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Candidate Name:



Secondary Four Express/Five Normal Academic

Preliminary Examinations 2020

Index No.

4E/5N

[illegible]

5076/01

Paper 1

28 August 2020

0800 – 0900

1 hour

Additional Material: Optical Mark Recognition (OMR)

Write in soft pencil.

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

Write your name, class, index number on the OMR and this question booklet.

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 OMR.

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

Any rough working should be done on this paper.

A copy of the Periodic Table is printed on page ??.

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

PARENT'S SIGNATURE

FOR EXAMINER'S USE

40

Setter: Mr Poh Soon Ming

Vetter: Mr Muhammad Khairi
Bin Ruslihan

This question paper consists of ?? printed pages including this page.

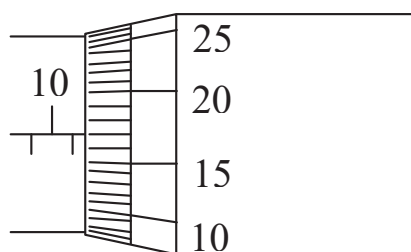
Multiple Choice Questions [40 marks]

Answer **all** questions and shade your answers on the OMR sheet provided.

- 1 Which row shows the correct SI unit of each property?

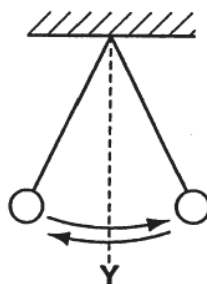
	length	mass	time	temperature
A	metre	gram	second	Celsius
B	centimetre	kilogram	hour	Kelvin
C	centimetre	gram	hour	Celsius
D	metre	kilogram	second	Kelvin

- 2 The diagram below shows a micrometer scale.



Given that the micrometer has no zero error, what is the reading shown?

- A** 10.15 mm **B** 10.67 mm **C** 11.15 mm **D** 11.17 mm
- 3 A pendulum swings backwards and forwards passing through Y as shown.

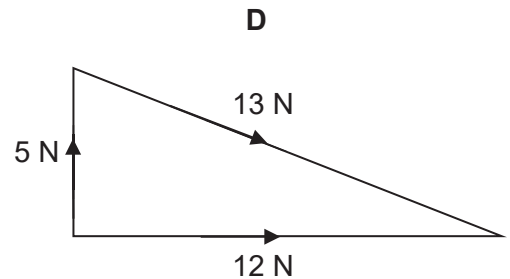
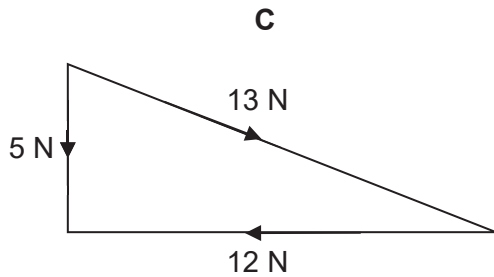
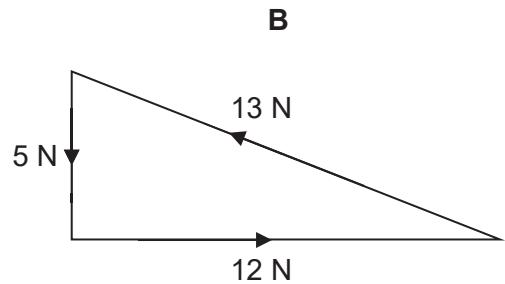
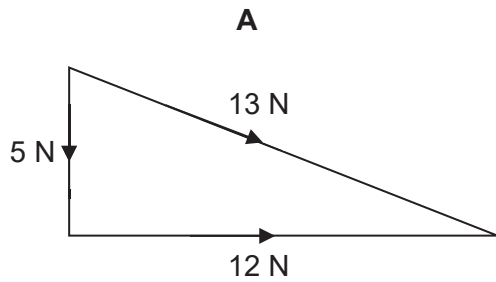


The first time the pendulum passes through Y, a stopwatch is started. When the pendulum passes through Y the thirteenth time, the stopwatch is stopped. The reading on the stopwatch is 25 s.

What is the period of the pendulum?

