

Name: Index no.: Class:.....



Bukit Batok Secondary School

GCE O LEVEL PRELIMINARY EXAMINATIONS 2024 SECONDARY 4 EXPRESS

PHYSICS

Paper 1 Multiple Choice

6091/01
28 August 2024
1 Hour
1005 – 1105 h

Additional Materials: Multiple Choice Answer Sheet (OAS)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class in the spaces provided at the top of this page.

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 OAS.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

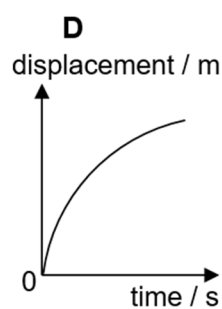
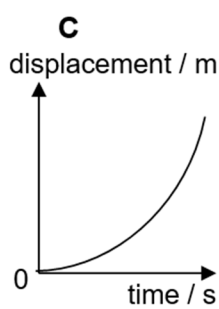
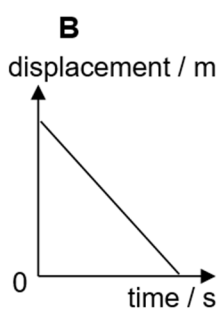
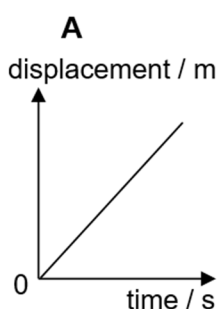
Any rough working should be done in this booklet.

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

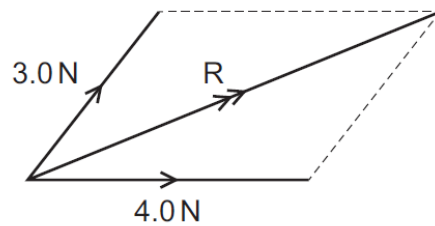
- 1 Which pair contains one vector quantity and one scalar quantity?
- A acceleration and friction
 - B displacement and charge
 - C moment and force
 - D velocity and weight
- 2 A cyclist, riding at a speed of 5.0 m/s, brakes with uniform deceleration and stops in a distance of 300 cm.

How long does the cyclist take to stop?

- A 0.60 s
 - B 1.2 s
 - C 1.3 s
 - D 3.0 s
- 3 A lorry travels along a straight road. It decelerates upon seeing the red light ahead.
- Which diagram shows the displacement-time graph of the lorry?



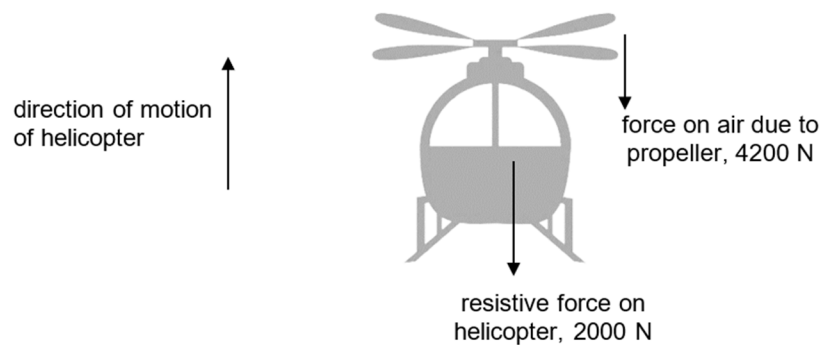
- 4 The diagram shows the resultant R of a 3.0 N force and a 4.0 N force acting at a point.



The angle between the 3.0 N force and the 4.0 N force can be any value from 0° to 90° .

Which value of R is not possible?

- A 4.0 N
 - B 5.0 N
 - C 6.0 N
 - D 7.0 N
- 5 A helicopter moves through the air and ascends against a total resistive force of 2000 N . The propeller on the helicopter sweeps the air downwards with a force of 4200 N .



