Name: _____ ( ) Class: _____

PRELIMINARY EXAMINATION
GENERAL CERTIFICATE OF EDUCATION ORDINARY LEVEL

PHYSICS **6091/01**

Paper 1 Multiple Choice **30 August 2022**

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, index number and class on the Answer Sheet in the spaces provided.

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 separate Answer Sheet.

Read 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 on this booklet.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **17** printed pages and **1** blank page.

1 Which of the following has the same value as 5.0×10^{7} μm?

A 5.0×10^{8} nm
B 5.0×10^{-4} mm
C 5.0×10^{3} cm
D 5.0×10^{-1} m

2 A micrometer screw gauge is used to measure the thickness of a sheet of glass. Diagram 1 shows the reading on the micrometer when the jaws are closed with nothing between the jaws.
Diagram 2 shows the reading on the micrometer when the jaws are closed around the glass sheet.

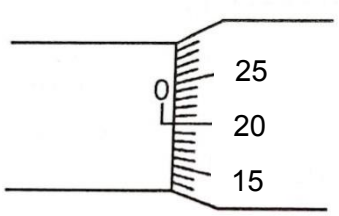


diagram 1

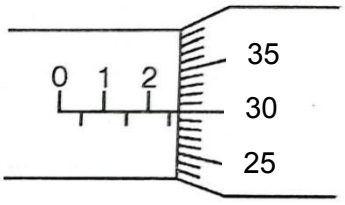
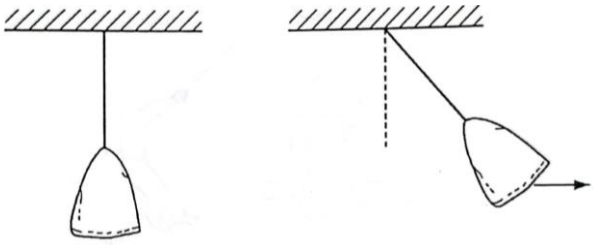


diagram 2

What is the thickness of the glass sheet?

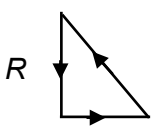
A 2.10 mm
B 2.35 mm
C 2.60 mm
D 2.85 mm

3 A heavy rack is suspended from a ceiling by a rope. The sack is then pulled to one side and held stationary.

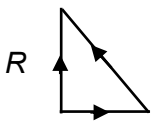


Which vector diagram shows the resultant force *R* of the pulling force and tension?

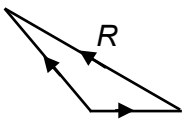
A



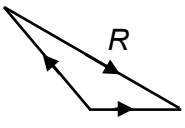
B



C



D



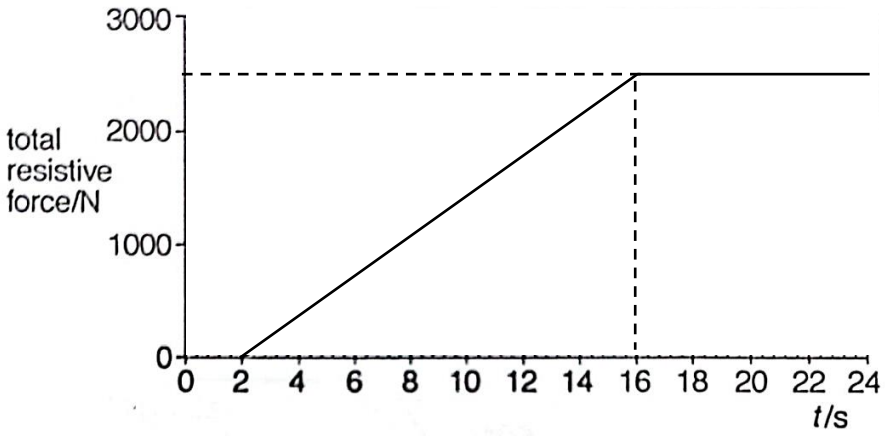
4 A block of wood of mass 2.0 kg is pushed along the horizontal flat surface of a bench with a force of 4.0 N. It moves at constant speed.

