

Class

Register Number

Name

6091/01

22/4P/6091/1

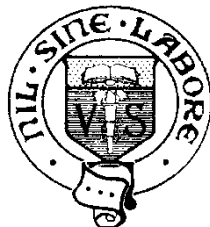
**PHYSICS
PAPER 1**

Tuesday

13 September 2022

1 hour

VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL
VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL
VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL
VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL VICTORIA SCHOOL

**VICTORIA SCHOOL****PRELIMINARY EXAMINATION
SECONDARY FOUR**

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Write your name, class and index number on all the work you hand in.

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

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** that 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.

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

This question paper consists of 18 printed pages, including the cover page.**[Turn Over**

- 1 A micro-meter screw gauge is used to measure the diameter of a steel ball.

Fig. 1.1 shows the reading on the micro-meter when it is closed without an object. Fig. 1.2 shows the reading taken with the steel ball between the jaws.

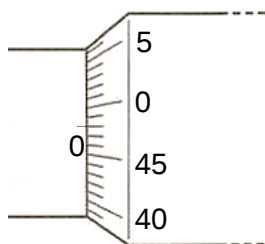


Fig. 1.1

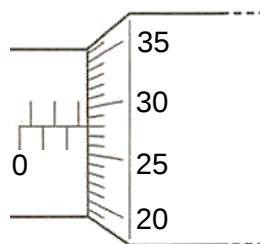
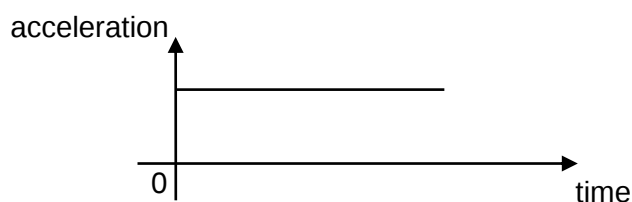


Fig. 1.2

What is the diameter of the steel ball?

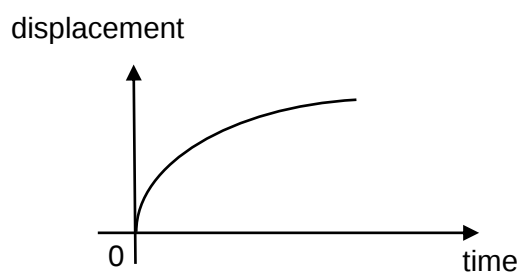
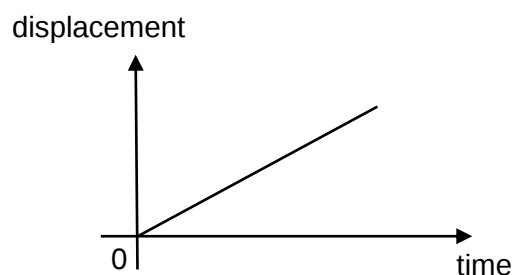
- A 2.78 mm B 2.80 mm C 5.28 mm D 5.30 mm
- 2 A car is at rest at a traffic light. When the traffic light turns green, the car driver steps on the accelerator. The graph shows the variation of the acceleration with time of the car. The traffic light turns green at time = 0.



Which graph represents the displacement-time graph of the car?

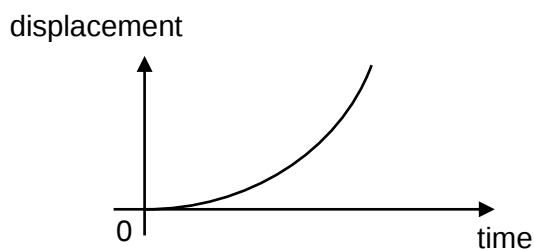
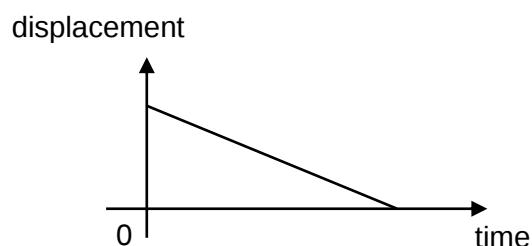
A

B

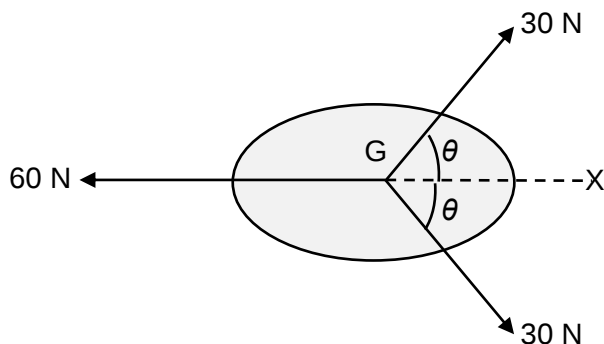


C

D



- 3 The diagram shows three forces acting on the centre of gravity G of a body which is initially at rest. The 30 N forces make an angle θ with the line GX.



