



南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL
Preliminary Examination 2022
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

29 Aug 2022, 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.

- 4 Two forces of magnitude 10 N and 20 N are added to produce a resultant.

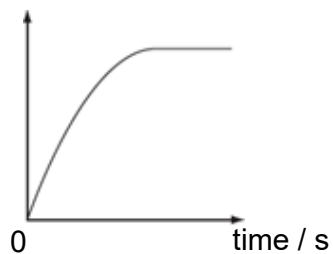
Which statement about the resultant is correct?

- A It may be zero.
- B It may be a scalar quantity.
- C It's magnitude cannot be greater than 20 N.
- D It's direction can be the same as the direction of the 10 N or 20 N force.

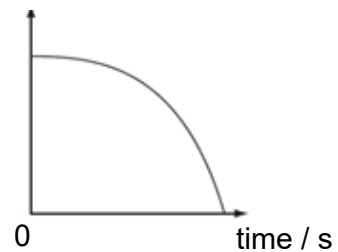
- 5 An object is dropped from a height and experiences considerable air resistance.

Which displacement-time graph illustrates the motion of the object?

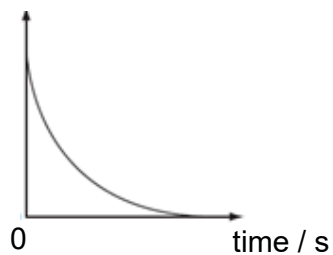
A displacement / m



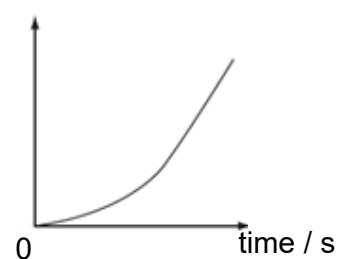
B displacement / m



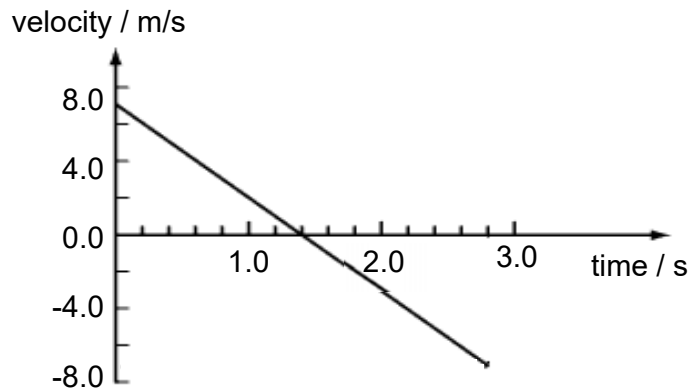
C displacement / m



D displacement / m



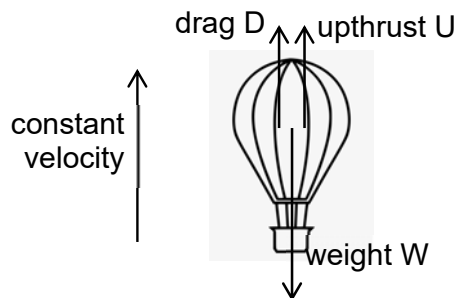
- 6** A stone is thrown vertically upwards on planet P. The velocity time-graph of the stone is shown.



What is the gravitational acceleration on planet P when its velocity is zero?

- | | | | |
|----------|----------------------|----------|----------------------|
| A | 0.0 m/s ² | B | 5.0 m/s ² |
| C | 7.0 m/s ² | D | 10 m/s ² |

- 7** A hot air balloon rises vertically up at constant velocity. Three forces, upthrust, weight and drag, act on the balloon.



