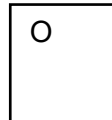




TAMPINES SECONDARY SCHOOL

Secondary Four Express
PRELIMINARY EXAMINATION 2023



NAME

CLASS

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REGISTER
NUMBER

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PHYSICS

6091/01

Paper 1 Multiple Choice

21 Aug 2023

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 Answer Sheet in the spaces provided unless this has 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 answer 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 Which of the following is a possible reading obtained from using a metre rule?

A

0.6 m

B

0.64 m

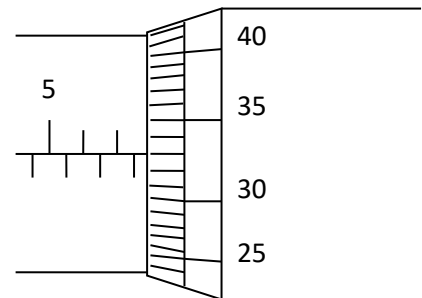
C

0.643 m

D

0.6431 m

2 Peng Zhong used a micrometer screw gauge to measure the thickness of a metal sheet. The diagram shows part of the apparatus. However, this micrometer screw gauge has an inherent zero error of -0.03 mm.



What is the actual thickness of the metal sheet?

A

7.80 mm

B

7.86 mm

C

10.30 mm

D

10.36 mm

3 Which car, moving from rest, has an average acceleration of 2.5 m/s^2 ?

A

a car reaching a speed of 10 m/s in 2.5 s

B

a car reaching a speed of 25 m/s in 2.5 s

C

a car reaching a speed of 30 m/s in 20 s

D

a car reaching a speed of 50 m/s in 20 s

4 A 20 N force pushes a 5.0 kg object along a horizontal rough surface where the frictional force is 5.0 N.

What is the acceleration of the object?

- A** 1.0 m/s^2
- B** 3.0 m/s^2
- C** 4.0 m/s^2
- D** 5.0 m/s^2

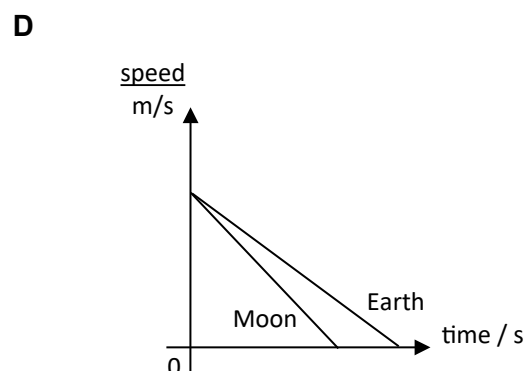
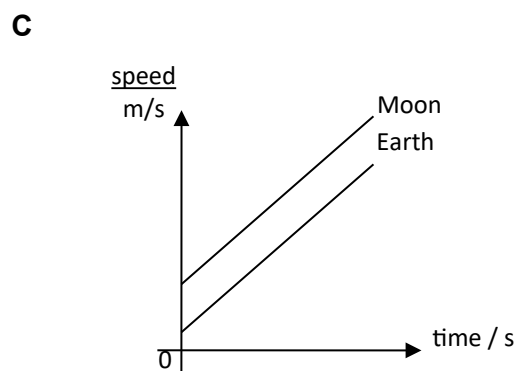
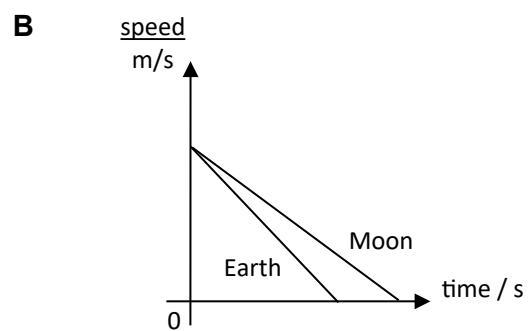
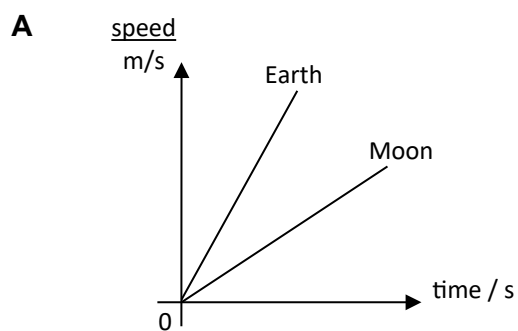
- 5** A tray supports a 1 kg mass and a 3 kg mass as shown. The gravitational field strength is 10 N/kg .



