



Paya Lebar Methodist Girls' School (Secondary)
Preliminary Examination 2026
Secondary 4 Express

CANDIDATE NAME		()	CLASS	
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Physics

6091/01

Paper 1 (Multiple Choice)

31 Aug 2026

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on the front cover.

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

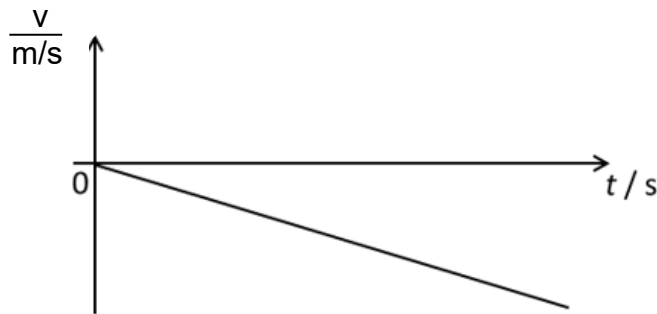
There are **forty** questions in this paper. Answer all questions.

For each question, four possible answers (A, B, C, and D) are given.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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

- 1 Which pair of units measure the same quantity?
A km/h and kg/m^3 **B** N/m^3 and Pa **C** V and J/C **D** W and J
- 2 What is the approximate mass of an apple?
A $2.0 \times 10^3 \text{ mg}$ **B** $2.0 \times 10^7 \text{ ng}$ **C** $2.0 \times 10^{-4} \text{ Mg}$ **D** 8.0 kg
- 3 Which of the following statements must be correct?
A An object has zero acceleration when it moves at a constant speed.
B An object can have a constant velocity even though its speed is changing.
C An object cannot come to rest momentarily if it is moving with a constant acceleration.
D An object moving with changing velocity can have a constant acceleration.
- 4 The velocity – time graph of a body is shown below.



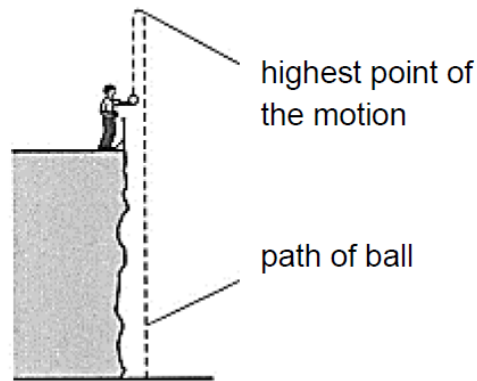
A student makes four statements about the motion of the body.

1. The body is accelerating in the negative direction.
2. The body is decelerating.
3. The acceleration of the body is decreasing.
4. The speed of the body is increasing.

Which statements are correct?

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

- 5 A student stands near the edge of a cliff. He throws the ball upwards.



What is the acceleration of the ball when it is at the highest point of its free fall motion and during its descent?

	at the highest point of motion	as the ball moves downwards
A	10 m/s ² downwards	constant
B	less than 10 m/s ² downwards	increases
C	0	constant
D	0	increases

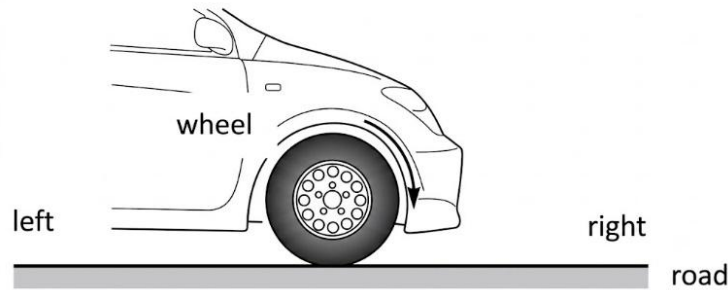
- 6 A rocket of mass 1000 kg is descending downwards upon the surface of the Moon where the gravitational field strength is 1.67 N/kg.

If the deceleration of the rocket is 5.0 m/s², what is the upward force exerted by the rocket engine?

- A** 2500 N **B** 6670 N **C** 7500 N **D** 10 000 N

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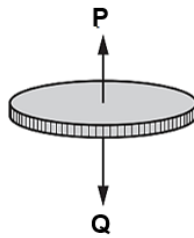
- 7 The front wheel of a car is turned in a clockwise direction by the engine as the car moves towards the right. There is a force of friction between the front wheel and the road.



