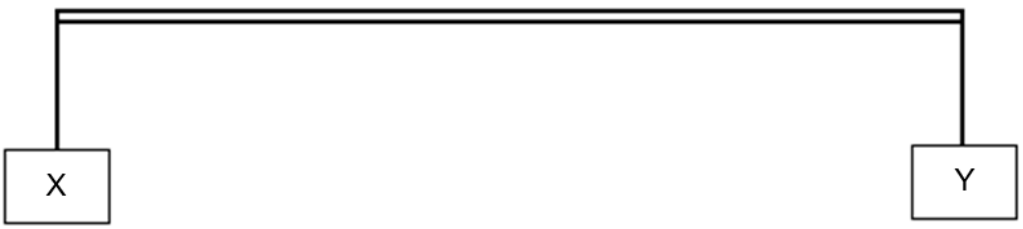
**D** The mechanical frog will take a shorter time to reach the top and a shorter time to come down as compared to jumping on the Earth.

**6** Three forces act on an object in different directions.

Which diagram shows the largest resultant force?




**7** Two weights, X and Y are hung on the two ends of a light half-meter rule. The weight of X is twice that of Y.




How far from X should the rule be pivoted in order to balance the rule?

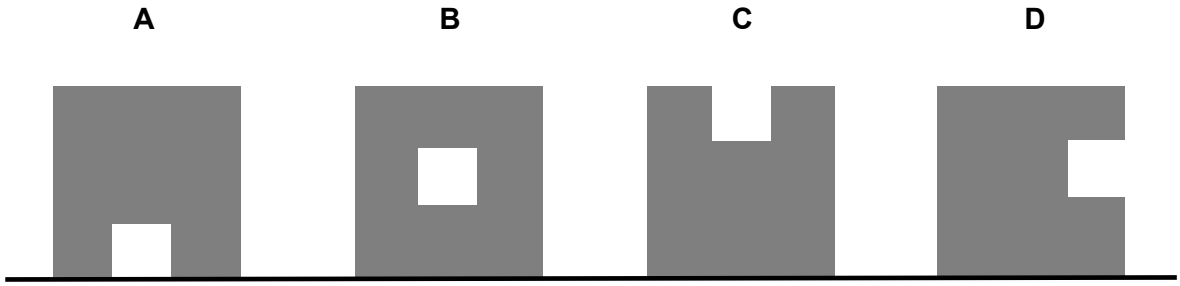
**A** 16.7 cm **B** 33.3 cm **C** 25.0 cm **D** 66.7 cm



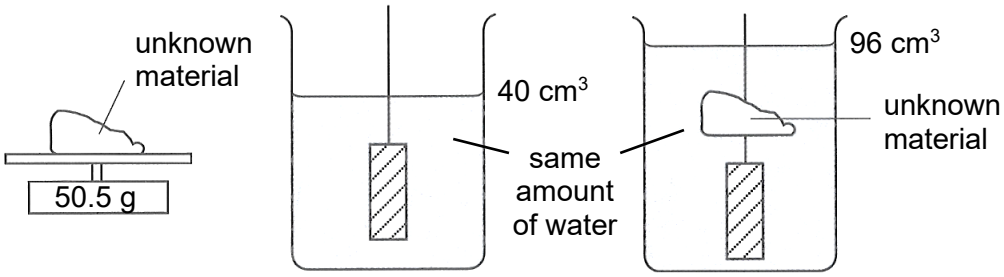
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**8** The diagrams show the cross-sections of four solid objects with similar mass.

Which object is the most stable?



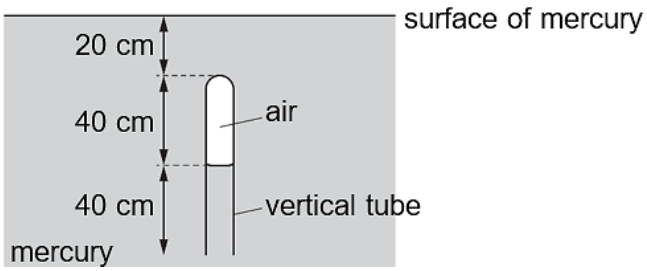

**9** The results obtained in an experiment to determine the density of an unknown material are illustrated in the diagram.