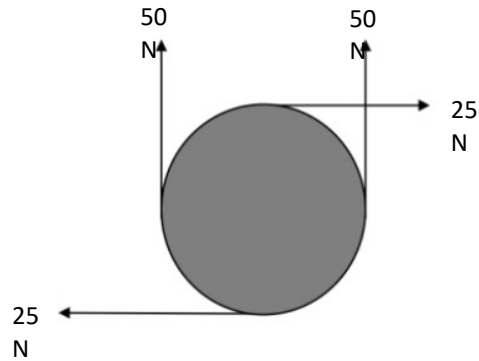
What is the force acting on the 1 kg mass by the 3 kg mass?

- A** 10 N
- B** 20 N
- C** 30 N
- D** 40 N

- 6** The acceleration due to the gravity of the Moon is one-sixth of that of the Earth. If a stone is thrown upwards, which graph shows the variation of the speed of the stone with time as it goes up on the Moon and on the Earth?



- 7 Four forces are applied to a circular object as shown in the diagram.



Which of the following gives the correct resultant moment and resultant force on the object?

	resultant moment	resultant force
A	zero	zero
B	non zero	zero
C	zero	non zero
D	non zero	non zero

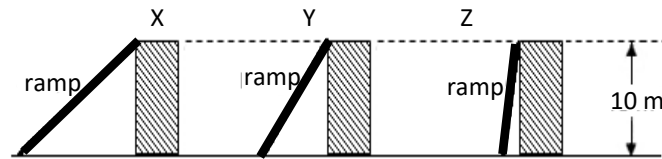
- 8 The table below gives the height of the centre of gravity above the base and the base area of several cuboids.

cuboid	height of centre of gravity	base area
P	4 cm	5 cm ²
Q	4 cm	10 cm ²
R	6 cm	5 cm ²
S	6 cm	10 cm ²

Which of the following statements is true?

- A** P has the greatest stability while R has the least stability.
- B** R has the greatest stability while Q has the least stability.
- C** R has the greatest stability while S has the least stability.
- D** Q has the greatest stability while R has the least stability.

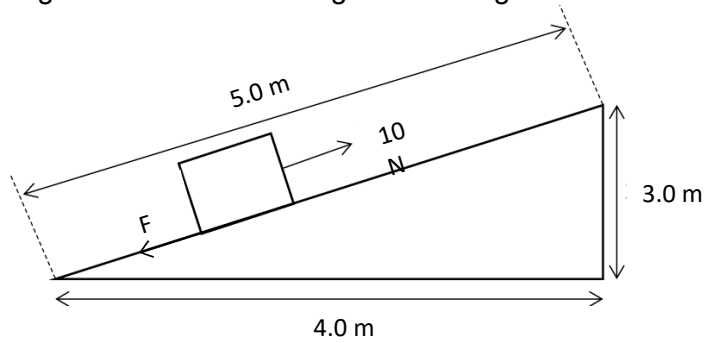
- 9** A load is pushed along three different lengths of ramps from ground level to a height 10 m above the ground. All the ramps are of the same material but placed at different angles from the ground. All the ramp's surfaces are frictionless, and the load moves at constant speed throughout.



Which path will require the most amount of energy in pushing the load up?

