



南洋女子中學校

NANYANG GIRLS' HIGH SCHOOL

Preliminary Examination 2023

Secondary Four 'O' Level

CANDIDATE
NAME

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CENTRE
NUMBER

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INDEX
NUMBER

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PHYSICS

6091/01

Paper 1 Multiple Choice

28 Aug 2023, Monday

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, Centre number and index number on the Answer sheet in the spaces provided unless this has already been done for you.

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.

Read the instructions on the Answer Sheet very carefully.

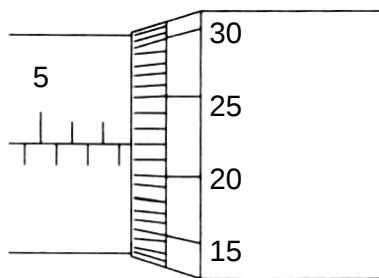
Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

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

1 Which measurement represents the longest length?

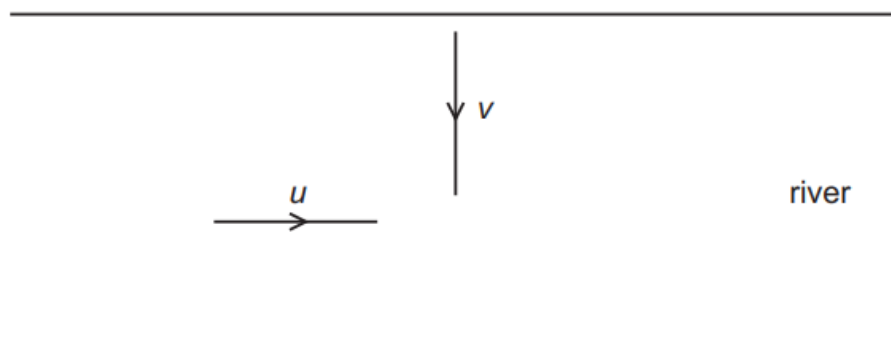
- A 1.2×10^{-4} Mm
- B 1.2×10^3 km
- C 1.2×10^5 cm
- D 1.2×10^7 μ m

2 What is the reading shown by the micrometer screw gauge below?

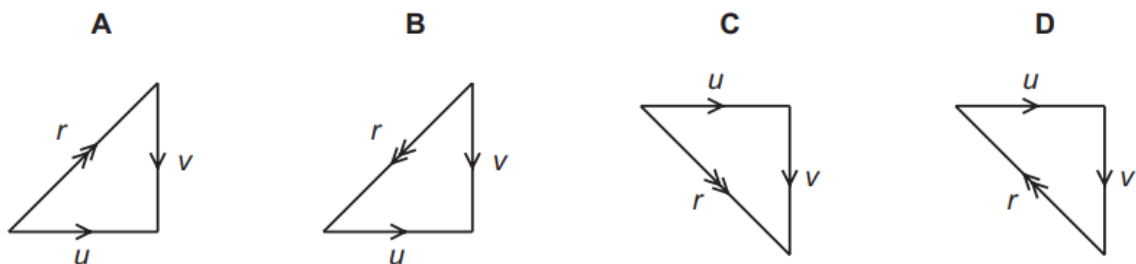


- A 5.272 mm
- B 5.72 mm
- C 7.22 mm
- D 7.72 mm

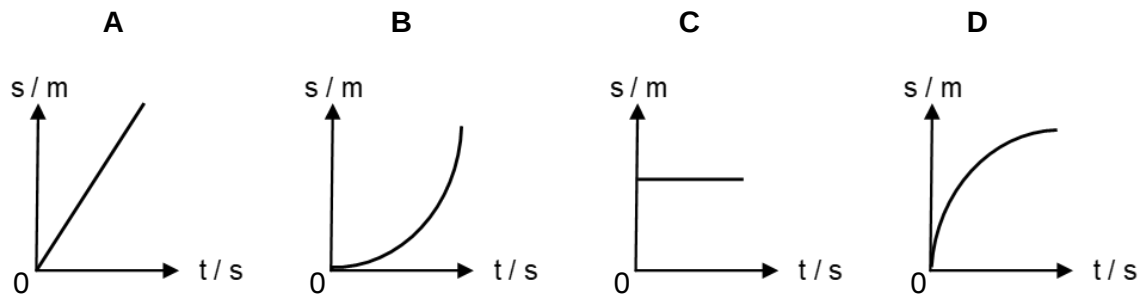
3 A boat starts moving across a river at a velocity v perpendicular to the river bank. The boat encounters a current along the river of velocity u , as shown in the diagram.