What is the density of the unknown material?

**A** 90 kg/m$^3$ **B** 530 kg/m$^3$ **C** 900 kg/m$^3$ **D** 1300 kg/m$^3$

**10** A vertical tube, closed at one end, is fully submerged in mercury (Hg). A column of air is trapped inside the tube.




Atmospheric pressure is 76 cm Hg.

What is the difference between the pressure of air in the tube and the atmospheric pressure?

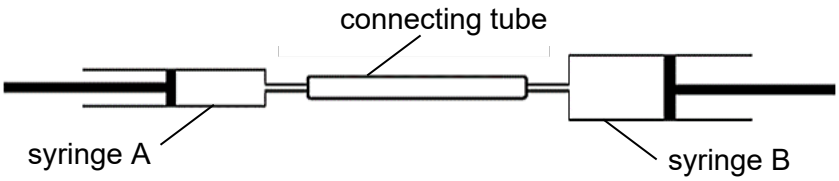
**A** 20 cm Hg **B** 60 cm Hg **C** 96 cm Hg **D** 136 cm Hg



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**11** In the diagram, Syringe A is connected to Syringe B through a connecting tube. Both syringes are filled with water.

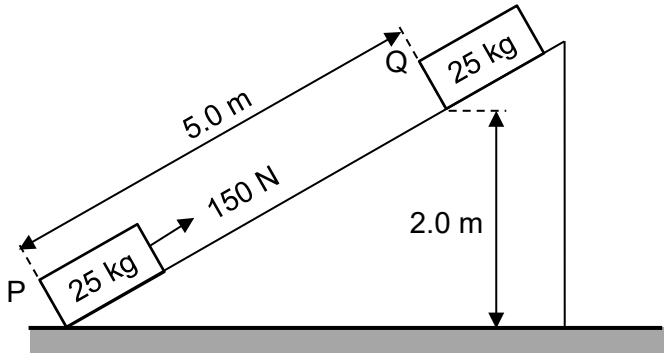
The radius of the piston in syringe B is twice the radius of the piston in syringe A. A force *F* is applied on the piston in syringe A.




What is the force experienced by the piston in syringe B?

**A** 0.25 *F* **B** *F* **C** 2 *F* **D** 4 *F*

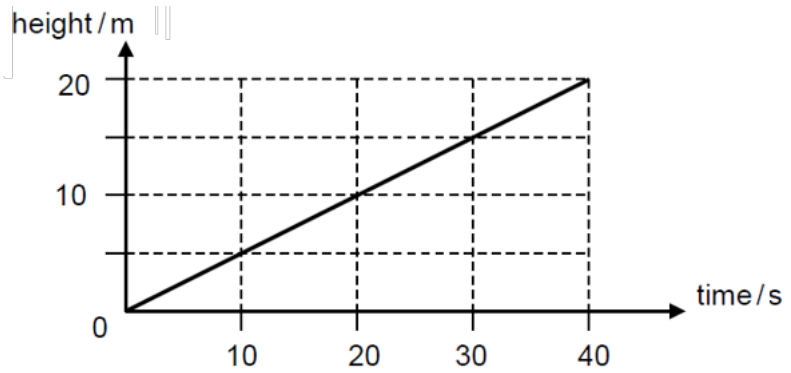
**12** Work is done when a force of 150 N pulls a box of mass 25 kg at constant speed along a rough ramp from P to Q, as shown. Gravitational field strength $g$ = 10 N/kg.




What is the work done against friction?

**A** 0 J **B** 250 J **C** 500 J **D** 750 J

**13** The graph shows how the vertical height through which a winch raises a mass of 10 kg varies with time.




What is the power output of the winch?