What is the direction of the frictional forces on the front wheel of the car?

	frictional force on the front wheel
A	to the left
B	clockwise
C	to the right
D	anti-clockwise

- 8 A coin falls from rest through the air and eventually reaches a constant speed. There is a resultant force acting on the coin due to the two forces **P** and **Q** shown in the diagram.



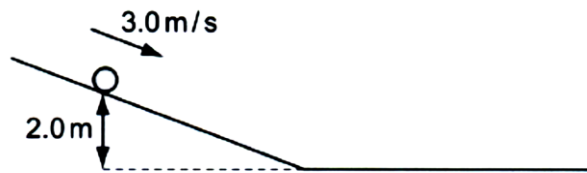
What happens to force **P** and what happens to the resultant force **before** the coin reaches constant speed?

	force P	resultant force
A	decreases	increases
B	decreases	decreases
C	increases	increases
D	increases	decreases

- 9 A parachutist opens his parachute and falls to Earth at constant speed.

What is the principal energy transfer taking place as he falls?

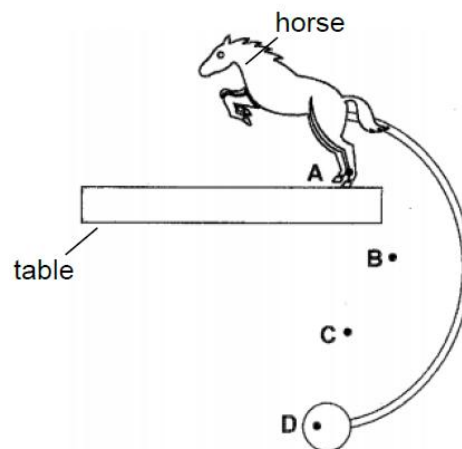
- A kinetic store to gravitational potential store of energy
 - B kinetic store to internal store of energy
 - C gravitational potential store to kinetic store of energy
 - D gravitational potential store to internal store of energy
- 10 A ball of mass 0.40 kg rolls down a hill. At 2.0 m above the bottom of the hill, the speed of the ball is 3.0 m/s.



The gravitational field strength, g is 10 N/kg.

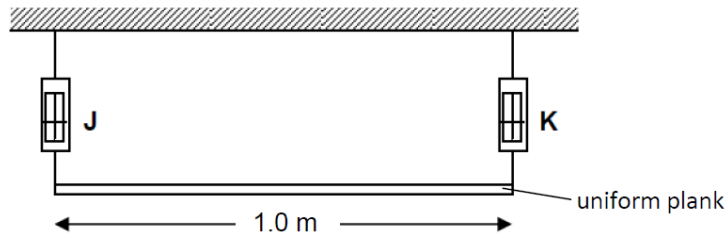
What is the kinetic energy of the ball at the bottom of the hill given that the work done to overcome friction is 1.2 J?

- A 1.8 J
 - B 8.0 J
 - C 8.6 J
 - D 9.8 J
- 11 The diagram shows the rest position of a balancing toy near the edge of a table.
- Which position is most likely to be the center of gravity of the toy?



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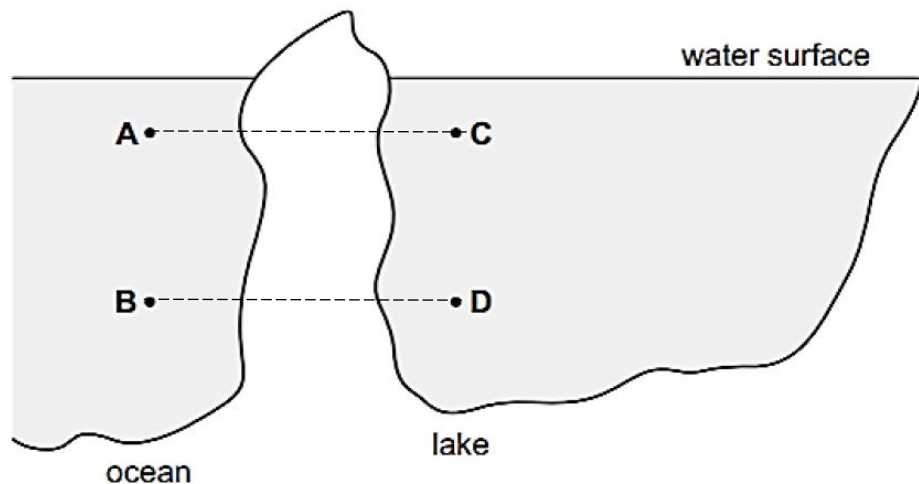
- 12** A uniform plank of length 1.0 m is supported by two spring balances **J** and **K**. The readings of **J** and **K** are both 150 N.



