



**BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2026
SECONDARY FOUR EXPRESS / G3**

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

PHYSICS

Paper 1

Multiple Choice

6091/01

14 August 2026

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, class and register number on the Multiple Choice Answer Sheet 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 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 A student was instructed to measure the dimensions of a metre rule.

What instruments should she use for the length, width and thickness of the metre rule?

	length	width	thickness
A	measuring tape	digital calipers	digital micrometer
B	measuring tape	digital micrometer	digital micrometer
C	metre rule	digital calipers	digital calipers
D	metre rule	metre rule	digital calipers

- 2 The list shows some physical quantities.

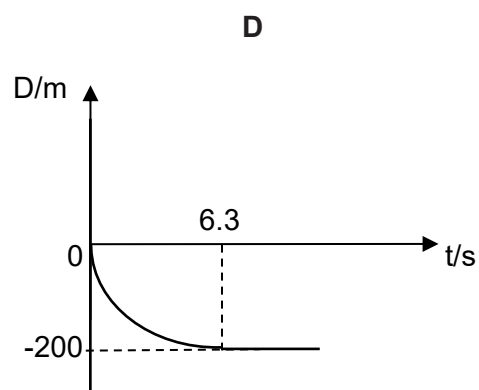
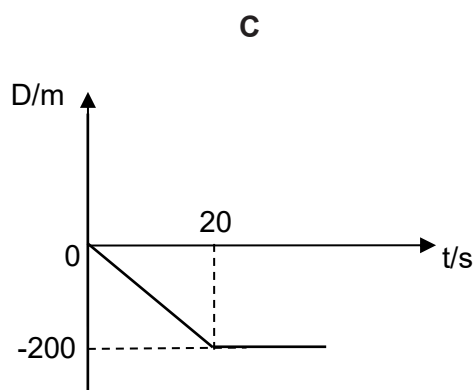
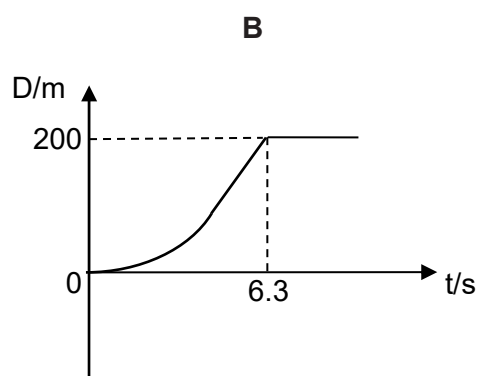
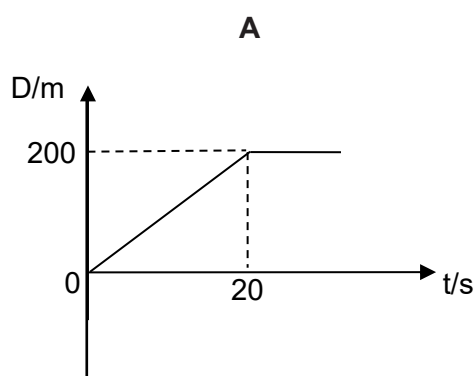
area, displacement, electrical current, energy, potential difference, time

How many derived quantities and vector quantities are in the list?

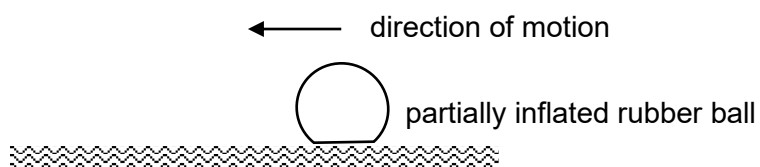
	derived quantities	vector quantities
A	3	1
B	3	3
C	4	2
D	4	3

- 3 A bowling ball is dropped from an aeroplane flying horizontally 200 m above the ground.

Assuming $g = 10 \text{ m/s}^2$, which graph best shows the vertical displacement D of the bowling ball from the aeroplane over time t ?



