

GAN ENG SENG SCHOOL
Preliminary Examination 2021



**CANDIDATE
NAME**

CLASS

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**INDEX
NUMBER**

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PHYSICS

Paper 1 Multiple Choice

6091/01

13 September 2021
1 hour

Sec 4 Express

Additional Materials: OTAS

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and index number on the OTAS.

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 choice in soft pencil on the separate OTAS.

Read the instructions on the OTAS 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.

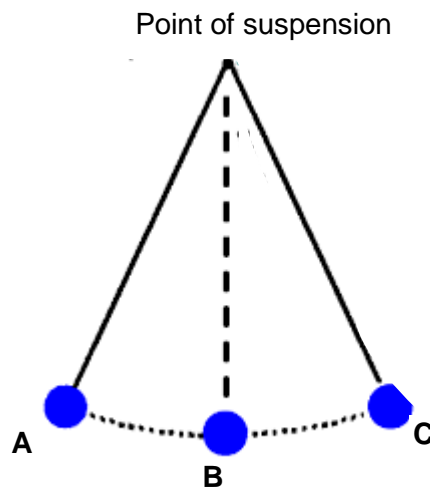
Total Marks
40

1 Which of the following represents the lowest speed?

A 200 000 nm/s
C 20 $\mu\text{m/s}$

B 0.02 dm/min
D 2 cm/h

2 Jovan was using the following pendulum to find out the time taken for the pendulum bob to travel. He released the pendulum bob at A and obtained a total time of 25.28 s as the pendulum bob swings past **B** twenty times.



What is the time taken for the pendulum bob to swing from A to B?

A $25.28 / (4 \times 20)$
C $25.28 / (2 \times 4 \times 20)$

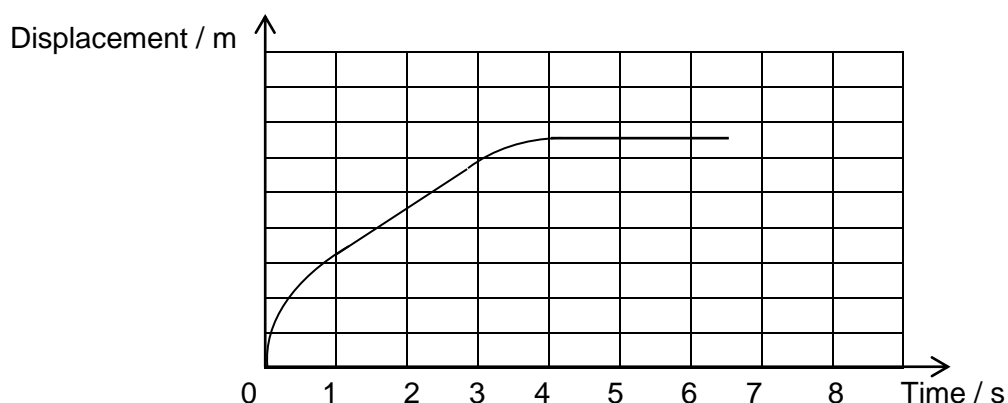
B $25.28 / (4 \times 10)$
D $25.28 / (2 \times 4 \times 10)$

3 Two balls, A and B, were thrown up by Yong Pang and David respectively. It was observed that ball A landed on the ground much earlier than ball B.

What can be deduced based on this observation? Assume there is no resistance during the throw.

A Yong Pang threw up the ball with a higher speed than David.
B David threw up the ball with a higher speed than Yong Pang.
C Ball A is having a higher mass than ball B.
D Ball B is having a higher mass than ball A.

- 4 The graph below shows the displacement of a falling object with time.



What time will it start to experience terminal velocity?

- A** 0 s **B** 1 s
C 3 s **D** 4 s
- 5 Darren was pushing a box from rest along a rough surface with a force of 5 N. The box with a mass of 1 kg accelerated at 2 m/s^2 .

What is the friction force on the rough surface?

- A** 1 N **B** 2 N
C 3 N **D** 7 N
- 6 Two boxes, P and Q, were pushed along a smooth surface from rest. Box P accelerated twice the acceleration of box Q. Box Q has a mass thrice of box P.

