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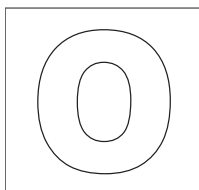
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GAN ENG SENG SCHOOL
Preliminary Examination 2020



**CANDIDATE
NAME**

CLASS

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**INDEX
NUMBER**

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PHYSICS

Paper 1 Multiple Choice

6091/01

14 September 2020
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.

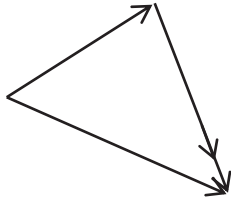
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

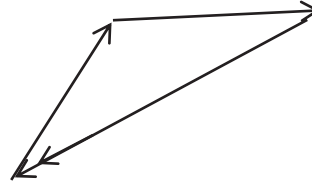
Total Marks
40

- 1 Which of the following vector addition shows correctly the addition of two forces?

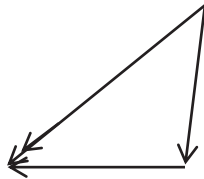
A



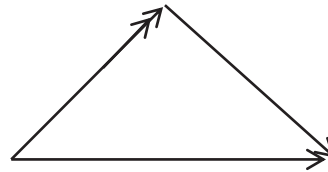
B



C



D



- 2 Which of the following representing the longest length?

A 400 μm

B 0.004 Gm

C 4 000 dm

D 40 Mm

- 3 Object X falls freely from rest for 3 seconds and object Y also falls freely from rest for 6 seconds.

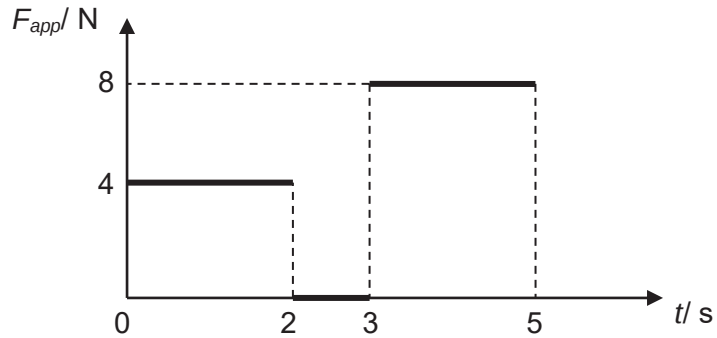
Which of the following statements is **true**?

- A Y falls half as far as X.
 B Y falls twice as far as X.
 C Y falls three times as far as X.
 D Y falls four times as far as X.

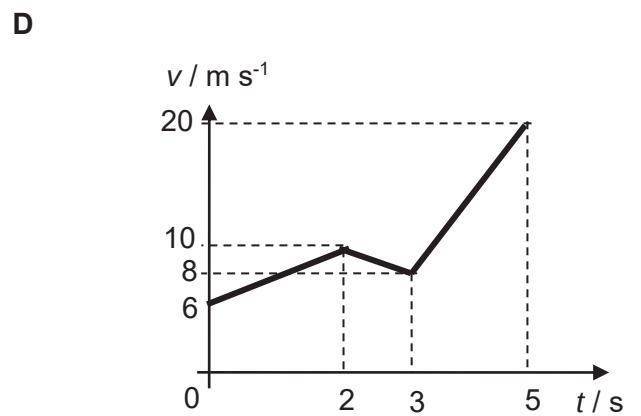
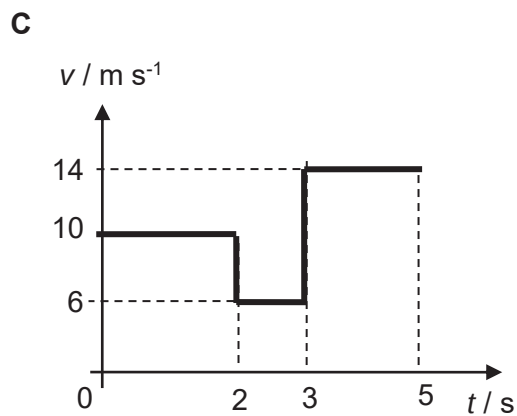
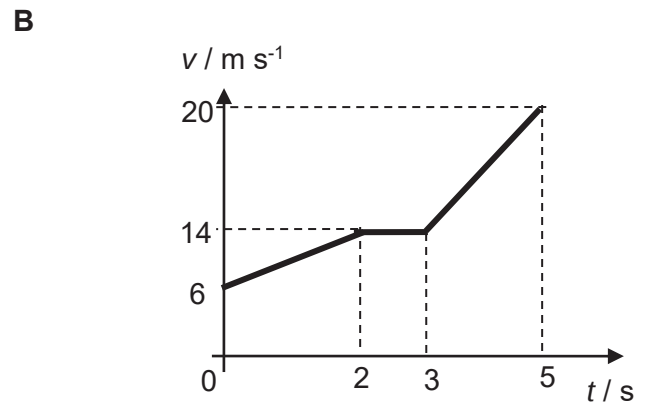
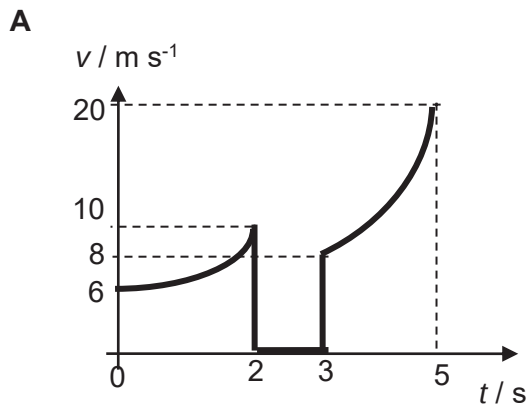
- 4 Joash threw a ball vertically upwards at an initial speed of 30 m s^{-1} . What is the distance travelled by the ball 5 s after the throw?

A 75 m **B** 65 m
C 45 m **D** 25 m

- 5 The graph below shows the force acting on a 1 kg block of wood which is originally moving at 6 m s^{-1} on a table.



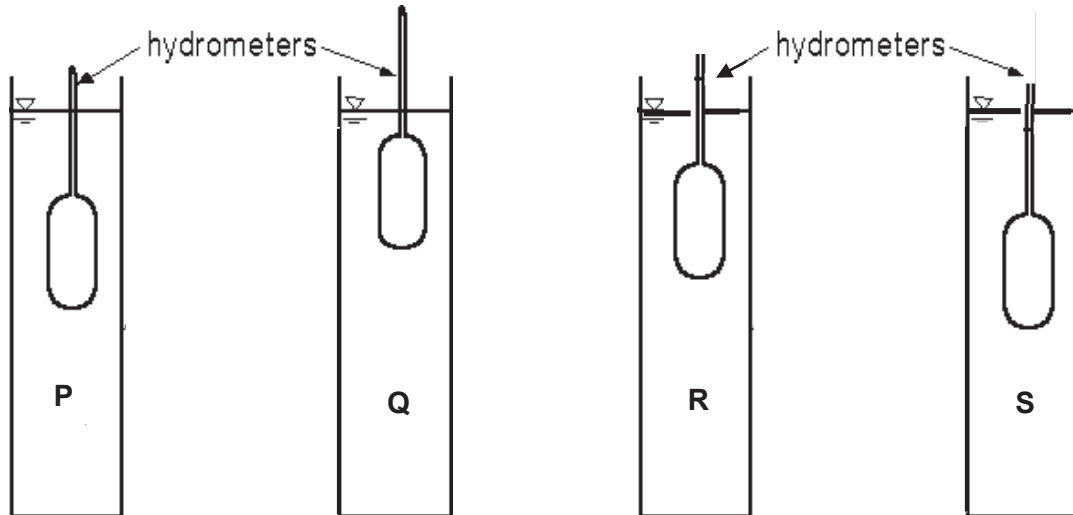
If the table has a friction of 2 N, what is the velocity-time graph of the wood?



6 Which of the following will experience the largest inertia?

- A A bowling ball that is rolling at 20 m/s.
- B A basketball that is falling at a rate of 10 m/s².
- C An elephant that is at rest.
- D A car that is travelling at 100 km/h.