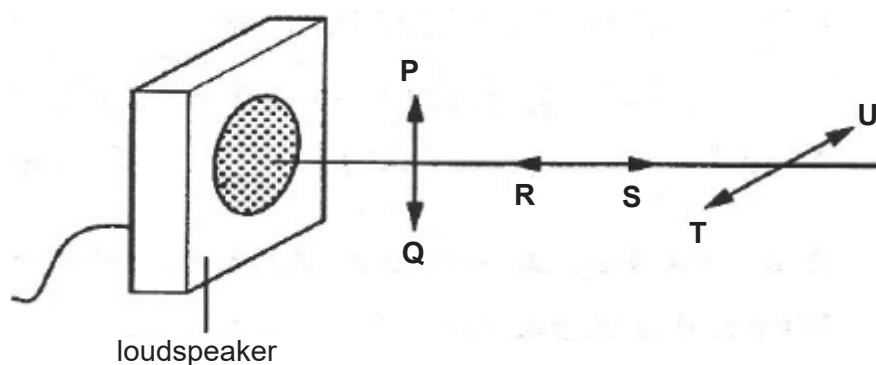
- A** 1.92 s **B** 2.08 s **C** 3.85 s **D** 4.17 s

- 4 Which diagram (not drawn to scale) correctly shows the addition of a 5 N and a 12 N force?



- 5 Which of the following is a property of inertia?
- A** mass of the body
 - B** size of the body
 - C** speed of the body
 - D** weight of the body
- 6 What is the volume of an object if its weight and density are 60 N and 1.5 g/cm³ respectively, in a gravitational field strength of 8.6 N/kg?
- A** 4.65 m³
 - B** 46.5 cm³
 - C** 465 m³
 - D** 4650 cm³
- 7 A man weighing 700 N runs up a flight of stairs of height 70 m in 1 minute. What is the power output of the man?
- A** 0.17 W
 - B** 600 W
 - C** 820 W
 - D** 49 000 W
- 8 A block of metal of mass 500 g is 3.0 m high and has a square base of side 0.50 m. What is the maximum pressure the block can exert on the ground? Take acceleration of free fall to be 10 m/s².
- A** 3.0 Pa
 - B** 8.0 Pa
 - C** 15 Pa
 - D** 20 Pa
- 9 A child goes for a hearing test. What is the range of frequencies of sound that the child is able to hear?
- A** 2 Hz to 20 Hz
 - B** 2 Hz to 2 kHz
 - C** 20 Hz to 2 kHz
 - D** 20 Hz to 20 kHz

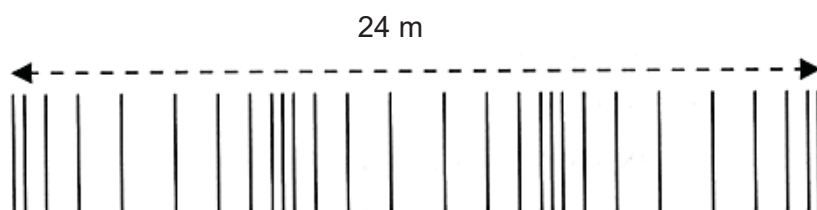
- 10 A loudspeaker emits sound waves. In which direction(s) do the air particles vibrate?



- A PQ only B RS and UT C RS only D PQ and UT
- 11 Which of the following correctly states the changes to the speed and frequency of a sound wave when it passes from air into water?

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

- 12 A series of compressions and rarefactions of a sound wave is shown below.

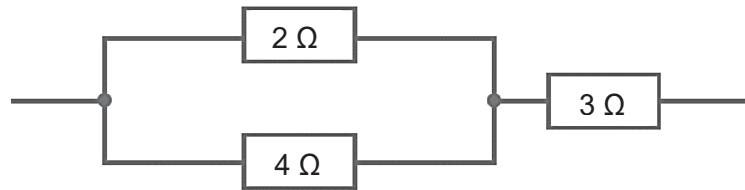


What is the wavelength of the sound?

- A 8.0 m B 12.0 m C 16.0 m D 24.0 m
- 13 Which of the following is **not** a difference between boiling and evaporation?
- A Evaporation is a slow process but boiling is fast process.
 B Evaporation takes place only at the surface of the liquid but boiling takes place throughout the liquid.
 C Evaporation takes place at any temperature but boiling takes place only at 100 °C.
 D During boiling, bubbles are formed but not during evaporation.
- 14 The e.m.f. of a dry cell is 3.0 V. What is the amount of non-electrical energy converted by the cell to electrical energy to drive 4.0 C of charge around a circuit?

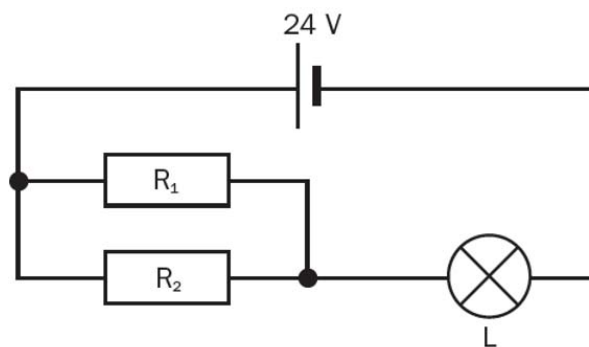
- A 0.75 J B 1.3 J C 3.0 J D 12 J

- 15 The figure below shows part of a circuit.