Which of the following shows the correct relationship between force exerted on box P, F_P and force on box Q, F_Q ?

- A** $F_P = (2/3) F_Q$ **B** $F_P = (3/2) F_Q$
C $F_P = 3 F_Q$ **D** $F_P = 6 F_Q$

- 7 Jerome was trying to find out the density of sphere. He dropped one sphere into a measuring cylinder as shown in Fig. 7a while dropping another four identical spheres into the same measuring cylinder as shown in Fig. 7b. He placed 3 spheres on an electronic balance and recorded m g.

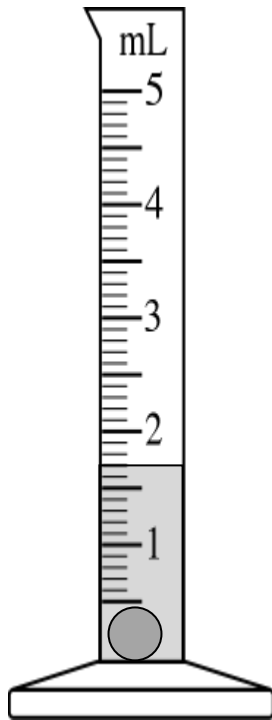


Fig. 7a

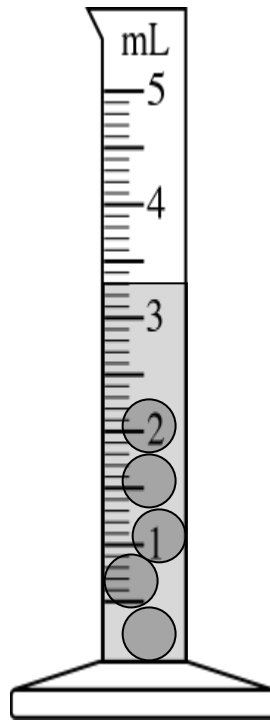


Fig. 7b

What is the density of the spheres?

- | | | | |
|----------|-------------------------------|----------|-------------------------------|
| A | $(3.3 - 1.7) / 4m$ | B | $(3.3 - 1.7) / 5m$ |
| C | $4m / [3 \times (3.3 - 1.7)]$ | D | $3m / [4 \times (3.3 - 1.7)]$ |

- 8 Kenneth was trying to plot a graph of weight against gravitational field strength for a mass.

How will the graph be different when the same graph was plotted for different planets?

- A** The graph will be the same as previous.
- B** The graph will now be having a gentle gradient.
- C** The graph will now be having a steeper gradient.
- D** The graph will now show a negative gradient.

- 9 Which of the following identifies the type of equilibrium for each diagram correctly?

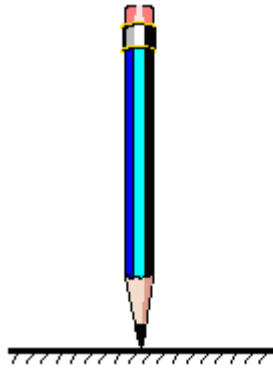


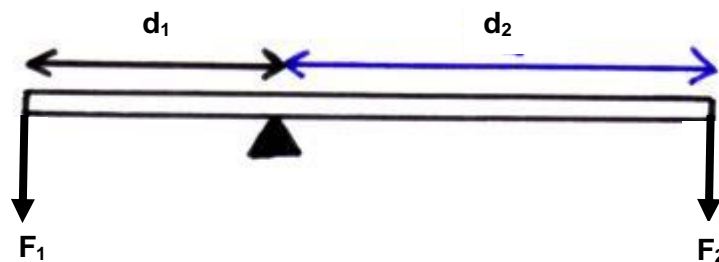
Fig. 9a



Fig. 9b

	Fig. 9a	Fig. 9b
A	Stable	Unstable
B	Unstable	Neutral
C	Unstable	Stable
D	Neutral	Unstable