What is the motion of the body?

- A It accelerates in the direction GX.
- B It accelerates in the direction XG.
- C It moves at constant speed in the direction GX.
- D It moves at constant speed in the direction XG.

- 4 There is a small air bubble in some water.

The volume of the bubble is $2.37 \times 10^{-8} \text{ m}^3$.

The density of air is 1.29 kg / m^3 .

The density of water is 1000 kg / m^3 .

The gravitational field strength is 10 N / kg .

What is the weight of the air in the air bubble?

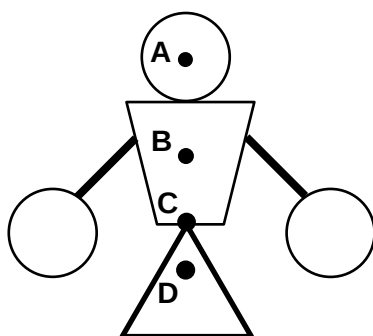
- A $3.06 \times 10^{-8} \text{ N}$
- B $1.84 \times 10^{-7} \text{ N}$
- C $3.06 \times 10^{-7} \text{ N}$
- D $2.37 \times 10^{-4} \text{ N}$

5 Which of the following statements is true?

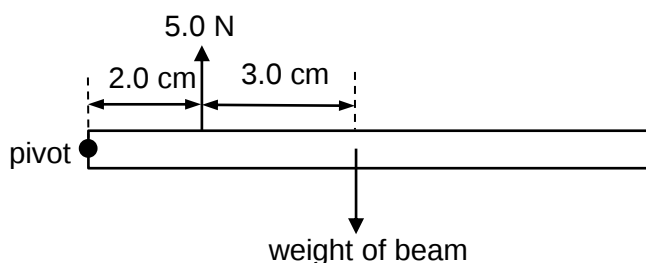
- A Mass is the gravitational force acting on an object.
- B The mass of an object is dependent on the gravitational field strength at that point.
- C The reluctance of a body to change its state of rest or uniform motion is dependent on its mass.
- D The unit for weight is kilogram.

6 The diagram shows a balancing toy pivoted on a triangular stand. When the toy is tilted slightly, it remains stationary at the new position.

Where is the centre of gravity of the balancing toy?



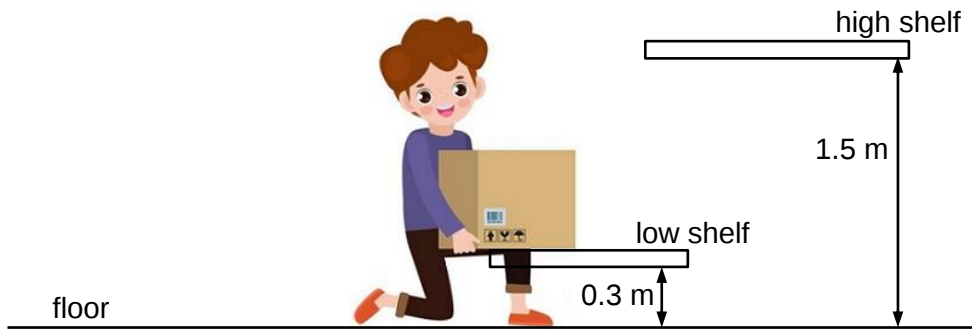
7 A beam is pivoted at one end. A force of 5.0 N is acting vertically upwards on it as shown. The beam is in equilibrium.



What is the weight of the beam?

- A 2.0 N
- B 3.0 N
- C 3.3 N
- D 5.0 N

- 8 The diagram shows a student lifting a box of weight 50 N from a low shelf to a high shelf.

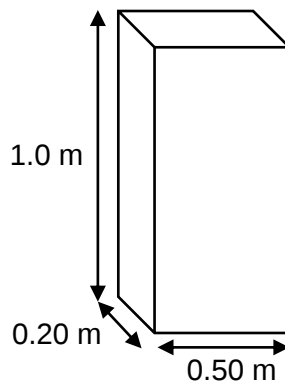


How much work is done by the student?

- A 30 J B 60 J C 75 J D 90 J
- 9 A 5.0 kg box that is initially at rest is pushed horizontally across a smooth floor. At a time of 3.0 s, the speed of the box is 3.0 m / s. At a time of 5.0 s, the speed of the box is 7.0 m / s.