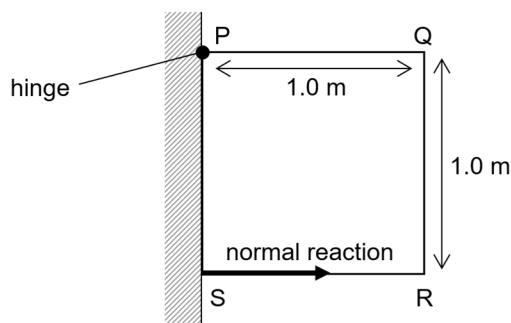
What is the upward force on the propeller due to the air?

- A 2200 N
 - B 2000 N
 - C 4200 N
 - D 6200 N
- 6 An alloy is made by mixing 450 g of cobalt of density 9.0 g/cm^3 with 240 g of steel of density 8.0 g/cm^3 .

Assuming no chemical reaction occurs, what is the density of the alloy?

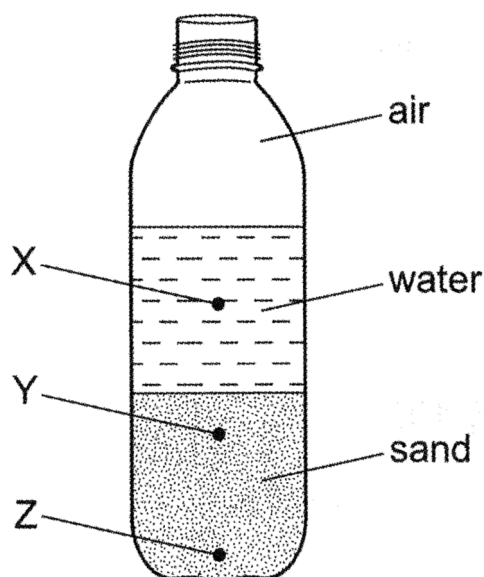
- A 6.0 g/cm^3
- B 8.6 g/cm^3
- C 17 g/cm^3
- D 41 g/cm^3

- 7 A square shop sign of side 1.0 m made from a uniform flat lamina PQRS is attached to a vertical wall by a hinge at P so that S rests against the wall vertically below P. The mass of the sign is 5.0 kg.



What is the normal reaction exerted by the wall at S?

- A 25 N
 B 50 N
 C 75 N
 D 100 N
- 8 The diagram shows a bottle containing air, oil and sand.

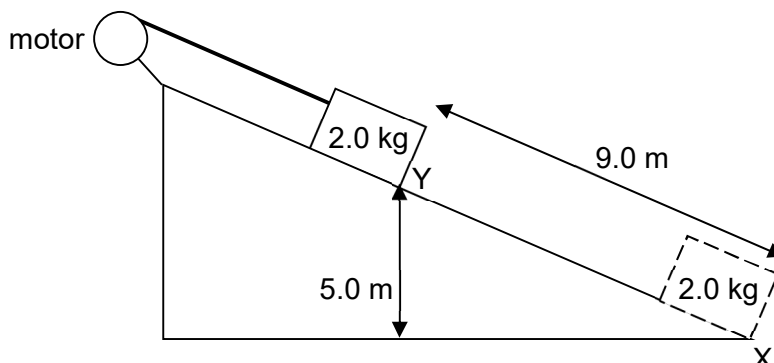


More sand is added to the bottle. This affects the position of the centre of gravity of the bottle and its contents.

How might the centre of gravity move?

- A from X towards Y
 B from Z towards Y
 C from Y towards X
 D from Y towards Z

- 9 The diagram shows a motor used to pull a mass of 2.0 kg up a ramp. The mass is moving at constant speed between X and Y. The gravitational field strength of Earth is 10 N/kg



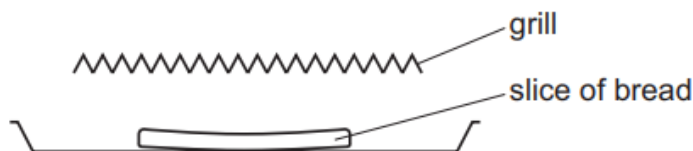
What is the power of the motor if the mass is lifted from point X to point Y in 4.0 s?