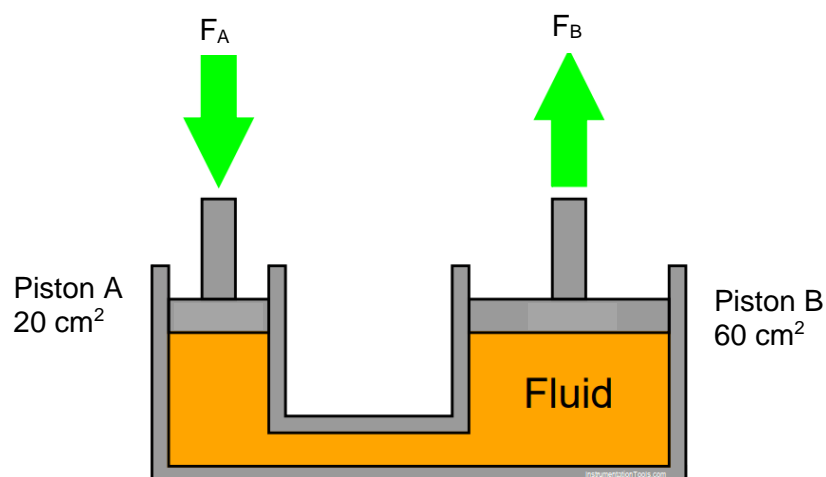
- 10 Brian was using a light rod balanced with two forces, F_1 and F_2 as shown below to test for the principle of moment.



Brian increases the value of F_1 as he tries to plot a graph of $F_1 d_1$ against $F_2 d_2$. How will the gradient of the graph changes as the value of F_1 increases?

- A It will remain constant.
- B It will decrease.
- C It will increase.
- D It will not be known unless an experiment is carried out.

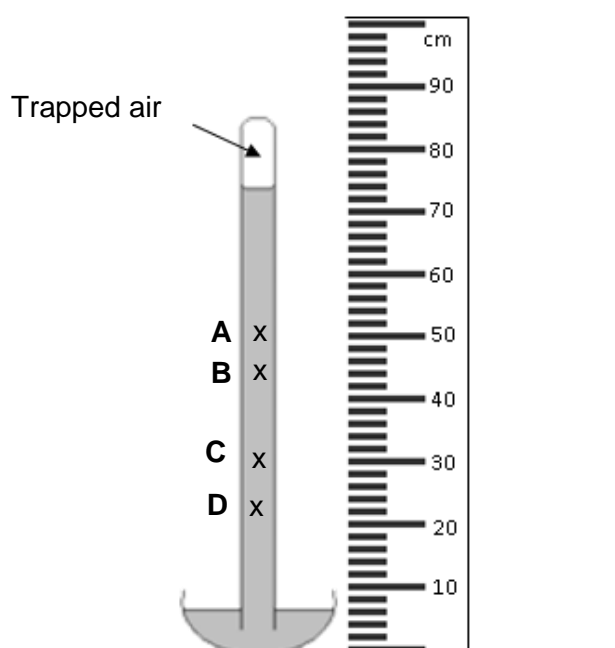
- 11 The diagram below shows a simple hydraulic system. F_B is created at piston B as F_A is being applied at piston A.



Which of the following states accurately F_A , F_B and the displacement by piston B as piston A is pushed down by 3.0 cm?

	F_A / N	F_B / N	displacement by piston B / cm
A	10	30	0.3
B	20	60	1.0
C	30	30	3.0
D	30	10	9.0

- 12 The diagram below shows a mercury barometer used to measure the surrounding atmospheric pressure. The trapped air has a pressure of 20 cm Hg.



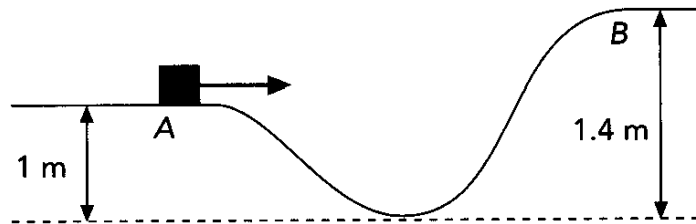
What is the point that measured 44 cm Hg?

- 13 A 500 g ball was dropped from a height of 5 m.

What is the potential energy of the ball when it has dropped 2 m?