What is the gain in kinetic energy from 3.0 s to 5.0 s?

- A 20 J B 40 J C 100 J D 120 J
- 10 The diagram shows an aluminium block with density of 2700 kg / m^3 resting on one side.

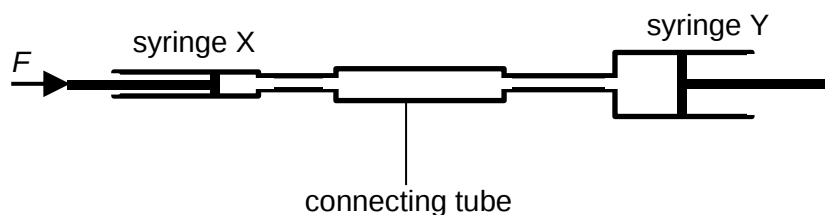


What is the smallest pressure that it can exert on the floor?

- A 1400 Pa B 5400 Pa C 27 000 Pa D 54 000 Pa

- 11** In the diagram, syringe X is connected to syringe Y through a connecting tube. Both syringes and the connecting tube are filled with water.

The radius of the piston in syringe Y is twice the radius of the piston in syringe X. A force, F , is applied on the piston in syringe X.



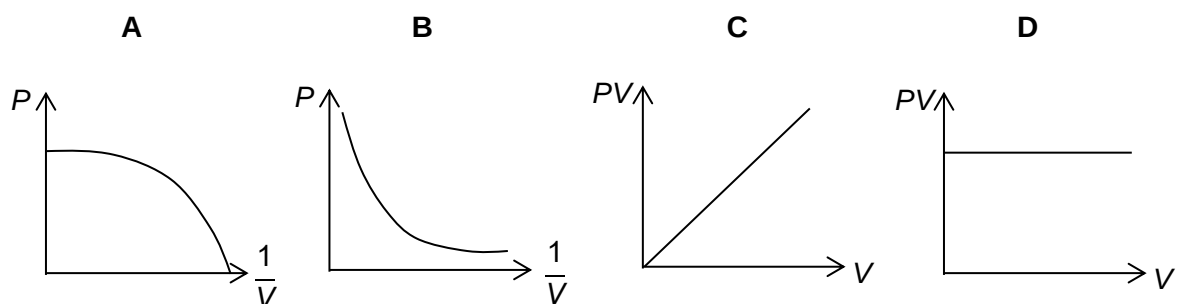
What is the force experienced by the piston in syringe Y?

- A** $0.25 F$ **B** $0.50 F$ **C** $2.0 F$ **D** $4.0 F$
- 12** The resistance of a copper wire when placed in water at 20°C is $0.50\ \Omega$. When the same wire is placed in a beaker of boiling water, its resistance is $2.1\ \Omega$.

What is the temperature when the resistance of the wire is $1.6\ \Omega$?

- A** 45°C **B** 55°C **C** 65°C **D** 75°C
- 13** Which of the following statements about temperature is true?
- A** Temperature is a form of energy.
B Temperature is a measure of the amount of heat within a body.
C Temperature is a measure of the degree of hotness or coldness of a body.
D Temperature will flow from a hotter region to a cooler region.
- 14** Robert Boyle in 1662, states that the pressure P of a given quantity of gas varies inversely with its volume V at constant temperature.

Which graph is correct?

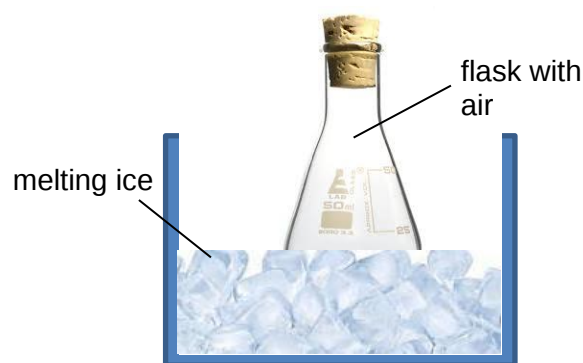


- 15** A gas in a container is compressed to half its original volume at constant temperature.

What effect does this have on the average speed of the molecules and the pressure they exert?

	average speed of molecules	pressure of gas
A	decreases	decreases
B	increases	increases
C	remains constant	decreases
D	remains constant	increases

- 16** A flask is filled with air and tightly capped at room temperature. The flask is then placed in melting ice.



Which of the following is true about the pressure and the speed of air molecules in the flask?

	pressure	speed of molecules
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 17** Which statement correctly describes thermal energy transfer?