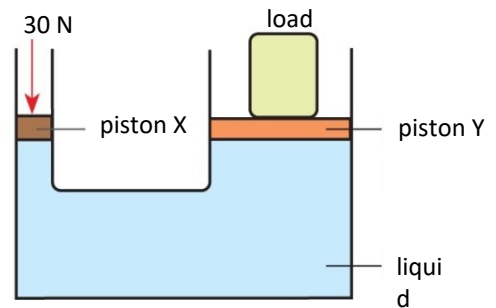
- A** path X
- B** path Z
- C** path Y
- D** equal amount of work is done for every path

- 10** Jaden uses 10 N to push a 0.80 kg box up a 5.0 m slope. The box also experiences a resistive force F along the slope. The gravitational field strength is 10 N/kg.



What is the magnitude of F ?

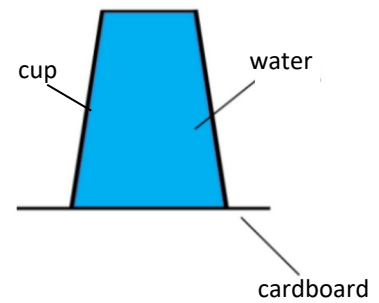
- A** 2.0 N
- B** 5.2 N
- C** 9.5 N
- D** 10 N
- 11** The diagram shows a hydraulic jack. The cross-sectional area of piston Y is six times larger than piston X. When a 30 N force is applied onto piston X, it moves downwards. As a result, an upward force, F , acts on piston Y and the load moves upwards.



What is the magnitude of the upward force, F , exerted on the load?

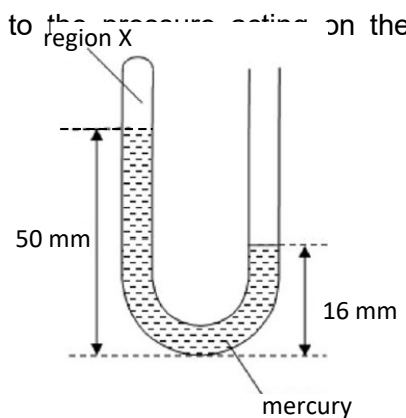
- A** 5.0 N
- B** 30 N
- C** 60 N
- D** 180 N

- 12** Ryo filled a cup with water and covered it with a piece of cardboard. He observed that when he inverted the cup, the cardboard remains in place and the water does not flow out of the cup.



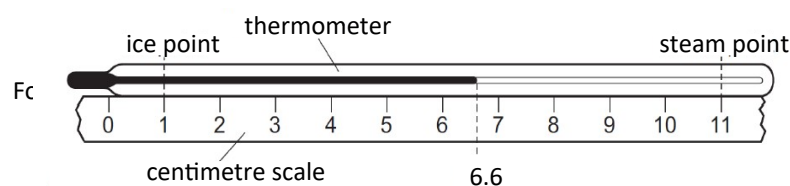
Which of the following explains his observation?

- A** The atmospheric pressure is equal to the weight of the water.
- B** The suction force of the water on the cardboard prevents it from falling.
- C** The upward force exerted by the air on the cardboard is equal to the weight of the water.
- D** The pressure exerted by air on the cardboard is equal to the pressure exerted on the cardboard due to the weight of the water.
- 13** The diagram shows a U-tube filled with mercury. The left arm is sealed, and the right arm is exposed. There is some trapped air in region X. The atmospheric pressure is 760 mmHg.



What is the pressure of the trapped air in region X?

- A** 726 mmHg
- B** 744 mmHg
- C** 776 mmHg
- D** 794 mmHg
- 14** A centimetre scale is placed next to an unmarked mercury-in-glass thermometer. The ice point and the steam point are marked.



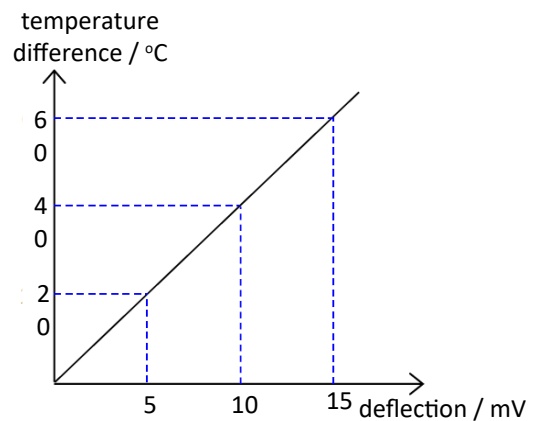
What is the temperature shown on the thermometer?