- | | | | |
|----------|------|----------|------|
| A | 10 J | B | 15 J |
| C | 20 J | D | 25 J |

- 14 A small object of mass 2.0 kg moves along a track as shown in the diagram below. The speeds of the object at point A and B are 5.0 m/s and 1.0 m/s respectively. The length of the track AB is 4.0 m.



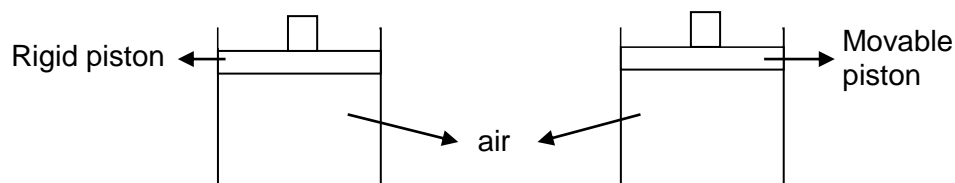
What is the average value of frictional force acting on the object as it is moving from A to B?

- | | | | |
|----------|-------|----------|-------|
| A | 2.0 N | B | 3.0 N |
| C | 4.0 N | D | 6.3 N |

- 15 The function of many machines is to change energy from one form to another as efficiently as possible. Which machine is 90% efficient?

- A** A car engine as it converts 100 J of chemical energy to 90 J of thermal energy.
- B** A electric drill as it converts 80 J of electrical energy to 70 J of kinetic energy.
- C** A solar panel as it converts 20 J of light energy to 18 J of thermal energy.
- D** An electrical heater in a kettle as it converts 70 J electrical energy to 63 J of thermal energy.

- 16** Both containers of air, having the same initial temperature, are being heated.



Which of the following quantities is/are different for both containers?

- i The frequency of collisions on the walls of the container by the air particles.
- ii The average force exerted on the walls of the container by the air particles.
- iii The average distance between the air particles.
- iv The average kinetic energy of the air particles.

A i, iii

B ii, iii

C i, ii

D iii, iv

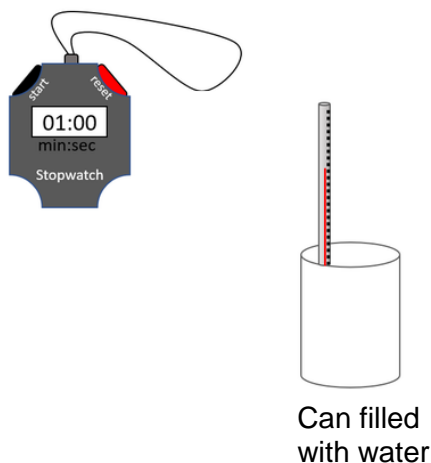
- 17** Which of the following is a property of both liquids and gases?

- A** They always fill their containers.
- B** They are incompressible.
- C** They can flow.
- D** They have molecules in fixed positions.

- 18** Which of the following will receive the most heat from the sun through conduction?

- A** A large spacecraft in the outer space facing the sun.
- B** The water at the reservoir under the sun.
- C** The solar panel at the roof facing the sun.
- D** The water in the metal can left under the sun.