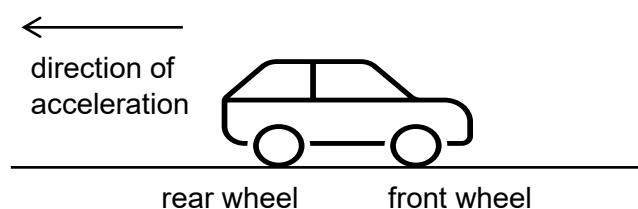
- 4 A partially inflated rubber ball is rolling on a field as shown.



How many types of contact and non-contact forces are there acting on the rubber ball?

	contact force	non-contact force
A	2	2
B	3	1
C	4	1
D	4	2

- 5 The rear wheel of a car is turned anticlockwise by the engine as the car accelerates in reverse as shown. The front wheel of the car is not powered by the engine.



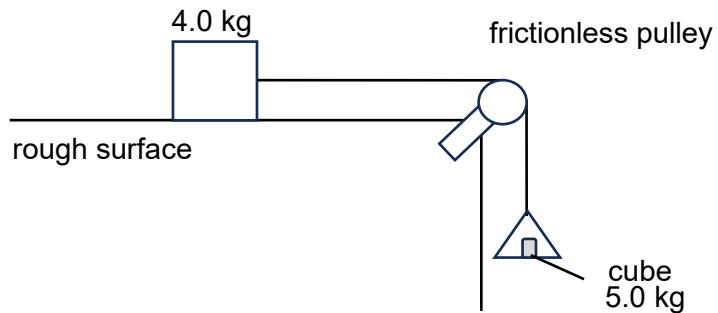
How do the directions of the frictional forces acting on the front and rear wheels of the car compare with the direction of acceleration?

	front wheels	rear wheels
A	same	opposite
B	same	same
C	opposite	opposite
D	opposite	same

- 6 Which object has the least inertia?

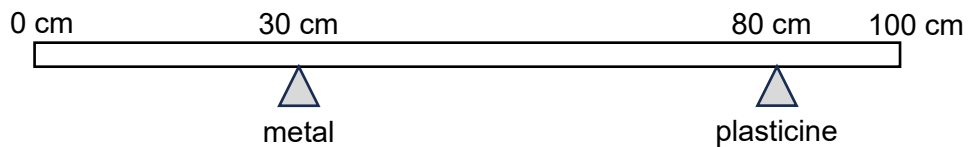
object	density / kgm^{-3}	volume / m^3
A	980	1.20
B	1000	1.16
C	1160	0.98
D	1320	0.87

- 7 The diagram shows a block connected by a string on a rough surface. The string passes over a frictionless pulley with a tray of negligible mass attached at the end. A cube of mass 5.0 kg is placed on the tray as shown.



If the tray has an acceleration of 2.0 m/s^2 , what is the magnitude of the friction between the block and the rough surface? The gravitational field strength is 10 N/kg .

- A 2.0 N
 B 8.0 N
 C 18 N
 D 32 N
- 8 A uniform metre rule of weight 1.0 N is resting on a metal wedge and a plasticine wedge at the 30 cm mark and the 80 cm mark respectively as shown.

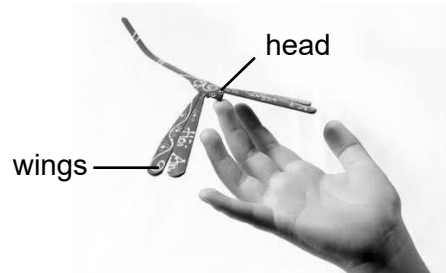


The plasticine wedge will deform if it encounters any force exceeding 0.5 N.

At which mark of the metre rule can a glass block of weight 1.0 N be placed closest to the plasticine wedge without the wedge deforming?