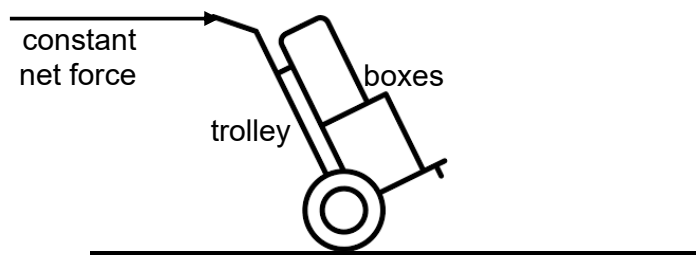
Which relationship between these forces is correct?

- A** $W > D + U$
- B** $D + U = W$
- C** $U = W = D$
- D** $D + U > W$

- 8** Which pair of forces is a pair of action-reaction forces?

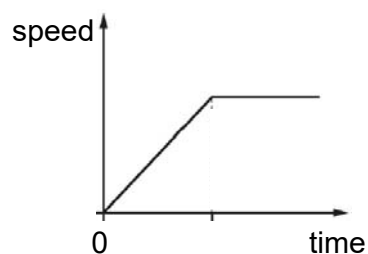
- A** force pulling a rope and tension in the rope
- B** thrust acting on a car and air resistance acting on the car
- C** upward force acting on a plane and weight acting on the plane
- D** gravitational force on a book and reaction force acting on the book

- 9 A constant net force acts on a trolley with some boxes of sand at rest. As the trolley moves in a straight line, the sand in the box gradually leaks away through a hole at the bottom at a constant rate.

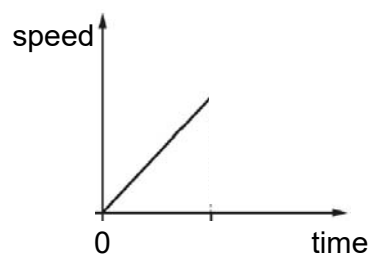


Which is the speed-time graph for the trolley?

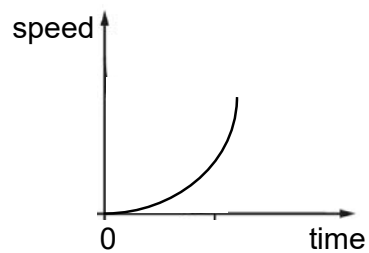
A



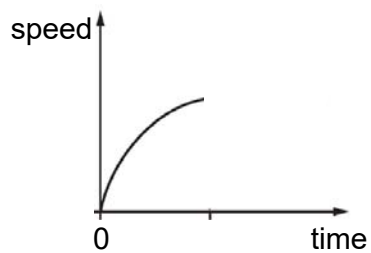
B



C



D

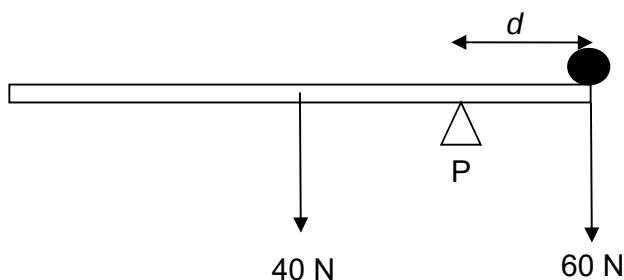


- 13** A block of mass 27 g and density 4.5 g/cm^3 is immersed in a measuring cylinder containing 50.0 cm^3 of water.

What is the final reading on the measuring cylinder?

- | | |
|-----------------------------|-----------------------------|
| A 50.2 cm^3 | B 54.5 cm^3 |
| C 56.0 cm^3 | D 77.0 cm^3 |

- 14** A 4.00 m long uniform plank weighing 40 N balances on pivot P when a load of 60 N is placed at one end.