- A 7.0 W
 B 18 W
 C 25 W
 D 43 W
- 10 A fixed mass of gas is cooled while kept at constant volume.

How do the behaviour and distance of the molecules of the gas change?

	average speed	average distance apart
A	decreases	unchanged
B	decreases	decreases
C	unchanged	unchanged
D	unchanged	decreases

- 11 A slice of bread is placed under a red-hot electric grill to make toast.



How is thermal energy transferred from the grill to the bread?

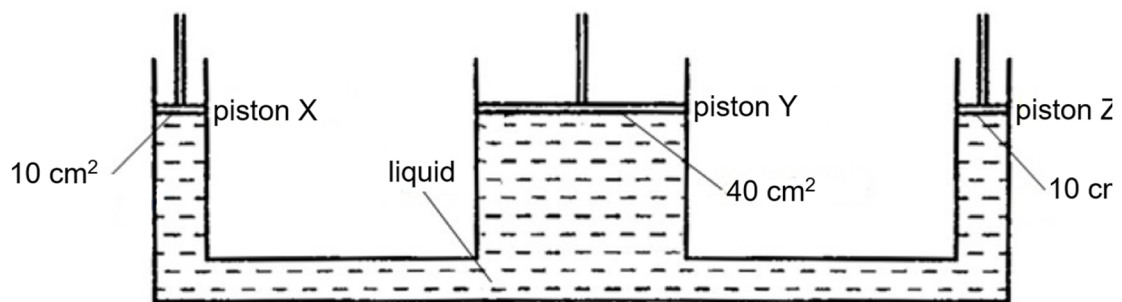
- A radiation only
 B conduction and radiation
 C convection and radiation
 D conduction, convection and radiation

- 12** The 200 V battery of an electric car is charged with a current of 33 A for 4.0 hours. The efficiency of the charging process is 0.90.

How much useful energy is transferred to the battery?

- A** 21 000 000 J
- B** 86 000 000 J
- C** 95 000 000 J
- D** 110 000 000 J

- 13** The system shown in the diagram contains a liquid. The three pistons are connected by means of the reservoir of liquid.

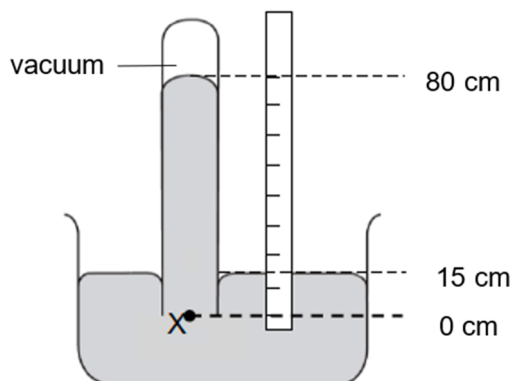


A downward force of 250 N is exerted on piston Y.

What is the upward force exerted by the liquid on piston X?

- A** 31.3 N
- B** 62.5 N
- C** 1000 N
- D** 2000 N

- 14** A simple mercury barometer is used to measure atmospheric pressure as shown below.

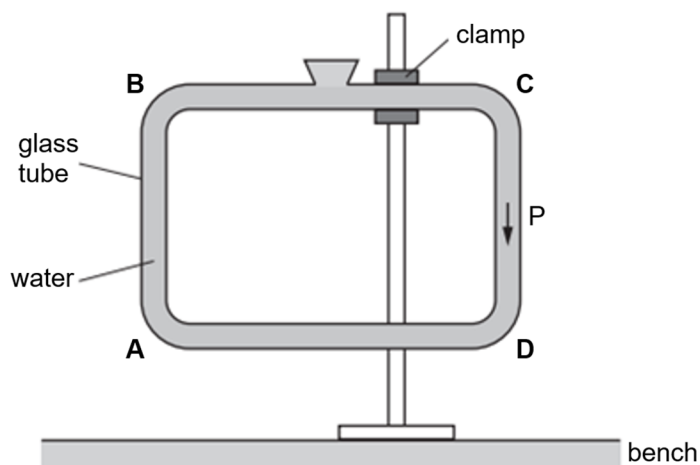


What is the pressure at X?