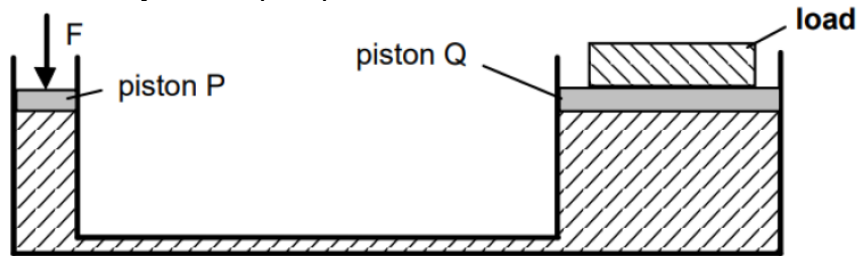
When **J** is moved 0.25 m towards **K**, what are the new readings shown on **J** and **K**?

	reading on J	reading on K
A	200 N	100 N
B	200 N	150 N
C	150 N	200 N
D	100 N	200 N

- 13** An underwater diver moves from the ocean to a fresh water lake. The density of water in the lake is less than in the ocean. In which position does the diver experience the smallest pressure due to the water?



- 14 The diagram shows a hydraulic pump.



Which of the following comparisons is true?

- A The pressure on piston P is the same as the pressure on piston Q.
 - B The pressure on piston P is smaller than the pressure on piston Q.
 - C The force F is the same as the weight of the load.
 - D The force F is greater than the weight of the load.
- 15 The input power to a motor is 300 W. In 20 s, it lifts a load through a height of 6.0 m at constant speed.

The efficiency of the motor is 60%.

What is the weight of the load?

- A 60 N
 - B 600 N
 - C 900 N
 - D 1000 N
- 16 “When a substance is heated, the average kinetic energy of the particles in the substance remains constant. The particles begin to slide past each other.”

What is the name of the process described above?

- A boiling
 - B condensation
 - C freezing
 - D melting
- 17 A gas is in a sealed container of constant volume. The gas is heated and the pressure of the gas on the walls of the container increases.

How do the particles of the gas cause this increase in pressure?

- A They expand.
- B They hit each other more frequently.
- C They hit the container more frequently.
- D They vibrate faster.

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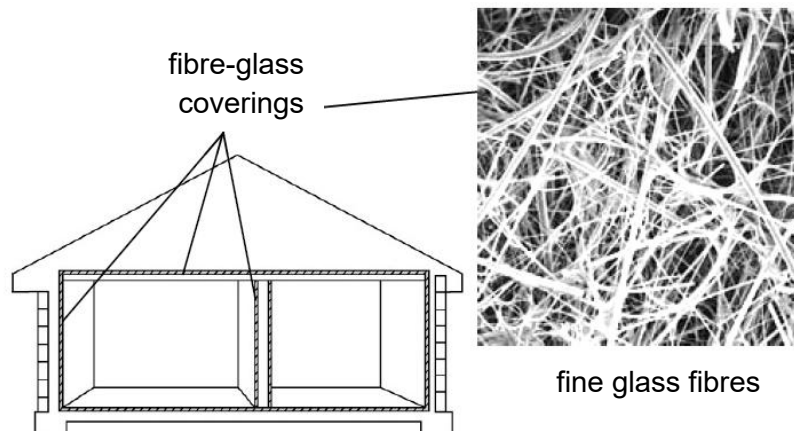
- 18** Pot X and pot Y are both in a cool room.
 Pot X contains hot water below its boiling point.
 Pot Y is identical to pot X but contains water that is kept boiling by a hotplate underneath it.



What happens to the energy of the particles in the water in pot X and pot Y?

	average internal kinetic energy of water in X	average internal kinetic energy of water in Y
A	decreases	increases
B	decreases	stays the same
C	stays the same	increases
D	stays the same	stays the same