7 Hydrometers are used to measure the density of four different liquids, **P**, **Q**, **R** and **S** as shown.



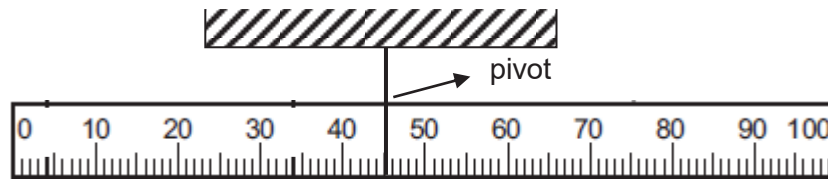
Which arrangement shows correctly the decreasing density of the four liquids?

- A Q, R, P, S
- B Q, R, S, P
- C S, P, Q, R
- D S, P, R, Q

8 Which of the following statements about gravitational field is correct?

- A Gravitational field strength of the earth is independent of location.
- B Gravitational field causes forces on objects because they are charged.
- C The gravitational field attraction of the Earth acts towards the centre of the Earth.
- D The gravitational field strength on the Moon is less than that on Earth because there is no atmosphere on the Moon.

- 9 A 200 g metre rule is balanced at the 45 cm mark as shown below.

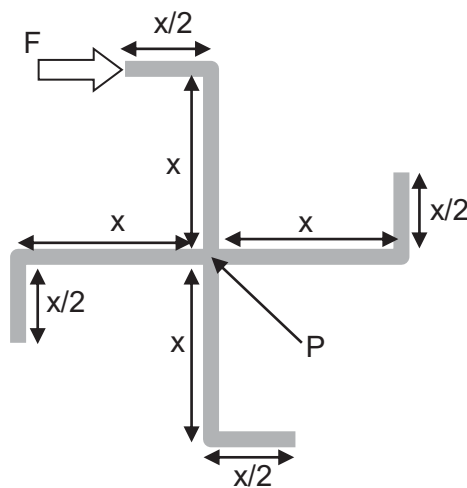


A load of 50 g is now hung at the 15 cm mark.

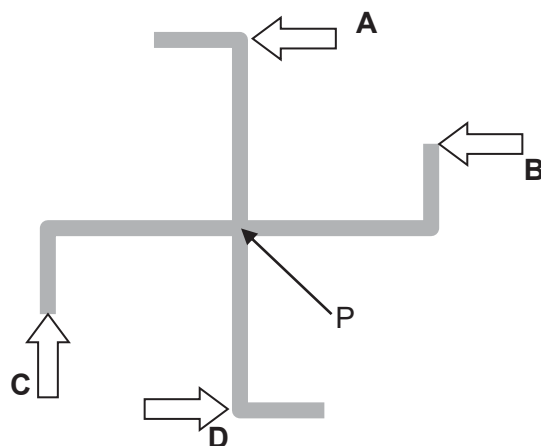
What is the new pivot position that will allow the ruler to be balanced again?

- | | | | |
|----------|------------|----------|------------|
| A | 39 cm mark | B | 37 cm mark |
| C | 35 cm mark | D | 30 cm mark |

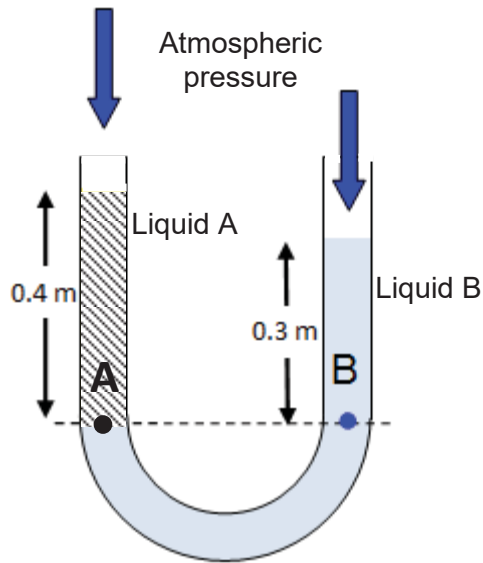
- 10 An object was spinning about its pivot point, P, due to a force F as shown below.



Which direction should a force, $2F$, be applied to stop the spinning?

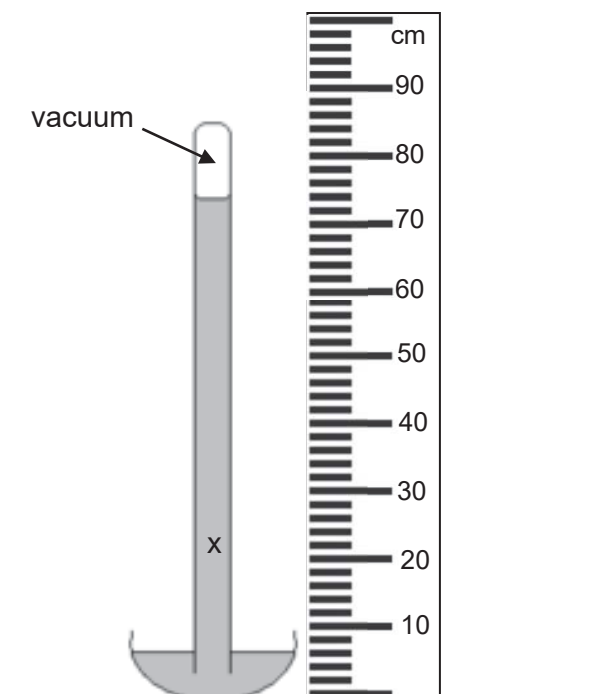


- 11 In the manometer as shown below, 0.4 m of liquid A was added together with liquid B.



What is the density of liquid B if the density of liquid A is ρ ?

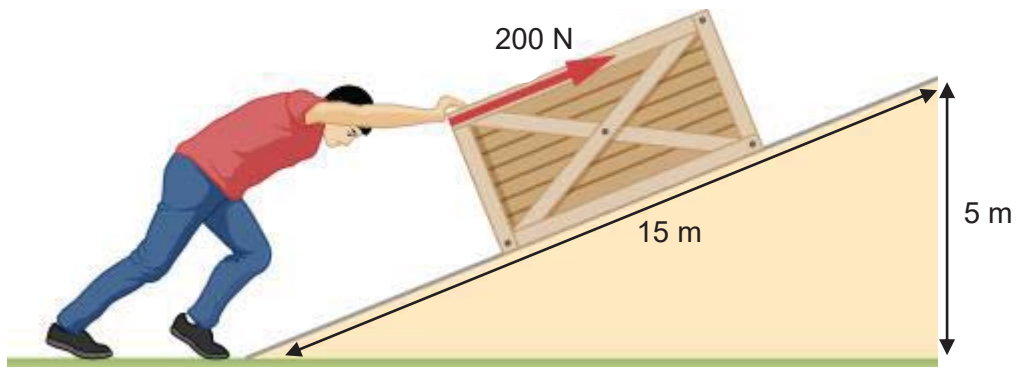
- | | | | |
|----------|-----------|----------|-----------|
| A | $4\rho/3$ | B | $3\rho/4$ |
| C | $4\rho/7$ | D | $3\rho/7$ |
- 12 The diagram below shows a mercury barometer used to measure the surrounding atmospheric pressure.



What is the pressure measured at X?

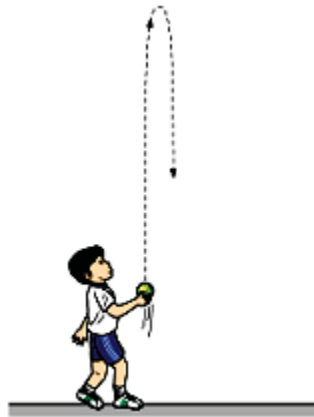
- | | | | |
|----------|----------|----------|----------|
| A | 16 cm Hg | B | 22 cm Hg |
| C | 52 cm Hg | D | 62 cm Hg |

- 13 Xavier was pushing a mass 50 kg to the top of the ramp. The gravitational field strength is 10 N/kg.



What is the efficiency of Xavier?

- | | | | |
|----------|--------|----------|--------|
| A | 83.3 % | B | 13.3 % |
| C | 25.0 % | D | 8.3 % |
- 14 Donovan was throwing a 500 g basketball upwards with an initial velocity of 20 m/s. The gravitational field strength is 10 N/kg and assuming no air resistance.