Which vector diagram shows the resultant velocity r of the boat?



- 4 Which displacement-time (s-t) graph shows a body moving at a constant velocity?



- 5 A car accelerates uniformly from rest at time $t = 0$ s along a level road. The car travels 12 m in the time between $t = 1.0$ s and $t = 2.0$ s.

How far does it travel in the time between $t = 3.0$ s and $t = 4.0$ s?

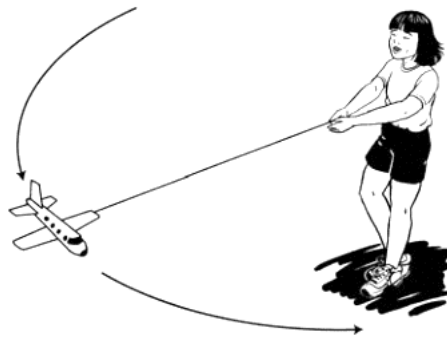
- A** 28 m **B** 35 m **C** 48 m **D** 64 m
- 6 In a experiment, a student jumps upward off a common bathroom scale as the laboratory partner records the scale reading.



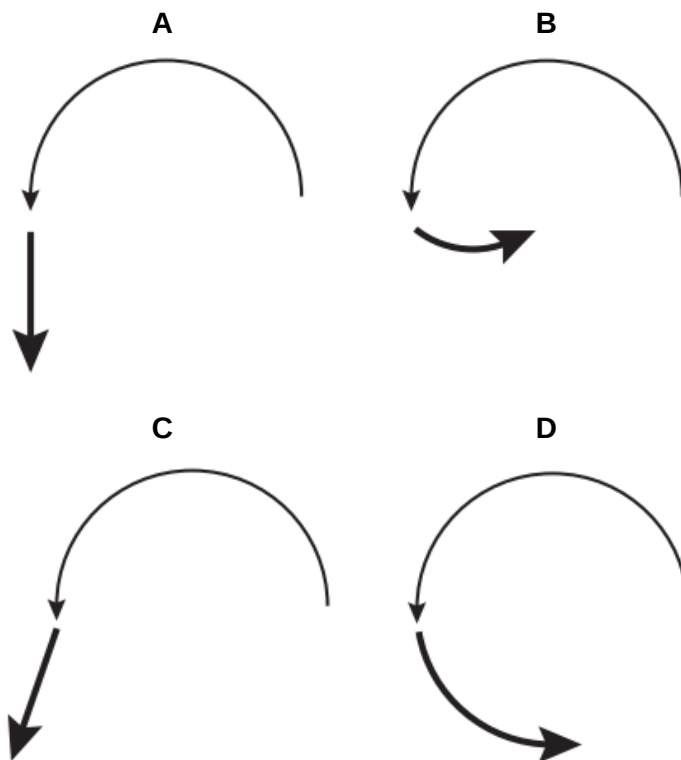
What does the laboratory partner observe during the instant the student pushes off?

- A** The scale reading will remain unchanged during the entire time the student is in contact with the scale.
- B** The scale reading will increase momentarily then will decrease during the entire time the student is in contact with the scale.
- C** The scale reading will decrease then increase during the entire time the student is in contact with the scale.
- D** The scale reading will decrease during the entire time the student is in contact with the scale.

- 7 A student swings a toy plane in a circle on a string.

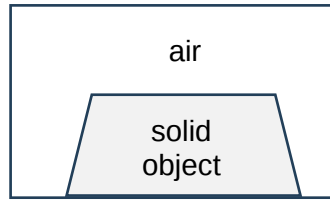


What path (top view) would the toy plane take if the string suddenly breaks?



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8 A box has an internal volume of 1000 cm^3 . When a solid object is placed in the closed box, the volume of air in the box is 520 cm^3 .