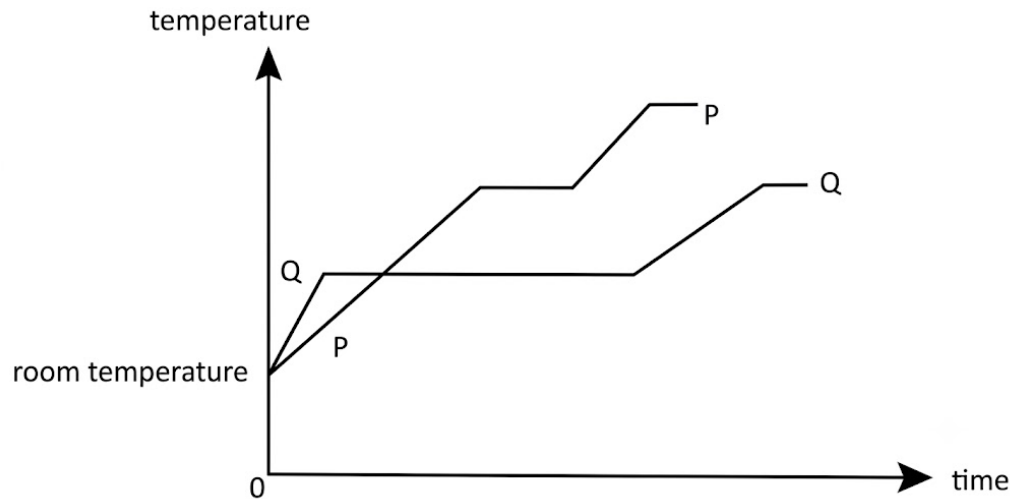
- 19** Fibre-glass coverings laid on the floor, walls and ceiling of a house can greatly reduce the rate of heat lost to the surroundings. Fibre-glass consists of a large amount of fine glass fibres.



Which of the following statements is **not** a reason why glass fibres are chosen for thermal insulation?

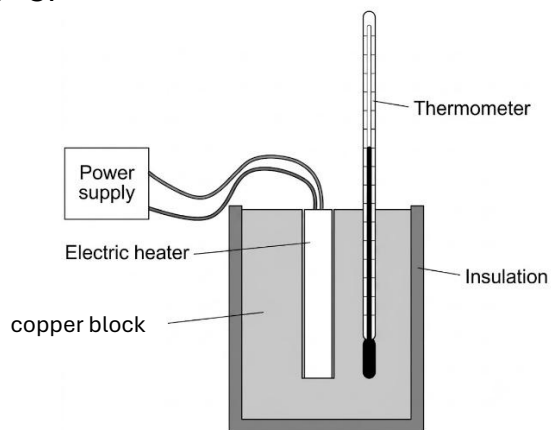
- A** glass fibres reduce emission of radiation
- B** glass fibres reduce convection currents
- C** glass fibres trap air
- D** glass fibres increase surface area

- 20** The graph shows the variation in temperature of two solid objects, P and Q, of equal masses when they are separately heated by identical heaters.



Which of the following deductions is correct?

- A** The melting point of P is lower than Q.
 - B** The specific heat capacity of P in the solid state is larger than that of Q.
 - C** The specific latent heat of fusion of P is larger than that of Q.
 - D** More energy is required to raise the temperature of P to boiling point than Q.
- 21** A 0.30 kW heater is used to heat a well-insulated 3.0 kg mass of copper for 5 minutes. The temperature rises by 75 °C.

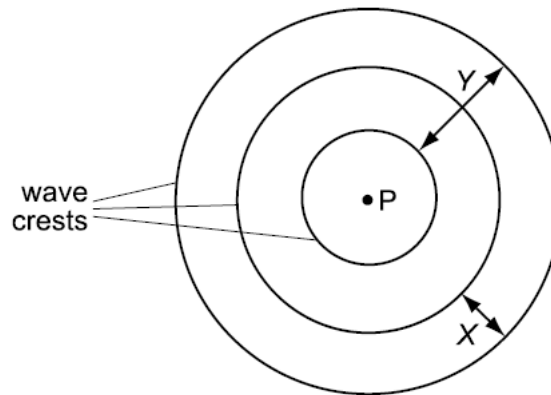


What is the specific heat capacity of copper?

- A** 0.0067 J/(kg °C)
- B** 0.40 J/(kg °C)
- C** 6.7 J/(kg °C)
- D** 400 J/(kg °C)

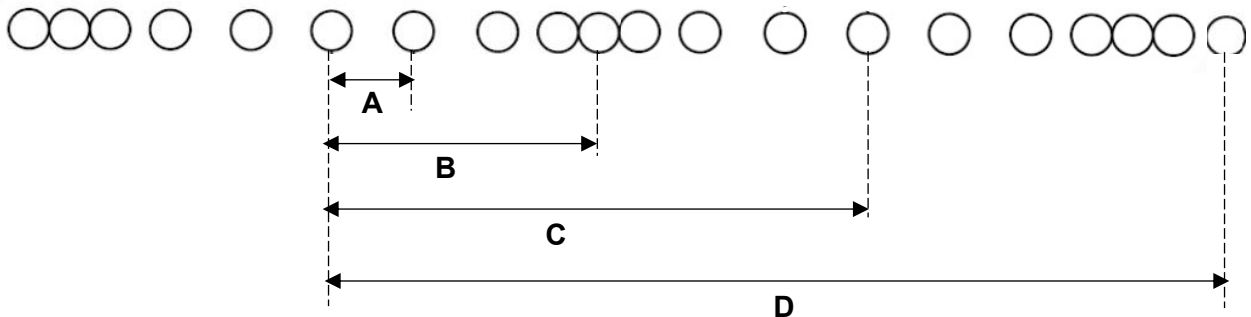
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- 22** A vertical stick is dipped up and down in the water at point P.