- A** Conduction is a process of thermal energy transfer that involves the vibration of particles.
- B** Heat flows from a hotter body to a colder body, and coldness flows in the opposite direction.
- C** Radiation refers to the process of heat transfer by the movement of fluid due to density differences.
- D** There is no heat flow when two bodies are in thermal equilibrium.

- 18** Two metal pots that are identical except that one has a silver exterior and the other has a black exterior are placed on an electric hot plate to heat up the water.

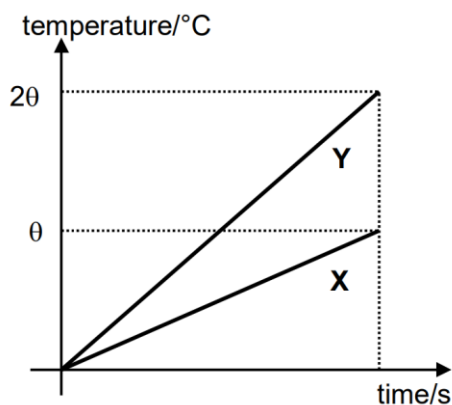
Which pot should he use and how does heat transfer occur between the pot and water?

	colour of pot	heat transfer by
A	black	conduction and convection
B	black	radiation and conduction
C	silver	conduction and convection
D	silver	convection and radiation

- 19** A burn from steam at 100 °C can be worse than a burn from water at 100 °C.

Which statements correctly explains the reason?

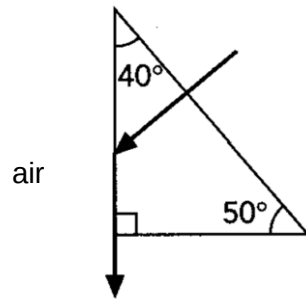
- A** Steam contains more energy than water.
B Steam has a greater specific heat capacity than water.
C Steam hits your skin with greater force.
D Steam is hotter than water.
- 20** Liquid X and liquid Y are placed in similar containers. They are heated with the same electric heater. The graph shows how the temperature of the liquids changes with time.



If the mass of liquid X is half that of liquid Y, what is the relationship between the heat capacity of liquid X, C_X to the heat capacity of liquid Y, C_Y ?

- A** $4C_X = C_Y$
B $C_X = 2C_Y$
C $2C_X = C_Y$
D $C_X = 4C_Y$

- 21** A ray of light enters a glass prism normal to the surface and travels along the path as shown.



(diagram not drawn to scale)

What is the refractive index of the glass?

- A** 1.31
 - B** 1.33
 - C** 1.50
 - D** 1.56
- 22** An object is placed at 18.0 cm from a convex lens of focal length 15.0 cm.

What is the characteristic of the image formed?

- A** real, inverted and diminished
 - B** real, inverted and magnified
 - C** virtual, upright and magnified
 - D** virtual, upright and diminished
- 23** In determining the speed of sound in a medium, a man strikes one end of the medium, while a boy, who stands 2 km away, measures the time taken for the sound to travel to him.

The boy measures the time taken to be 6.0 s.

What is the speed of sound in the medium?

- A** 14 m s⁻¹
- B** 50 m s⁻¹
- C** 70 m s⁻¹
- D** 333 m s⁻¹

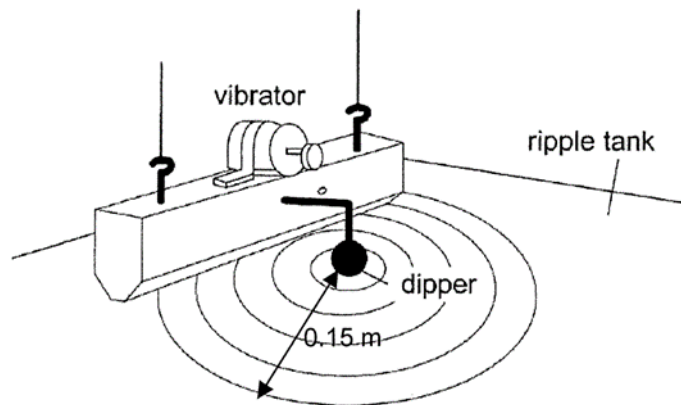
- 24 A sound is produced by a musical instrument in air with a frequency f_1 and wavelength λ_1 .

The sound then enters the water and has a frequency f_2 and wavelength λ_2 .

Which of the following is correct?

- A $f_2 < f_1$ and $\lambda_2 = \lambda_1$
- B $f_2 < f_1$ and $\lambda_2 < \lambda_1$
- C $f_2 = f_1$ and $\lambda_2 < \lambda_1$
- D $f_2 = f_1$ and $\lambda_2 > \lambda_1$

- 25 A circular dipper connected to a vibrator produces waves at a frequency of 30 Hz in the ripple tank.