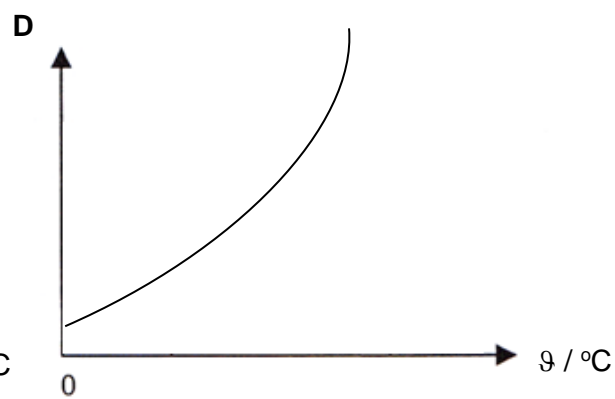
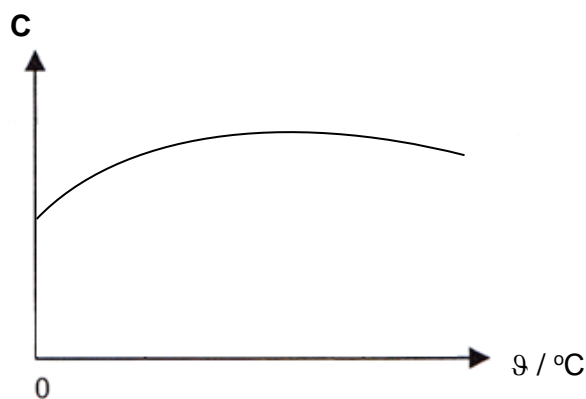
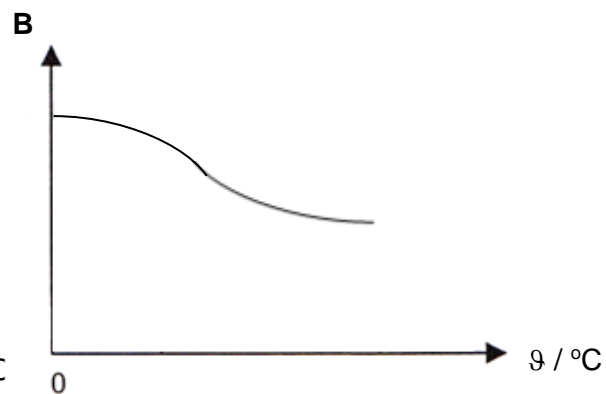
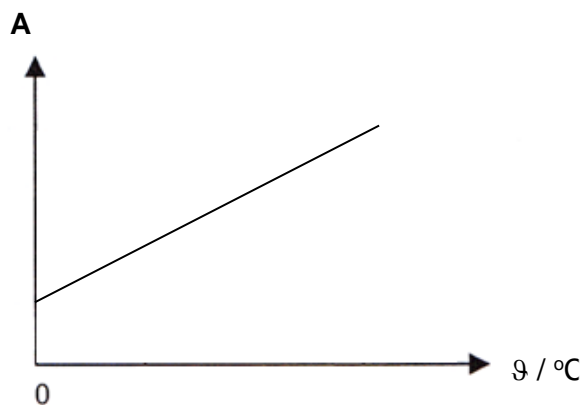
- 19 Roy was conducting an experiment on radiation as shown in the diagram below.



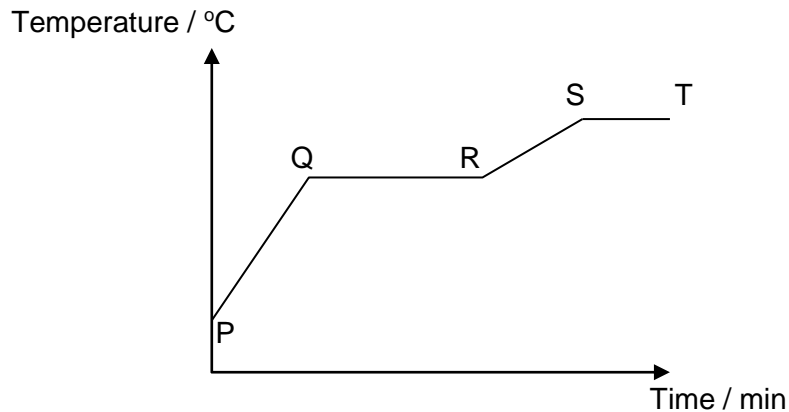
Which of the following changes will not affect the rate of radiation?

- A Changing the can to a metal.
- B Changing the can to a darker colour.
- C Changing the can to a smoother surface.
- D Changing the can to a bigger surface area.

- 20 Which of the following graph will definitely not be used as thermometric property?



- 21 Yuqi was heating 100 g of solid X in the Physics lab. He obtained a temperature - time graph as shown below.

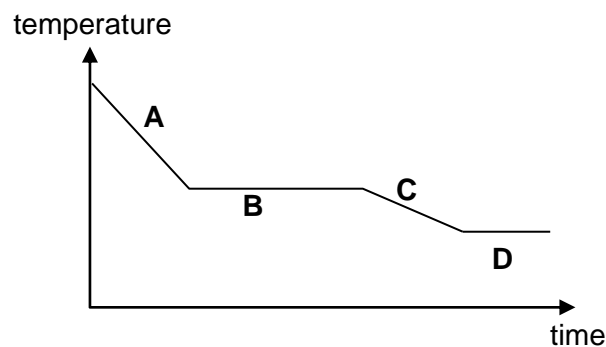


Which of the following statement is correct?