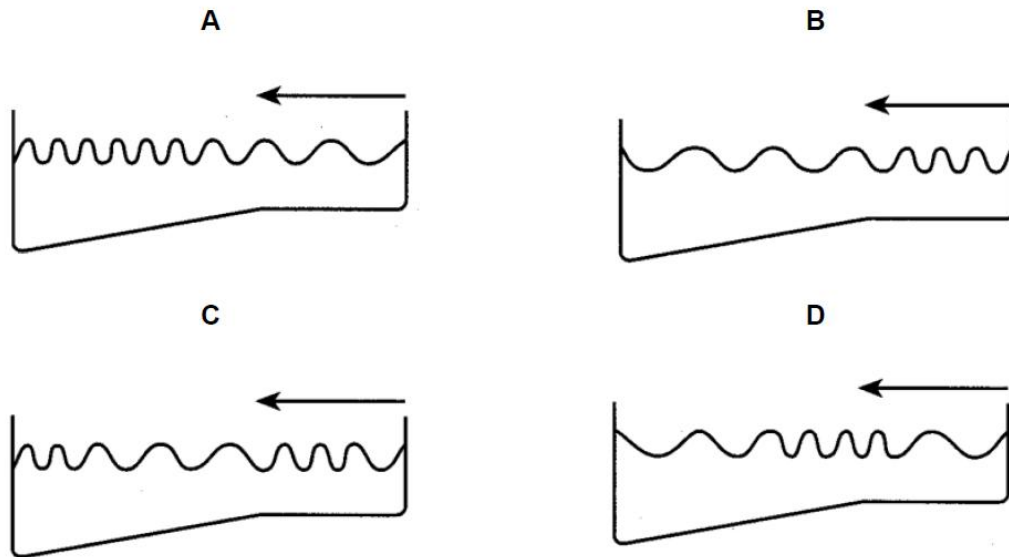


In two seconds, three wave crests are produced on the surface of the water.
Which statement is correct?

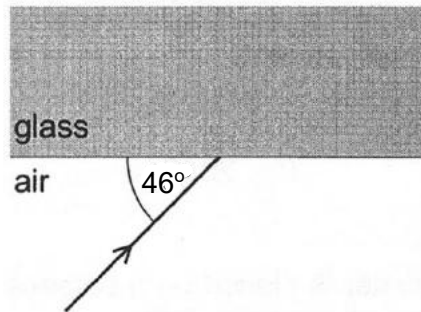
- A** Distance X is the amplitude of the waves.
 - B** Distance Y is the wavelength of the waves.
 - C** Wave speed is the product of 1.5 and distance X.
 - D** Frequency of the waves is 3 Hz.
- 23** The diagram below represents the position of air molecules in a sound wave.



- 24** A ripple tank contains water of varying depths. Which diagram correctly represents the water waves as they travel from the shallow to the deep region?



- 25** A ray of light strikes the surface of a glass block as shown in the diagram below.