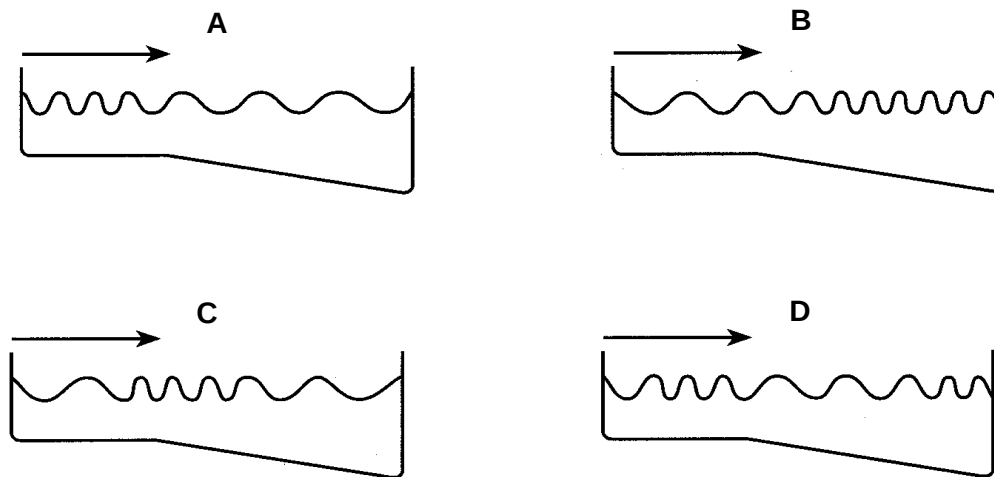
The distance between the centre of the dipper and the outermost ring of the wave is 0.15 m.

What is the speed of the wave?

- A 0.90 m s^{-1}
- B 4.5 m s^{-1}
- C 90 m s^{-1}
- D 450 m s^{-1}

- 26 A ripple tank contains water of varying depths.

Which diagram correctly represents the water waves as they travel from the shallow to the deep region?



- 27 Electromagnetic waves are known to share certain common characteristics.

Which of the following is **incorrect**?

- A They all travel with the speed of $3.0 \times 10^8 \text{ m s}^{-1}$ in vacuum.
 - B They are all transverse waves.
 - C They always obey the laws of reflection and refraction.
 - D When they pass from one optical medium into another medium, their frequencies, wavelengths and speeds always change.
- 28 Microwaves, visible light and X-rays are all part of the electromagnetic spectrum.

What is the correct order of increasing wavelength?

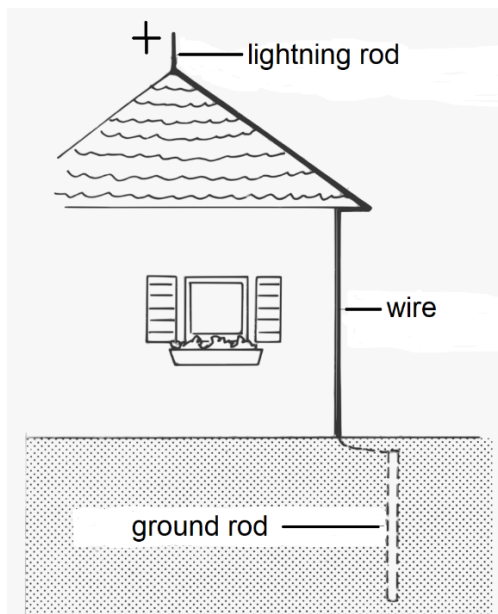
shortest —————→ *longest*

- | | | | |
|---|------------|---------------|---------------|
| A | microwaves | visible light | X-rays |
| B | microwaves | X-rays | visible light |
| C | X-rays | microwaves | visible light |
| D | X-rays | visible light | microwaves |

- 29** A metallic lightning rod is placed on top of a house.

The lightning rod is connected to the ground rod by a metallic wire.