What is the gain in potential energy of the basketball after leaving Donovan's hand for 1 s?

- | | | | |
|----------|-------|----------|------|
| A | 100 J | B | 75 J |
| C | 25 J | D | 10 J |

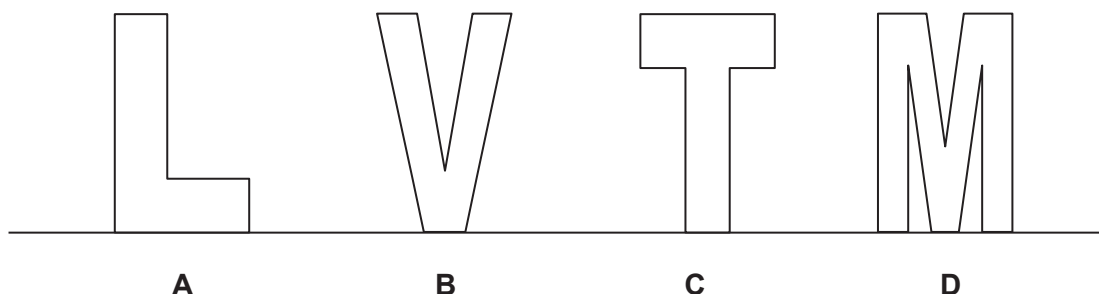
- 15** A gas is heated in a rigid sealed container. Which quantity does not change?
- A** The average speed of the gas particles
 - B** The average force exerted on the walls of the container by the gas particles
 - C** The average distance between the gas particles
 - D** The frequency of collisions on the walls of the container by the gas particles

- 16** According to the kinetic theory, matter is made up of very small particles in a constant state of motion.

Which row best describes the particle behaviour in the liquid state?

	forces between particles	motion of particles
A	strong	move randomly at high speed
B	strong	vibrate but are free to move position
C	very strong	vibrate to and fro about a fixed position
D	weak	move randomly at high speed

- 17** All the objects below are made of the same material and having the same thickness.



Which object will cool down the fastest if they were all being heated to the same temperature?

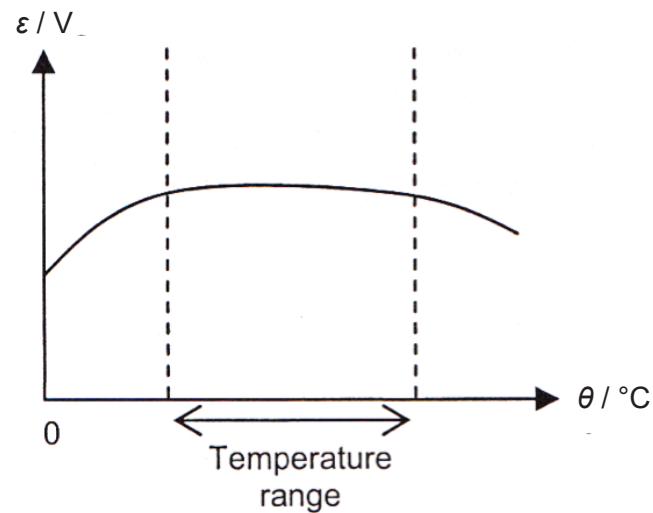
- 18** Which statement about the transfer of thermal energy is correct?
- A** All metals conduct thermal energy equally well.
 - B** Convection can only occur in solids or liquids.
 - C** Convection occurs in liquids because hot liquid is denser than cold liquid.
 - D** The radiation that transfers thermal energy is a type of electromagnetic radiation.

- 19** When ice changes into water at 0 °C,

- I work is done in breaking the molecular structure of ice in solid state.
- II internal energy is increased.
- III energy is absorbed to raise the temperature.

- D** I, II and III

- 20** The diagram shows a graph of how the e.m.f., ε / V , of a thermocouple varies with temperature, $\theta / ^\circ\text{C}$.



Why is the thermocouple inappropriate for measurement of temperature in the range as shown?

- A** The thermocouple produces an e.m.f. at 0 °C.
B The relationship between ε and θ is non-linear.
C The thermocouple does not always indicate a unique value of e.m.f..
D The e.m.f. has not been measured using temperatures using the Kelvin scale.

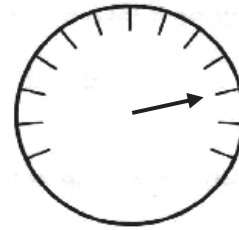
- 21 The diagrams show the scale of a voltmeter connected to a thermocouple thermometer.



thermocouple probe in melting ice



thermocouple probe in steam



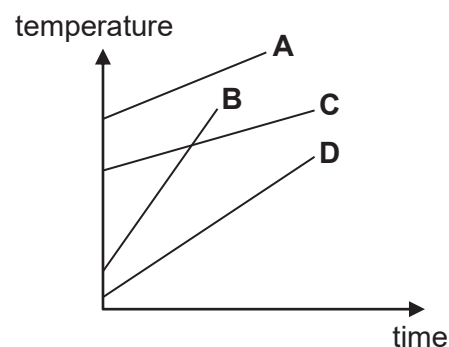
thermocouple probe in liquid

What is the temperature of the liquid?

- A** 75 °C
B 100 °C
C 120 °C
D 125 °C
- 22 When Satish mixed 30 g of liquids Q and 50 g of liquid R together, he obtained a final temperature of 45 °C.

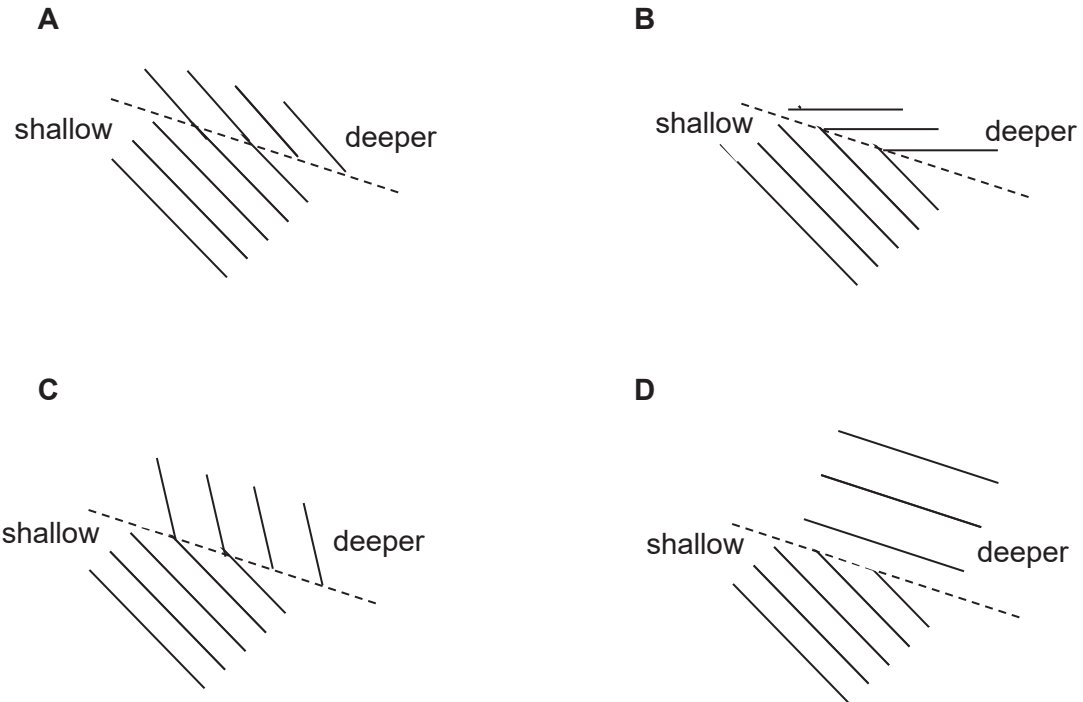
What is the ratio of heat capacity of liquid Q to heat capacity of liquid R if the initial temperature of liquid Q and R are 20 °C and 90 °C respectively?

- A** 9/5
B 5/9
C 1/3
D 3/1
- 23 Four different materials of equal mass were heated by the same heater. The temperature-time graph of the four different materials were shown below.