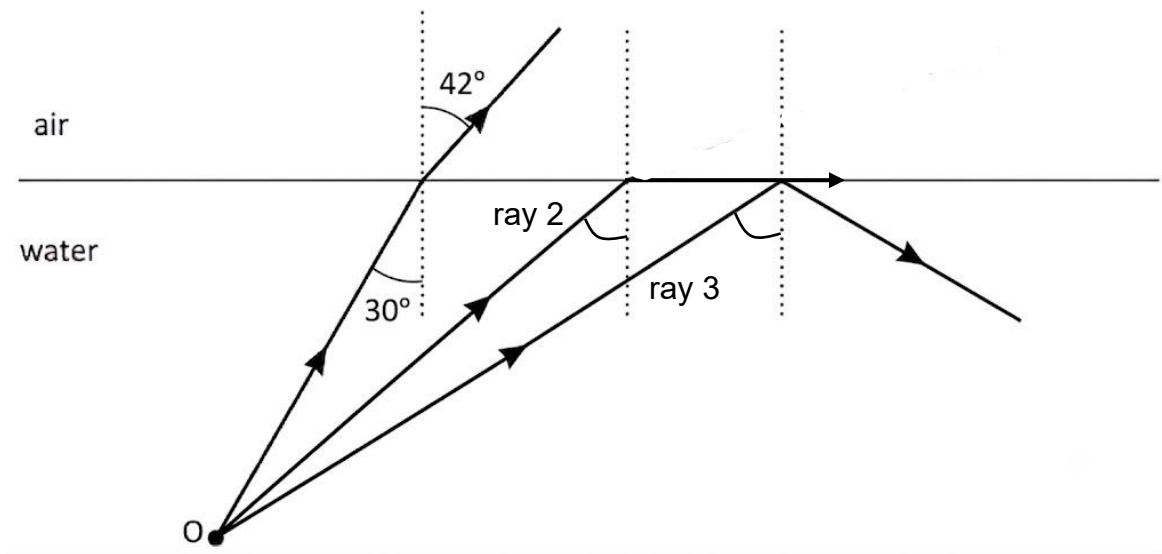
The refractive index of the glass is 1.5.

By how many degrees does the light ray change direction when entering the glass?

- A** 16° **B** 17° **C** 18° **D** 28°
- 26** Bats produce ultrasound to navigate. What is the possible frequency range of ultrasound waves?
- A** 20 to 100 Hz
B 20 to 2000 Hz
C 2000 to 20 000 Hz
D 20 000 to 80 000 Hz

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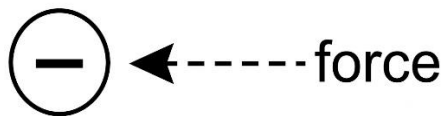
- 27 The diagram below shows light travelling from water and undergoing refraction.



Which the following shows correctly the angle of incidence of rays 2 and 3?

	ray 2	ray 3
A	48°	49°
B	42°	48°
C	48°	45°
D	50°	48°

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



What is the direction of the external electric field?

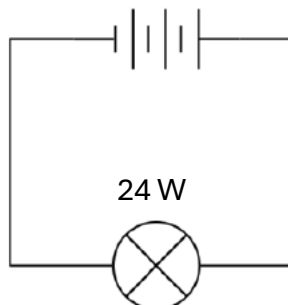
- A** horizontally to the right **B** horizontally to the left
C vertically downwards **D** vertically upwards

- 29** The wire of a heating element has resistance R . The wire breaks and is replaced by a different wire. Data for the original wire and the replacement wire are shown in the table.

	length	diameter	resistivity of metal
original wire	l	d	ρ
replacement wire	l	$2d$	ρ

What is the resistance of the replacement wire?

- A** $\frac{R}{4}$
- B** $\frac{R}{2}$
- C** $2R$
- D** $4R$
- 30** A battery is used to light an electric lamp rated at 24 W **above** its normal brightness. The battery provides a charge of 120 C in 60 s.

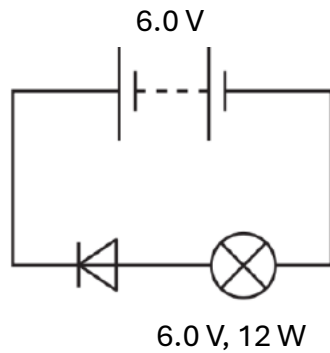


What is a possible value of the e.m.f of the battery?

- A** 5 V **B** 10 V **C** 12 V **D** 24 V

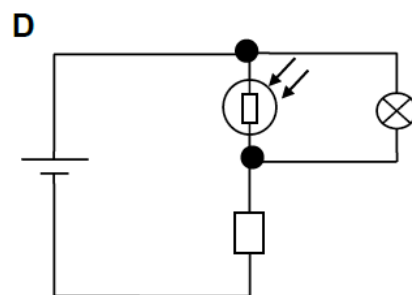
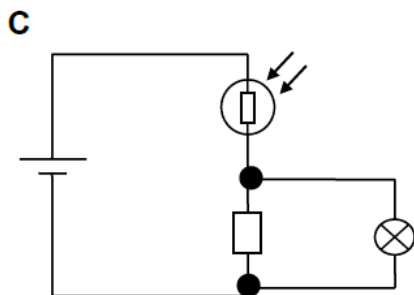
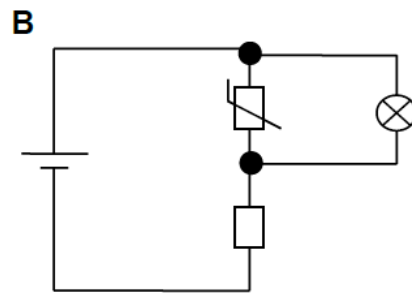
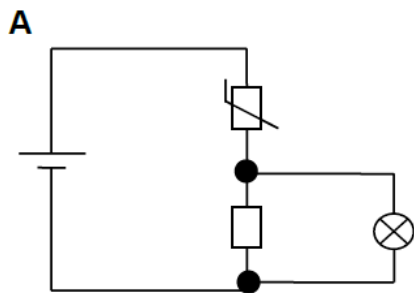
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- 31** A student sets up the circuit as shown. The lamp does not light up.