- A** 0 cmHg
B 15 cmHg
C 65 cmHg
D 80 cmHg
- 15** Air in a closed container contains smoke, illuminated by bright light. When viewed through a microscope, bright specks of light are seen moving at random.
- Which statement is correct?
- A** The random motion of specks is faster in a vacuum.
B The specks move faster when the air is at a higher temperature.
C The specks seen are molecules of air in rapid random motion.
D When the light is turned off, the specks slow down and stop moving.
- 16** How does the motion of molecules in a solid differ from that of molecules in a gas?

	molecules in a solid	molecules in a gas
A	rotate and vibrate randomly	move randomly
B	rotate and vibrate randomly	vibrate randomly
C	vibrate about their fixed positions	move randomly
D	vibrate about their fixed positions	vibrate randomly

- 17** The diagram shows a glass tube filled with water and suspended above a bench. The water is free to circulate around the tube. At point P, there is a convection current moving in a downwards direction.



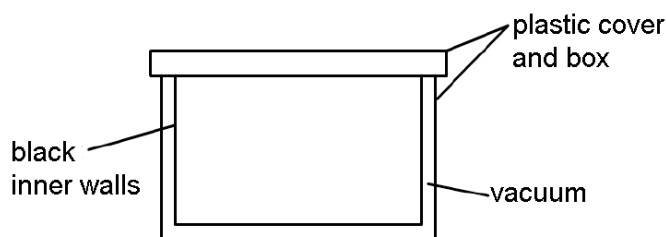
At which points are the tube heated or cooled to cause this convection current?

- A** Heating at A and heating at D
 - B** Cooling at B and heating at D
 - C** Heating at C and cooling at B
 - D** Heating at A and cooling at C
- 18** A box with mass 4.0 kg is pulled from rest along a horizontal floor by a constant force F . A constant frictional force of 1.0 N acts on the box. When the box has travelled 1.0 m its velocity is 1.5 m/s. The kinetic store of the box is equal to the work done on the box.

What is force F ?

- A** 2.0 N
- B** 3.5 N
- C** 4.0 N
- D** 5.5 N

- 19 The diagram below shows the cross-section of a plastic container.



A student claims that the container can keep food warm for a long duration. He offers the following explanations:

- I The plastic cover reduces heat loss through conduction as plastic is a poor conductor of heat.
- II The black inner walls will absorb heat from the environment to keep food warm since black surfaces are good absorbers of infrared radiation.
- III The vacuum between the walls of the container will prevent heat losses to the surroundings through conduction and convection.

Which of the following explanations is/are correct?

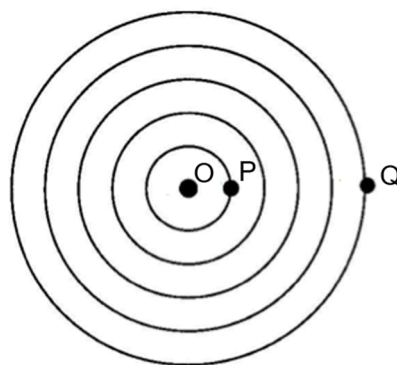
- A I and III only
 - B I only
 - C I, II and III
 - D II and III only
- 20 A thin sheet of material is shiny and white. It is used to wrap around an athlete who has run a race.

What is the effect of the sheet being shiny and white rather than dull and black?

- A It reflects less radiation from the athlete and the athlete cools down more quickly.
 - B It reflects less radiation from the athlete and the athlete cools down more slowly.
 - C It reflects more radiation from the athlete and the athlete cools down more quickly.
 - D It reflects more radiation from the athlete and the athlete cools down more slowly.
- 21 The temperature of a body increases by 1°C . Which other quantity also increases?