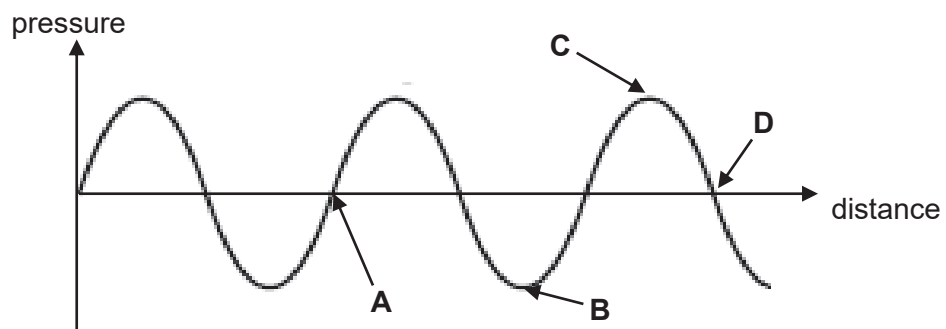


Which material has the lowest specific heat capacity?

24 Which of the following shows correctly the wavefront as it enters into a deeper region?

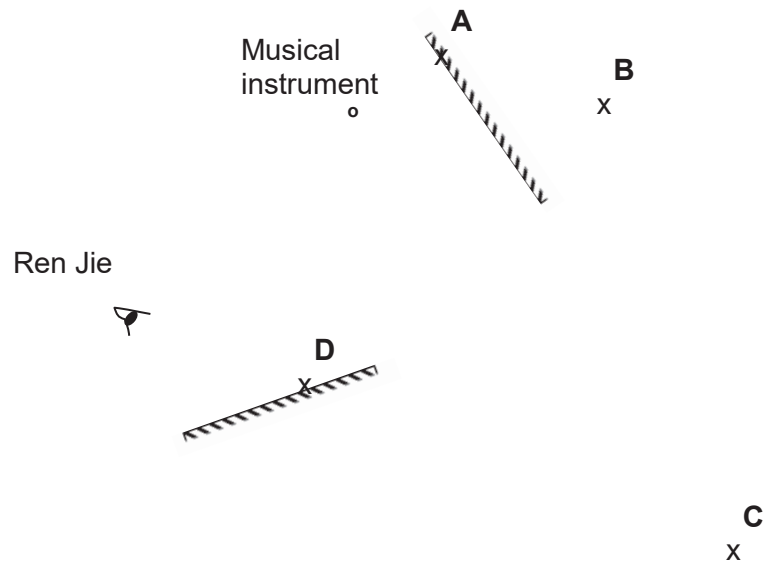


25 The diagram below shows a pressure-distance graph of a longitudinal wave.



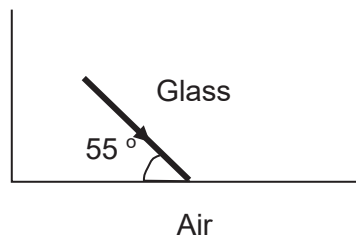
Which point indicates that it is the centre of rarefaction?

- 26 Ren Jie was looking through the mirror at his musical instrument.



Where is the position of the image of musical instrument?

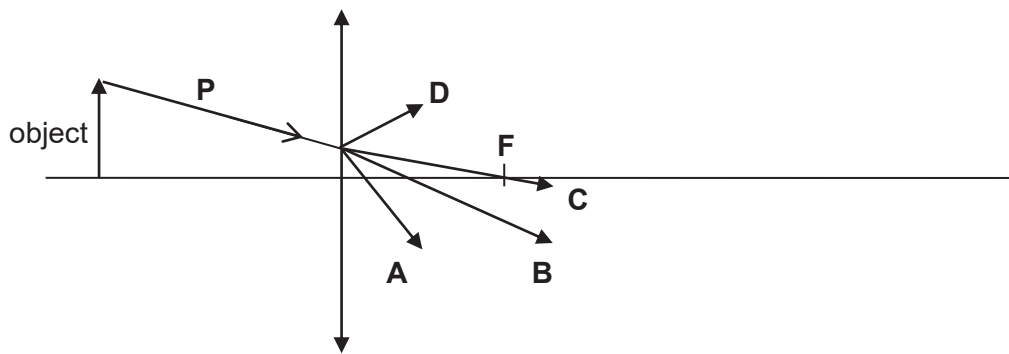
- 27 A beam of light shone at an angle of 55° in the glass is shown below.



What is the change in the direction of the light path if the refractive index of glass is 1.45?

- | | | | |
|----------|--------------|----------|--------------|
| A | 56.3° | B | 31.7° |
| C | 23.3° | D | 21.3° |

- 28 An object is placed in front of a thin converging lens as shown below.



Which direction shows correctly the path ray P will take after it passes through the lens?

- 29 Which list shows electromagnetic waves in order of increasing frequency?

- A visible light, X-rays, Gamma rays
- B visible light, Gamma rays, X-rays
- C X-rays, Gamma rays, visible light
- D Gamma rays, X-rays, visible light

- 30 What is the wavelength of an electromagnetic wave that has a frequency of 6.0×10^5 GHz?

- | | | | |
|---|-------------------------|---|-------------------------|
| A | 5.0×10^{-13} m | B | 5.0×10^{-10} m |
| C | 5.0×10^{-7} m | D | 5.0×10^{-4} m |

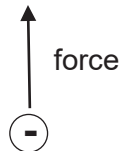
- 31 How will the amplitude and wavelength change as sound increases in loudness and pitch?

- | | Amplitude | Wavelength |
|---|-----------|------------|
| A | increase | increase |
| B | increase | decrease |
| C | decrease | increase |
| D | decrease | decrease |

32 Which object will not attract tiny pieces of paper?

- A a metal knife sharpened with a knife sharpener
- B a ceramic spoon wiped with a kitchen cloth
- C a plastic comb combed through dry hair
- D a wooden pencil rubbed with an eraser

33 A stationary negative charge in an electric field experiences an electric force in the direction shown.



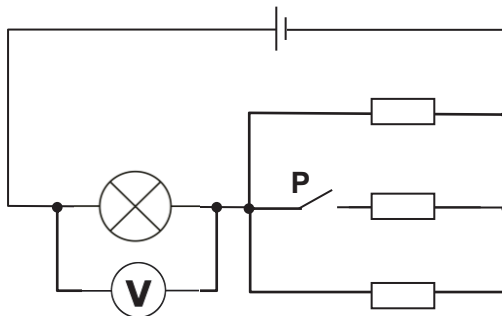
What is the direction of the electric field?

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

34 An electron carries $1.6 \times 10^{-19} \text{ C}$. What is the potential difference across a 5Ω resistor if there are 1×10^{10} electrons flowing through it in $4 \mu\text{s}$?

- | | | | |
|---|---------------------------------|---|----------------------------------|
| A | 0.002 V | B | 2.00 V |
| C | $3.2 \times 10^{-14} \text{ V}$ | D | $1.28 \times 10^{-15} \text{ V}$ |

35 A circuit was set up with a lamp connected as shown below.



What happens to the voltmeter reading as switch **P** is closed?

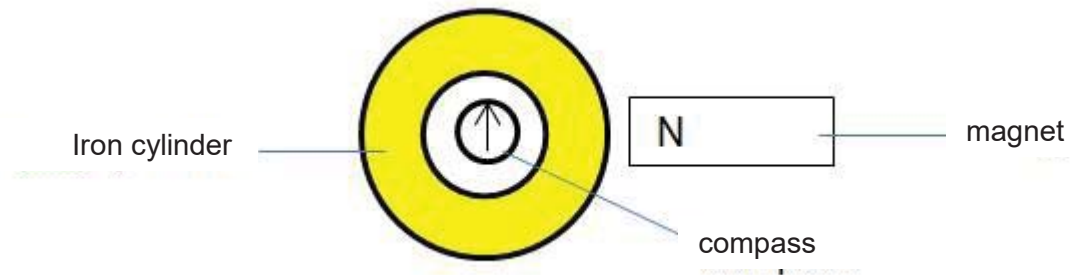
- A The voltmeter reading remains unchanged.
- B The voltmeter reading decreases.
- C The voltmeter reading increases.
- D The voltmeter reading shows zero reading.

- 36 Yida was spending 6 hours each night revising for his upcoming Physics examination. He had two 100 W light bulbs in his room. The weekly bill for his room was \$3.00

How much saving would he have in a week if a unit of electricity cost 24 cents?