- A 0 cm
 B 5 cm
 C 35 cm
 D 85 cm

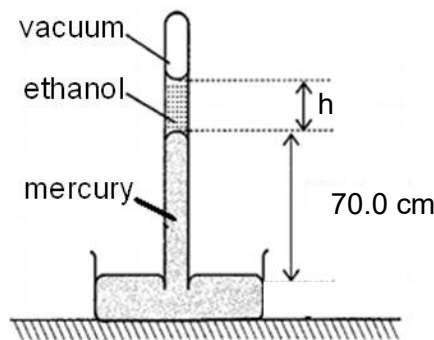
- 9 The diagram shows a balancing dragonfly toy.



The heavy wings of the dragonfly are intentionally set below the head which serves as the pivot.

Which statement explains why the toy **cannot** be designed with its wings held above its head?

- A The centre of gravity of the dragonfly will be higher than the pivot, making the dragonfly unstable.
 - B The centre of gravity of the dragonfly will be lower than the pivot, making the dragonfly less stable.
 - C The line of action of the weight of the dragonfly will be further from the pivot, making the dragonfly less stable.
 - D The pivot will be directly aligned with the line of action of the weight of the dragonfly, making the dragonfly unstable.
- 10 A barometer contains mercury mixed with some ethanol as shown.



The following data is given on a particular day.

atmospheric pressure	= 72.5 cmHg
density of ethanol	= 789 kg/m ³
density of mercury	= 13 600 kg/m ³
gravitational field strength	= 10 N/kg

What is the height h of the ethanol above the mercury column?

- A 2.5 cm
- B 4.2 cm
- C 19.7 cm
- D 43.1 cm

- 11 An electric generator at a hydroelectric dam has an efficiency of 85%.

If the total useful power generated by the generator is 120 MW, what is the rate of energy transferred to the surroundings?

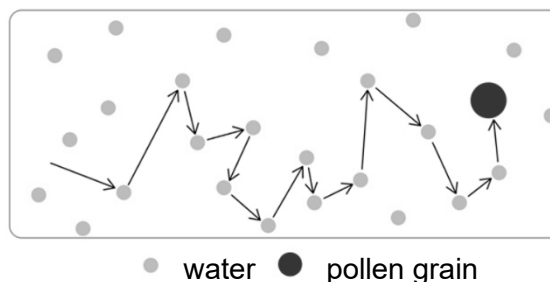
- A 18 MW
- B 21 MW
- C 102 MW
- D 138 MW

- 12 Singapore requires a highly reliable energy resource that can continuously provide electricity day and night while minimising its carbon footprint.

Based on efficiency, reliability and environmental impact, which energy resource best satisfies these requirements?

- A fossil fuel
- B nuclear energy
- C solar energy
- D wind energy

- 13 The diagram shows the path taken by a single pollen grain suspended in water over some time.



Which statement correctly explains the motion of the pollen grain?

- A The pollen grain has particles that vibrate about fixed positions.
- B The pollen grain is being bombarded by water particles in random directions.
- C The pollen grain is bombarding water particles in random directions.
- D The pollen grain is following the path of least resistance.

- 14 A mechanic pumps air into a tyre without any change in volume and temperature.

Which statement best explains why the pressure in the tyre increases?

- A The density of the air in the tyre has increased.
- B The distance between the air particles has decreased.
- C The force of collision between the air particles and the tyre has increased.
- D The frequency of collision between the air particles and tyre has increased.

- 15 An unlit matchstick is placed close to a very hot flame from a Bunsen burner.

Why does the matchstick not light up?

- A The flame is not hot enough.
- B The air is a poor thermal conductor.
- C The matchstick is a better thermal conductor than the surrounding air.
- D The matchstick can only be lit by striking it on a rough surface.

- 16 In winter, it is a common practice to wear several layers of clothes to keep warm.

Four statements are made on this practice.

statement 1 The fabrics used are poor thermal conductors.

statement 2 The layers of air trapped are poor thermal conductors.