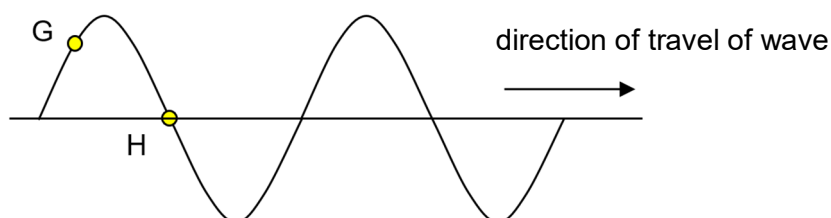
- A heat capacity
- B internal energy
- C latent heat
- D specific heat capacity

- 22** The following diagram illustrates crest of circular wavefronts radiating from a point source O. The time taken for a wavefront to travel from P to Q is 10 s, and the distance between P and Q is 8.0 m.



How long does it take for a wave to travel 30 m?

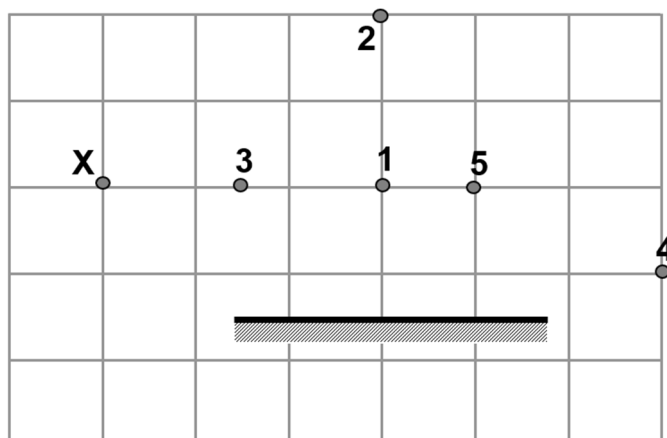
- A** 24.0 s
B 26.7 s
C 30.0 s
D 37.5 s
- 23** The diagram shows a wave with two points G and H marked. The wave is moving in the direction shown.



What happens to the frequency and speed of vibration of particle G and direction of vibration of particle H as the wave moves to the right?

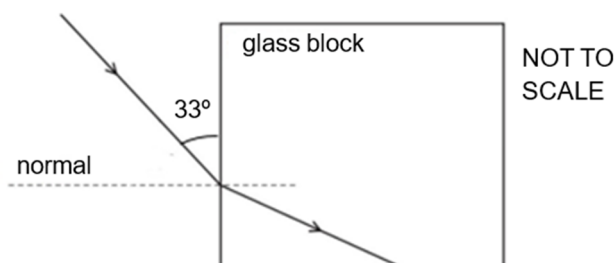
	frequency	direction of vibration of particle G	direction of vibration of particle H
A	constant	upwards	downwards
B	constant	downwards	upwards
C	increases	upwards	upwards
D	increases	downwards	downwards

- 24 A person stands at a point X as shown.



Which images of the pins (1, 2, 3, 4, 5) will the person be able to see in the mirror?

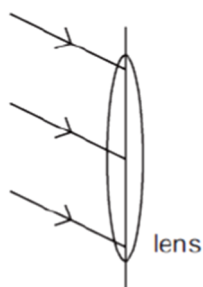
- A pins 1 and 2 only
 B pins 3 and 4 only
 C pins 1, 4 and 5 only
 D pins 2, 4 and 5 only
- 25 The diagram shows a light ray passing from air into a glass block. The glass block has a refractive index of 1.5.