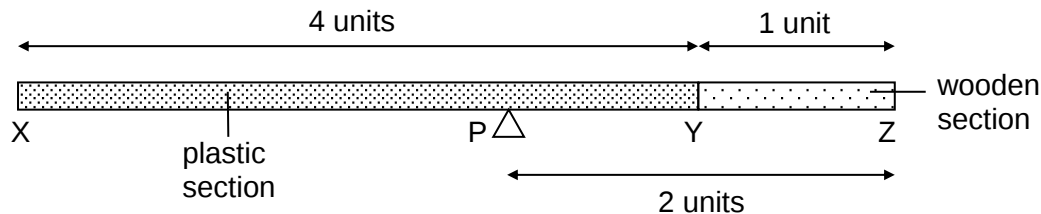


Given that the density of the solid object is 8.00 g/cm^3 , what is the mass of the object?

A	60.0 g	B	3840 g
C	4160 g	D	8000 g

9 A uniform rod XYZ is made up of two sections. The length of the plastic section, XY, is 4 times that of the wooden section, YZ.

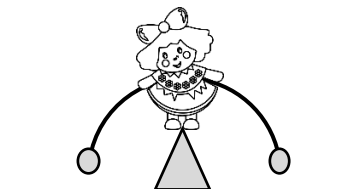
The rod balances at a point P such that the distance PZ that is twice the length of the wooden section.



What is the ratio of the mass of the wooden section to the mass of the plastic section?

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

10 The diagram shows a balancing toy pivoting on a triangular stand. When the toy is tilted slightly, it does not topple but swings back to its original position.



Which statement correctly describes this toy?

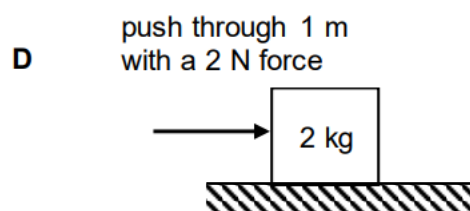
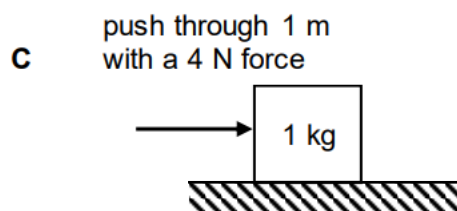
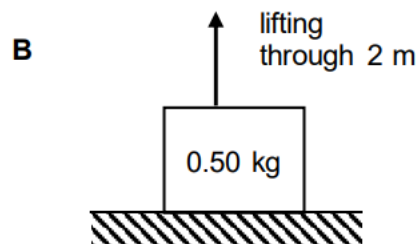
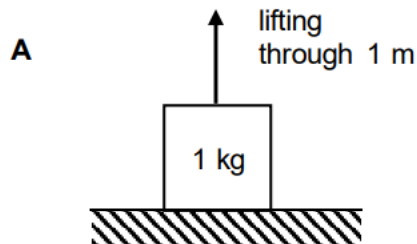
A The toy is in stable equilibrium.

B The toy is in neutral equilibrium.

C The toy is in unstable equilibrium.

D The toy is in unbalanced equilibrium.

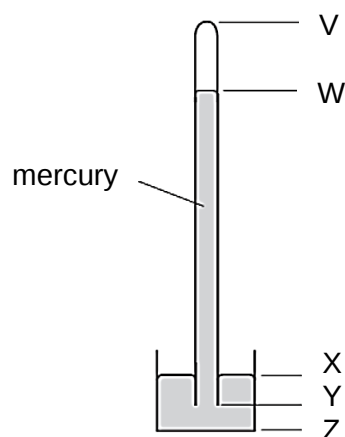
- 11** A student does some simple exercises with some heavy blocks.
The gravitational field strength g is 10 N / kg .
In which exercise does she do the least amount of work?



- 12** A ball is thrown upwards and reaches a height of 0.50 m .
Ignoring air resistance, how high will the same ball reach if it is thrown upwards with twice the initial speed?