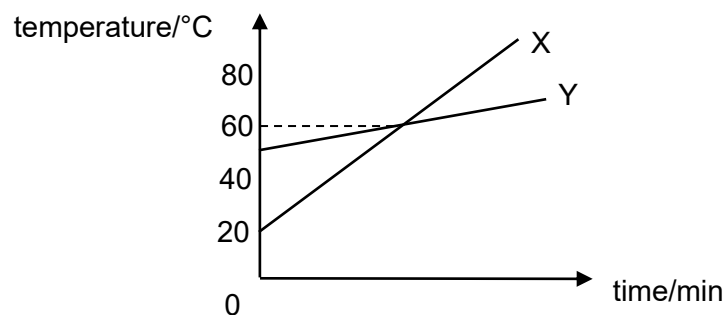
statement 3 The clothes reduce the amount of body heat emitted.

statement 4 Clothes make convective currents less likely to occur.

Which statements best explain why this practice keeps people warm in winter?

- A 1 and 2
- B 1, 2 and 3
- C 1, 2 and 4
- D 2, 3 and 4

- 17 Two blocks, X and Y, are made of the same metal and are heated by heaters with the same power rating. The graph shows the variation of temperature with time.



What is the ratio of the mass of X to the mass of Y?

- A 0.25
- B 0.33
- C 0.75
- D 3.0

18 Which row correctly compares boiling and evaporation?

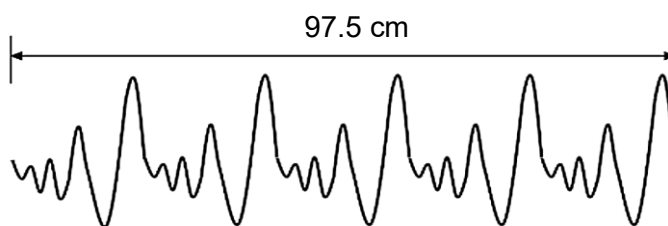
	boiling	evaporation
A	decrease in internal kinetic store	decrease in internal kinetic store
B	increase in internal kinetic store	no change in internal potential store
C	increase in internal potential store	decrease in internal kinetic store
D	no change in internal potential store	increase in internal kinetic store

19 A gold bar and a block of glass of equal mass are heated to the same temperature and allowed to cool back to room temperature.

Why does the gold bar reach thermal equilibrium with the surrounding air faster than the block of glass?

- A** Gold has a lower specific heat capacity than glass.
- B** Gold has a lower specific latent heat of fusion than glass.
- C** The gold bar has a higher density than the block of glass.
- D** The gold bar has a higher heat capacity than the block of glass.

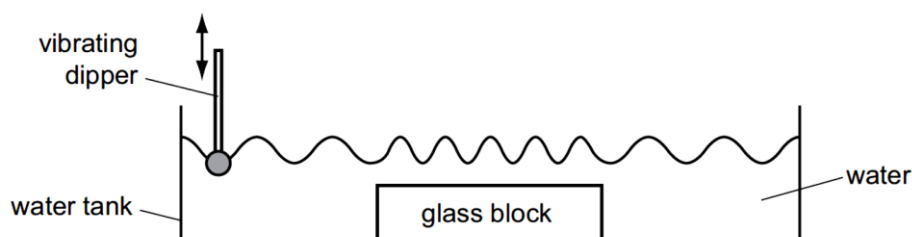
20 A small flute in a concert hall produces a sound wave as shown.



Given that the speed of sound in air is 340 m/s, what is the frequency of the sound made?

- A** 17.4 Hz
- B** 332 Hz
- C** 349 Hz
- D** 1740 Hz

- 21** A ripple tank is used to show wave behaviour. The dipper vibrates up and down at a constant frequency.



What happens to the frequency and to the speed of the wave as it reaches the glass block?

	frequency	speed
A	decrease	remains the same
B	increase	remains the same
C	remains the same	decrease
D	remains the same	increase

- 22** A deep underwater volcano erupts and produces a sound wave. As the sound wave passes through the sea surface, the speed and amplitude of the sound wave are reduced.

What happens to the pitch and loudness of the sound heard by a person on an island nearby?

	pitch	loudness
A	lowered	lowered
B	lowered	remains the same
C	remains the same	lowered
D	remains the same	remains the same

- 23** Which row shows the correct application for microwaves and ultraviolet radiation in the electromagnetic spectrum?

	microwaves	ultraviolet radiation
A	detecting forged bank notes	security scanning machines
B	detecting industrial defects	sterilisation of food
C	transmitting handphone signals	intruder alarm
D	used in GPS satellites	detecting forged bank notes

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

TRAY

What does the student see in the mirror?