- A** 44 °C
- B** 56 °C
- C** 60 °C
- D** 66 °C

- 15** The graph shows how the temperature difference between junctions X and Y of a thermocouple causes a variation in the deflection of a milli-voltmeter.

If X is placed in a substance of 25 °C and Y is placed in another substance of higher temperature, a deflection of 26 mV is seen.

What is the temperature of Y?



- A** 79 °C
- B** 104 °C
- C** 129 °C
- D** 145 °C

- 16** In which of the following scenarios is conduction the primary mode of heat transfer?

- A** cooking food in an oven
- B** cooling a room with air conditioner
- C** melting ice by placing it on a hot stove
- D** feeling the warmth of the sun on your skin

- 17** Which of the following factors affects the rate of convection current?

- (i) temperature difference
- (ii) location of heat source

(iii) density of material

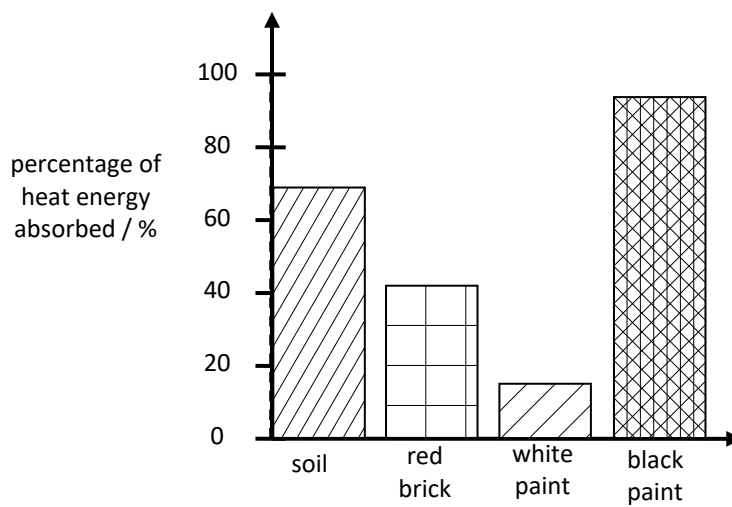
A (i) only

B (i) and (ii) only

C (i) and (iii) only

D All of the above

- 18** Different surfaces absorbed different proportions of the Sun's radiant energy. The diagram shows the percentage of thermal energy absorbed by some surfaces.



Which is the best way to treat a flat roof to reduce the amount of heat absorbed by the roof?

A

cover the roof with a layer of red brick dust

B

cover the roof with a layer of soil

C

paint the roof black

D

paint the roof white

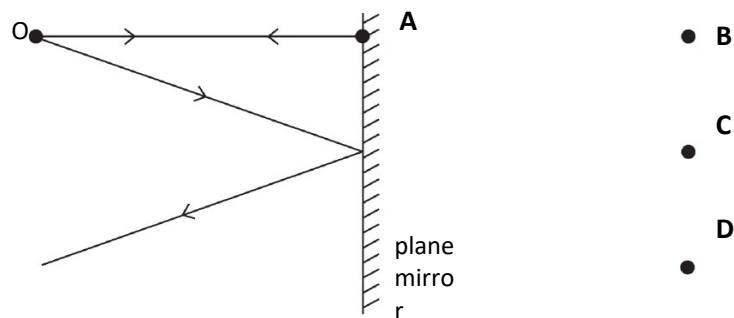
- 19 The table below shows the properties of four substances, A, B, C and D at 80 °C and 150 °C.

	at 80 °C		at 150 °C	
substance	definite volume	definite shape	definite volume	definite shape
A	no	no	no	no
B	yes	yes	yes	no
C	yes	no	no	no
D	yes	no	yes	no

Which of the following best identifies the possible melting point and boiling point of substances A, B, C and D?

substance	melting point	boiling point
A	40 °C	82 °C
B	160 °C	200 °C
C	25 °C	120 °C
D	74 °C	148 °C

- 20 The diagram shows two rays of light from an object O being reflected from a plane mirror. At which position will the image be formed?