When the pushing force is increased to 12 N, what is the acceleration of the block?

A 0 m/s^2
B 4.0 m/s^2
C 6.0 m/s^2
D 8.0 m/s^2

5 The graph shows the total resistive force that acts on a car of mass 830 kg over a period of time.

The car is at rest at t = 0 s. A constant driving force of 2500 N acts on the car from t = 2 s to t = 24 s.



Which statement is **incorrect**?

A The acceleration of the car is 3.0 m/s^2 at t = 2 s.
B The acceleration of the car is zero after t = 16 s.
C The car is stationary from t = 0 s to t = 2 s.
D The resultant force acting on the car increases from t = 2 s to t = 16 s.

6 Which of the following correctly describes an action-reaction pair of forces?

A The backward force acting on water by propeller and the resistive force acting on the boat.
B The reaction force on a book resting on a table and the weight of the book.
C A runner pushes backward on the ground and the ground pushes forwards on runner.
D The pulling force acting on a trolley and the frictional force acting on the trolley.

7 A rocket is travelling vertically upwards. Three vertical forces act on it. The thrust acts upwards and is equal to 100 000 N. The weight of the rocket is equal to 80 000 N.

What is the magnitude and direction of the drag force acting on the rocket when it is travelling upwards at constant speed?

	magnitude	direction
A	20 000 N	downwards
B	20 000 N	upwards
C	160 000 N	downwards
D	160 000 N	upwards

8 Two stones of different masses fall from rest at the same time from a table. Air resistance is ignored.

What will happen and why?

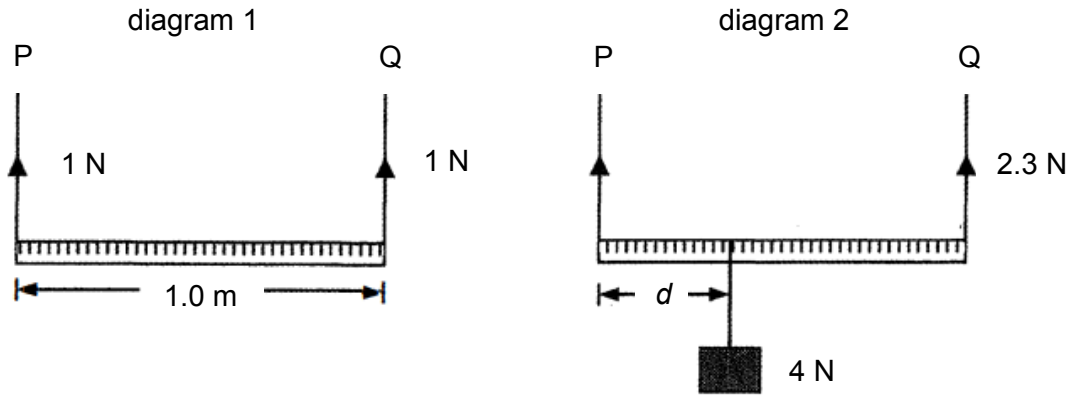
	What will happen	why
A	Both stones hit the floor at the same time.	The acceleration is constant.
B	Both stones hit the floor at the same time.	The speed is constant.
C	The heavier stone hits the floor first.	Acceleration increases with weight
D	The heavier stone hits the floor first.	Speed increases with weight

9 A rock has a weight of 19 N on Mars. The rock is then taken back to Earth. The gravitational field strength of Mars is 3.7 N/kg and the gravitational field strength of Earth is 9.8 N/kg. The mass is unchanged when transported.