A

YBAT

B

TRAY

C

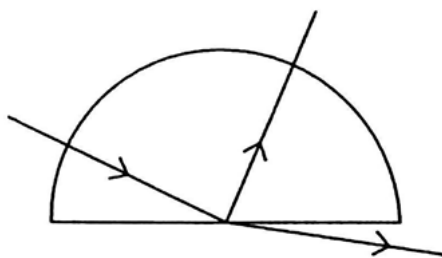
YRAT

D

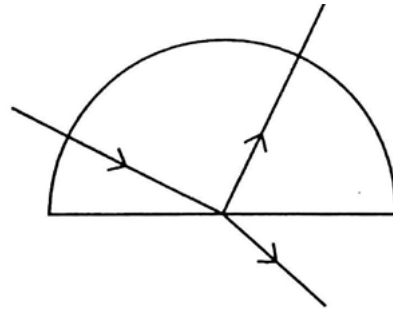
YATY

- 25 A ray of light enters a semi-circular glass block along a normal to the curved surface. Which diagram correctly shows the partial reflection and refraction of the ray?

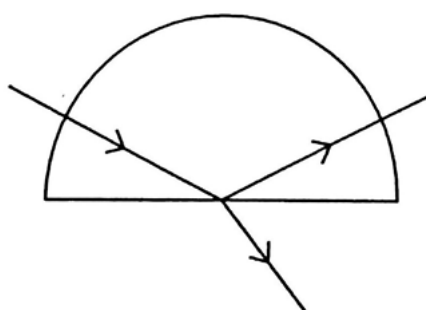
A



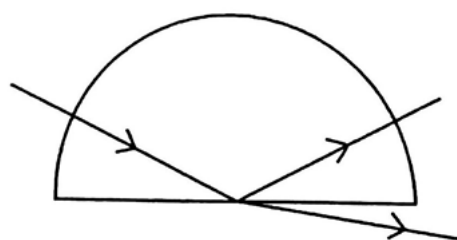
B



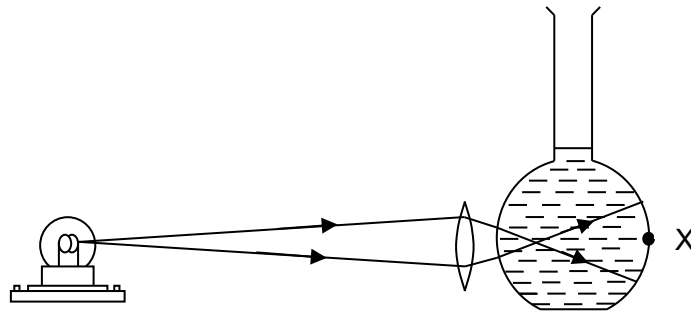
C



D



- 26** A converging lens is placed in front of a flask filled with water. When a light bulb is placed in front of the converging lens, no sharp image is formed at point X as shown.