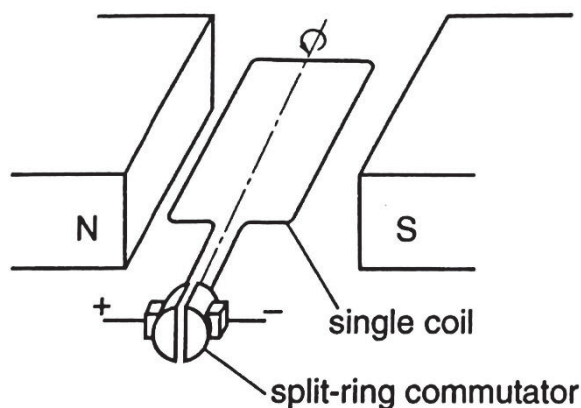
- | | | | |
|----------|-----------|----------|-----------|
| A | 270 cents | B | 201 cents |
| C | 199 cents | D | 98 cents |

- 37 A compass is placed inside a closed iron cylinder on the table. The north pole of a permanent magnet is brought near the cylinder as shown in diagram.



In which direction does the needle of the compass point?

- | | |
|----------|--------------------------------|
| A | away from the permanent magnet |
| B | opposite direction |
| C | original direction |
| D | towards the permanent magnet |
- 38 The diagram shows a two-pole single-coil electric motor.

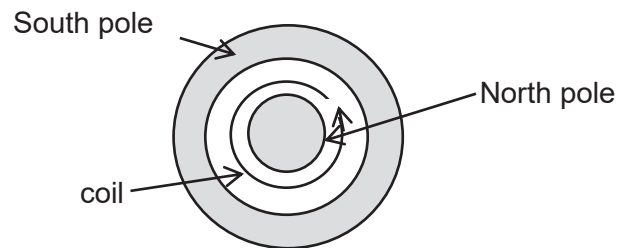


The split-ring commutator reverses the current in the coil as it rotates.

How many times did the current reversed as the coil completes one full revolution?

- | | | | |
|----------|---|----------|---|
| A | 1 | B | 2 |
| C | 3 | D | 4 |

- 39** The diagram shows the front view of a loudspeaker, which consists of magnets and a coil amongst other items.



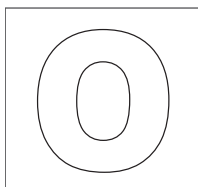
If the current is flowing in the speaker's coil in an anticlockwise direction as shown, what is the direction the coil that it will move?

- | | | | |
|----------|---------------|----------|------------------|
| A | To the right. | B | Out of the page. |
| C | To the left. | D | Into the page. |
- 40** Two long, parallel conductors carrying current lie in a horizontal plane. The two conductors attract one another.

Which statement is true?

- A** The two currents are in the same direction.
- B** The two currents are in opposite direction.
- C** The two currents are parallel to the Earth's magnetic field.
- D** The two currents are at 90° to the Earth's magnetic field.

END OF PAPER



GAN ENG SENG SCHOOL
Preliminary Examination 2020



**CANDIDATE
NAME**

CLASS

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**INDEX
NUMBER**

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PHYSICS

Paper 2

6091/02

01 September 2020
1 hour 45 minutes

Sec 4 Express

Candidates answer on the Question Paper.

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.

Write in dark blue or black pen on both sides of the paper.

You may use a soft pencil for any diagrams or graphs.

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

Section A

Answer **all** questions.

Section B

Answer **all** questions. **Question 11** has a choice of parts to answer.

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

At the end of the examination, fasten all your work securely.

The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use	
Section A	50
Section B	30
Total	80

Section A [50 marks]For
Examiner's
UseAnswer **all** the questions in this section.

- 1 (a)** The size of a virus is approximately the size of ultraviolet wavelength.

State the wavelength of the ultraviolet in metres.

.....[1]

- (b) (i)** Given that the thickness of a hair is about 10^3 times more than size of a virus, state a suitable apparatus to measure the thickness of hair.

.....[1]

- (ii)** State two necessary steps needed to ensure that accurate readings are obtained when reading the thickness of hair.

.....

.....[2]

- 2** Alex was running for the inter-school 5 km cross country competition. He ran a total displacement of 5 km round a reservoir. He completed the whole competition with a time of 20 minutes. Alex's friend, Clement shared that his velocity is 15 km/h.

- (a)** State what is meant by displacement of 5 km.

.....
[1]

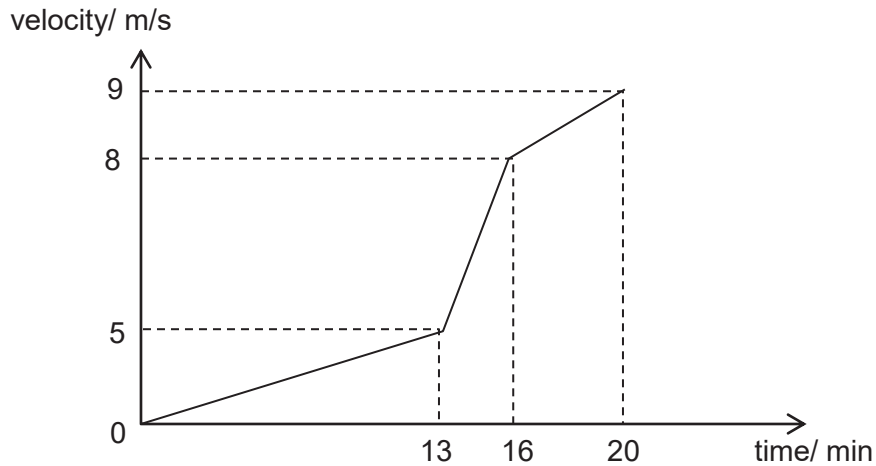
- (b)** In the paragraph above, state and explain the two errors found.

.....

[2]

2 (c) The velocity time graph of Alex during the run was shown below.

For
Examiner's
Use



- (i) State and explain the period at which Alex was running with the greatest acceleration.

.....

[2]

- (ii) Calculate the greatest resultant force that Alex is experiencing. Take Alex's mass as 50 kg.

Greatest resultant force =[2]

- 3 An object of mass 0.80 kg is suspended and equally supported by two identical strings as shown in Fig. 3. (not drawn to scale).

For
Examiner's
Use

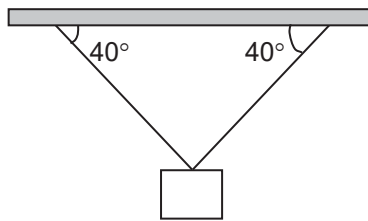


Fig. 3

- (a) State two differences between mass and weight.

.....

.....

.....

.....[2]

- (b) Calculate the weight of the object. (Gravitational field strength = 10 N/kg)

weight = [2]

- (c) By drawing a scale diagram, determine the magnitude of the tension in one string.

Tension = [4]

- 4 Andres was trying to open a door at the AVA room as shown in Fig. 4.

For
Examiner's
Use

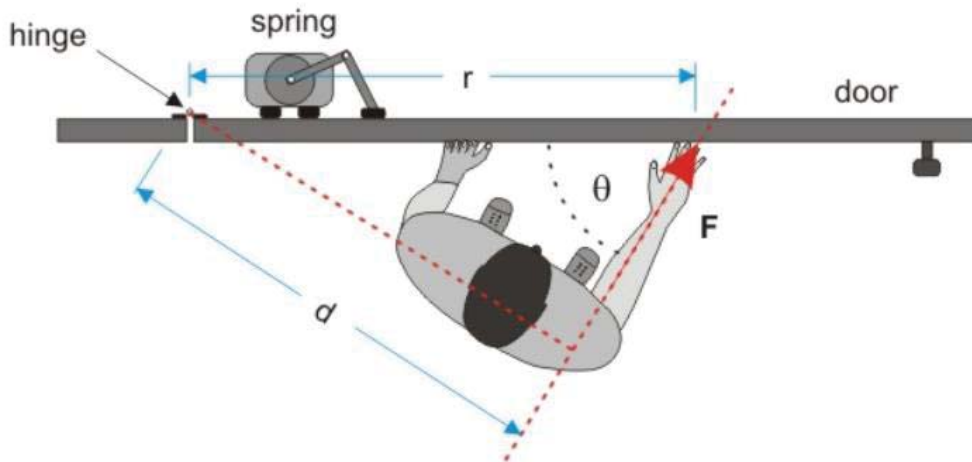


Fig. 4

- (a) State and explain two ways how Andres could open the door more efficiently.