**A** 5.0 W **B** 20 W **C** 50 W **D** 200 W



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**14** Which of the following statements about Brownian motion is correct?

**A** In a Brownian motion experiment, the air particles can be observed to move in an irregular, unpredictable fashion.

**B** In a Brownian motion experiment, the smoke particles in air will slow down if the air temperature decreases.

**C** In a Brownian motion experiment, the air particles can be observed to move faster if the temperature increases.

**D** It strictly applies to gases only.

**15** A cold solid is placed on top of a hot solid. Thermal energy is transferred from the hot solid to the cold one.

What is the explanation for this?

**A** A hot solid expands, so its particles will move further apart.

**B** Energy is transferred from one particle to the next.

**C** Heat always rises.

**D** Molecules are free to move randomly through the solids.

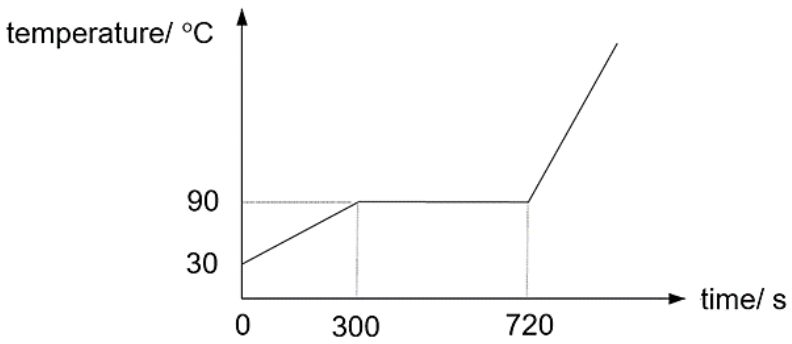
**16** A bullet was fired into a copper block of 2.0 kg at an initial temperature of 28.0 °C. The bullet has a mass of 5.0 g and penetrates the copper block at 400 m/s.

The specific heat capacity of copper is 400 J/(kg K). Assume that all heat generated in the process is absorbed by the copper block.

What is the final temperature of the copper block?

**A** 28.5 °C **B** 33.0 °C **C** 78.0 °C **D** 528.0 °C

**17** The diagram shows a graph of temperature against time when 0.50 kg of salt is being heated.




If heat energy is supplied to the salt at a rate of 100 W, what is the specific latent heat of fusion of the salt?

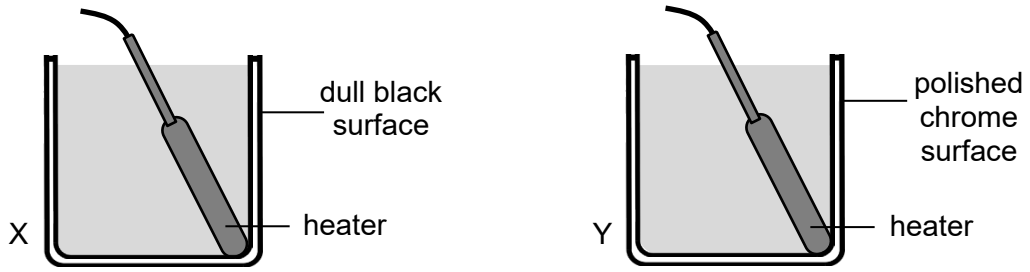
**A** $1.4 \times 10^3$ J kg$^{-1}$ **B** $2.1 \times 10^4$ J kg$^{-1}$

**C** $8.4 \times 10^4$ J kg$^{-1}$ **D** $1.4 \times 10^5$ J kg$^{-1}$



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**18** The diagram shows two copper cans, X and Y, with outer surface of different texture filled with the same amount of water at room temperature and heated by heaters of same power.




Which of the following statements is correct?

**A** Water in X boils faster because dull black surface is a good absorber.

**B** Water in X boils faster because dull black surface is a good emitter.

**C** Water in both cans take same length of time to boil because texture of outer surface will not affect the rate of energy absorbed by the water.