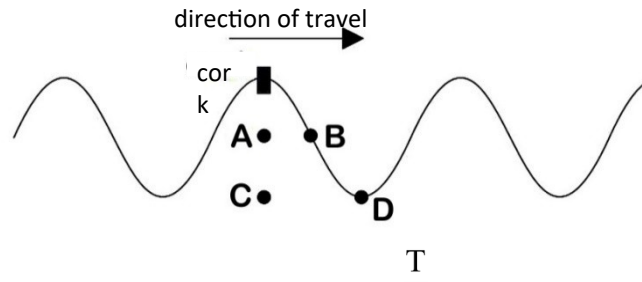
- 21 A thin converging lens of focal length 15 cm forms a real, inverted and magnified image of an object placed at a distance u from the lens.

What are the possible values of u ?

- (i) 15 cm
 - (ii) 20 cm
 - (iii) 25 cm
 - (iv) 30 cm
- A** (i) and (ii)
- B** (ii) and (iii)
- C** (i), (ii) and (iii)

D (iii) and (iv)

- 22** A water surface wave (ripple) is travelling to the right on the surface of a lake. The wave has period T . The diagram shows the surface of the lake at a particular instant of time. A piece of cork is floating in the water in the position shown.



Which is the correct position of the cork at a time $\frac{T}{4}$ later?

- 23** Which two types of electromagnetic radiation are both used to kill cancerous cells?

- A** gamma-rays and microwaves
- B** microwaves and ultra-violet radiation
- C** ultra-violet radiation and X-rays
- D** gamma-rays and X-rays

- 24** The diagram shows the main sections of the electromagnetic spectrum in order of increasing frequency. Some of the sections are labelled. The section P has a frequency just below that of visible light.

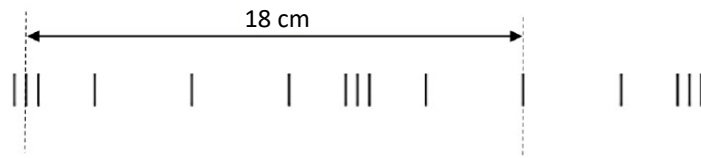
radio waves		P	visible light			gamma rays
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—————→ increasing frequency

Which application uses the section P?

- A** radio
- B** suntanning bed
- C** satellite television
- D** television remote controller

- 25** A longitudinal wave of period 1.0 s passes along a spring. The diagram shows the position of coils in the spring at a particular time.



Which of the following shows the original wavelength of the wave above and the new wavelength if a wave of period 2.0 s passes along the same spring?

	original wavelength	new wavelength
A	9 cm	18 cm
B	12 cm	12 cm
C	12 cm	24 cm
D	18 cm	9 cm

- 26** A man P faces a vertical wall which is 500 m away from him. A second man Q stands 200 m behind P. When P fires a gun, Q hears the shot and an echo.

Given that the speed of sound in air is 340 m/s, what is the time interval between the two sounds?

A 1.2 s

B 1.8 s

C 2.9 s

D 3.5 s

- 27** What will happen if a positive charge is placed in an electric field?

A The charge will experience a force.

B The charge will remain positive but become larger.

C The charge will remain positive but become smaller

D The charge will be neutralised by a negative charge.

28 A positively charged rod attracts a suspended bob.

Which of the following statements describe the charges on the suspended bob?

A The bob can be either neutral or negatively charged.

B The bob is negatively charged.

C The bob is neutral.

D The bob must have fewer positive charges.