.....

.....

.....

.....

.....[2]

- (b) State what is moment and its formula.

.....

.....

.....

.....[2]

- (c) State two reasons why moment is not measured in Joule.

.....

.....

.....

.....

.....[2]

- 5 A manometer was used to measure the pressure difference between the atmospheric pressure and the gas pressure in a chamber as shown in Fig. 5.1. The atmospheric pressure is 76 cm Hg and the density of mercury is $13\,600\text{ kg/m}^3$.

For
Examiner's
Use

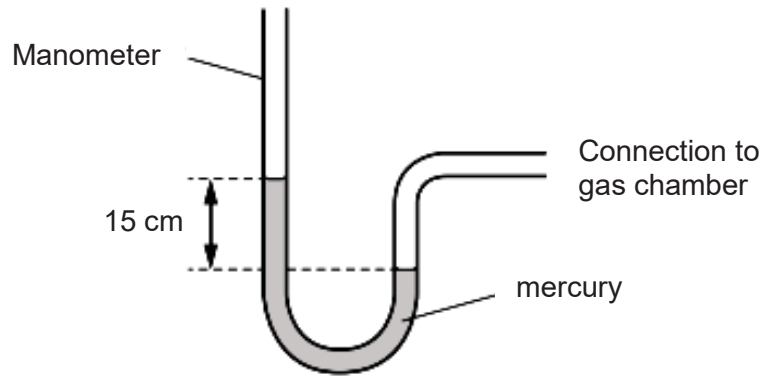


Fig. 5.1

- (a) State the pressure found in the gas chamber in Pa.

pressure = [2]

- (b) The liquid used in the manometer is now changed to liquid X. Liquid X has a density of $6\,800\text{ kg/m}^3$ and the manometer increases in its diameter. State the new height difference found in the manometer. Support your explanation with numerical calculation.

height difference = [2]

- For
Examiner's
Use



[4]

- 6 A simple pendulum of length 1.00 m has a bob of mass 0.20 kg. The bob is pulled aside by a horizontal distance of 0.3 m and is then released as shown in Fig. 6.

For
Examiner's
Use

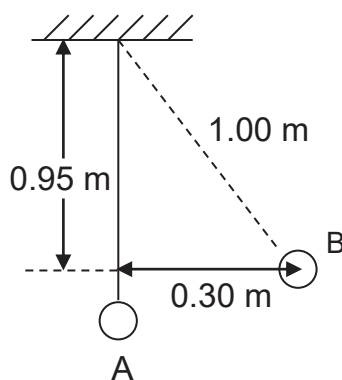


Fig. 6

- (a) Calculate the gravitational potential energy at position B.

gravitational potential energy = [2]

- (b) Calculate the velocity at which the bob will pass through A.

velocity at A = [2]

- (c) State the assumption made in (b).

.....
[1]

- 7 A light uncharged metal ball, X, is freely suspended and is in contact with an uncharged metal sphere, Y, as shown in Fig 7.1. A positive charged metal rod, Z, is moved towards Y as shown in Fig. 7.2

For
Examiner's
Use

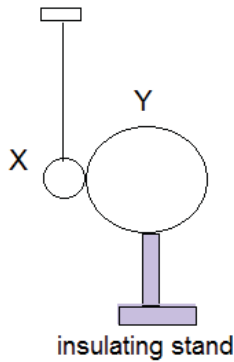


Fig. 7.1

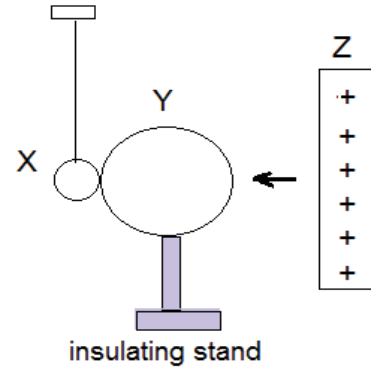
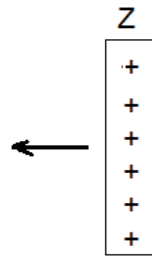


Fig. 7.2

- (a) Explain what is meant by *electric field*.

..... [1]

- (b) State the charges induced on spheres X and Y in Fig. 7.2

X : Y : [1]

- (c) Sketch in Fig 7.1 the electric field pattern between Y and Z. [1]

- (d) When Z is brought to touch Y and then removed, suggest what will happen.

..... [3]

- 8 In the circuit shown in Fig. 8.1, E is a battery of e.m.f. 20.0 V and negligible internal resistance. R_1 is a variable resistor of maximum resistance $400\ \Omega$, R_2 is a fixed resistor of resistance $200\ \Omega$, V_1 is a voltmeter and A is an ammeter.

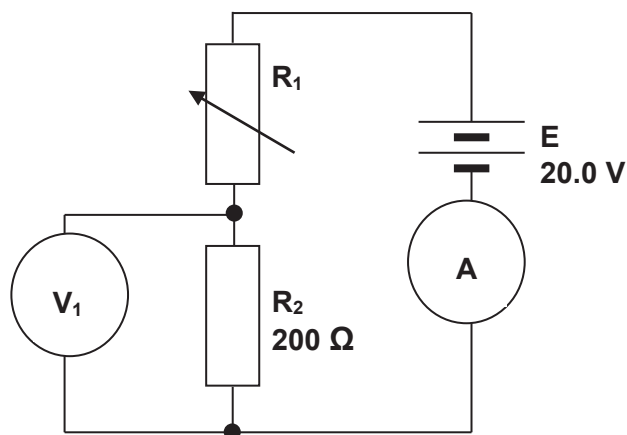


Fig. 8.1

- (a) Determine the maximum and minimum readings of V_1 .

maximum reading =[1]

minimum reading =[1]

- (b) Calculate the current through the ammeter when R_1 is set at $250\ \Omega$.

current =[2]

- 8 (c) A thermistor connected in series with a $1\,200\,\Omega$ resistor is added to the circuit as shown in Fig. 8.2. V_2 is the second voltmeter. When temperature is at $0\,^\circ\text{C}$, the resistance of the thermistor is $3\,600\,\Omega$. When the temperature is at $100\,^\circ\text{C}$, its resistance is $400\,\Omega$.

For
Examiner's
Use

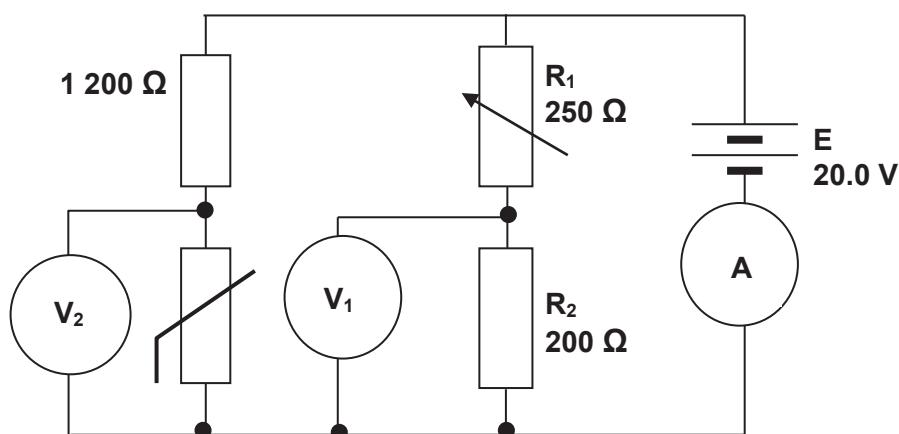


Fig. 8.2

Calculate the readings of the ammeter A and voltmeter V_2 when R_1 is set to $250\,\Omega$ and the thermistor is placed in steam from pure water boiling at standard atmospheric pressure.

ammeter reading =[1]

voltmeter reading =[1]

-
- The diagram illustrates a room heater system. It features a 230 V mains supply connected to a main switch. The circuit is divided into two parallel branches. The left branch contains a heating element. The right branch contains a resistor R in series with a switch S and a motor M. The switch S is controlled by a separate switch J. The diagram also shows air flow from cool air on the right to warm air on the left.