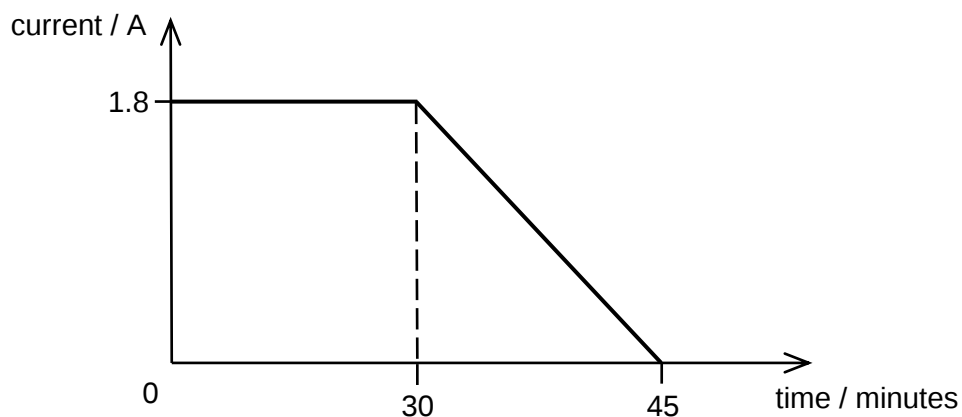
When a negatively charged cloud passes over the building, the lightning rod becomes positively charged.



Which of the following explains the positive charge at the tip of the lightning rod?

- A** Protons in the air are attracted and stay with the lightning rod.
- B** Protons in the ground rod are attracted towards the negatively charged cloud.
- C** The electrons in the conductor are repelled by the negatively charged cloud.
- D** The electrons move to the ground rod while the protons move to the lightning rod.

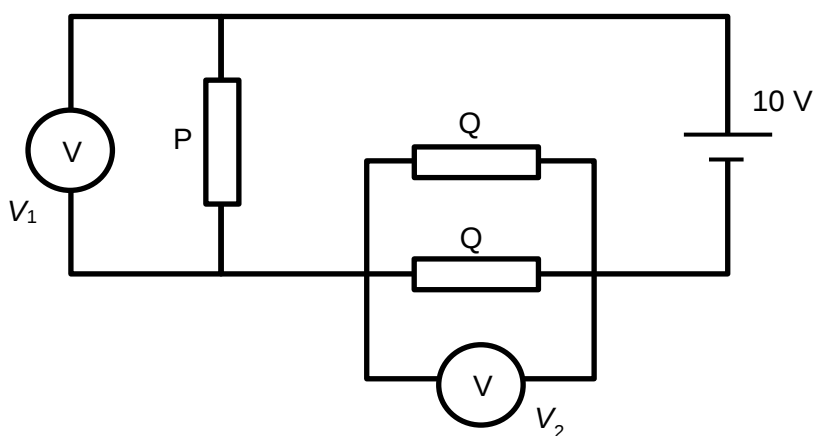
- 30** A laptop battery is charged by connecting it to a constant potential difference of 9.0 V. After a duration of 30 minutes, the initial current of 1.8 A slowly decreases to zero as shown.



What is the amount of charge that passes through the laptop battery during the time of 45 minutes shown in the graph?

- A** 67.5 C **B** 81.0 C **C** 608 C **D** 4050 C
- 31** In the circuit shown, the resistance of resistor P is twice the resistance of resistor Q. A cell with an electromotive force of 10 V forms part of the circuit.

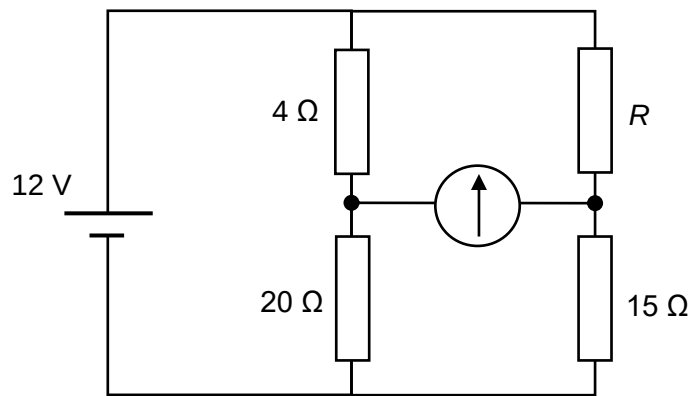
Two voltmeters display the readings of V_1 and V_2 .



What is the difference between V_1 and V_2 of the voltages shown on the voltmeters?