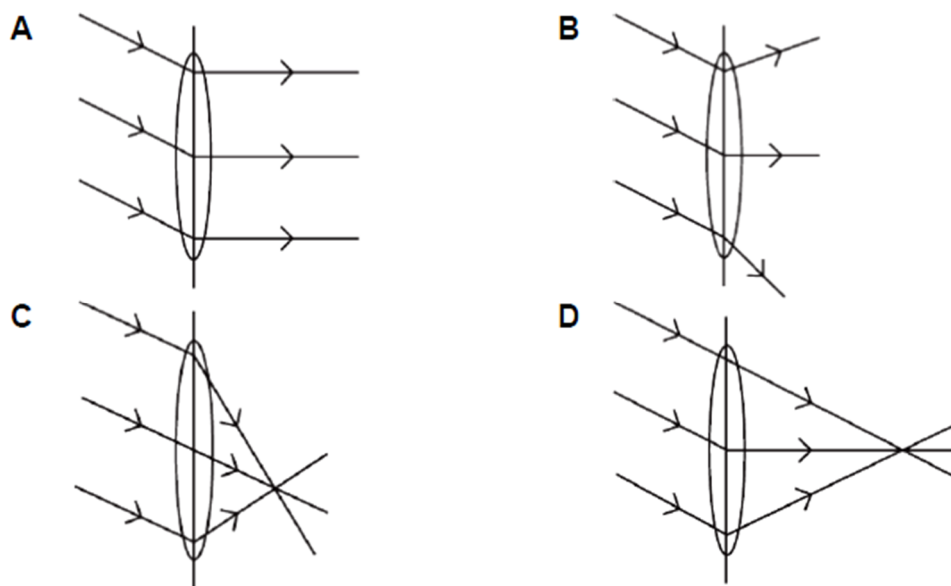
What is the angle of refraction in the glass and critical angle of the glass?

	angle of refraction / °	critical angle / °
A	34	42
B	34	60
C	38	42
D	38	60

- 26** Three parallel rays of light are incident on a converging lens as shown.



Which diagram shows the path of the rays after passing through the lens?



- 27** The diagram shows the main sections of the electromagnetic spectrum arranged in order of increasing frequency. Some of the sections are labelled in letters.

radio waves		R	light			gamma-rays
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Which application uses the section R?

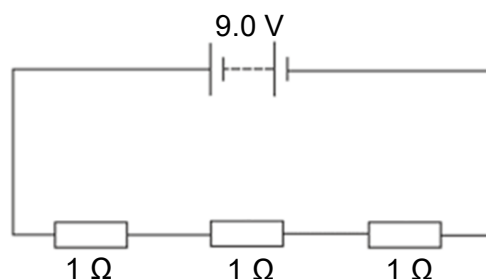
- A** killing cancerous cells
- B** satellite television
- C** sterilisation
- D** television remote control

- 28 The table gives type of charges acquired when some materials are rubbed together.

materials	positive charge	negative charge
glass rod rubbed with silk	glass rod	silk
ebonite rod rubbed with fur	fur	ebonite rod
ebonite rod rubbed with silk	silk	ebonite rod

Which statement is **incorrect** after rubbing together two materials?

- A Ebonite rod gains electrons from fur.
 B Glass rod gains electrons from silk.
 C Glass rod loses electrons to silk.
 D Silk loses electrons to ebonite.
- 29 The circuit below shows three identical resistors connected to a 9.0 V battery. In a given amount of time, 2.0 C of charge flows through each resistor.



What is the amount of energy dissipated by each resistor?

- A 4.5 J
 B 6.0 J
 C 9.0 J
 D 18 J
- 30 When a wire is directly connected to a battery, a current of 8.0 A passes through it. The wire has a length 8.0 cm and cross-sectional area of 25 mm².

What is the possible length and cross-sectional area of the metallic conductor to allow a current of 4.0 A to pass through, when connected to the same battery?

	length / cm	cross-sectional area / mm ²
A	4.0	25
B	8.0	12.5
C	8.0	50
D	16	12.5

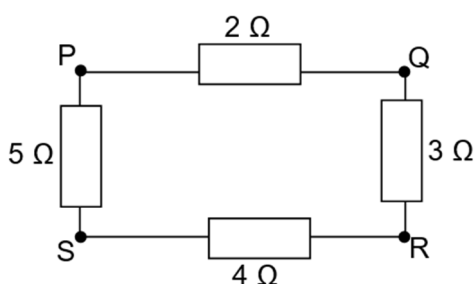
- 31 The diagram shows a circuit using a transducer.



Which combination below will result in the smallest potential difference across the output?