What is the mass and weight of the rock on Earth?

	mass on Earth / kg	weight on Earth / N
A	1.9	50
B	1.9	19
C	5.1	19
D	5.1	50

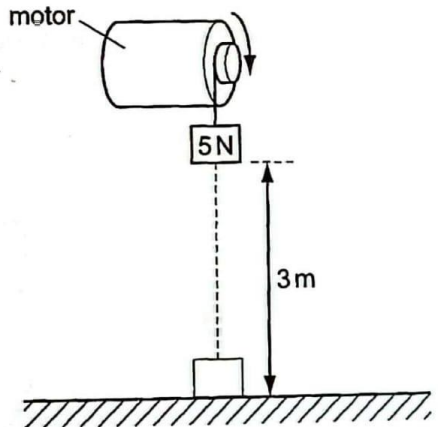
10 A uniform metre rule is supported by vertical wires P and Q and remains horizontal as shown in diagram 1. The tension in each wire is 1 N. When a weight of 4 N is hung from the metre rule at the position as shown in diagram 2, the tension in Q becomes 2.3 N while the metre rule remains horizontal.



What is the distance *d* of the weight 4 N from end P?

A 32.5 cm
B 57.5 cm
C 67.5 cm
D Cannot be found as tension in P is unknown

11 An electric motor is used to lift a 5 N load through 3 m as shown.



The amount of energy wasted is 10 J.

What is the efficiency of the motor?

A 15 %
B 40 %
C 60 %
D 67 %

12 Some students climb a flight of stairs in school, and each student is timed. Their weights and times are recorded in the table.

Which student develops the most power?

	weight/ N	time/s
A	400	10
B	450	12
C	490	15
D	540	16

13 In an experiment, smoke particles are suspended in air and viewed through a microscope. The smoke particles undergo jerky random motion.

Which statement is correct?

A Air particles have large mass compared to smoke particles and they move in one direction only.

B Air particles have large mass compared to smoke particles and they move in random directions.

C Air particles move at high speed compared to smoke particles and they move in one direction only.

D Air particles move at high speed compared to smoke particle and they move in random directions.

14 Which row shows physical properties that may both be used to define temperature scales?

A e.m.f at the junction of two different metals and volume of a liquid column
B mass of a solid object and resistance of a metal wire
C mass of a solid object and volume of a liquid column
D volume of a liquid column and weight of trapped gas

15 A student measures the resistance of a metal wire at the ice point and steam point. She records the results.

temperature	resistance / Ω
ice point	15.0
steam point	20.0

What is the temperature when the resistance of the wire is 22.0 Ω?

A 40 °C
B 60 °C
C 120 °C
D 140 °C

16 Which process(es) of thermal energy transfer require a medium?

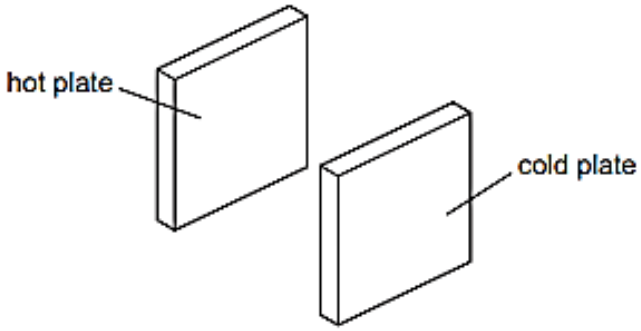
A conduction and convection
B conduction only
C convection and radiation
D radiation only

17 A student is comparing the design of a refrigerator and an oven. The cooling unit of the refrigerator and the heater of an oven can be fitted either at the top or at the bottom.

Which row shows the best position for the cooling unit and heater?

	cooling unit	heater
A	bottom	bottom
B	bottom	top
C	top	bottom
D	top	top

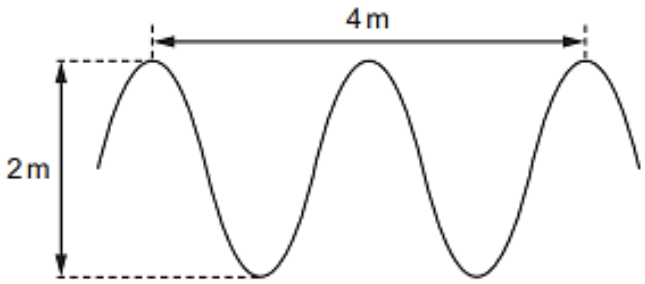
18 A hot metal plate is placed near to a cold metal plate.