**D** Water in Y boils faster because polished chrome surface is a poor radiator.

**19** Water in a beaker is heated from 10 °C to 100 °C. The water starts boiling at 100 °C.

Which of the following is true for the energy in the internal potential store (IPE) and the internal kinetic store (IKE) of the water molecules during heating and boiling?

| | heating from 10 °C to 100 °C | boiling at 100 °C |
|---|---|---|
| **A** | IKE increases slightly | IKE increases by a lot |
| **B** | IKE remains the same | IKE remains the same |
| **C** | IPE increases slightly | IPE increases by a lot |
| **D** | IPE remains the same | IPE remains the same |

**20** Which range of sound frequencies includes **only** frequencies of sound that can be heard by a healthy human ear?

**A** 0.5 Hz – 50 Hz

**B** 5 Hz – 500 Hz

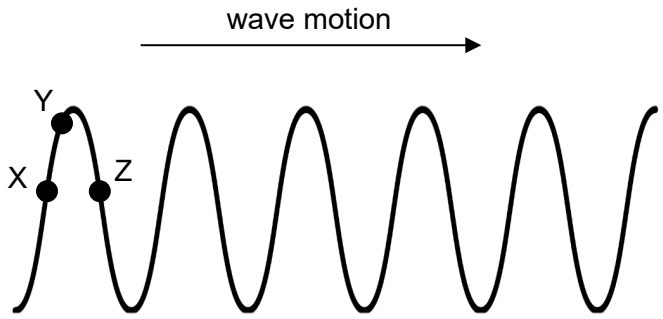
**C** 50 Hz – 5000 Hz

**D** 500 Hz – 50 kHz

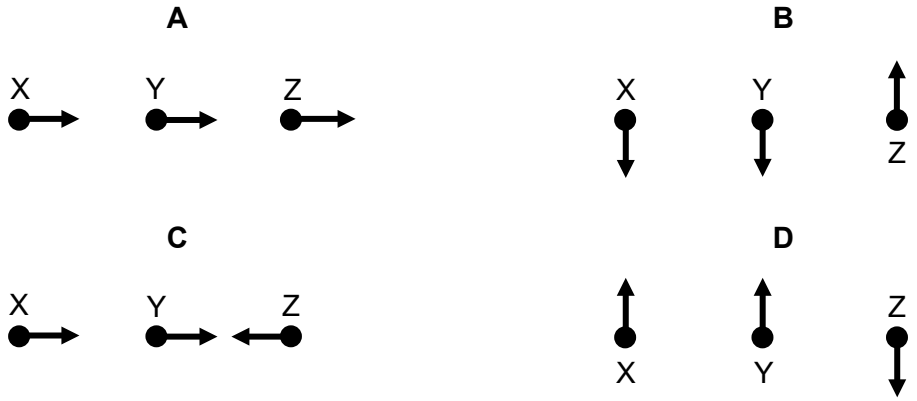


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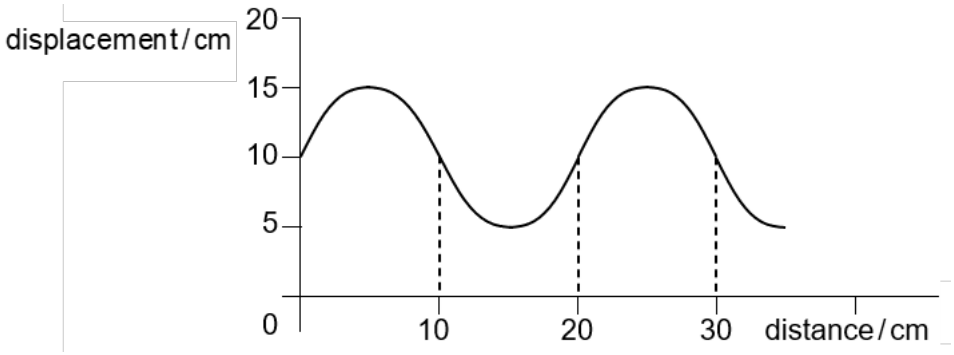
**21** A transverse wave moves along a rope in the direction shown in the diagram.