	R	light intensity
A	low resistance	bright
B	high resistance	bright
C	low resistance	dim
D	high resistance	dim

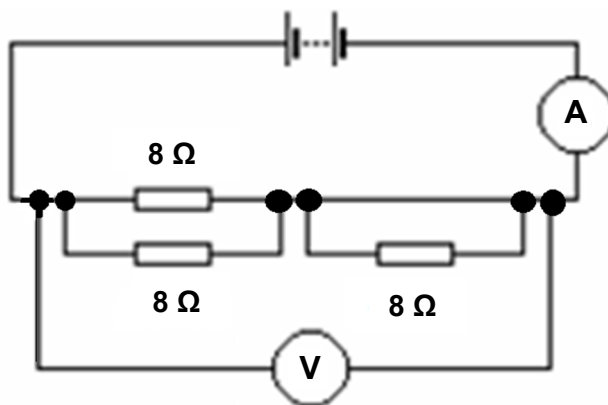
- 32 The diagram below shows a circuit with four different resistors.



Across which junctions will the maximum effective resistance be achieved?

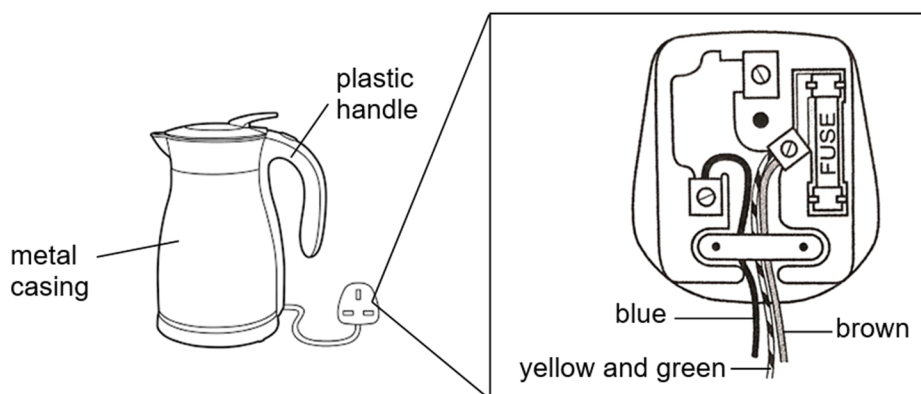
- A** PQ
- B** QR
- C** RS
- D** SP

- 33 Three $8\ \Omega$ resistors are connected as shown in the diagram.



What is the voltmeter reading when the ammeter reading is 2.0 A ?

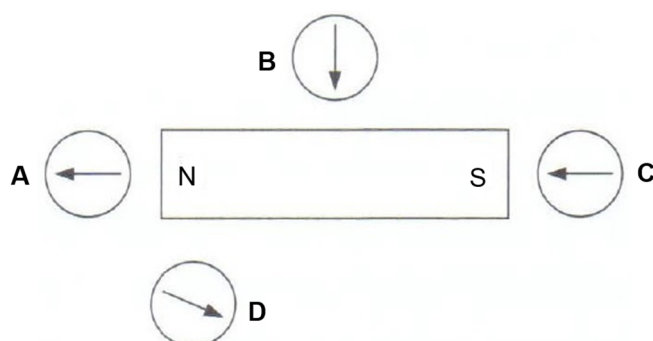
- A 2.0 V
 B 6.0 V
 C 8.0 V
 D 24 V
- 34 An electric kettle has a plastic handle and metal casing. The 3-pin plug of the electric kettle is wrongly wired and a magnified view is as shown. The colour of each wire is indicated in the diagram.



What would be the effect of this wrong wiring?

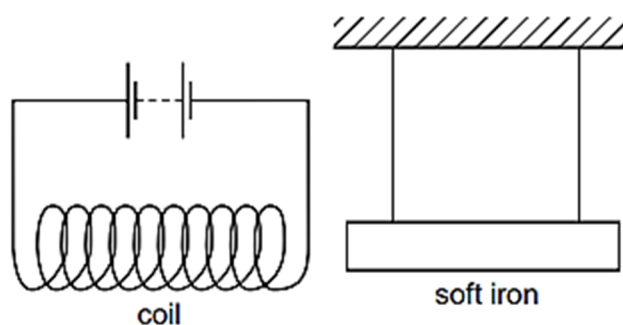
- A The electric kettle does not work.
 B The electric kettle overheats.
 C The fuse in the plug blows.
 D The metal casing becomes live.