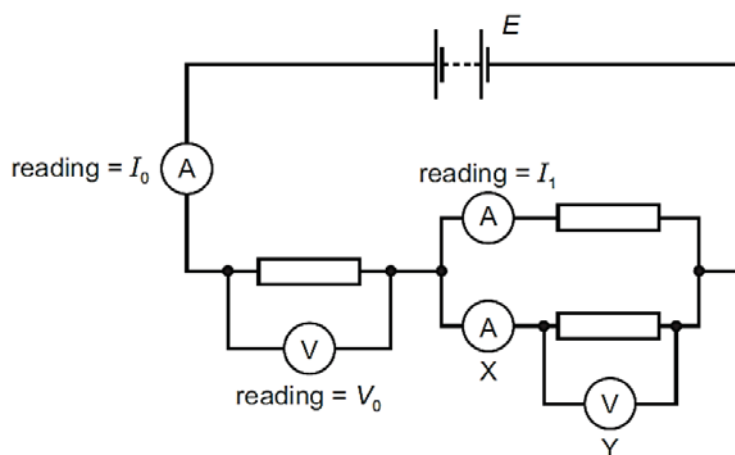
What is its effective resistance?

- A** $3.6\ \Omega$ **B** $4.0\ \Omega$ **C** $4.3\ \Omega$ **D** $9.0\ \Omega$
- 16 A $2.0\ \text{m}$ long wire with a radius of $1.0\ \text{mm}$ has a resistance of $16\ \Omega$. What is the resistance of the same type of wire which is $4\ \text{m}$ long and has a radius of $2.0\ \text{mm}$?
- A** $4.0\ \Omega$ **B** $8.0\ \Omega$ **C** $16\ \Omega$ **D** $32\ \Omega$
- 17 The circuit below shows resistors R_1 , R_2 and a lamp L connected to a $24\ \text{V}$ supply. The lamp L has a resistance of $2.0\ \Omega$. The current flowing through R_2 is $2.0\ \text{A}$. The current flowing through L is $6.0\ \text{A}$. What is the resistance of R_1 ?



- A** $2.0\ \Omega$ **B** $3.0\ \Omega$ **C** $6.0\ \Omega$ **D** $12.0\ \Omega$
- 18 An air conditioner draw $5\ \text{A}$ from a $250\ \text{V}$ supply when operating normally. What is the time taken for the air conditioner to convert $500\ \text{kJ}$ of electrical energy?
- A** $0.33\ \text{s}$ **B** $10\ \text{s}$ **C** $400\ \text{s}$ **D** $12\ 000\ \text{s}$

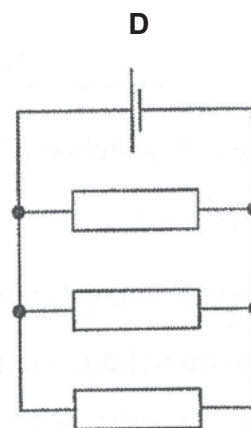
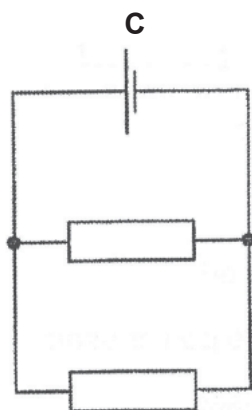
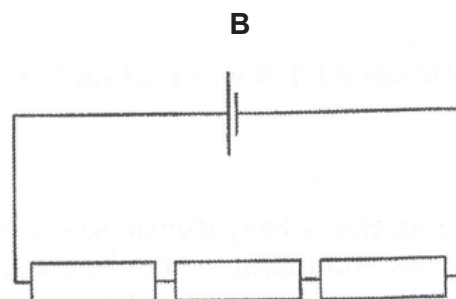
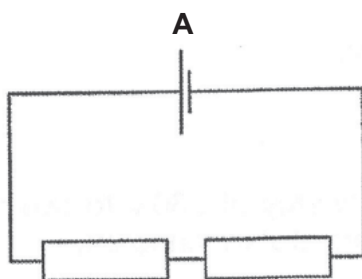
- 19 A student sets up the circuit shown.



What are the readings of ammeter X and voltmeter Y?

	ammeter X	voltmeter Y
A	$I_0 - I_1$	$E - V_0$
B	$I_0 - I_1$	$E + V_0$
C	$I_0 + I_1$	$E + V_0$
D	$I_0 + I_1$	$E - V_0$

- 20 A cell is connected to identical resistors in different combinations. In which circuit is electrical energy transformed at the greatest rate?