A 0.50 m **B** 1.0 m **C** 1.5 m **D** 2.0 m

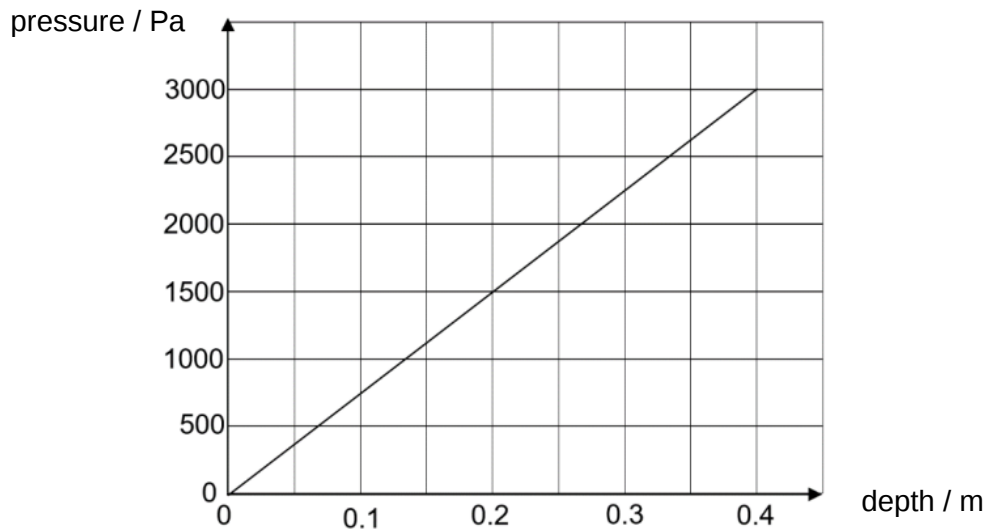
- 13** The diagram shows a simple mercury barometer.



When the atmospheric pressure increases, which distance will increase?

A VW **B** WX **C** XY **D** YZ

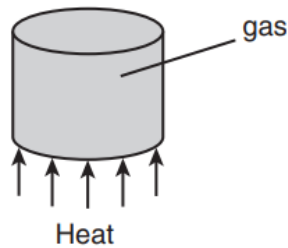
- 14** The graph shows how the pressure exerted by a liquid varies with depth below the surface.



What is the density of the liquid if the gravitational field strength is 10 N/kg ?

- A** 600 kg/m^3 **B** 750 kg/m^3 **C** 1200 kg/m^3 **D** 7500 kg/m^3
- 15** Below are four short paragraphs describing the particles in a beaker of water at 50°C . Which paragraph correctly describes the motion of the molecules?
- A** The particles all travel at the same speed. This speed is not large enough for any of the particles to leave the surface of the water. There are attractive forces between the particles.
- B** The particles have a range of speeds. Some particles travel sufficiently fast to leave the surface of the water. There are no forces between the particles.
- C** The particles have a range of speeds. Some particles travel sufficiently fast to leave the surface of the water. There are attractive forces between the particles.
- D** The particles have a range of speeds. The fastest particles are unable to leave the surface of the water. There are attractive forces between the particles.

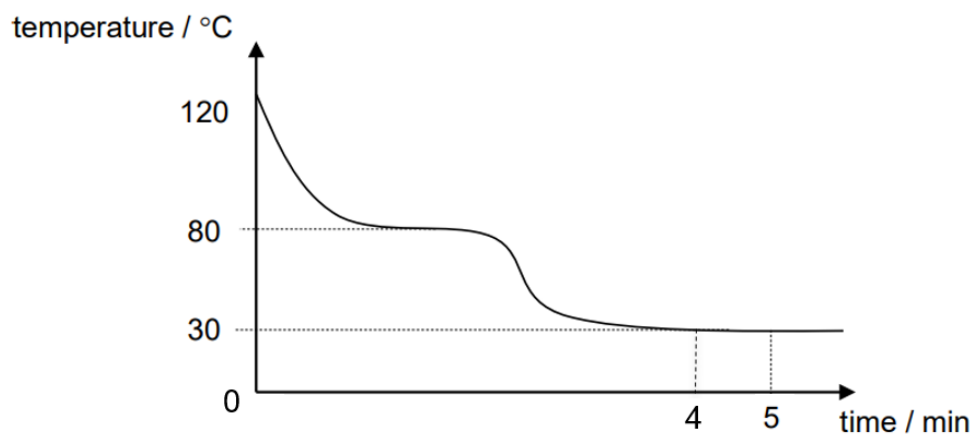
- 16 A gas in a sealed cylinder is heated.