Which row shows the colour for the hot plate and for cold plate that causes the temperature of cold plate to increase most slowly?

	hot plate	cold plate
A	dull black	dull black
B	dull black	shiny white
C	shiny white	dull black
D	shiny white	shiny white

19 The diagram represents a rope wave.



Which row shows the amplitude and wavelength of the wave?

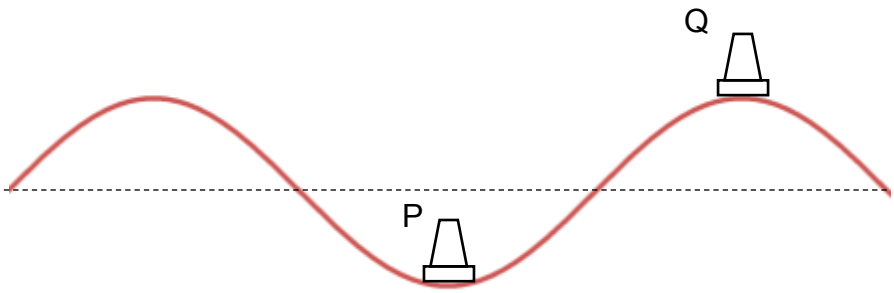
	amplitude / m	wavelength / m
A	1	2
B	1	4
C	2	2
D	2	4

20 A water wave moves from deep water to shallow water. Its speed decreases in shallow water.

Which statement correctly describes the frequency and wavelength of the wave in the shallow water?

A Both frequency and wavelength decrease.
B Both frequency and wavelength remain unchanged.
C Frequency decreases while wavelength remains unchanged.
D Frequency remains unchanged while wavelength decreases.

21 The diagram shows two buoys P and Q sitting on a pond. A wave moves across the pond from left to right.

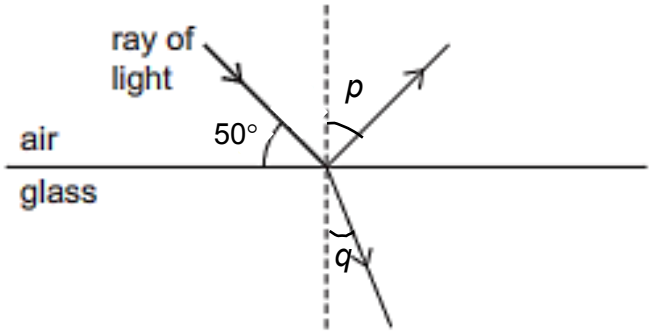


At the moment shown, buoy Q is at the crest and buoy P is at the trough.

Which row describes the movement of the buoys during the next cycle of the wave?

	P	Q
A	not moving	not moving
B	only rises	only falls
C	rises and falls	falls and rises
D	towards the right	towards the right

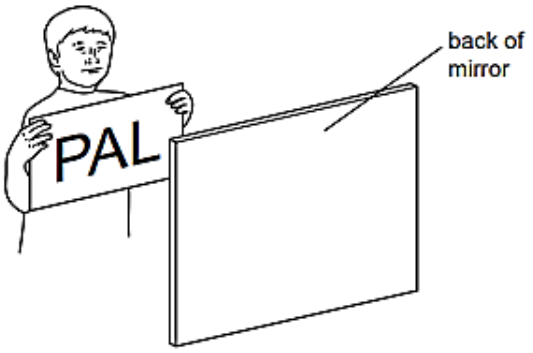
22 The diagram shows a ray of light in air incident on a glass block of refractive index 1.5. Some of the light is refracted, and some of the light is reflected. Two angles *p* and *q* are marked on the diagram.