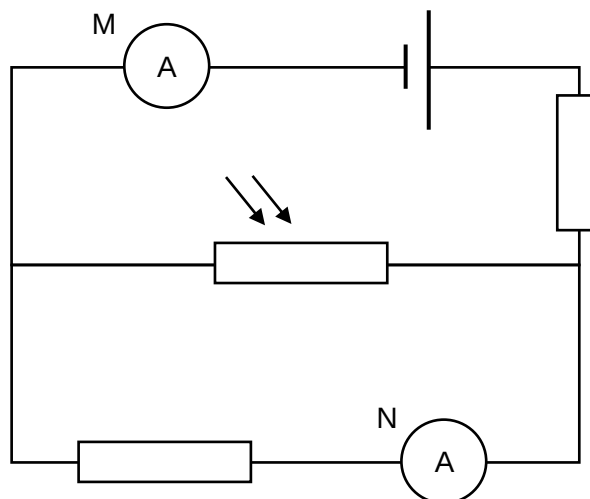
- A** 3.3 V **B** 6.0 V **C** 8.0 V **D** 10 V

- 32 The circuit shows a cell with an electromotive force of 12 V and the reading on the galvanometer is zero.



What is the value of resistor R ?

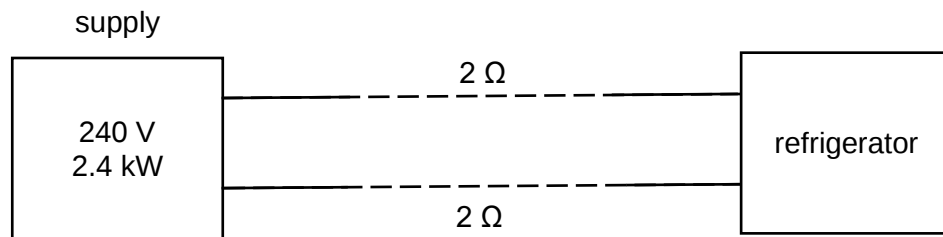
- A $3\ \Omega$ B $4\ \Omega$ C $9\ \Omega$ D $45\ \Omega$
- 33 The diagram shows a circuit connected to a light dependent resistor (LDR) and two fixed resistors.



What effect will a strong light shining on the LDR have on the readings of ammeters M and N?

	reading on ammeter M	reading on ammeter N
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 34** The power output of an electrical supply is 2.4 kW at a potential difference (p.d.) of 240 V. The two wires between the supply and the refrigerator each have a resistance of $2\ \Omega$, as shown.



What is the power supplied to the refrigerator and what is the p.d. across the refrigerator?

	power / kW	p.d. / V
A	2.0	200
B	2.2	220
C	2.2	240
D	2.4	240

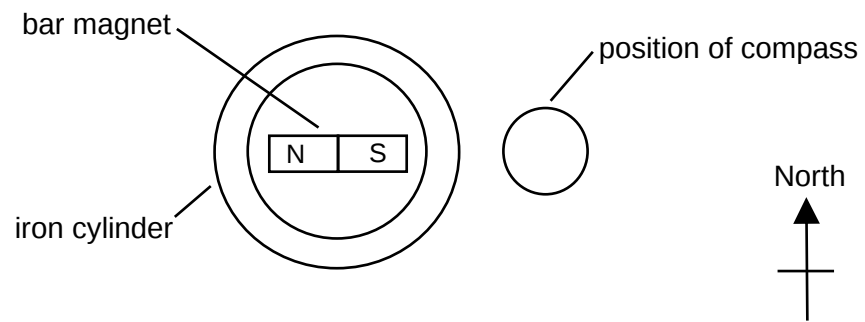
- 35** A rice cooker is connected to the 240 V mains supply using a plug containing a 12 A fuse.

The rice cooker is filled with water and rice. When it is switched on, the fuse blows. This happens again after a new fuse is fitted. A student then replaces the fuse with a steel paper clip, and the rice cooker works.

What else might happen because of replacing the fuse with a paper clip?

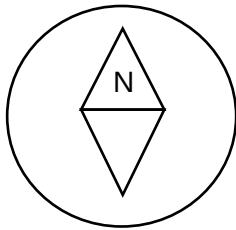
- A** More energy will be used up by the rice cooker as steel has a higher resistance.
- B** The current in the plug will magnetise the paper clip and makes it a better conductor.
- C** The rice cooker will be overloaded with a very large current and catches fire.
- D** The rice will cook faster as steel is a better conductor of electricity than the fuse.

- 36** A bar magnet is placed in a hollow iron cylinder. A small plotting compass is placed near the bar magnet as shown.

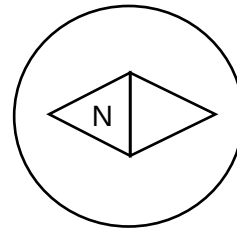


Which diagram shows the direction in which the compass needle points?