Which quantity does **not** increase as the gas is heated?

- A** the average number of gas molecules hitting the cylinder walls per second
B the average kinetic energy of the gas molecules
C the average speed of the gas molecules
D the average distance between the gas molecules
- 17 A student, who is perspiring profusely, stands under a ceiling fan.
What is the main reason for her to feel cooler after some time?
- A** The fan sets up a convection current around her.
B The fan absorbs the heat radiated from her body at a faster rate.
C The fan increases the rate of evaporation of sweat from her body.
D The fan increases the rate of radiation from her body to the surroundings.
- 18 A thermocouple thermometer provides readings in terms of current.
The current recorded by this thermometer at lower and upper fixed points are 5 mA and 25 mA respectively.
When this thermometer is placed inside a cup of hot coffee, its reading is 15 mA. What is the temperature of the coffee?
- A** 20 °C **B** 50 °C **C** 60 °C **D** 75 °C
- 19 A heater is partially immersed in water. It is found that 30 000 J has been transferred to the water in 5.0 minutes. This is half the energy supplied by the heater.
What is the power of this heater?
- A** 50 W **B** 100 W
C 200 W **D** 400 W

- 20** A substance in the liquid state is allowed to cool in a room.

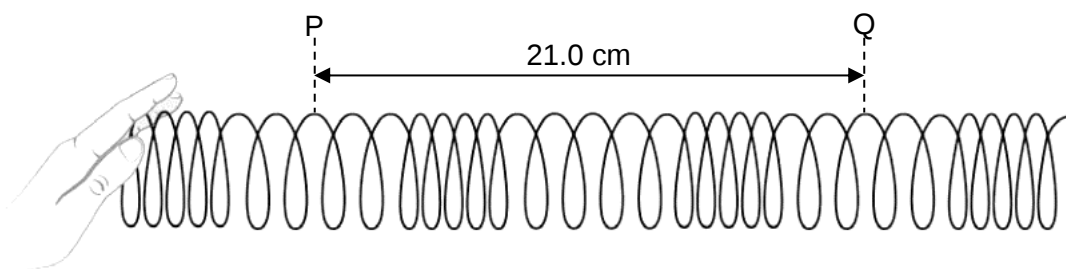


Which statement correctly describes the substance from 4 to 5 minutes?

- A** The substance is freezing.
- B** The kinetic energy of the particles in the substance decreases.
- C** The particles in the substance are in a random arrangement.
- D** There is no net thermal energy transfer between the substance and the surroundings.

Questions **21** and **22** are based on this diagram.

The diagram shows a wave travelling in a slinky spring after being pushed by a hand.



- 21** What is the wavelength of this wave?

- | | |
|------------------|------------------|
| A 5.25 cm | B 7.00 cm |
| C 10.5 cm | D 21.0 cm |

- 22** If a compression takes 1.0 s to travel from point P to Q, what is the frequency of this wave?

- | | |
|------------------|------------------|
| A 0.33 Hz | B 0.50 Hz |
| C 1.0 Hz | D 2.0 Hz |

- 23** A student holds a sheet of paper with letters on it facing a plane mirror. The letters on the paper are shown.

LOT

What does the student see in the mirror?

A

LOT

B

LO7

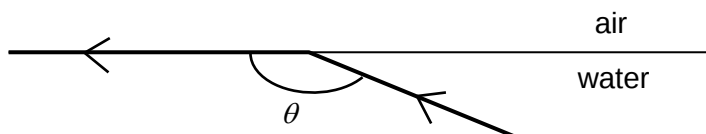
C

7OL

D

TOJ

- 24** The diagram shows the path of a ray of light from water as it strikes a horizontal water-to-air boundary.