What are the angles of *p* and *q*?

	p / °	*q* / °
A	40	25
B	40	27
C	50	31
D	50	33

23 A student holds a piece of paper in front of a plane mirror. The paper has the word 'PAL' written on it.



What is the image as seen by the student?

A

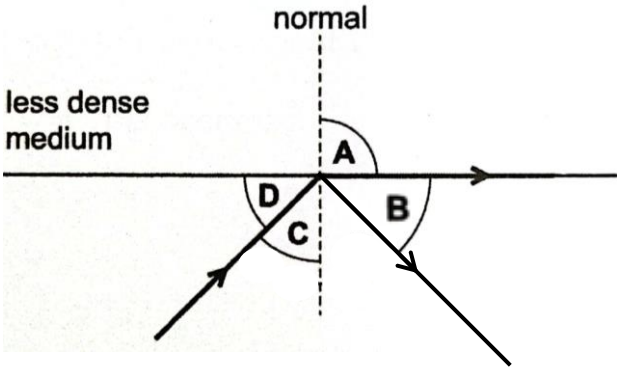
B

C

D

24 Light travels from one medium to a less dense medium. Most of the light is reflected but some is refracted along the boundary between the media as shown.

Which angle is the critical angle?



25 Which row shows regions of the electromagnetic spectrum in order of increasing frequency?

A X-ray → ultraviolet → visible light → infrared
B X-ray → infrared → visible light → ultraviolet
C infrared → visible light → ultraviolet → X-ray
D ultraviolet → visible light → infrared → X -ray

26 The three types of ultraviolet radiation are classified according to their wavelength.

UVA	315 – 400 nm
UVB	280 – 315 nm
UVC	100 – 280 nm

What is the largest frequency of the three types of radiation?

A 7.5×10^{10} Hz
B 3.0×10^{12} Hz
C 7.5×10^{14} Hz
D 3.0×10^{15} Hz

27 Which statement about ultrasound is **incorrect**?

A Ultrasound can travel through vacuum.
B Ultrasound has a frequency larger than 20 kHz.
C Ultrasound is used for prenatal imaging.
D Ultrasound is a type of longitudinal wave.

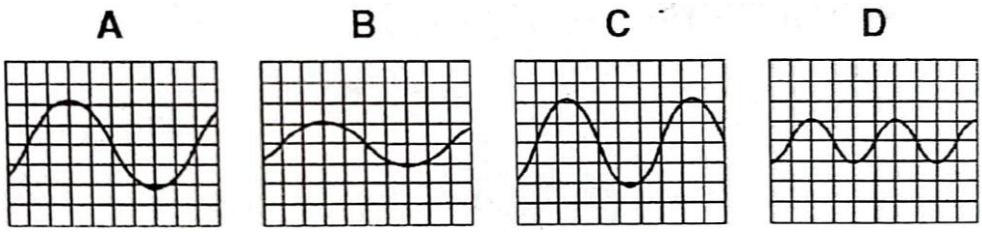
28 A student wishes to determine the speed of sound in air. She plans to measure the time from making a sound to hearing the echo from a cliff.

What type of sound and which distance should she use for her experiment?

	type of sound	distance to use
A	continuous sound	distance to cliff ÷ 2
B	continuous sound	distance to cliff × 2
C	short, sharp sound	distance to cliff ÷ 2
D	short, sharp sound	distance to cliff × 2

29 The diagrams show oscilloscope traces of sounds picked up by microphones. The controls settings are the same for all the traces.