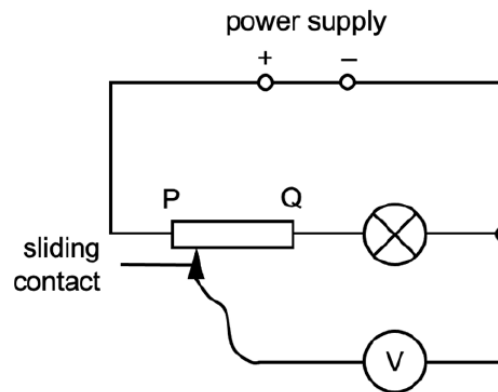


What will make the lamp light up?

- A** adding a fuse into the circuit
 - B** changing the supply to a 12 V battery
 - C** reversing the battery connections
 - D** reversing the connections to the lamp
- 32** In which of the circuits below will the bulb glow more brightly when less light shines on the circuit?



- 33 A circuit contains a variable potential divider PQ, a lamp and a voltmeter.

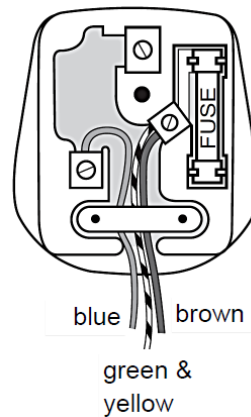


The sliding contact of the potential divider is moved towards end Q.

What happens to the brightness of the lamp and the reading on the voltmeter?

	brightness of lamp	voltmeter reading
A	does not change	decreases
B	does not change	increases
C	becomes brighter	decreases
D	becomes brighter	increases

- 34 The diagram below shows the plug of an old electric iron wired wrongly.

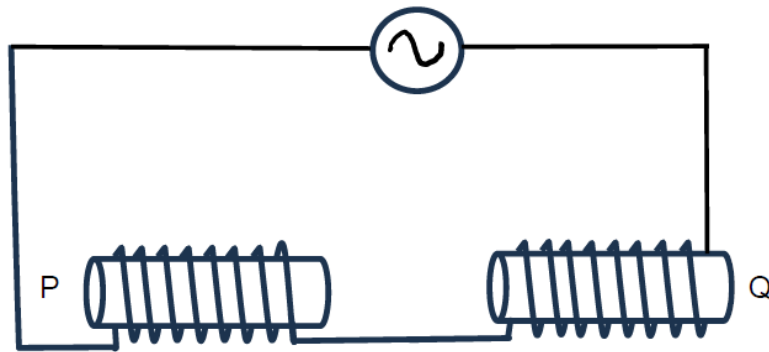


What happens when the electric iron is plugged into the electrical socket?

- A** The fuse in the plug blows.
- B** The metal casing of the iron becomes live.
- C** The neutral wire melts.
- D** The electric iron switches off immediately.

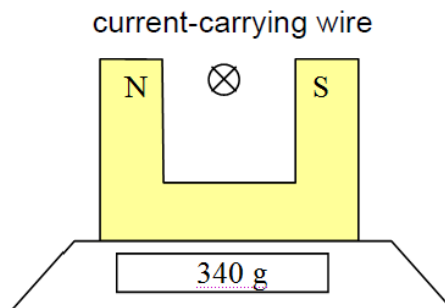
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- 35** Two iron bars P and Q are placed inside two solenoids as shown.



The solenoids are connected to a low frequency alternating current power supply.
What will happen to the iron bars P and Q?