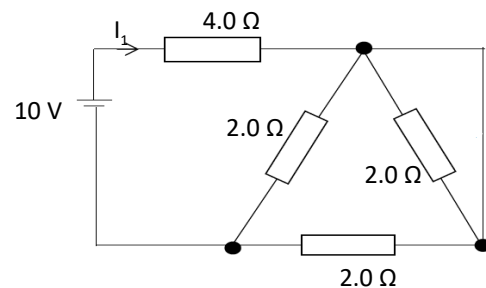
- 29** A copper wire X has resistance R . Another copper wire Y has twice the length and half the cross-sectional area of X.

What is the resistance of wire Y?

- A** $\frac{R}{2}$
- B** R
- C** $2R$
- D** $4R$

- 30** The diagram shows an electric circuit.

What is the value of current I_1 ?

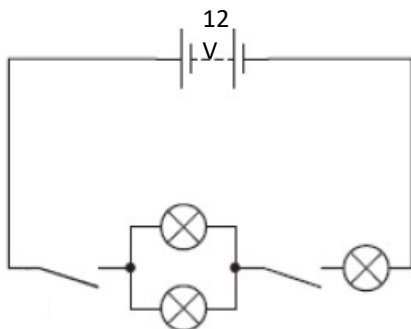


- A** 1.0 A
- B** 1.8 A
- C** 2.0 A
- D** 2.5 A

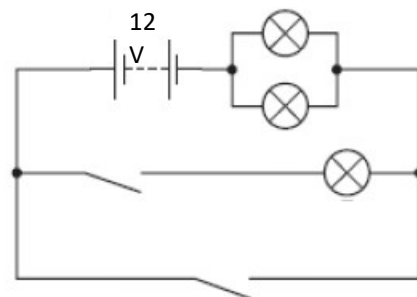
- 31** Liam connected three identical bulbs and two switches to a 12 V battery.

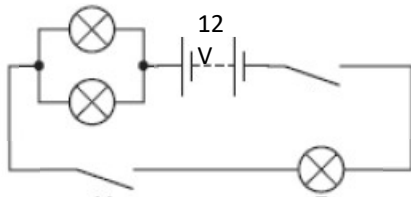
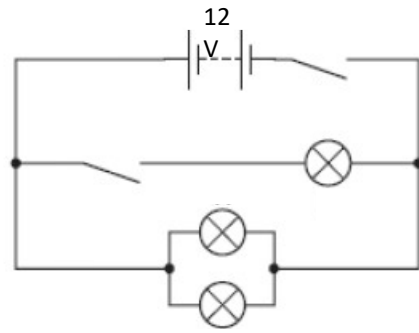
When the two switches are closed, which circuit would allow all the bulbs to work at full brightness of 12 V each?

A

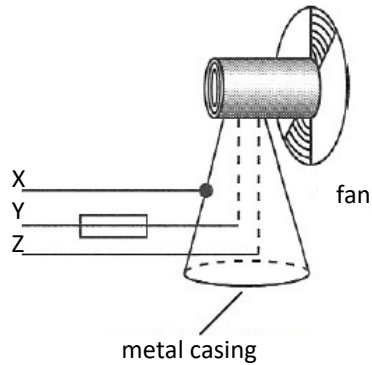


B



C**D**

32 The diagram shows the external wiring of an electric fan.



Which of the following statements is/are correct?

- (i) Wire X is always at a low potential.
- (ii) The switch of the fan should be connected to wire Y.
- (iii) Wire Z is brown in color.

- A** (i) only
- B** (i) and (ii) only
- C** (ii) and (iii) only
- D** All of the above

33 What is the main reason for insulating the wires of a household electrical circuit?

- A** To reduce heat loss.
- B** To beautify the wires.
- C** To prevent short circuit.
- D** To increase the maximum amount of current flowing in the wires.

34 Which of the following is the correct sequence to effectively demagnetize a magnetic steel bar using electrical method?