Which of the following shows the directions of movement of the particles X, Y and Z at the instant?




**22** The diagram shows the displacement-distance graph of a transverse wave.




What is the amplitude and wavelength of the wave?

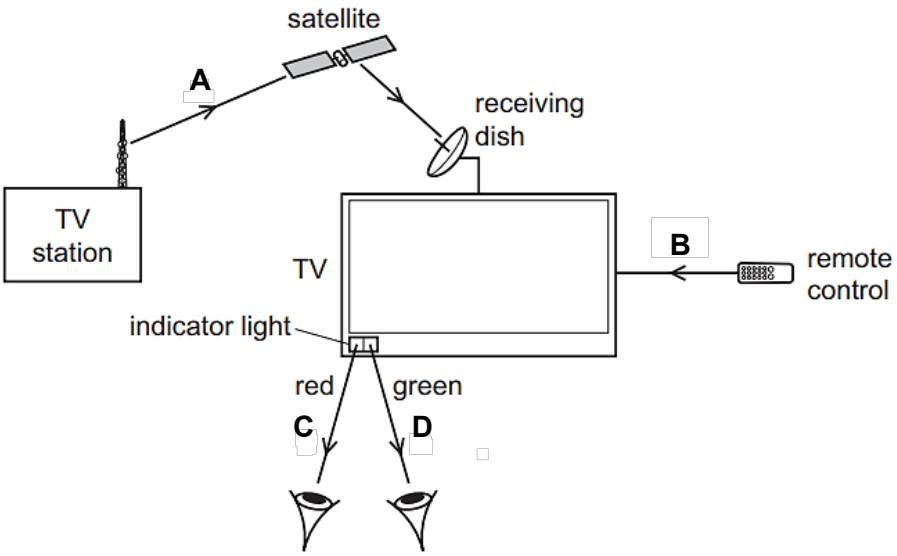
| | amplitude / cm | wavelength / cm |
|---|---|---|
| **A** | 5 | 10 |
| **B** | 5 | 20 |
| **C** | 10 | 5 |
| **D** | 10 | 10 |



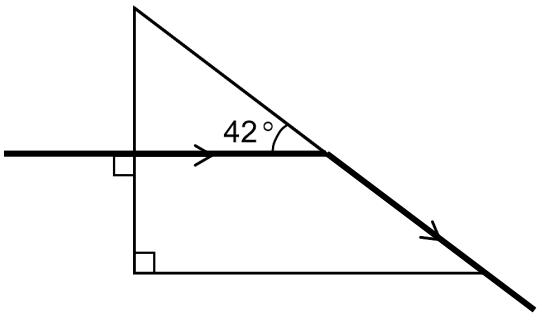
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**23** A television (TV) station transmits a signal to a television receiving dish. The television has an on / off indicator light. The television is switched on by a remote control which changes the indicator light from red to green.

Which electromagnetic wave used in these actions has the shortest wavelength?




**24** The diagram shows a light ray striking the surface of a prism perpendicularly. The light ray leaves the prism parallel to one side of the prism as shown.




What is the refractive index of the prism?

**A** 0.74 **B** 1.35 **C** 1.49 **D** 1.65

**25** Which of the following must be the property of a virtual image?

**A** It is laterally inverted.

**B** It is the same size as the object.

**C** It cannot be captured on a screen.

**D** It is as far behind the mirror as the object is in front.

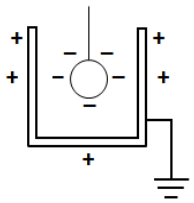


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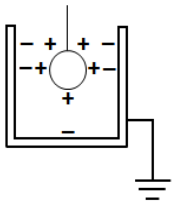
**26** A charged sphere is suspended by an insulating thread inside a metal can. The outside of the can is earthed.