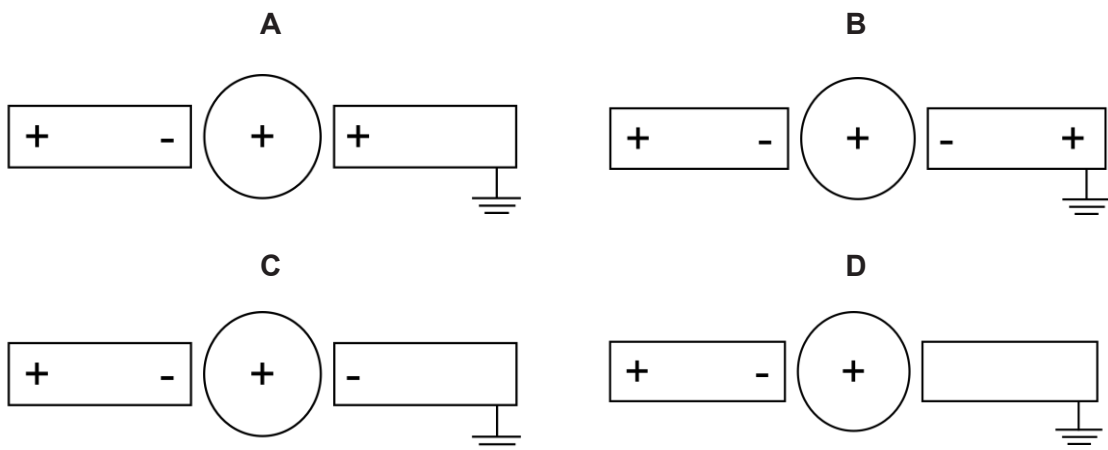
Which action can cause a sharp image to be formed at point X?

- I – change the lens to a thicker one
- II – replace the liquid with another that has lower optical density
- III – change the converging lens to a diverging one
- IV – bring the light bulb closer to the lens

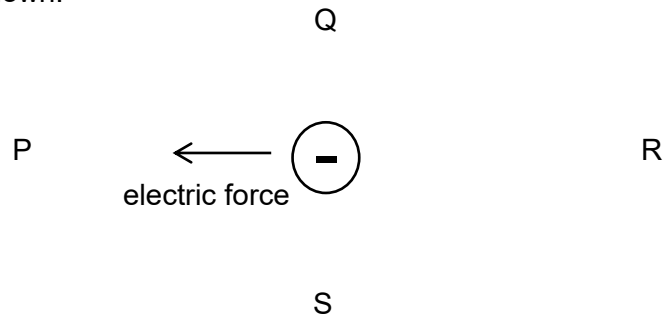
- A** I and II
- B** II and III
- C** II, III and IV
- D** III and IV

- 27** A positively charged metal sphere is placed halfway between two uncharged metal rods. One of the rods is connected to earth.

Which diagram shows how the charges are arranged?



- 28 A stationary negative charge in an electric field experiences an electric force in the direction as shown.



What is the direction of the electric field?

- A towards P
 - B towards Q
 - C towards R
 - D towards S
- 29 An inflated balloon is vigorously rubbed on a shirt.

Which row explains why the balloon will stick to the shirt subsequently?

	balloon	shirt
A	gains electrons	loses electrons
B	loses electrons	loses electrons
C	no change of electrons	gains electrons
D	no change of electrons	no change of electrons

- 30 During an electrical storm, an intracloud lightning flash occurs when charge flows from one cloud to another. On average, there are nine flashes every minute and 12 C of charge flows during each flash.

What is the average current between the clouds during the electrical storm?

- A 0.2 A
 - B 1.3 A
 - C 1.8 A
 - D 80 A
- 31 What is the definition of the electromotive force of a dry cell?
- A the charge passing through the dry cell per unit time
 - B the product of the square of the current in the dry cell and its resistance
 - C the work done to drive all charges through the dry cell per unit time
 - D the work done to drive a unit charge through the dry cell

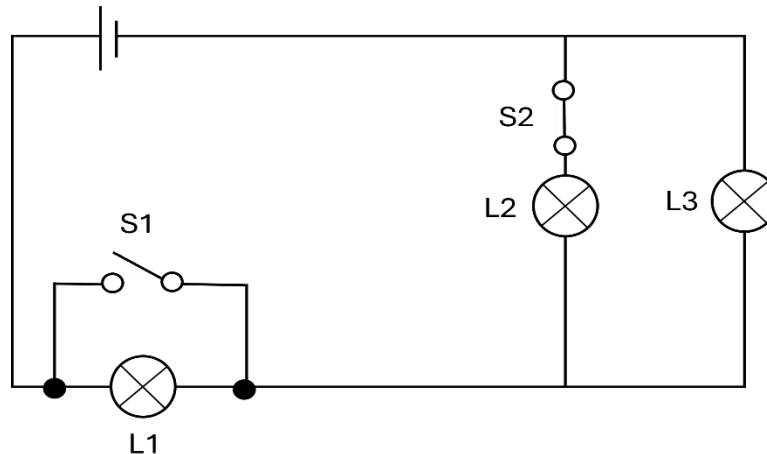
- 32 A wire has a resistance of R .