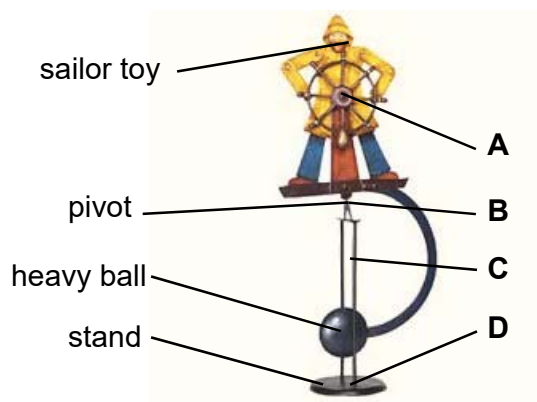


What is the distance d of the pivot P from the load?

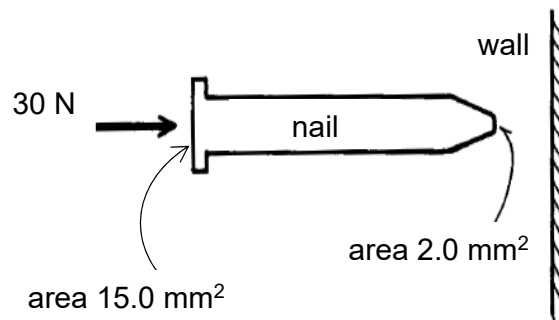
- | | |
|-----------------|-----------------|
| A 0.80 m | B 1.00 m |
| C 1.20 m | D 2.00 m |

- 15** A balancing sailor toy rests on a stand. It is free to rotate about the pivot. When displaced slightly, it returns to this resting position.

Where is the centre of gravity of this toy?



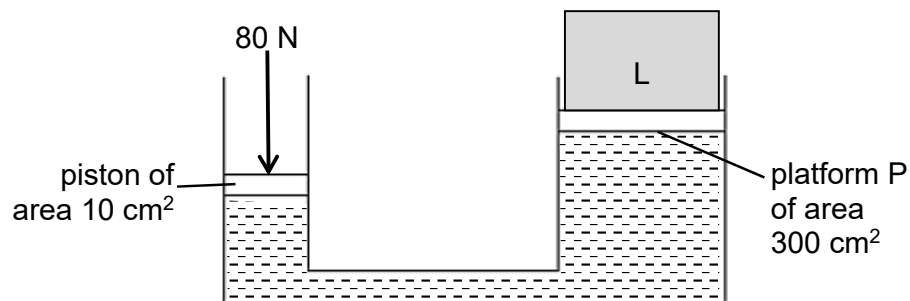
- 16** A force of 30 N is used to knock a nail into a wall.



What is the pressure exerted by the nail onto the wall?

- A** 2.0 N/mm²
- B** 15 N/mm²
- C** 60 N/mm²
- D** 450 N/mm²

- 17** In a simple hydraulic system, an effort of 80 N exerted on a piston of cross-sectional area 10 cm^2 supports a load L on a platform P , of negligible weight. P has a cross-sectional area of 300 cm^2 .



What is the weight of the load L?

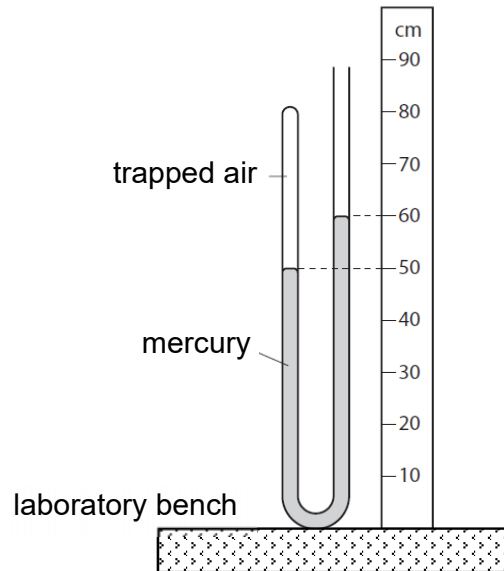
- A** 80 N
B 240 N
C 800 N
D 2400 N

- 18** A body of mass 80 kg drops from a height of 20 m. The gravitational field strength is 10 N/kg.