END OF PAPER

1	2	3	4	5	6	7	8	9	10
D	B	D	A	A	D	C	D	D	C
11	12	13	14	15	16	17	18	19	20
B	A	C	D	C	B	B	C	A	D

Class	Index No.



Secondary Four Express/Five Normal Academic

Preliminary Examinations 2020

4E/5N

[illegible]

5076/02

27 August 2020
0800 - 0915
1 hour 15 minutes

Write your name, class and index number on the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
Write your answers in the spaces provided.

Answer any **two** questions from this section and write your answers in the spaces provided.

The number of marks is given in brackets [] at the end of each question or part question. The use of an approved scientific calculator is expected, where appropriate.

PARENT'S SIGNATURE	FOR EXAMINER'S USE					
	Section A		Section B		Total	
		45		20		65

Vetter: Mr Muhammad Khairi Bin Ruslihan

Section A: Structured Questions [45 marks]

Answer **all** the questions in this section in the spaces provided.

- 1 Fig. 1.1 shows the forces acting on a car as it moves forward.

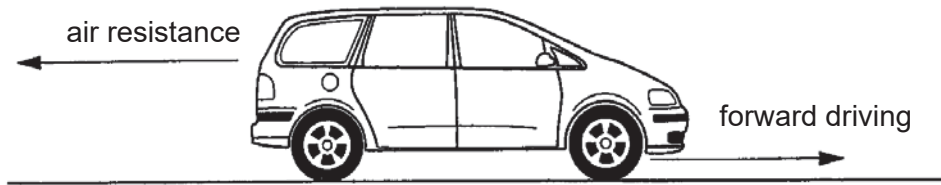


Fig. 1.1

Fig. 1.2 shows a graph of the velocity of the car against time.

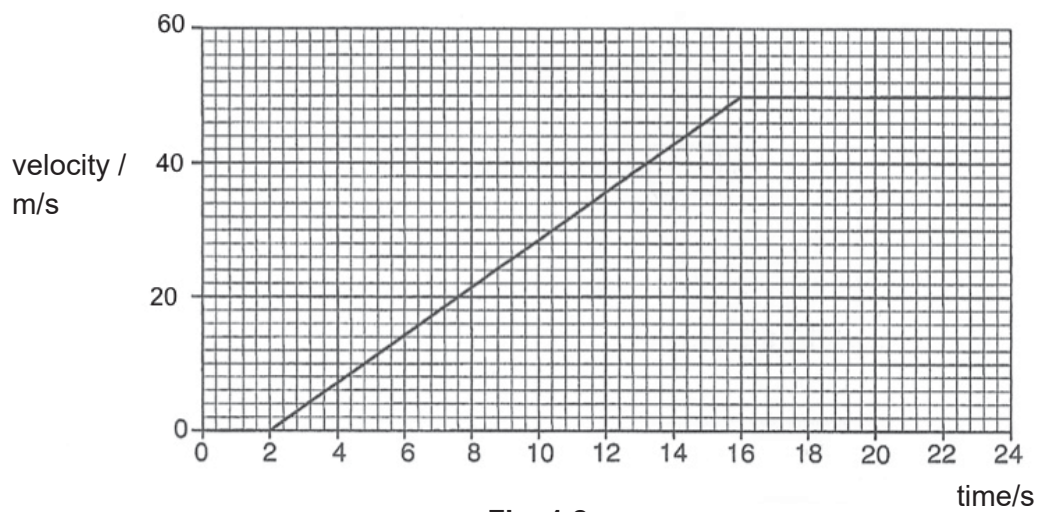


Fig. 1.2

- (a) Describe the motion of the car from $t = 0$ s to $t = 16$ s.

[2]

- (b) Calculate the distance travelled by the car from $t = 2$ s to $t = 24$ s.

distance = _____ m [2]

(c) The car has a mass of 1500 kg.

(i) State the resultant force on the car at $t = 20$ s.

resultant force = _____ N [1]

(ii) Calculate the resultant force on the car at $t = 10$ s.

resultant force = _____ N [3]

(d) Fig. 1.3 shows a tyre of the car.

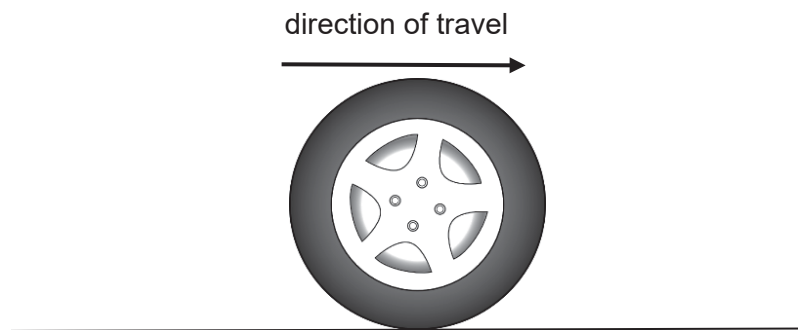


Fig. 1.3

On Fig. 1.3, draw an arrow to represent the frictional force acting on the tyre against the road. [1]

- 2 Fig. 2.1 shows a carpark gantry barrier. The weight of the pole is 600 N and the centre of gravity of the pole is 1.40 m away from the pivot. The centre of gravity of the movable counterweight is 0.50 m away from the pivot, causing the barrier to be in equilibrium.