Ten of the same wire are then bundled together and twisted to form a cable. The cable is subsequently cut into two shorter cables.

What is the resistance of one of these shorter cables?

- A** $0.05 R$ **B** $0.20 R$ **C** $0.50 R$ **D** $20 R$

- 33 Three identical lamps, L1, L2 and L3, are connected in a circuit as shown. Switch S1 is open while S2 is closed.

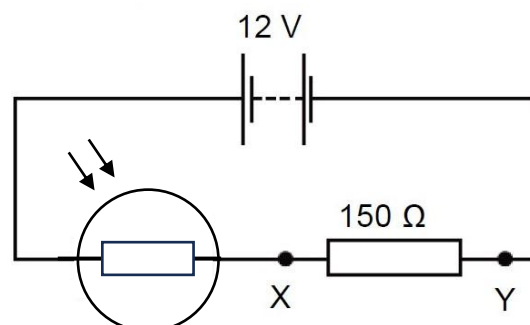


How will the brightness of the three lamps change when S1 is closed and S2 is opened?

	L1	L2	L3
A	brighter	no light	brighter
B	dimmer	no light	dimmer
C	no light	no light	brighter
D	no light	dimmer	dimmer

- 34 A light-dependent resistor (LDR) increases in resistance as brightness decreases and is used in a street lighting system.

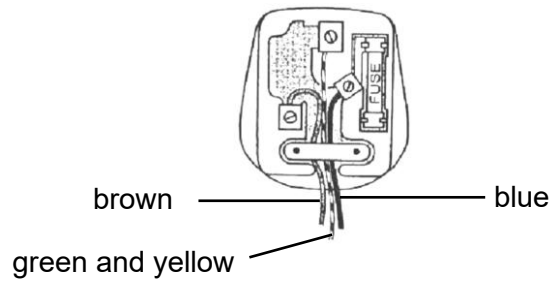
The streetlights are turned on when the potential difference between X and Y is 3.5 V .



What is the resistance of the LDR when the sun sets, and the streetlights are turned on?

- A** 44Ω **B** 62Ω **C** 88Ω **D** 360Ω

- 35 The plug of a washing machine with an external metal casing is shown.



What will happen if the washing machine is plugged into the mains supply while the switch is turned on?

- A The fuse will blow.
 - B The metal casing will become live.
 - C The washing machine operates normally.
 - D The washing machine will not operate.
- 36 An electric fan has the following label.

Operating voltage: 240 V/50 Hz
Power: 800 W – 2000 W

If the mains supply has a voltage of 240 V and it is connected to a miniature circuit breaker with a rating of 13 A, what is the maximum number of electric fans that can be connected in parallel?

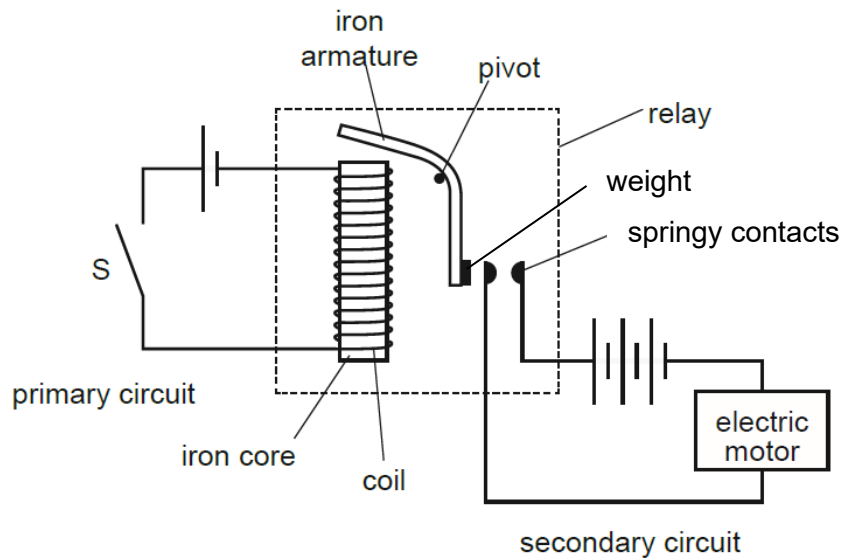
- A 3
 - B 4
 - C 8
 - D 9
- 37 A man wants to demagnetise a bar magnet using three different methods.