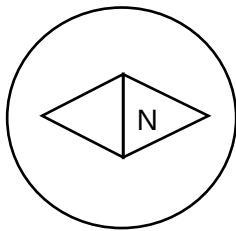
A



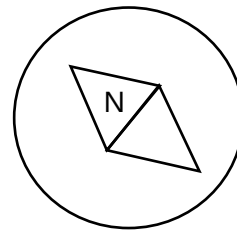
B



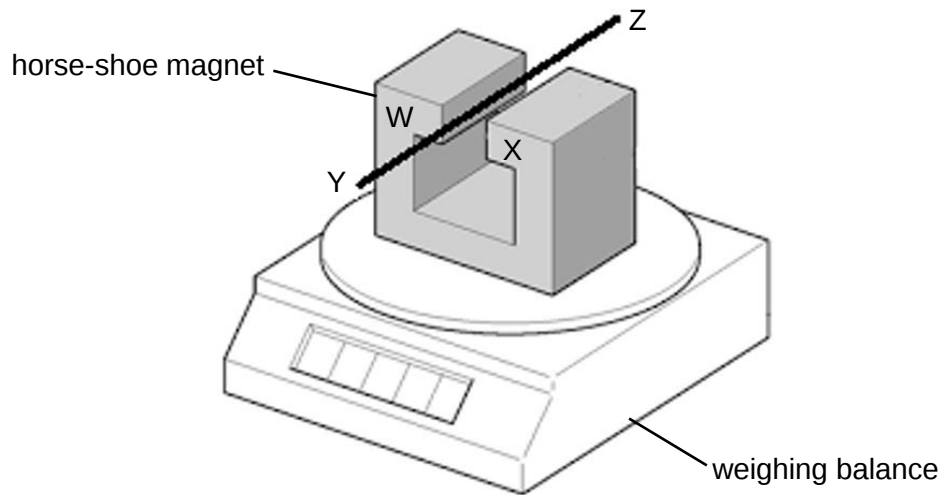
C



D



- 37** The diagram shows a current-carrying conductor YZ between the poles W and X of a magnet. The weighing balance shows the mass of the horse-shoe magnet before a current starts to flow in the conductor YZ.

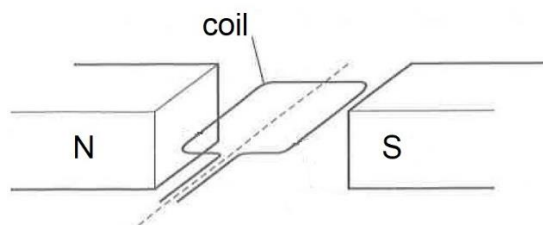


When a current flows in the conductor YZ, the weighing balance reads a mass that is greater than the mass of the horse-shoe magnet.

What should be the magnetic poles of W and X of the horse-shoe magnet and the terminals of conductor Y and Z?

	pole W	pole X	terminal Y	terminal Z
A	north	south	negative	positive
B	north	south	no current	no current
C	south	north	negative	positive
D	south	north	no current	no current

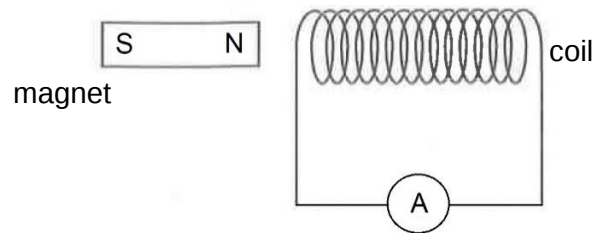
- 38** The diagram shows a pivoted coil between the two poles of a magnet. The pivoted coil carries a constant current, and the coil rotates about the pivot.



Which action does not, on its own, increase the size of the turning effect exerted on the coil?

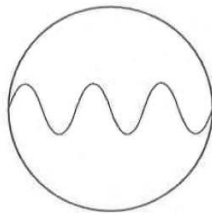
- A** increasing the current in the coil
- B** increasing the number of turns of the coil
- C** increasing the strength of the magnet
- D** reversing the current and magnetic poles

- 39 The diagram shows a coil connected to a sensitive ammeter. A magnet is placed next to the coil.



Which action results in a zero reading on the sensitive ammeter?

- A moving the magnet and the coil away from each other at the same speed
 - B moving the magnet and the coil at the same velocity
 - C moving the magnet and the coil towards each other
 - D moving the magnet perpendicularly away from the coil
- 40 The diagram shows the waveform seen on the screen of a cathode-ray oscilloscope (c.r.o.) when the signal from a musical sound is fed to the c.r.o. through a microphone.



The duration of time across the display of the c.r.o. screen is 2.1 ms.

What is the frequency of the musical sound?

- A 48 Hz
- B 480 Hz
- C 1400 Hz
- D 2900 Hz

End of Paper

This document is intended for internal circulation in Victoria School only. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior permission of the Victoria School Internal Exams Committee.