- (i) connect alternating current to a solenoid
- (ii) connect direct current to a solenoid
- (iii) insert the magnetized steel bar into a solenoid in the east-west direction
- (iv) pull the steel bar slowly out of the solenoid
- (v) switch off the current supply

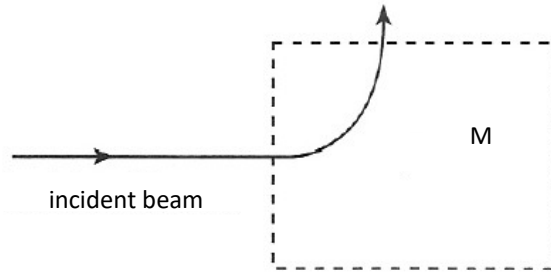
A $i \rightarrow iii \rightarrow v \rightarrow iv$

B $ii \rightarrow iii \rightarrow v \rightarrow iv$

C $iii \rightarrow i \rightarrow iv \rightarrow v$

D $iii \rightarrow ii \rightarrow iv \rightarrow v$

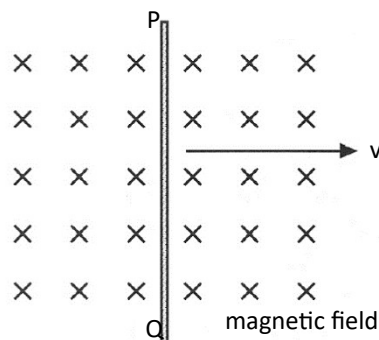
- 35** A beam of particles is directed towards a region M in which a magnetic field is applied. The beam is deflected as shown below.



What is the nature of the charged particles and the direction of the magnetic field?

	particles	direction of magnetic field
A	positively charged	into the page
B	positively charged	out of the page
C	negatively charged	into the page
D	neutral	out of the page

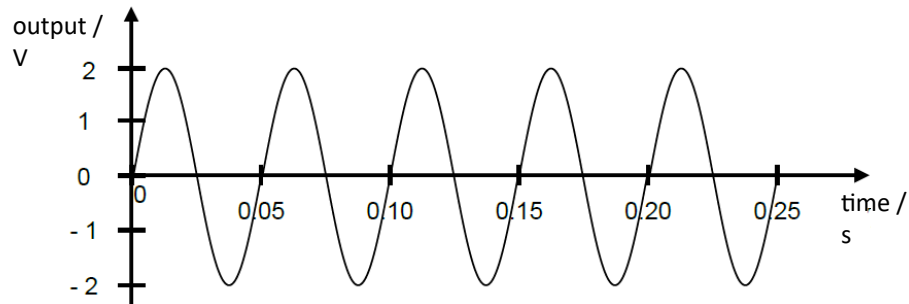
- 36** A rod is pulled to the right with velocity v through a magnetic field as shown.