What is the speed of the body when it hits the ground? Ignore air resistance.

- A** 10 m/s
B 20 m/s
C 200 m/s
D 400 m/s

- 19** A mercury manometer has some air trapped at its closed end. The atmospheric pressure is 76 cm Hg.



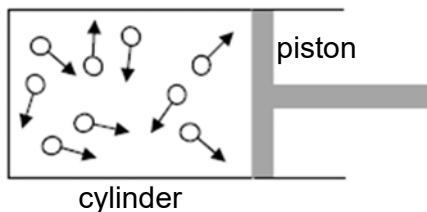
What is the pressure difference between the pressure of the trapped gas and the atmospheric pressure?

- | | |
|-------------------|-------------------|
| A 10 cm Hg | B 50 cm Hg |
| C 66 cm Hg | D 86 cm Hg |
- 20** Some smoke particles in air are trapped in a transparent cell and observed under a microscope. Bright specks of light are seen moving at random.

Which statement is correct?

- A** The specks of light move at the same speed.
- B** The random motion of the specks of light is faster in a vacuum.
- C** The specks of light are air molecules moving in random motion.
- D** The specks of light move faster when the air temperature is higher.

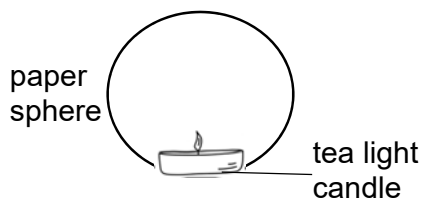
- 21** Hot gas inside a sealed cylinder is allowed to cool to room temperature. The volume of the cylinder remains constant as the piston remains in position.



What is true about the gas particles as the temperature drops?

	speed of gas molecules	frequency of collision with piston
A	unchanged	decreases
B	unchanged	unchanged
C	decreases	decreases
D	decreases	unchanged

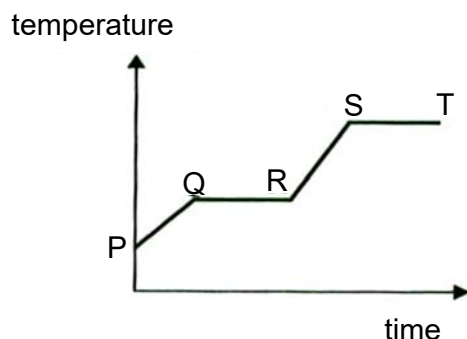
- 22** A tea light candle is lit and placed under a paper sphere as shown. After a while, the top of the sphere turns black and catches fire.



Which statement explains this observation?

- A** A convection current is set up and the hot air heats the top of the sphere.
- B** The wax from the candle evaporated and collected at the top of the sphere.
- C** Air is a good conductor of heat and conducts the heat upwards to the top of the sphere.
- D** Paper is a good conductor of heat and conducts the heat through the sphere to the top.

- 23 A solid substance is placed in a boiling tube and heated steadily. The temperature-time graph of the substance is shown below.



Which statement is **not** true?

- A The substance is a liquid between Q and R.
 - B The substance is a liquid between R and S.
 - C The substance is a mixture of solid and liquid between Q and R.
 - D The substance is a mixture of liquid and vapour between S and T.
- 24 The same amount of thermal energy is supplied to blocks of different masses.

Which block has the highest specific heat capacity?

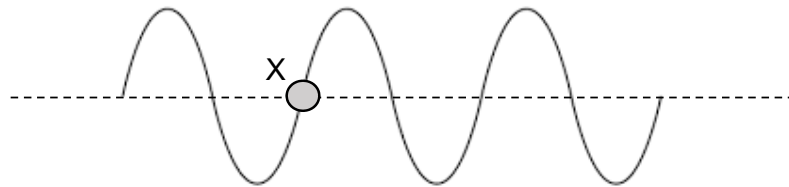
	mass of block / kg	increase in temperature / °C
A	2.0	5.0
B	3.0	3.0
C	4.0	2.0
D	5.0	1.0

- 25 A 500 g block of copper is placed in water boiling at 100 °C for 10 minutes. The block is then transferred into a styrofoam box with 1.0 kg of water at 30 °C. The specific heat capacity of copper is 400 J/(kg °C) and the specific heat capacity of water is 4200 J/(kg °C).