- A** Section PQ will take a longer duration when 200 g of solid X is used.
B Section QR indicates a change of state from liquid to gas.
C Section RS will show a smaller gradient when 50 g of liquid X is used.
D Section ST will be longer if the rate of heating increases.
- 22 Colin added 20 g of solid Q into 100 g of liquid P. Solid Q has an initial temperature of 10 °C while liquid P has an initial temperature of 80 °C. Both of them reach a final temperature of 60 °C. Assume no heat lost during the experiment.

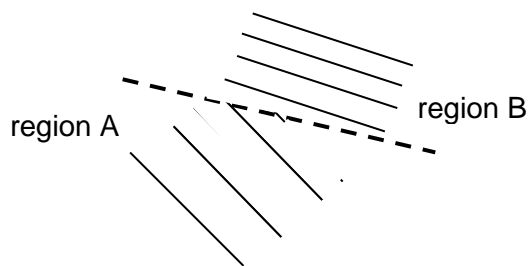
Which of the following statements is correct?

- A** Specific heat capacity of liquid P is higher than specific heat capacity of solid Q.
B The ratio of heat capacity of solid Q to heat capacity of liquid P is 2.5
C Solid Q changed its state during the experiment.
D Heat capacity of solid Q is less than heat capacity of liquid P.
- 23 A liquid is cooled and its temperature-time graph is shown below.



Which section can be used to determine the latent heat of fusion?

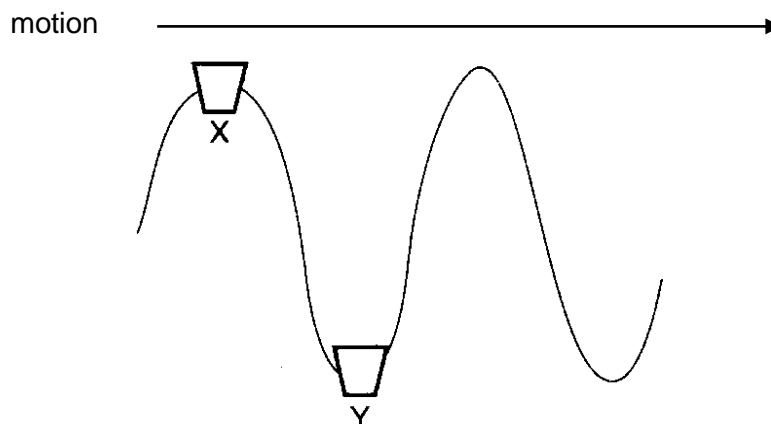
- 24 The diagram below shows a wave as it enters from region A to region B.



Which of the following statements illustrate clearly the diagram shown above?

- A** The water wave is entering from a shallow region to a deep region.
- B** The water wave gains speed as it enters into the region B.
- C** The sound wave is entering from water to air.
- D** The wave bends away from normal as it enters into region B.

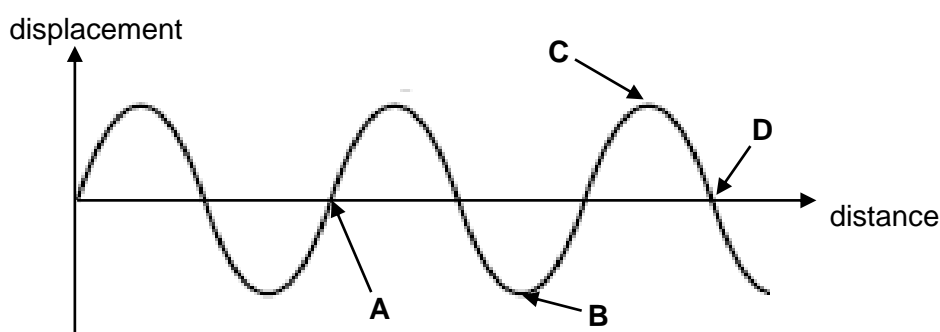
- 25 Two corks, X and Y, are floating on the water.