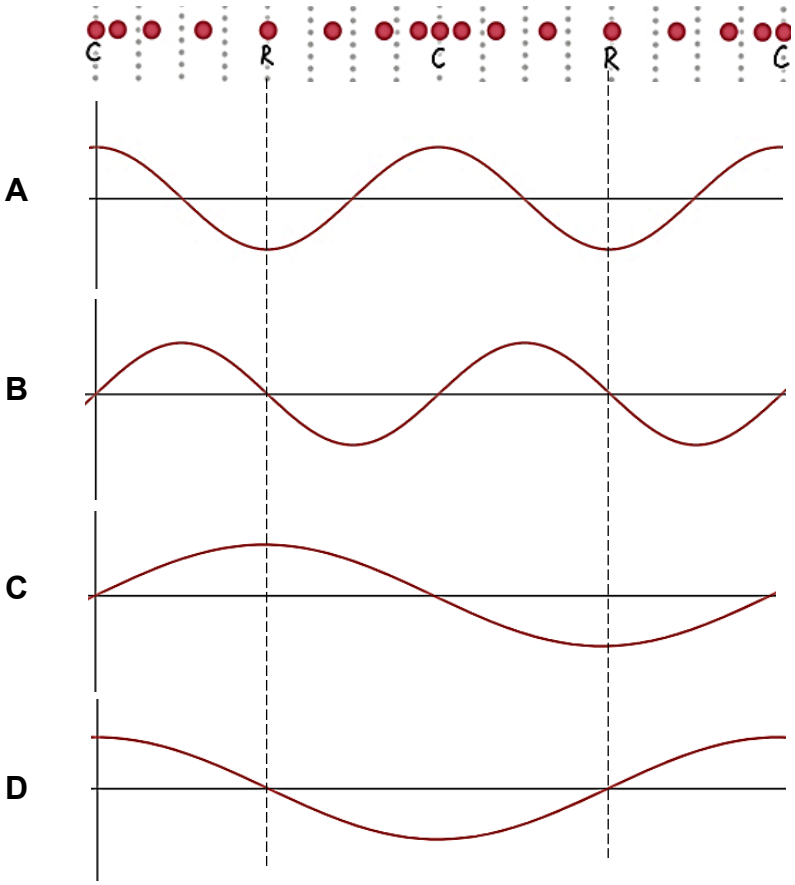
Which trace shows the sound that is the loudest and has the lowest pitch?



30 The diagram shows the positions of air particles in a longitudinal wave. The positions of compression and rarefactions are marked with "C" and "R" respectively.

Four students A, B, C, and D attempt to sketch a displacement-time graph of the wave.

Which student's graph is correct?



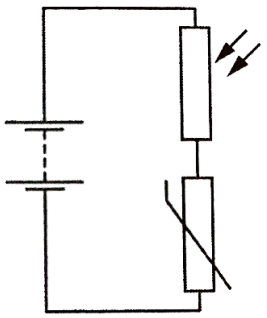
31 Wire X has a resistance of 12 Ω.

Wire Y is made of the same material as X but is half the length of X and has twice the diameter of X.

What is the resistance of wire Y?

A 1.5 Ω
B 3.0 Ω
C 6.0 Ω
D 12 Ω

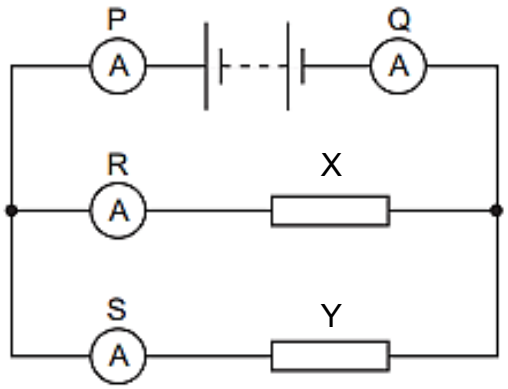
32 A light-dependent resistor (LDR) and a thermistor are connected in series with a battery.



Which conditions cause the potential difference across the LDR to be the largest?

A bright and cold
B bright and hot
C dark and cold
D dark and hot

33 The diagram shows four ammeters P, Q, R and S used to measure the current in different parts of the circuit. Resistor X has a larger resistance than resistor Y.