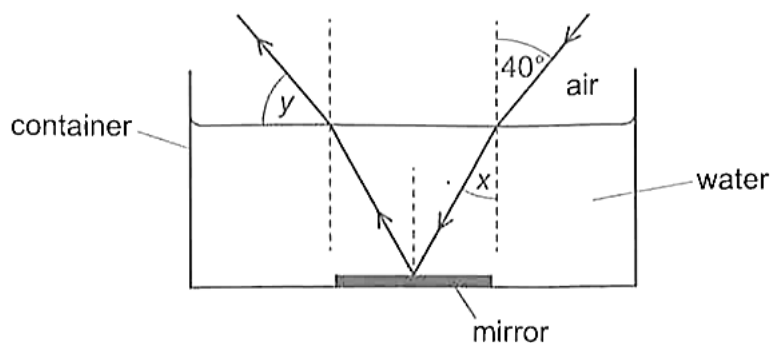


If the speed of light in water is 2.3×10^8 m/s and its speed in air is 3.0×10^8 m/s, what is the angle θ ?

- A** 100° **B** 120° **C** 130° **D** 140°

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

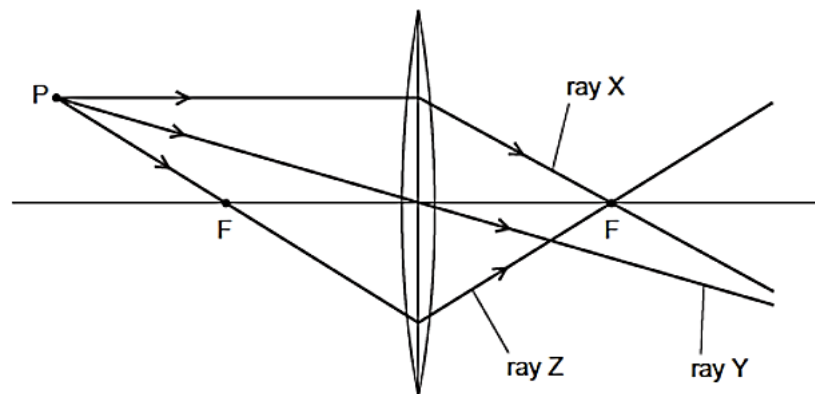
The refractive index of water is 1.33.



What are the angles x and y ?

	$x / ^\circ$	$y / ^\circ$
A	29	40
B	29	50
C	30	40
D	30	50

- 26** A student draws three rays of light from point P through a converging lens. Each point labelled F is a principal focus of the lens.



Which ray(s) is/are drawn correctly?

- A** ray Y only
 - B** ray Z only
 - C** ray X and Y
 - D** ray X and Z
- 27** It is known that the energy E of an electromagnetic wave and its frequency f is related by the product:

$$E = h \times f,$$

where h is a constant.

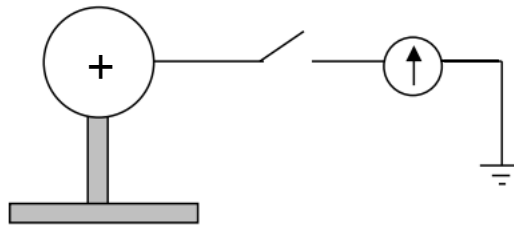
Which type of electromagnetic waves has the highest energy?

- A** infrared radiation
 - B** ultraviolet ray
 - C** microwaves
 - D** visible light
- 28** A musical instrument produces two notes. One note of frequency f has a speed v and a wavelength 3.0 m in air.

Another note has a frequency $3f$. What are its wavelength and speed in air?

	wavelength	speed
A	1.0 m	v
B	1.0 m	$3v$
C	9.0 m	v
D	9.0 m	$3v$

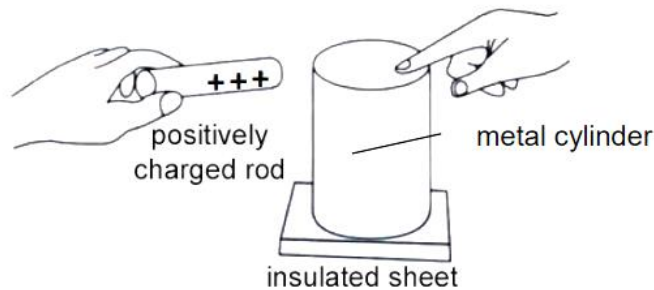
- 29** The diagram shows a centre-zero galvanometer connected to a positively charged insulated dome at one terminal and to the ground at the other terminal.