Which of the following statements describes correctly the motion of the two corks as the wave passes through them?

- A** Both will move in the opposite direction.
- B** Both are moving towards each other.
- C** Both are moving to the right as the wave passes through them.
- D** Both will move away from each other.

- 26 The diagram below shows a displacement-distance graph of a longitudinal wave.



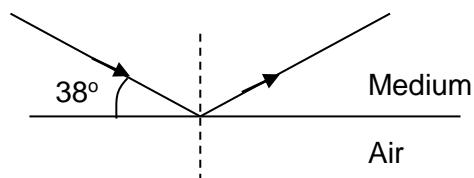
Which point indicates that it is the centre of compression?

- 27 Tania was looking at the image of an object through a thin converging lens.

Which of the following will **not** happen to the image of the object as she moves it further away from the lens?

- A The image will become smaller.
- B The image will become virtual.
- C The image will become laterally inverted.
- D The image will be nearer to the lens.

- 28 A ray of light that makes an angle of 38° with the medium boundary reflected back into the medium boundary as shown below.



Which of the following cannot be the refractive index of the medium?

- | | | | |
|---|------|---|------|
| A | 1.24 | B | 1.27 |
| C | 1.44 | D | 1.62 |

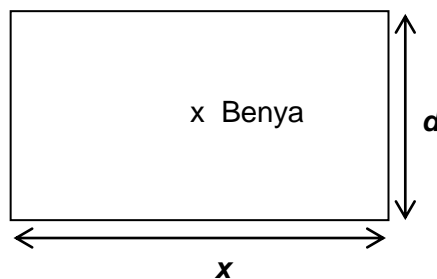
- 29 Electromagnetic waves of wavelength λ and frequency f travel at speed c in a vacuum. Which of the following describes the frequency and speed of an electromagnetic waves of wavelength 0.2λ ?

	frequency	speed in vacuum
A	$5f$	$0.2c$
B	f	$0.2c$
C	$0.2f$	c
D	$5f$	c

- 30 Which of the following is not a property of electromagnetic waves?

- A** They obey the wave equation.
- B** They can reflect and refract.
- C** They can be deflected by magnetic field.
- D** They travel at a speed of 3×10^8 m/s in air.

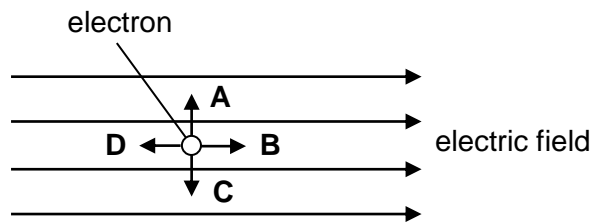
- 31 Benya was standing at the centre of a room as shown in diagram below. She was trying to determine the length of the room by using echo method. She created a clap and observe the time interval between first 2 echos. She recorded the time interval was 3 s.



What is the length of the room, x ? Assume that the speed of sound in air is 330 m/s.

- | | |
|--|---|
| <p>A $(2)(3)(330) - d$</p> <p>C $d + (3)(330)$</p> | <p>B $d + (2)(3)(330)$</p> <p>D $2(3)(330) / d$</p> |
|--|---|
- 32 Which of the following sound could not be heard by human in air?
- A** A sound with 24 000 μm wavelength
 - B** A sound with 19 nm wavelength
 - C** A sound with 30 Hz
 - D** A sound with 18 000 Hz

- 33 The diagram shows an electron in a uniform electric field. In which direction will the electron accelerate?



- 34 Which object will **not** attract tiny pieces of paper?