Which diagram shows the resulting charges on the sphere and on the can?

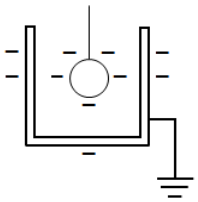
**A**



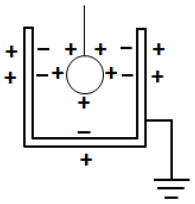
**B**



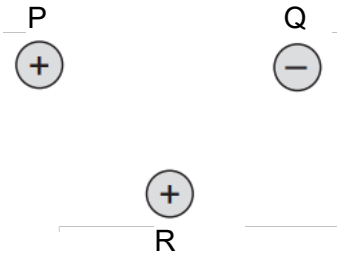
**C**



**D**



**27** The diagram shows the charges on three objects, P, Q and R.

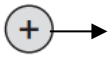



Which diagram shows the directions of the resultant force that act on object R?

**A**



**B**



**C**

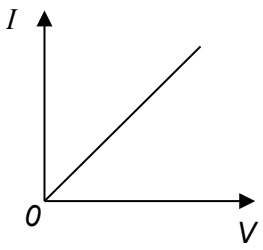


**D**

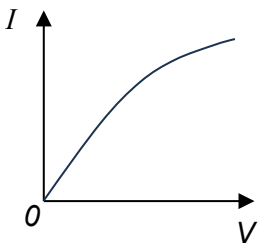


**28** Which graph best represents how current $I$ varies with voltage $V$ in a component in which the resistance decreases as the current increases?

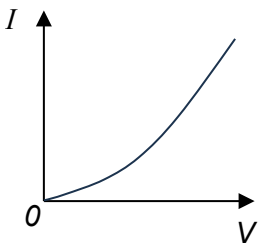
**A**



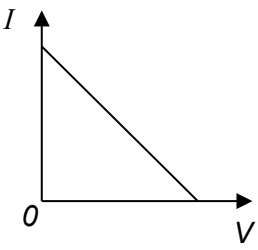

**B**




**C**




**D**






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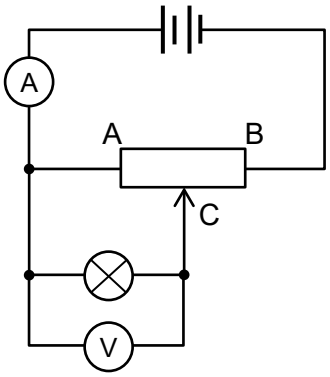
**29** To start a car with a flat battery, the battery can be connected to the battery in another car using two cables. These are called “jumper cables” and they have low resistance.

The resistance of a “jumper cable” is $R$. A second “jumper cable” is made from the same material.

What will be the resistance of the second “jumper cable” if both its length and diameter are doubled?

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

**30** A battery of e.m.f. 10 V is connected to the potentiometer which has a resistance of 100 Ω.




Which of the following statements is **not** correct?

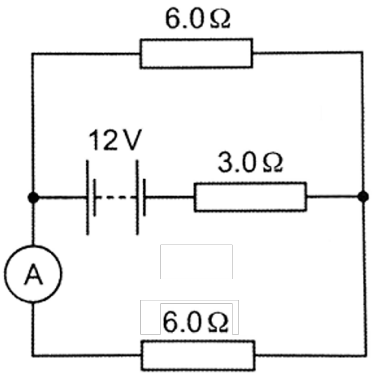
**A** The lamp does not light up when slider C is at position A.

**B** The lamp is at full brightness when slider C is at position B.

**C** The voltmeter reading is 5 V when slider C is in the middle between A and B.

**D** The ammeter reading is 0.10 A when slider C is at position A.

**31** The diagram shows three resistors connected to a 12 V battery.




What is the reading on the ammeter?