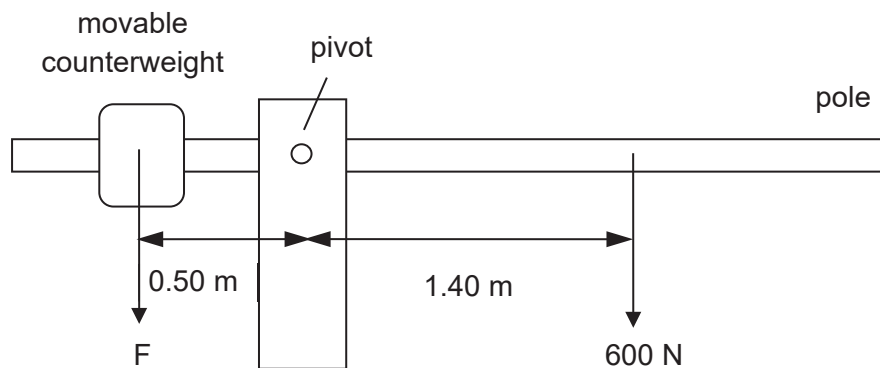


Fig. 2.1

- (a) State the principle of moments.

[1]

- (b) Calculate force F of the counterweight.

$$F = \underline{\hspace{2cm}} \text{ N} \quad [2]$$

- (c) Calculate the amount of force acting on the pivot.

$$\text{force} = \underline{\hspace{2cm}} \text{ N} \quad [1]$$

- (d) Explain how the barrier can be opened using the movable counterweight.

[2]

- 3** A toy airplane has a mass of 50 g. It is launched vertically upwards with a force of 4.5 N at $t = 0$ s. After 6.0 s, the toy airplane reached its maximum height and the speed of the toy airplane decreases to zero. It then begins to drop downwards. Assume that there is no air resistance and take the gravitational field strength as 10 N/kg.

(a) Calculate the weight of the toy airplane.

weight = _____ N [2]

(b) Draw a free-body diagram of the toy airplane at $t = 0$ s. Label all the forces acting on it clearly. [2]

(c) Calculate the acceleration of the toy airplane at 0 s.

acceleration = _____ m/s^2 [2]

(d) Calculate the maximum height attained by the toy airplane from the point of release if its initial speed is 60 m/s.

maximum height = _____ m [2]

(e) State the speed of the toy airplane just before it starts to drop downwards.

speed = _____ m/s [1]

(f) State the magnitude and direction of the acceleration of the toy airplane at $t = 6.0$ s.

acceleration = _____ m/s^2

direction = _____ [2]

- 4 Fig. 4.1 shows how the temperature of a pure liquid changes with time as it is heated at constant rate.

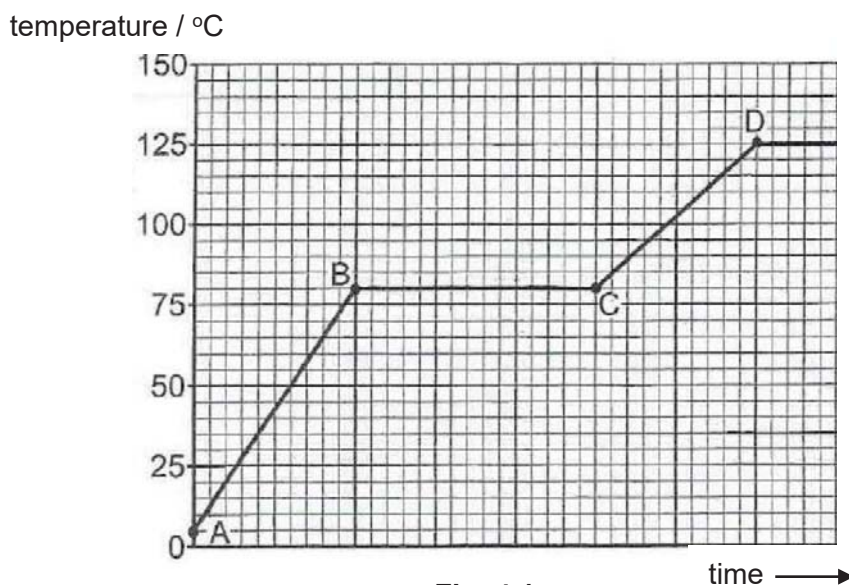


Fig. 4.1

- (a) State the process that is occurring between points B and C.
- _____ [1]
- (b) Explain why there is no change in temperature between points B and C even though heat is being supplied.
- _____
- _____
- _____ [2]
- (c) Describe the changes, if any, that occur to the movement and arrangement of the particles of the substance at 80 °C.
- _____
- _____
- _____ [2]