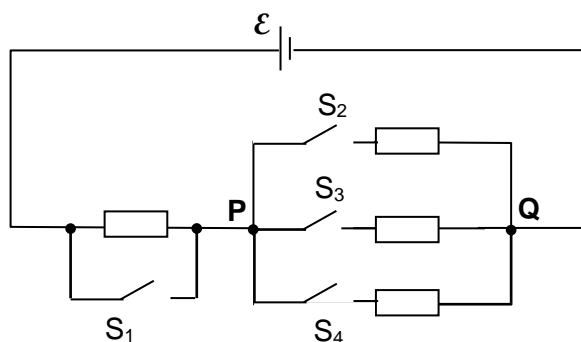
- A A plastic fork combed through dry hair
- B A ceramic plate wiped with a kitchen cloth
- C A wooden rod rubbed with an fur
- D A metal spoon wiped with a sponge

- 35 A wire, with thickness 2 mm and a length of 5 m, is placed across a potential difference of 8 V. A current of 4 A passes through it.

What is the amount of current flowing through another wire of the same material that has a thickness of 4 mm with a length of 2 m? Assume that the new wire has a potential difference of 8 V across it.

- A 40 A
- B 20 A
- C 0.2 A
- D 0.4 A

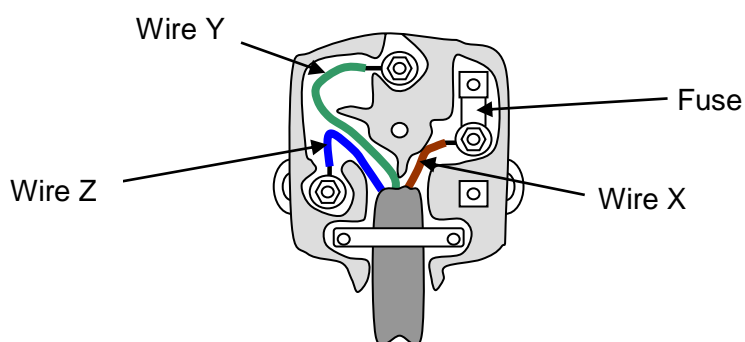
- 36 A circuit with four identical resistors are connected as shown below.



Which switches are to close so that the potential difference across PQ is equivalent to one-third of emf, \mathcal{E} ?

- A S_1 and S_2
- B S_1 , S_2 and S_3
- C S_2 and S_4
- D S_2 , S_3 and S_4

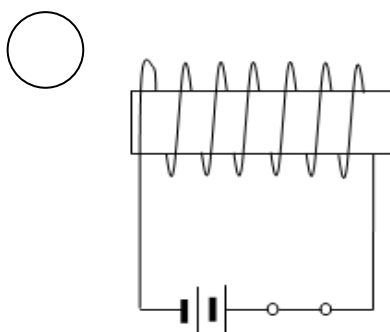
- 37 The diagram shows a 3-pin plug. Under normal conditions, the wire X carries a current of 2 A when the appliance is switched on.



What would be the current flowing in the wire Y and Z respectively?

	Wire Y	Wire Z
A	0 A	2 A
B	2 A	2 A
C	2 A	0 A
D	0 A	0 A

- 38 The diagram below shows a compass placed near a solenoid.



Ignoring the magnetic field strength of the Earth, which of the following shows the correct direction of the compass needle when the terminal of the battery is reversed?

A



B



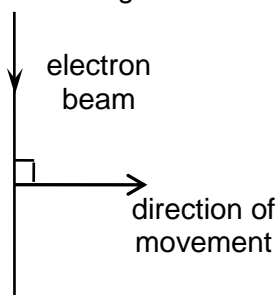
C



D

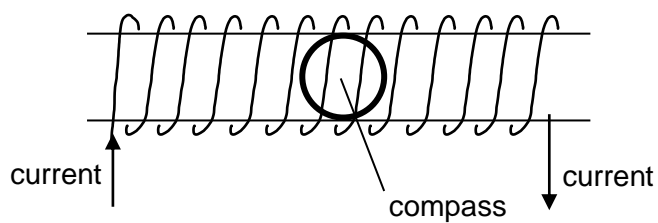


- 39** A beam of electrons travels between the poles of a magnet. The beam starts to move in the direction shown.







Which is the direction of magnetic field?

- A** Into the paper **B** Out of paper
C Towards left **D** Towards right
- 40** A compass is placed in the centre of a solenoid as shown in the diagram below.



In which direction will the compass needle point?

- A**  **B** 
- C**  **D** 

END OF PAPER