.....[3]

- 9 (b) During quality control tests of the hairdryer in the factory, switch S is first connected to contact J. Some measurements are made to obtain the data shown in Fig. 9.2.

For
Examiner's
Use

resistance of the heating element	25 Ω
resistance of resistor R	40 Ω
temperature of air entering the hairdryer	28 $^{\circ}\text{C}$
temperature of air flowing out of the hairdryer	33 $^{\circ}\text{C}$
rate of air flow through the hairdryer	46 g/s

Fig. 9.2

Calculate the specific heat capacity of air.

Specific heat capacity of air =[2]

- (c) Switch S is then connected to contact K. State and explain the change in the rate of air flowing through the hairdryer and the temperature of the air flowing out of the hairdryer, as compared to when switch S is connected to contact J.

.....

.....

.....

.....

.....

.....

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.....

.....[3]

- 9 (d) The cost of using the hair dryer for 25 minutes when the hair dryer is set to the higher air flow rate is 28 cents. Calculate the unit cost of the electricity used.

For
Examiner's
Use

Unit cost = [2]

- 10 (a) Fig. 10.1 shows an object, O placed at 10 cm away from the lens.

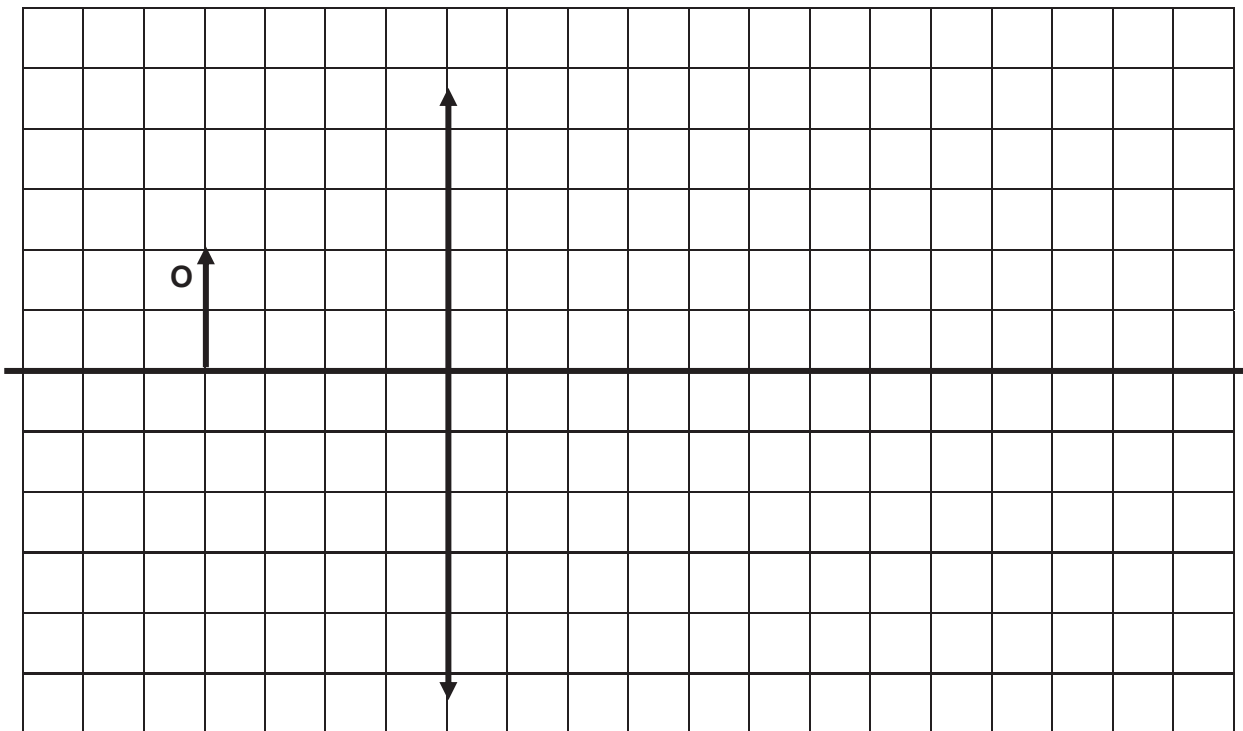


Fig. 10.1

- (i) A virtual image of 1.5 times the size of object is formed. Draw 2 rays in Fig. 10.1 to locate the position of the image and label it as I. [3]
- (ii) State the distance of the image from the lens.

distance of image from lens = [1]

- 10 (b) Fig. 10.2a represent the positions of equally spaced 'dots' of air molecule before a sound wave passes through air. The dots in Fig. 10.2b represents the positions of the same 'rows' at one particular instant as the sound wave passes.

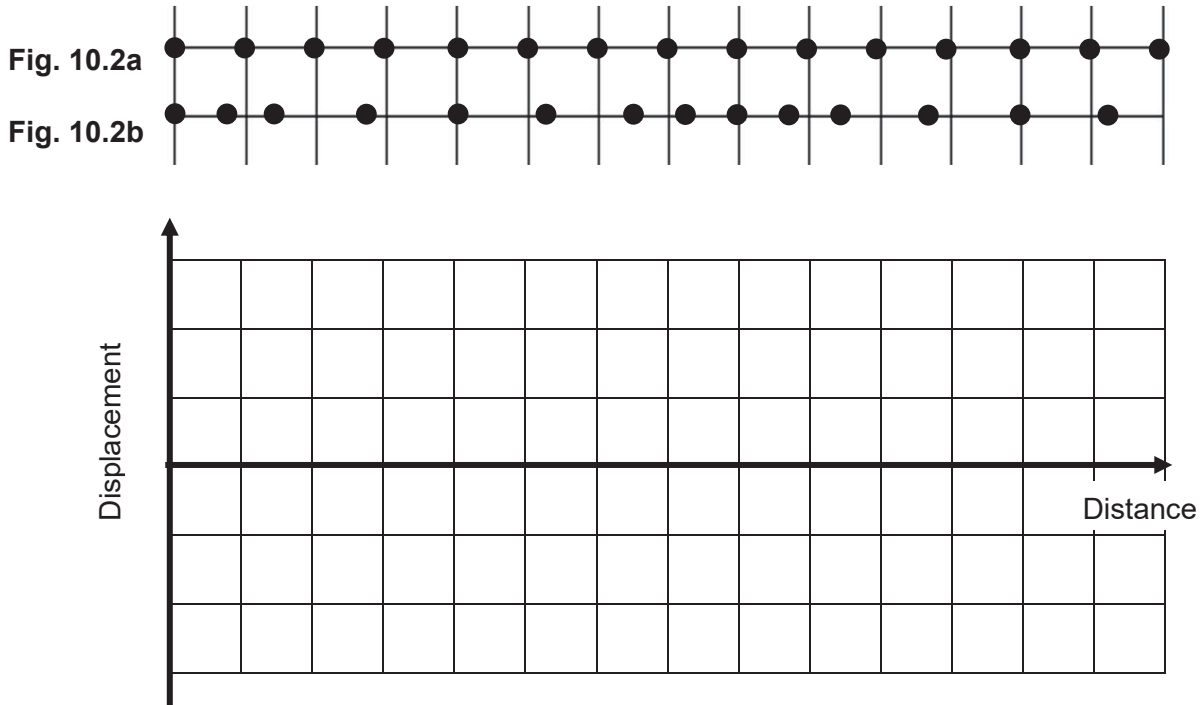


Fig. 10.3

- (i) In Fig. 10.2b, mark out accurately the amplitude and the wavelength of the sound wave and labelled it as a and λ respectively. [2]
- (ii) In Fig. 10.3, sketch accurately the displacement distance graph of the sound wave. Positive displacement is to the right. [2]
- (iii) State how will the displacement distance graph in Fig. 10.3 change when the sound created is now louder and of a higher pitch.
-
-
-[2]

11 EITHER

- (a) Fig. 11.1 shows a drop tower found in an amusement park. A 5 kW motor was used to lift up a gondola carrying riders to the top of the vertical structure. It then released to free fall down the tower. Magnetic brakes were activated to slow down the gondola as it approached the bottom of the ride. Take acceleration due to free fall as 10 m/s^2 .