- method 1 Heat the bar magnet to a high temperature and let it cool.
- method 2 Place the bar magnet in an east to west orientation and hammer it.
- method 3 Place the bar magnet inside a coil that has a direct current in it and remove it from the coil slowly.

Which methods can effectively demagnetise the bar magnet?

- A method 1
- B methods 1 and 2
- C methods 1, 2 and 3
- D methods 2 and 3

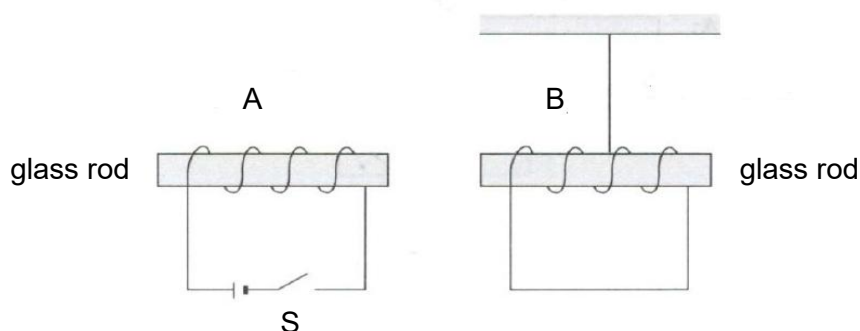
- 38 The diagram shows a relay in which a primary circuit is used to turn on an electric motor in a secondary switch. A weight on the iron armature ensures that the springy contacts separate when switch S is open.



Due to a technician's error, the iron core in the primary circuit is replaced with a steel core.

What is the most likely consequence of this?

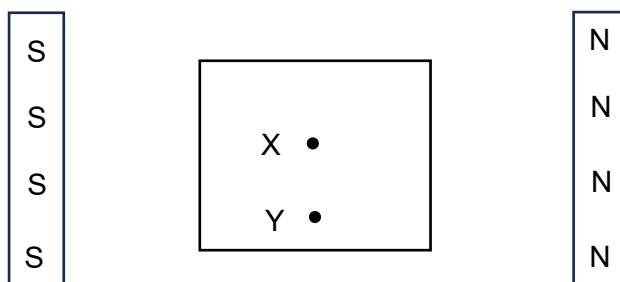
- A The electric motor can be turned on but not turned off.
 - B The electric motor cannot be turned on when switch S is closed.
 - C The electric motor will operate as usual without any significant effect.
 - D The electric motor will turn on and off repeatedly when switch S is closed.
- 39 The diagram shows a fixed solenoid A connected to a circuit. It is placed next to another solenoid B that is suspended freely on an insulated string.
- Both solenoids consist of copper wires coiled around glass rods.



What happens to the suspended solenoid B when switch S is closed?

- A B will remain at rest.
- B B will swing away from A and return to original position.
- C B will swing back and forth continuously.
- D B will swing towards A and return to original position.

- 40 A narrow beam of radiation from a radioactive source travels into the page through point X.



The beam is then placed in a uniform magnetic field. Radiation is now detected both at points X and Y.

What types of radiation are present in the narrow beam?

- A alpha-radiation and beta-radiation
- B alpha-radiation and gamma-radiation
- C beta-radiation and gamma-radiation
- D alpha-radiation, beta-radiation and gamma-radiation

END OF PAPER