Which is the final temperature of the copper and water mixture?

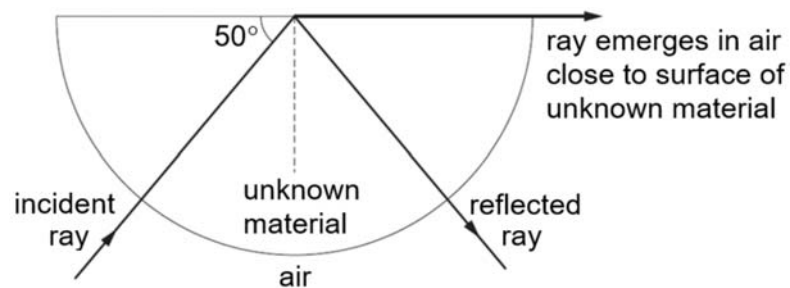
- A 33.2 °C
- B 36.5 °C
- C 52.6 °C
- D 70.0 °C

- 26** A water wave travels from right to left. It has a period of 1.0 s. An object X floats on the water in the position shown.



Which statement is true about the subsequent motion of X?

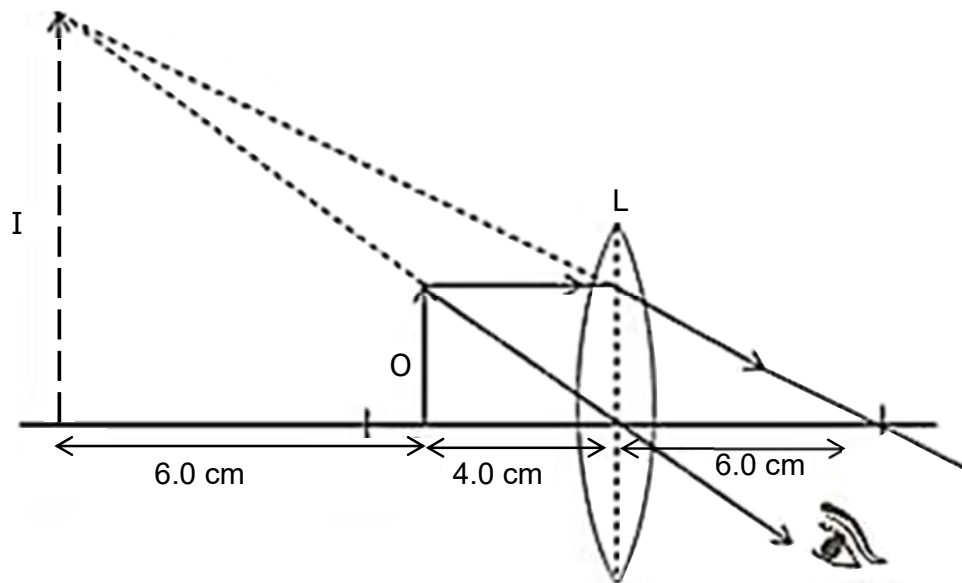
- A** X will accelerate upwards and reach the peak in 0.75 s.
 - B** X will accelerate downwards and reach the trough in 0.25 s.
 - C** X will decelerate upwards and reach the peak in 0.25 s.
 - D** X will decelerate downwards and reach the trough in 0.75 s.
- 27** A ray of monochromatic light passes through a transparent semi-circular block of an unknown material.



What is the refractive index of the unknown material?