- 5 Fig. 5.1 shows the displacement–distance graph of a transverse wave at a particular instant. The speed of the wave is 310 m/s.

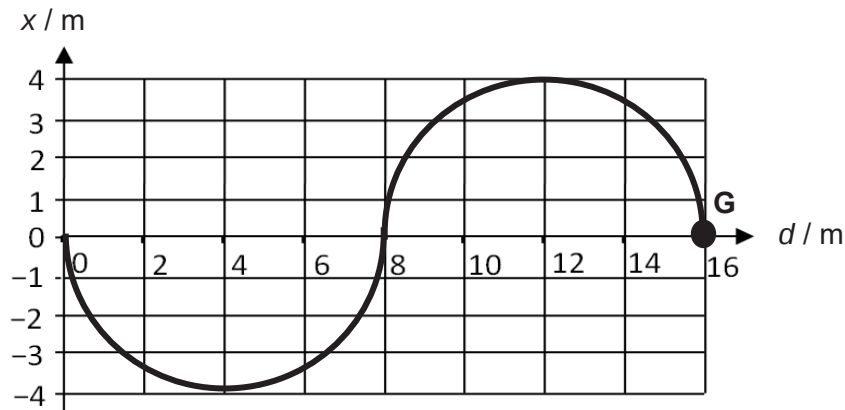


Fig. 5.1

- (a) What is meant by the term 50 Hz?

_____ [1]

- (b) State the wavelength of the wave.

wavelength = _____ m [1]

- (c) Calculate the period of the wave.

period = _____ s [2]

- (d) Mark a point 'X' clearly on the graph that is in phase with point G. [1]

- (e) On Fig. 5.1, sketch a second curve that has double the frequency and half the amplitude of the wave shown on Fig. 5.1. [2]

- (f) State two differences between ultrasound and radio waves.

 _____ [2]

- 6 (a) State what is meant by an *electric field*.

[1]

- (b) A thin strip of metal is fixed to an uncharged plastic rod. The metal strip is initially uncharged and hangs vertically downwards. When placed close to a negatively charged sphere, the strip bends, as shown in Fig. 6.1.

The metal strip contains negatively charged particles that are free to move within the strip.

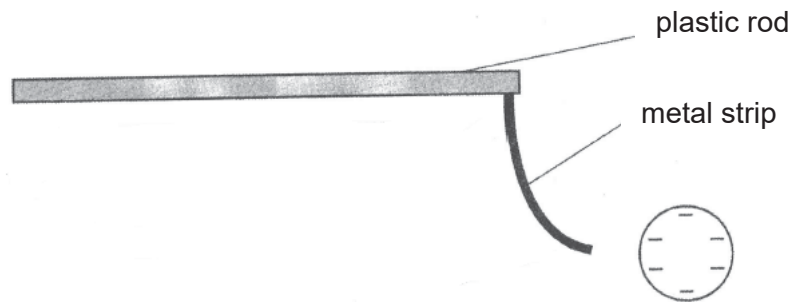


Fig. 6.1

Describe and explain what happens to the negatively charged particles in the metal strip when the negatively charged sphere is placed close to it.

[2]

- (c) On Fig. 6.2, draw the electric field of the two charges that are placed close to each other.

[2]



Fig. 6.2

Section B: Free Response Questions [20 marks]

Answer **any two** questions in this section in the space provided.

- 7 Fig. 7.1 shows a light ray travelling from air through a piece of glass and then into liquid L before emerging into air again. The refractive index of liquid L is 1.65.