Which statement correctly describes what is observed in the galvanometer when the switch is closed?

- A** The pointer deflects momentarily.
- B** The pointer shows a steady deflection.
- C** The pointer shows no deflection.
- D** The pointer vibrates for a short period of time

30



A student tries to charge a neutral metal cylinder in the following steps:

- 1 Bring a positively charged rod near the cylinder.
- 2 Touch the cylinder with a finger.
- 3 Remove the positively charged rod.
- 4 Remove the finger.

What is likely to happen to the metal cylinder after the above process?

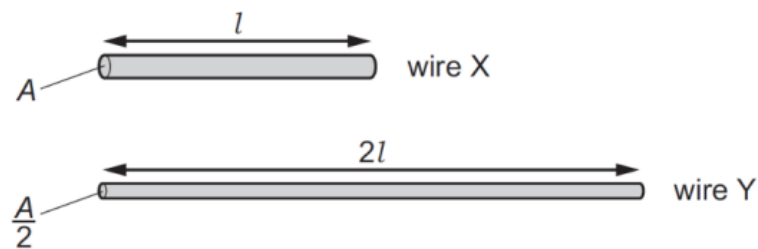
- A** It remains neutral.
- B** It becomes positively charged.
- C** It becomes negatively charged.
- D** It positively charged on one side and negatively charged on the other side.

- 31** When a potential difference (p.d.) of 2.0 V is applied across a resistor, 10 J of energy is dissipated as heat.

What is the amount of charge flowing through this resistor?

- A** 0.20 C **B** 12 C **C** 5.0 C **D** 20 C

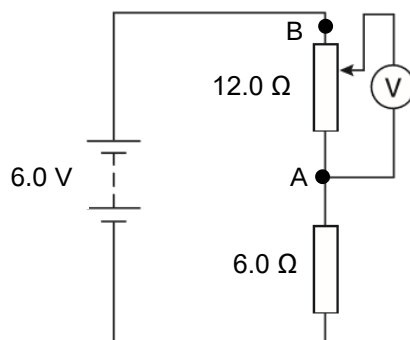
- 32** A copper wire X has resistance R . Another copper wire Y has twice the length and half the cross-sectional area of X.



What is the resistance of Y?

- A** $\frac{1}{2} R$ **B** R **C** $2 R$ **D** $4 R$

- 33** The diagram shows a circuit with a potential divider connected in series with a fixed resistor 6.0Ω .



The moveable contact of the voltmeter is adjusted to a point between A to B.
What are the minimum and maximum readings on the voltmeter?

	minimum voltage / V	maximum voltage / V
A	0	4.0
B	0	6.0
C	2.0	4.0
D	6.0	12.0

- 34** The diagram shows a thermistor and a light dependent resistor (LDR) in series.



Which row provides the conditions that will give the smallest total resistance between X and Y?

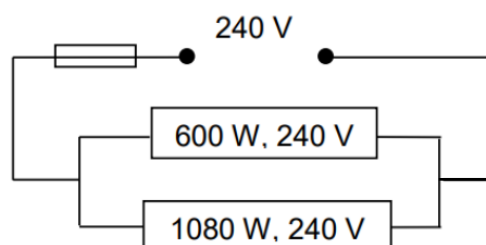
	lighting	temperature
A	bright	cold
B	bright	hot
C	dark	cold
D	dark	hot

- 35** In which situation(s) 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

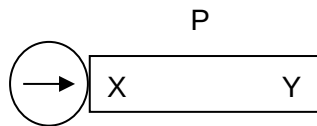
- 36** Two electrical appliances rated '600 W, 240 V' and '1080 W, 240 V' are connected in parallel to a 240 V a.c. supply.