Which two ammeters read the largest current?

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

34 A voltmeter is used to measure the potential difference across a resistor.

What is the position and the resistance of the voltmeter in the circuit?

	position	resistance
A	in parallel to the resistor	very high
B	in parallel to the resistor	very low
C	in series with the resistor	very high
D	in series with the resistor	very low

35 A household uses four 60 W lamps. The cost of 1 kWh of electrical energy is $0.30.

What is the cost per day of using the lamps for 10 hours?

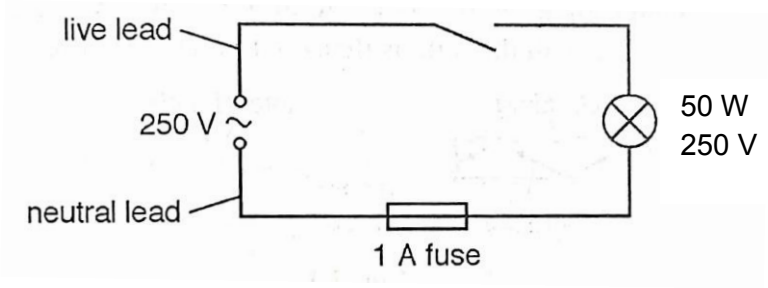
A $0.20
B $0.72
C $12.00
D $72.00

36 An electric kettle has a metal casing. The cable contains a wire that is connected to the earth pin of the plug.

Which danger can be prevented by this wire?

A the cable and the kettle becoming too hot
B the casing of the kettle becoming live
C the casing of the kettle becoming wet on the outside
D the casing of the kettle overheating

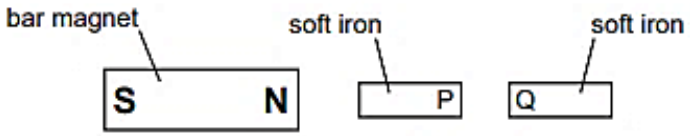
37 A student suggests setting up the circuit as shown. The lamp has a plastic casing.



Why is this circuit unsafe for use?

A The fuse rating is too small.
B The fuse is connected in the wrong lead.
C The switch is connected in the wrong lead.
D There is no earth lead connected to the lamp.

38 Two bars of soft iron are placed near a bar magnet.



Which row states and explains the behaviour P and Q of the soft iron bars?

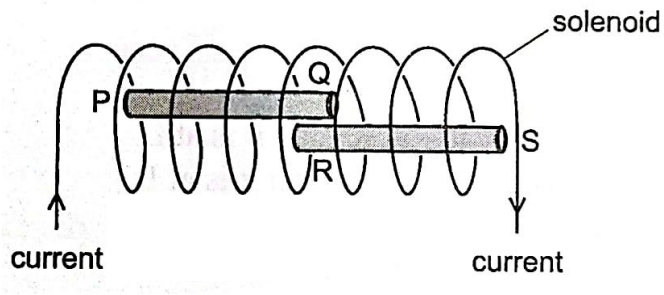
	P and Q	reason
A	attract	P and Q are like poles
B	attract	P and Q are unlike poles
C	repel	P and Q are like poles
D	repel	P and Q are unlike poles

39 How many of the following methods can be used to demagnetise a piece of steel?

heating it until it is red hot
pulling it from a coil that is carrying an alternating current
placing it in an east-west direction and hammering it
putting it in a coil which is carrying a direct current

A 1
B 2
C 3
D 4

40 Two pieces of soft iron PQ and RS are placed inside a solenoid. They become magnetised by the current in the solenoid.



Which poles are found at P, Q, R, S?

	at P	at Q	at R	at S
A	N pole	N pole	S pole	S pole
B	N pole	S pole	N pole	S pole
C	S pole	N pole	N pole	S pole
D	S pole	S pole	N pole	N pole

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