Fig. 11.1

- (i) Calculate the height of the tower in Fig. 11.1 if the gondola has a mass of 200 kg and it takes 30 s to reach to the top of the tower.

height of tower = [2]

- (ii) Calculate the time taken for the gondola to reach the bottom of the tower when released.

time taken = [2]

- 11 (b) Daryl did a mockup of the drop tower using two electromagnets, A and B as shown in Fig. 11.2. The electromagnet A is used to hold the mass, a magnetic material, in place while the electromagnet B is used to create a braking force.

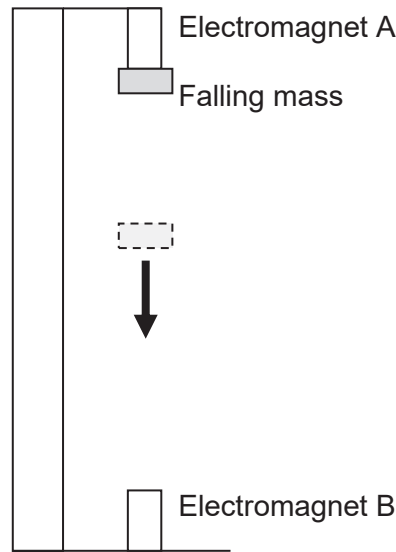


Fig. 11.2

- (i) If the falling mass has a mass of 20 g, suggest with reason the magnetic force that the electromagnet B has in order to allow the falling mass to come to rest instantly.

.....

[2]

- (ii) Suggest two ways the electromagnet can increase its strength if a larger falling mass is used.

.....

[2]

- (iii) Daryl intended to increase the height of the fall of the falling mass. State, with reason, if the strength of electromagnet B need to change to break the fall.

.....

[2]

OR

- 11 (a) Fig. 11.3 shows a type of motor. PQ and RS are solenoids. The solenoids and the coil ABCD are connected in parallel to a battery.

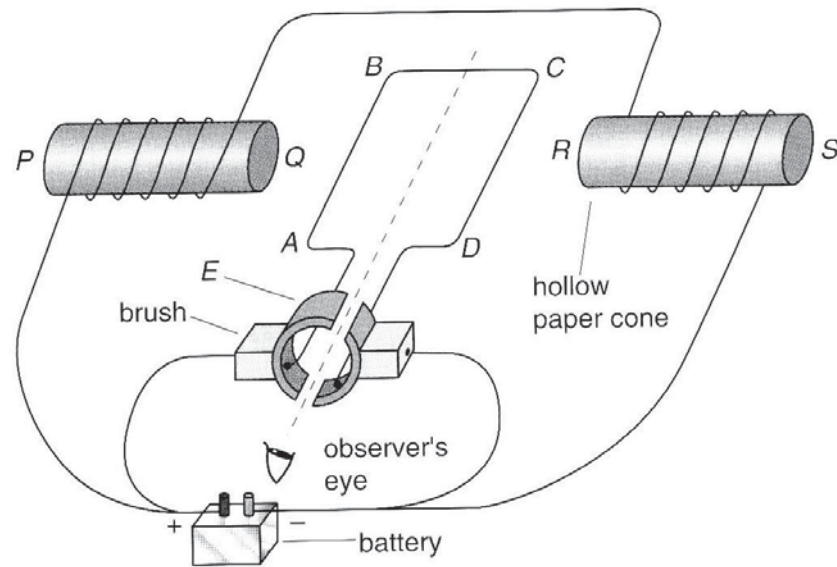


Fig. 11.3

- (i) State the polarity at end Q.
.....[1]
- (ii) State the direction of rotation of the coil as seen by the observer.
.....[1]
- (iii) Explain why the coil will rotate continuously.
.....
.....
.....
.....
.....
.....
.....
.....[2]

- 11 (b) Fig 11.4 shows how the current varies with the potential difference for light bulbs J and K.

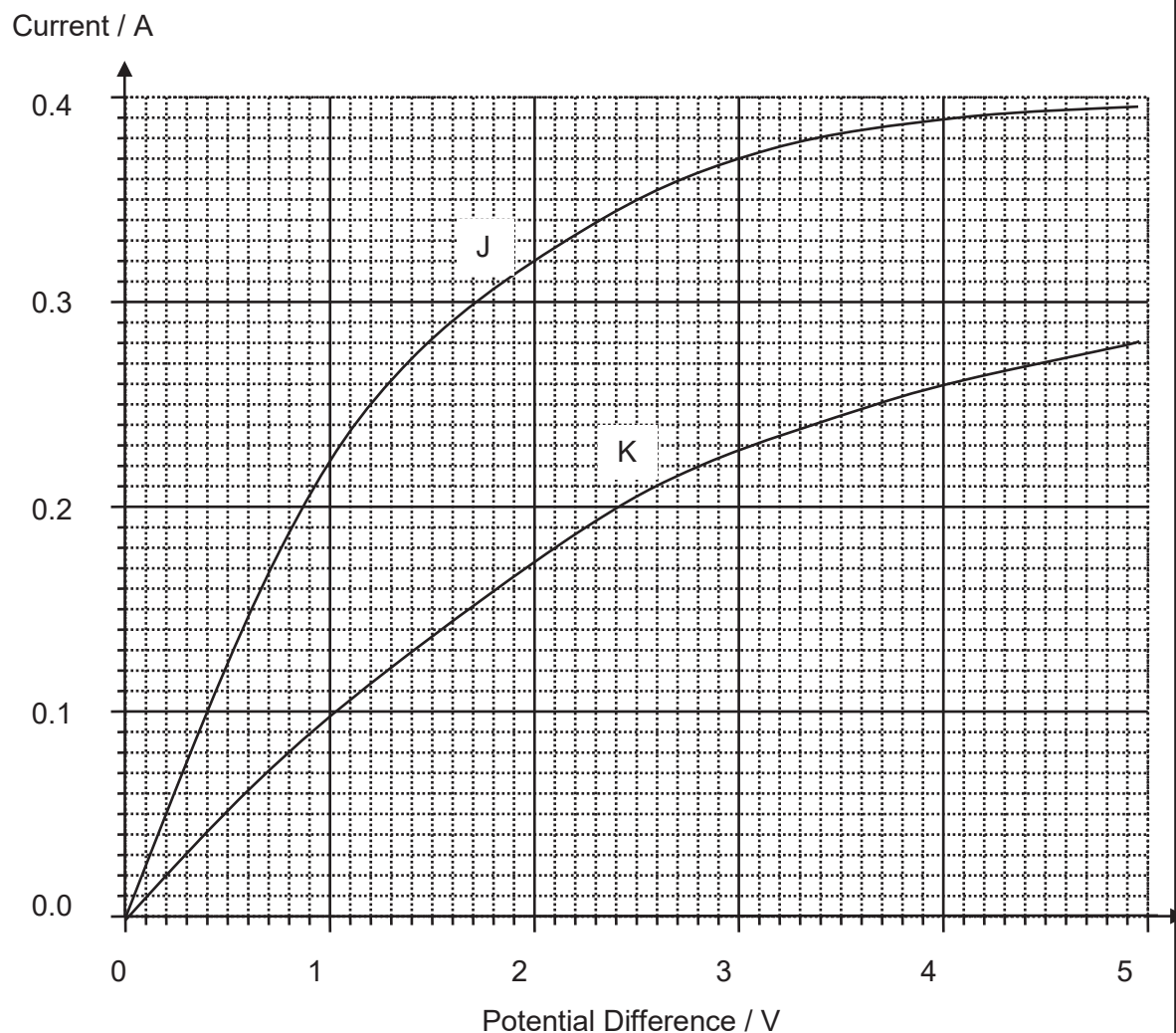


Fig 11.4

- (i) State, with reason, if the filament of light bulb J and K are ohmic conductors.

.....
[2]

- 11 (b) (ii) Estimate the resistance of bulb J and the resistance of bulb K when they are operating at $V = 0.20 \text{ V}$.

resistance of bulb J =

resistance of bulb K = [2]

- (iii) The filaments of both bulbs are coiled tungsten wire. Describe two differences between the filaments of the bulbs that would cause their difference in resistance.

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.....
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.....
.....
.....[2]

END OF PAPER