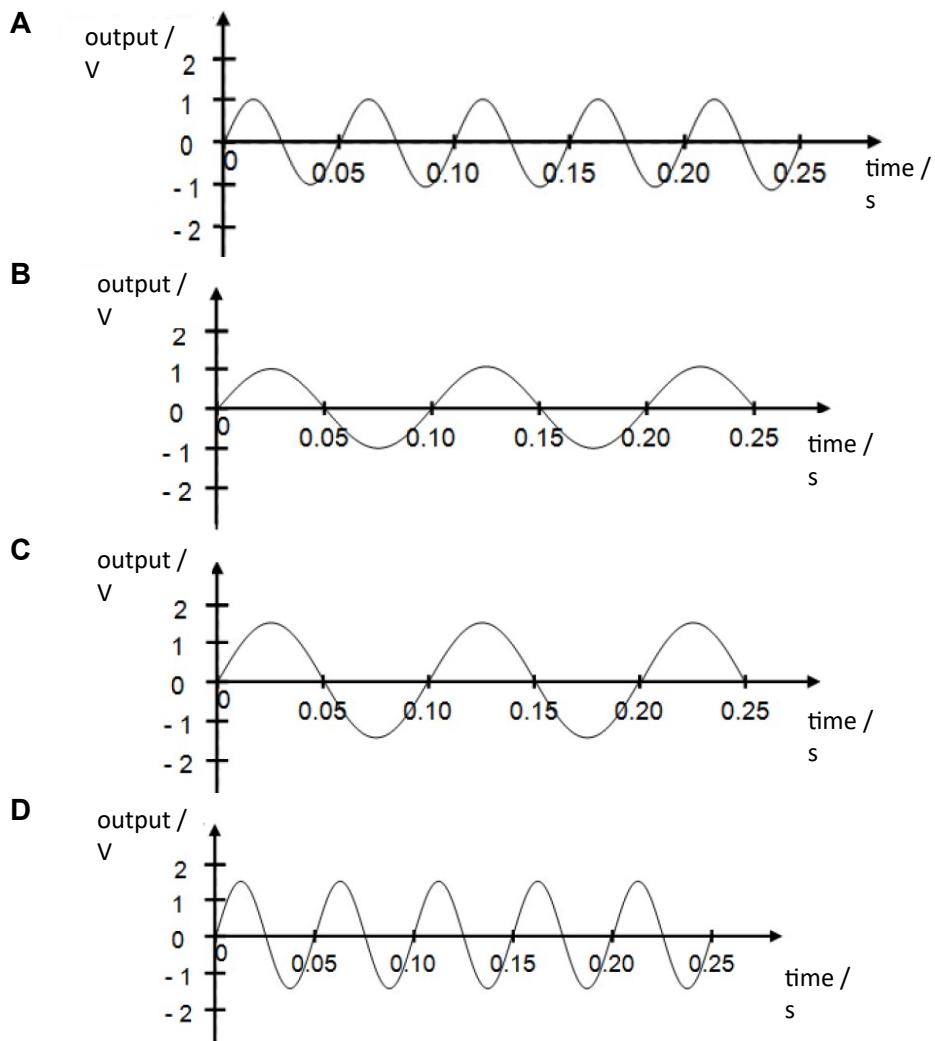
Which of the following statements is/are correct?

- (i) Q is at a higher potential than P.
 - (ii) A current will flow from Q to P in a rod if a wire is connected between P and Q.
 - (iii) The induced e.m.f. increases when the velocity increases.
- A** (i) only
- B** (i) and (ii) only
- C** (ii) and (iii) only
- D** All of the above

- 37** The graph below shows the output of an a.c. generator. The coil has 20 turns, and the generator rotates 20 times in one second.



Which graph shows the output when the coil rotates 10 times in one second?

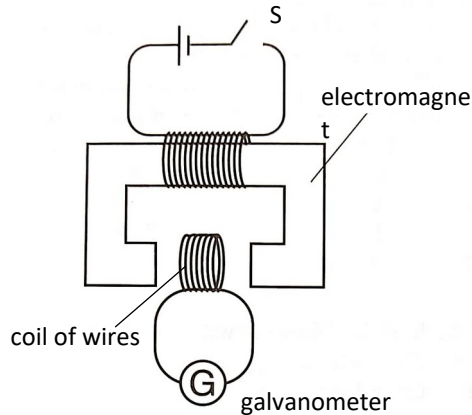


- 38** What is the purpose of the slip rings in an A.C. generator?

- A** To increase the turn ratio of the generator.
- B** To control the frequency of the generated current.
- C** To reverse the direction of the current in the coil every half a revolution.

DB	To provide electrical contact between the rotating coil and external circuit.
C	25 ms
D	15 V
39	30 ms
	7.5 V
	45 V

A coil of wires is connected to a sensitive galvanometer G. It is placed between the poles of an electromagnet as shown.



Switch S was closed and then opened again immediately.

Which of the following observation is true?

- A** The galvanometer shows no deflection as long as the switch remains closed.
- B** The galvanometer shows brief deflection in the same direction on closing and opening of the switch S.
- C** The galvanometer shows brief deflection in one direction on closing and in the opposite direction when opening the switch S.
- D** The galvanometer shows no deflection at all since there is no relative movement of the coil with respect to the electromagnet.

40 The diagram below shows an oscilloscope display set at 2.5 V/division and 20 ms/division



What is the period and
signal?

voltage of the input

	period	voltage
A	25 ms	7.5 V

End of Paper