- | | |
|---------------|---------------|
| A 0.64 | B 0.77 |
| C 1.31 | D 1.56 |

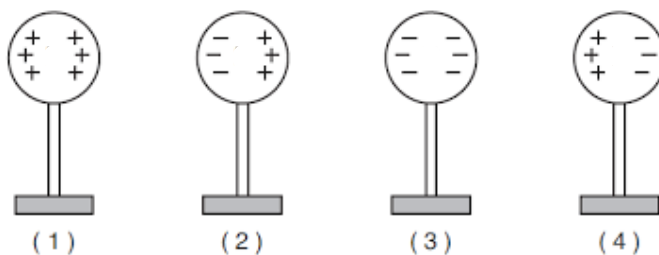
- 28** A converging lens L acts as a magnifying glass when an object O is placed 4.0 cm from the centre of the lens. The image I is 6.0 cm from A .



What is the magnification of the image?

- | | | | |
|----------|------|----------|------|
| A | 0.40 | B | 0.67 |
| C | 1.5 | D | 2.5 |
- 29** Which type of electromagnetic wave is used to destroy cancer cells?
- | | | | |
|----------|-------------|----------|------------------|
| A | radio waves | B | gamma rays |
| C | microwaves | D | ultraviolet rays |

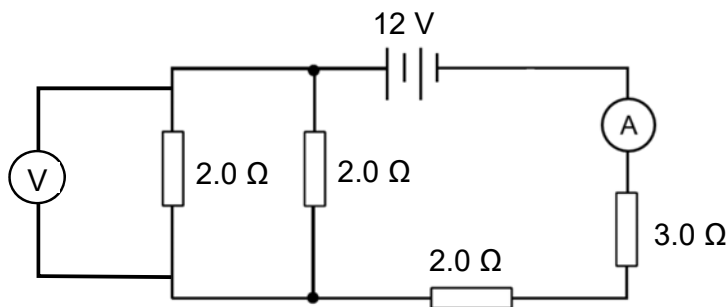
- 30** Four identical metal spheres on insulating stands are placed next to each other. The charge on each of the spheres is shown.



Which of the following is true when two spheres are placed in contact with each other and far away from the other spheres?

	spheres in contact	movement of charge	final charge on both spheres
A	(1) and (2)	positive charges from (1) to (2)	positive
B	(2) and (3)	negative charges from (3) to (2)	negative
C	(2) and (4)	negative charges from (2) to (4) and positive charges from (4) to (2)	neutral
D	(1) and (3)	positive charges from (1) to (3) and negative charges (3) to (1)	neutral

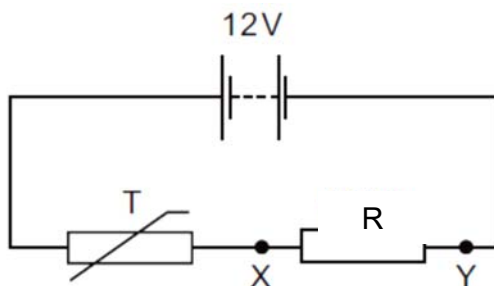
- 31** An electrical circuit with four resistors is set up.



What is the reading on the voltmeter?

- | | |
|----------------|----------------|
| A 1.0 V | B 2.0 V |
| C 2.7 A | D 3.0 V |

- 32** A thermistor T increases in resistance as temperature decreases and is used in a fire alarm system. The alarm system is connected across X and Y .