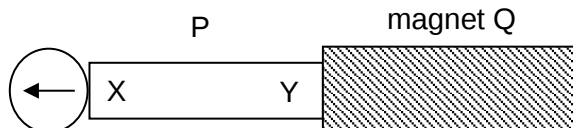
What is the energy consumed by these two appliances if they are switched on for 2.0 hours?

- A** 1.2 kWh **B** 3.4 kWh **C** 7.0 kWh **D** 14 kWh

- 37** The direction of a compass needle placed at one end X of a piece of unknown material P is as shown.



When the other end Y is brought near to a magnet Q, P is attracted to Q.
When the compass is placed at X, it reverses direction.

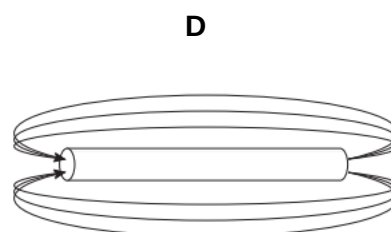
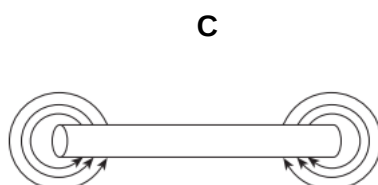
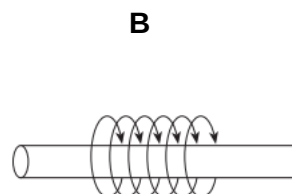
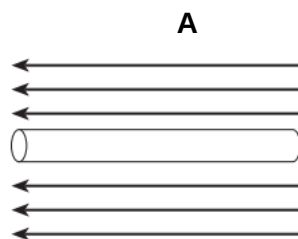


What can be deduced about the piece of material P?

- A** It is a magnet with X as the North pole.
 - B** It is a magnet with X as the South pole.
 - C** It is made of a material such as aluminium.
 - D** It is made of a material such as iron.
- 38** A current flows through a wire as shown.

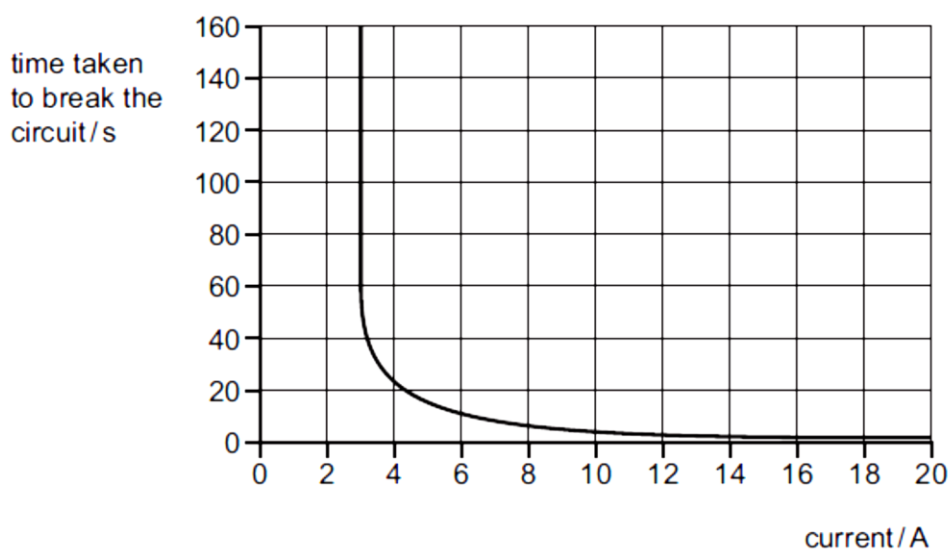


Which diagram represents the magnetic field produced by this current?



- 39** A circuit-breaker is designed to protect a circuit which usually carries a current of 2 A.

The time taken to break the circuit depends on the current, as shown in the graph.



What happens when the current in the circuit is 2 A and what happens when the current is 18 A?

	when the current is 2 A	when the current is 18 A
A	the circuit breaks in less than 5 s	the circuit breaks in less than 5 s
B	the circuit breaks in less than 5 s	the circuit does not break
C	the circuit does not break	the circuit breaks in less than 5 s
D	the circuit does not break	the circuit does not break

- 40** Electric power cables transmit electrical 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

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