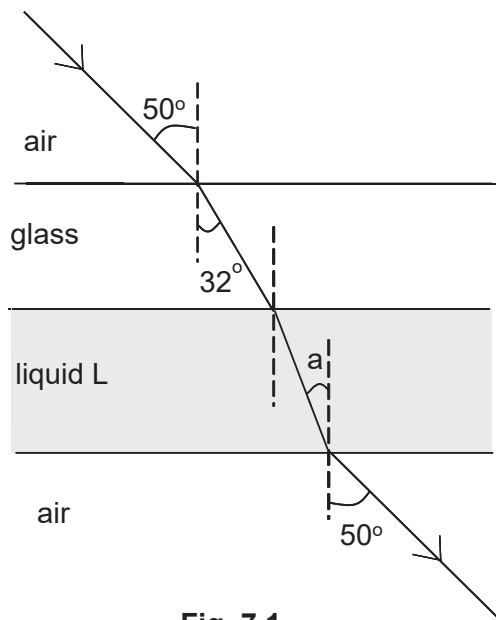


Fig. 7.1

- (a) Calculate the refractive index of the piece of glass.

refractive index = _____ [2]

- (b) Calculate angle a.

angle a = _____ [2]

- (c) Given that the speed of light in air is 3.0×10^8 m/s, calculate the speed of light in liquid L.

speed = _____ [2]

- (d) Fig. 7.2 shows an object **O** placed in front of a thin converging lens. The positions of the focal points are marked with the letter **F**.

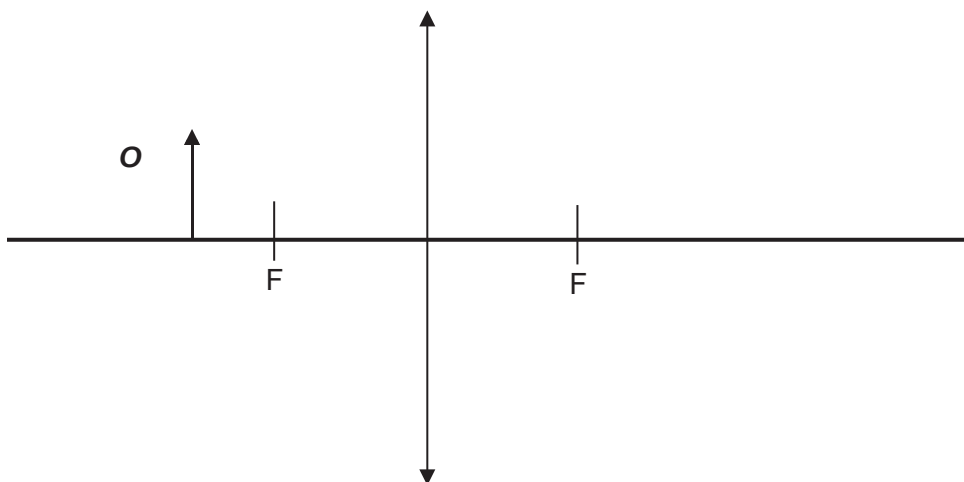


Fig. 7.2

- (i) On Fig. 7.2, draw two light rays from the object to obtain the position of the image. Label the image "I". [3]
- (ii) If the distance of the object from the lens is reduced to be less than the focal length, state whether you will obtain a real or virtual image.

_____ [1]

- 8 Fig. 8.1 shows the electrical wiring in a table lamp.

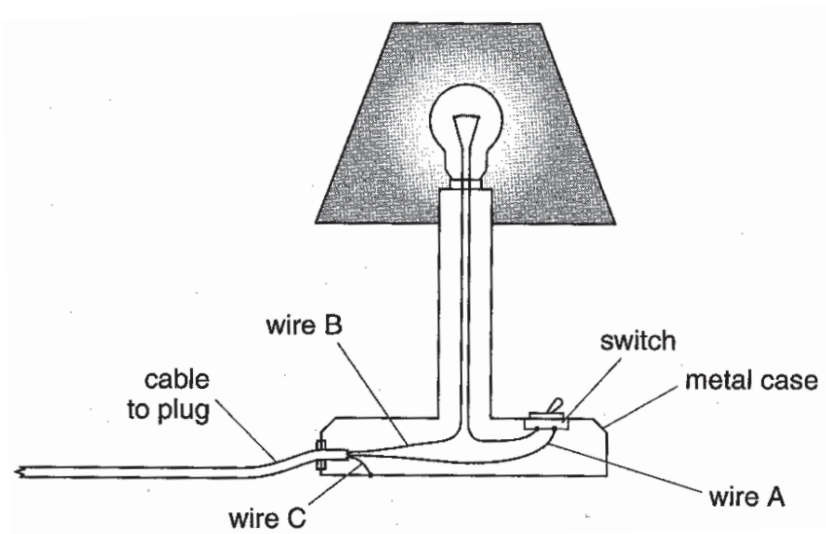


Fig. 8.1

- (a) The lamp is marked “240 V, 500 W”.
- (i) Calculate the resistance of the lamp.

resistance = _____ [2]

- (ii) The lamp is switched on for 8 hours daily. Calculate the cost for 1 day, given that the electrical consumption rate is \$0.23 per kWh.

cost = _____ [2]

- (b) Explain why wire A rather than wire B is connected to the live terminal in the plug.