**A** 0.50 A **B** 1.0 A **C** 1.3 A **D** 2.0 A



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**32** An electric kettle labelled '220 V, 1 kW' is fitted with a plug that contains a 13 A fuse. When it is connected to a 220 V mains supply, the water in it takes a few minutes to boil.

What will happen when the plug is connected to a 110 V mains supply?

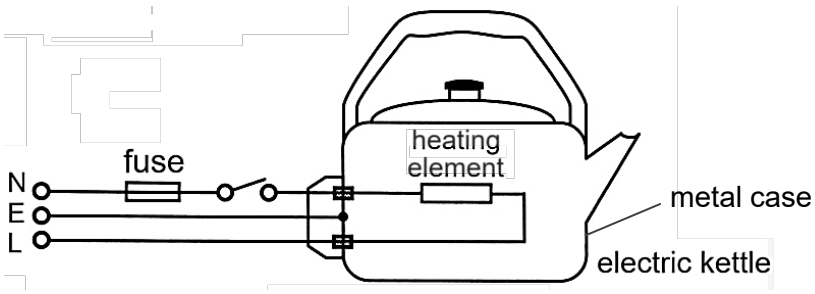
**A** The kettle does not work.

**B** The fuse in the plug blows.

**C** The water takes a longer time to boil.

**D** The heating element of the kettle melts.

**33** A switch and a fuse of an electric kettle are incorrectly connected in the neutral wire of the mains supply as shown in the diagram.




Which of the following statements about the kettle is **not** correct?

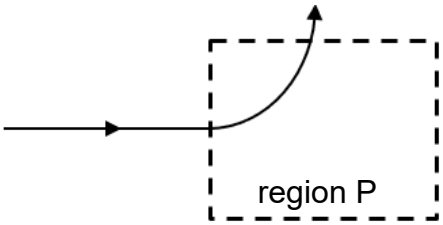
**A** The kettle will still operate when the switch is closed.

**B** The kettle is double insulated.

**C** The casing will be at high voltage when there is an electrical fault even after the fuse blows due to large current flowing through the earth wire.

**D** The heating element will remain at high voltage even when the switch is opened.

**34** A beam of particles is directed towards a region P in which a magnetic field is applied.



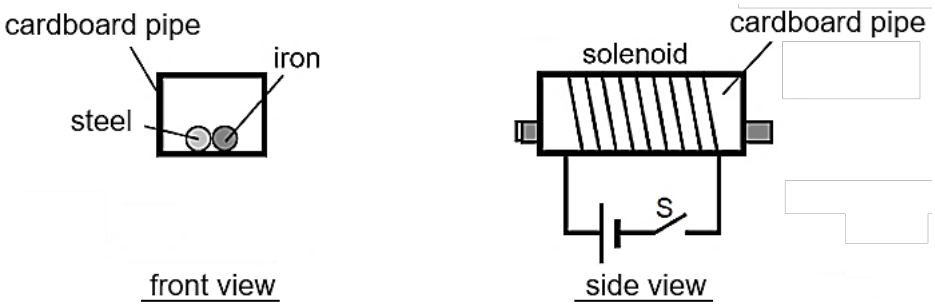

If the beam is deflected upwards as shown, which row best describe the nature of the charged particles and the direction of the magnetic field?

| | particles | direction of magnetic field |
|---|---|---|
| **A** | neutron | out of the page |
| **B** | electrons | into the page |
| **C** | protons | out of the page |
| **D** | protons | into the page |



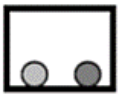
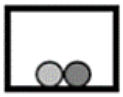
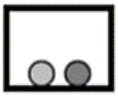
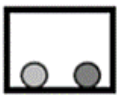
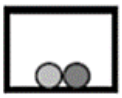
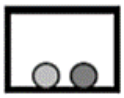
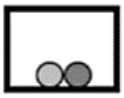
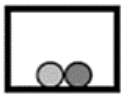
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**35** An iron rod and steel rod are placed inside a rectangular cardboard pipe. A coil of wire is wound around the cardboard pipe to form a solenoid. The diagram shows the front and side view of the **same** setup.