- 35** Four compasses are placed around a bar magnet, as shown in the diagram.



Which one points to the wrong direction?

- 36** A coil is connected to a battery and a soft iron bar is hung near to it.

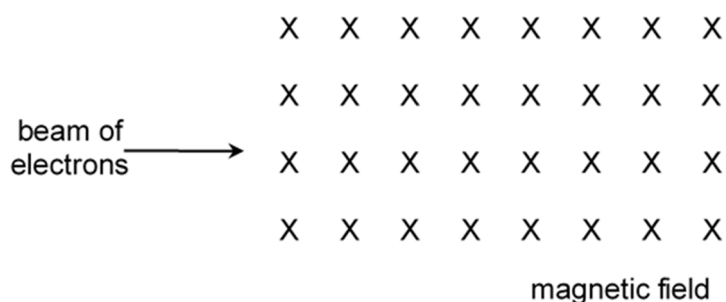


The connection to the battery is then reversed.

How does the soft iron behave in the two cases?

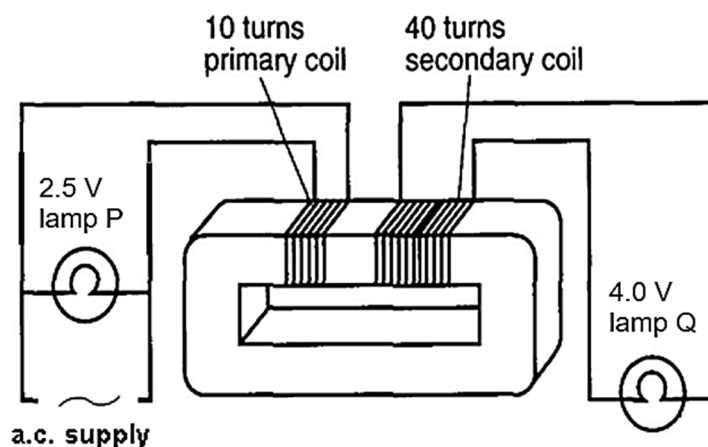
	with the battery before reversing connection	with the battery after reversing connection
A	attracted to the coil	attracted to the coil
B	attracted to the coil	repelled from the coil
C	repelled from the coil	attracted to the coil
D	repelled from the coil	repelled from the coil

- 37 The diagram shows a beam of electrons entering a magnetic field.



What is the effect of the magnetic field on the electrons?

- A The electrons deflected into the paper.
 - B The electrons are deflected out of the paper.
 - C The electrons are deflected towards the bottom of the diagram.
 - D The electrons are deflected towards the top of the diagram.
- 38 A student sets up a model transformer as shown in the diagram below.



The a.c. supply is 2.5 V. One lamp has a working voltage of 2.5 V while the other has a working voltage of 4.0 V.

If lamp P is at normal brightness, what does the student notice about the lamp Q?

- A brighter than normal
- B dimmer than normal
- C normal brightness
- D not lighted up

- 39** The isotope radon-222 has a half-life of 3.8 days.

Which statement about a sample containing 1.0 mg of radon-222 is correct?

- A** After 1.9 days there is 0.75 mg of radon-222 left.
- B** After 3.8 days there is 0.50 mg of radon-222 left
- C** Its half-life doubles when the mass is 2.0 mg.
- D** There is no radon-222 left after 7.6 days.

- 40** A neutral atom of an isotope has the nuclide notation $^{205}_{81}\text{Tl}$.

Which statement is correct?

- A** There are 81 electrons in the nucleus of the atom.
- B** There are 205 neutrons in the nucleus of the atom.
- C** There are 43 more neutrons than electrons in the atom.
- D** There are 124 protons in the nucleus of the atom.

--- End of Paper ---