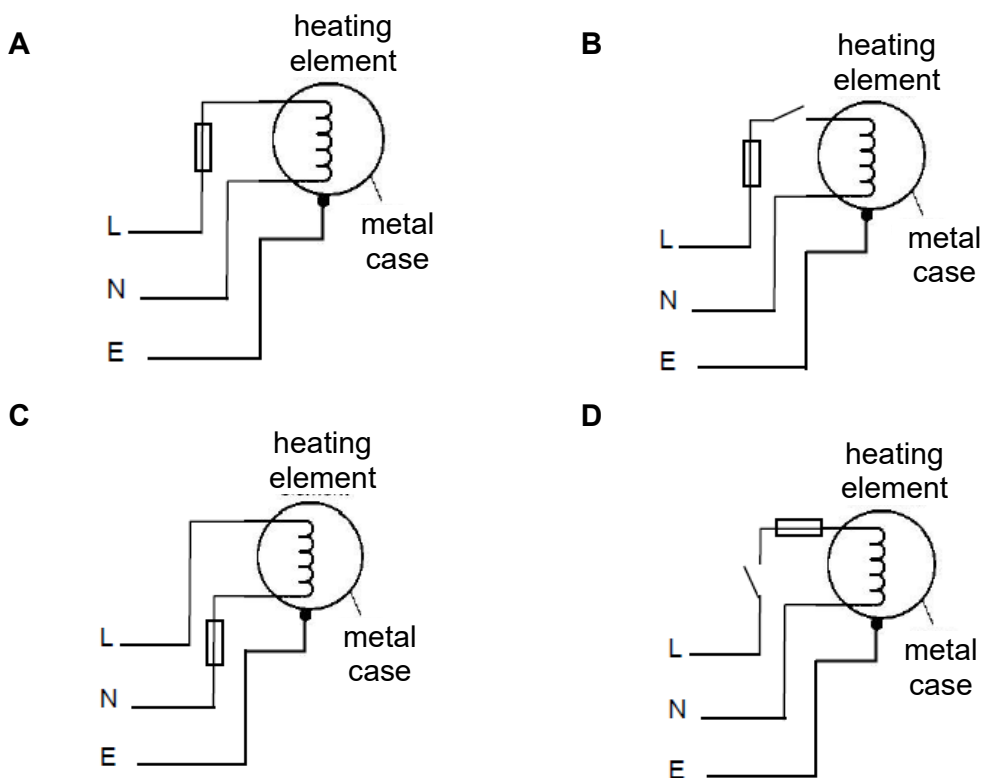


The resistor R is now replaced by a light dependent resistor.

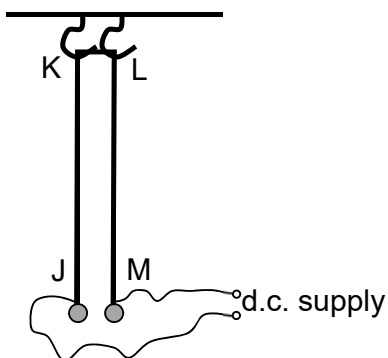
Under what conditions will the alarm be triggered?

- | | |
|------------------------|--------------------------|
| A cold and dark | B cold and bright |
| C hot and dark | D hot and bright |
- 33** An electric iron with a metal case is connected to the electrical mains of a house. The heating element is not in electrical contact with the metal case.

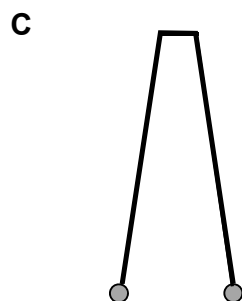
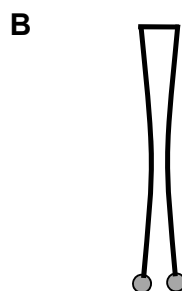
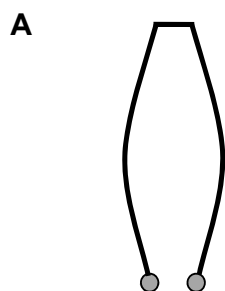
Which is the correct wiring to the live wire L , the neutral wire N and the earth wire E ?



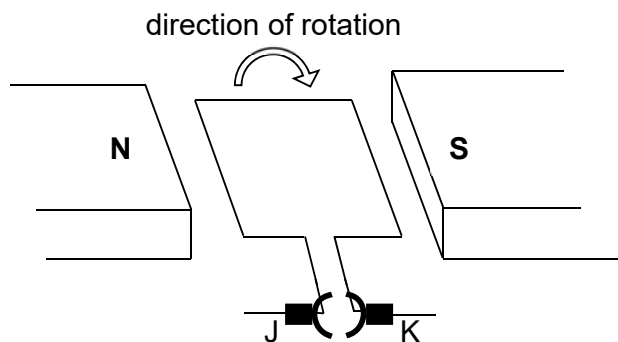
- 36** A light straight wire is bent into the shape JKLM and suspended from two hooks to form two long straight parallel sections JK and LM. Small weights are attached to the bottom J and M to keep them straight. The wire is connected to a d.c. supply.