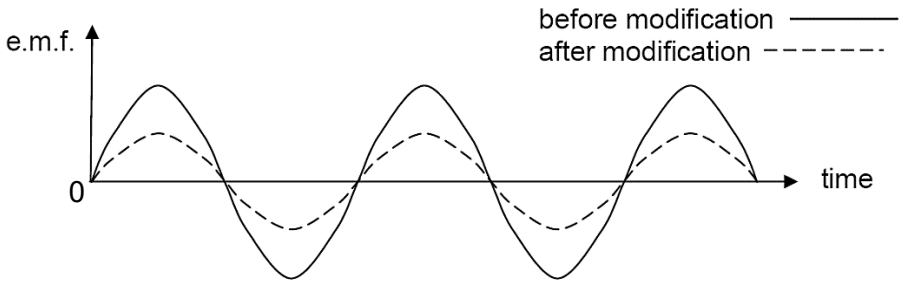



Switch S is closed for a short while and is then opened.

Which of the following shows the positions of the steel and iron rods?

| | S closed | S opened |
|---|---|---|
| **A** |  |  |
| **B** |  |  |
| **C** |  |  |
| **D** |  |  |

**36** The variation of the e.m.f. produced by a simple a.c. generator against time before and after modification is shown below.




Which of the following could be the modification that was carried out?

**A** weaker magnets were used

**B** speed of rotation was reduced

**C** direction of rotation of coil was reversed

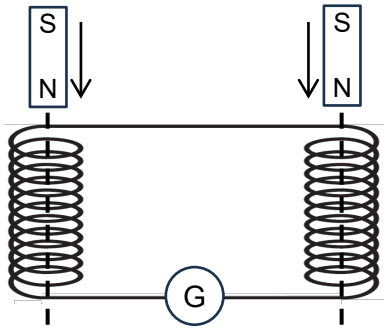
**D** number of turns in the coil was increased



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**37** Two small coils are connected in series to a sensitive galvanometer. A magnet is held above each coil as shown in the figure below.

When only the magnet in the left coil is dropped, the galvanometer needle deflects towards the right.




Both magnets are now dropped at the same time.

Which statement describes the motion of the galvanometer needle?

**A** The needle deflects towards the left and with a greater magnitude.

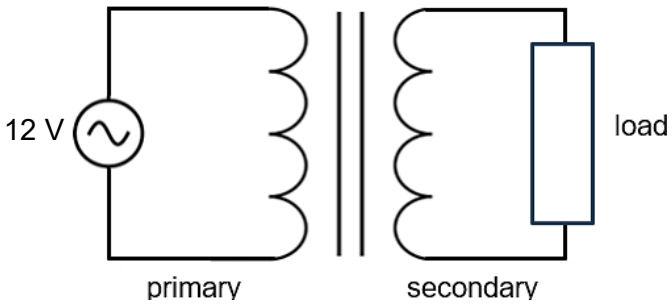
**B** The needle deflects towards the right and with a greater magnitude.

**C** The needle deflects towards the right and with the same magnitude.

**D** The needle does not move.

**38** A non-ideal transformer supplies power to a load. The potential difference across the load is 24 V and the current flowing through the secondary coil is 2.4 A.

The efficiency of the transformer is 90 %.



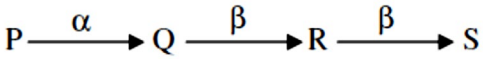

What is the current drawn by the primary coil from the 12 V source?

**A** 3.5 A **B** 4.3 A **C** 4.8 A **D** 5.3 A



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**39** Below shows part of a radioactive series.




Which of the following nuclei are isotopes of the same element?

**A** P and R
**B** P and S
**C** Q and S
**D** Q, R and S

**40** Which of the following common item emits ionising radiation?

**A** LED TV
**B** microwave oven
**C** cell phone
**D** smoke detector



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