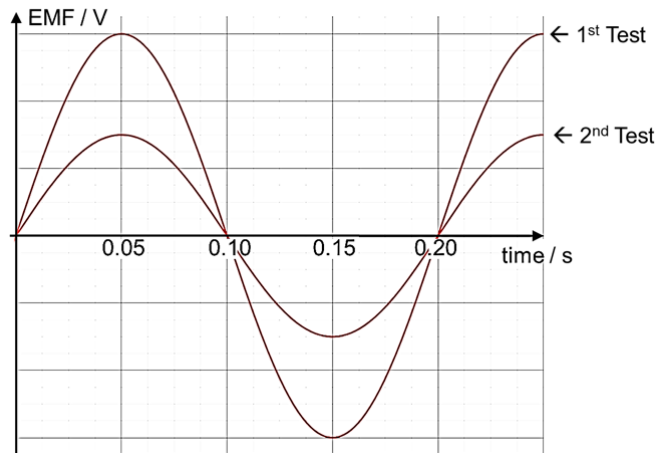
- A** They will be attracted to each other.
 - B** They will both swing from left to right continuously.
 - C** They will oscillate towards and away from each other continuously.
 - D** They will repel from each other.
- 36** A current-carrying wire is placed between the poles of the horseshoe magnet as shown.
The electronic balance reads 340 g.



Which of the following could be the reading on the electronic balance when the current in the wire is switched off?

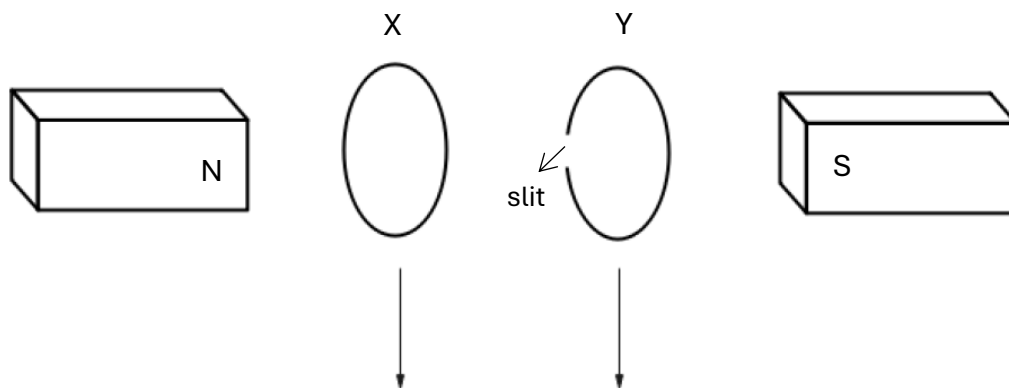
- A** 0 g
- B** 330 g
- C** 340 g
- D** 350 g

- 37 Alex conducts two tests on a handheld generator. The first test is used as a reference and Alex makes one change in the second test. An EMF vs time graph is used to record the output for both tests, as shown below.



What change has Alex made in the second test?

- A Alex rotates the generator handle at half its initial speed.
 - B Alex weakens the strength of the magnet in the generator by half.
 - C Alex rotates the generator handle in the opposite direction.
 - D Alex shortens the length of the generator handle by half.
- 38 X and Y are two metal rings of equal weight but a slit is cut in Y. They are held stationary between the two magnets and then dropped as shown.



Which statement is correct? Assume uniform magnetic field between the poles.

- A Both rings fall with same downward acceleration.
- B Ring X falls with uniform velocity while ring Y falls with increasing velocity.
- C Ring Y hits the floor first.
- D Ring X hits the floor first.

[Turn over

39 Which statement about an alpha particle is correct?

- A** It can pass through thick paper
- B** It has no charge.
- C** It is a helium atom.
- D** It is not a type of electromagnetic radiation.

40 A sample of a radioactive isotope with very long half-life is placed next to a detector. Sheets of different material are inserted, one at a time, between the radioactive sample and the detector.

The background count rate is subtracted from the readings on the detector and the corrected count rates are recorded in the table.

type of material	corrected count rate / count per sec
no sheet inserted	450
thin aluminium sheet	381
thin lead sheet	285
thin paper sheet	452

Which types of radiation are emitted by the radioactive sample?

- A** alpha particles and beta particles
- B** alpha particles only
- C** beta particles and gamma radiation only
- D** gamma radiation only

End of Paper

Answer Key

1	C	11	C	21	D	31	C
2	C	12	A	22	C	32	D
3	D	13	C	23	C	33	A
4	B	14	A	24	B	34	B
5	A	15	B	25	A	35	A
6	B	16	D	26	D	36	D
7	C	17	C	27	A	37	B
8	D	18	B	28	A	38	C
9	D	19	D	29	A	39	D
10	C	20	B	30	D	40	C