What is the appearance of the wire when the d.c. supply is switched on?



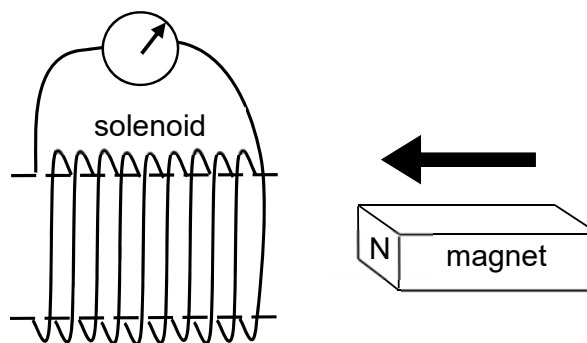
- 37 A d.c. supply is connected across the carbon brushes J and K of a simple d.c. motor.



Which of the following correctly identifies the connection of carbon brushes to the positive terminal of the d.c. supply and, the correct value of the torque at the instant shown in the above diagram?

	carbon brush connected to positive terminal	value of torque at instant shown
A	J	minimum
B	J	maximum
C	K	minimum
D	K	maximum

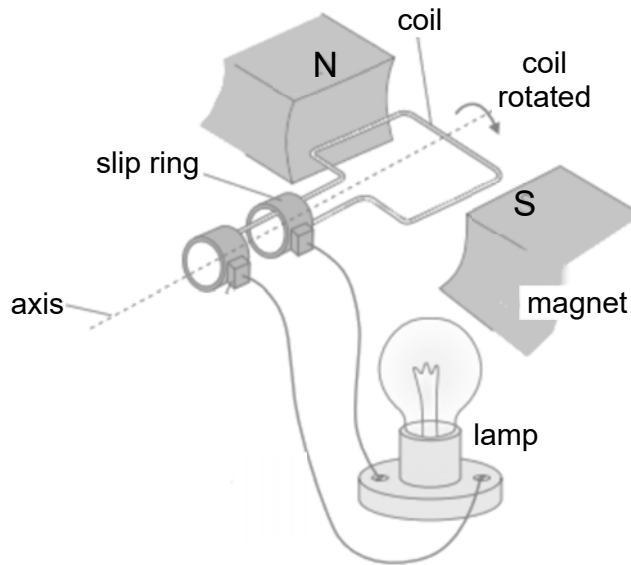
- 38 When the north pole of a magnet is moved towards a solenoid as shown, an e.m.f. is induced in the solenoid and the galvanometer shows a deflection.



Which change will cause a deflection in the same direction?

- A Reverse the winding of the solenoid.
- B Move the south pole of the magnet towards the coil.
- C Move the north pole of the magnet away from the coil.
- D Reverse the winding of the solenoid and move the north pole away from the solenoid.

- 39** A simple a.c. generator is used to operate a lamp.



Which change will **not** increase the brightness of the lamp?

- A** increase the number of turns in the coil
 - B** increase diameter of the slip rings used
 - C** increase the strength of the magnets used
 - D** increase the frequency of rotation of the coil
- 40** The voltage of the electrical power generated at a power plant is raised using a step-up transformer before the electrical power is delivered along transmission cables to consumers.

What is the advantage of stepping up the voltage before transmission?

- A** The power loss in the cables is decreased.
- B** The current supplied to the consumer is increased.
- C** The frequency of the a.c. supply can be increased.
- D** The resistance of the transmission cables can be reduced.

End of Paper

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