[2]

- (c) The cable is connected to a plug which contains a fuse. State the purpose of the fuse.

[1]

- (d) State which wire carries no current when the table lamp is working normally.

[1]

- (e) Wire A becomes loose and touches the metal case. Explain why a person who later touches the case does not feel any shock and is unharmed.

[1]

- (f) A second lamp has double insulation and there is no wire connected to the case. Explain why this lamp is still safe to use.

[1]

- 9 (a) Equal mass of hot water is poured into two different metal pans. Once the pans are in thermal equilibrium with the hot water, temperatures of the hot water in both pans are taken and shown in Fig. 9.1.

The identical pans are of different colours, where one is black and the other is white. Both pans are uncovered and cooled under the same conditions.

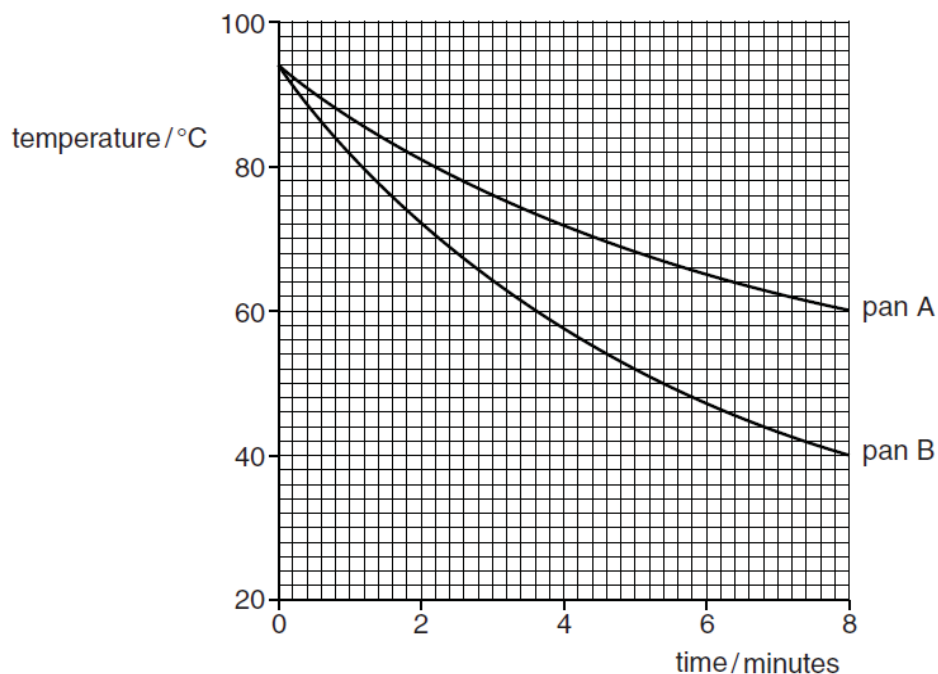


Fig. 9.1

- (i) Explain why water has a fixed volume but not a fixed shape.

[2]

- (ii) State and explain the colour of pan B.

[1]

- (iii) Describe and explain how the curves in Fig. 9.1 will change when the experiment is repeated with the pans covered.

[2]

(b) Fig. 9.2 shows a hot water storage tank.

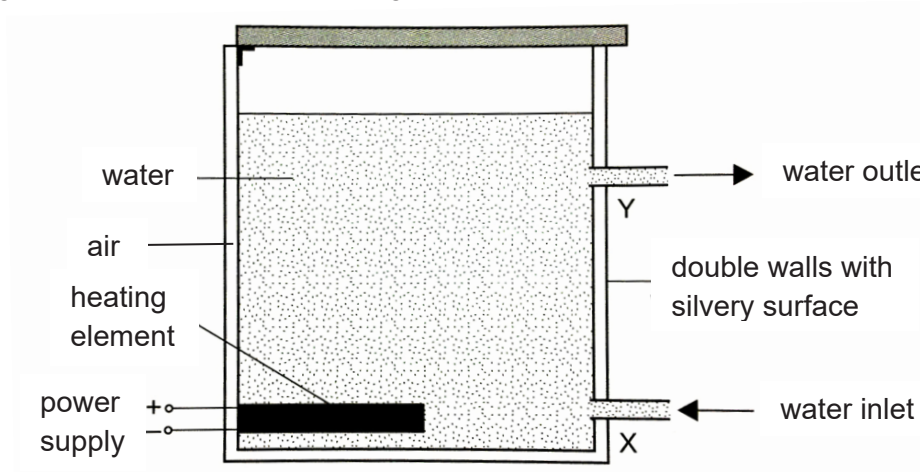


Fig. 9.2

(i) Describe how all the water in the storage tank becomes hot.

[3]

(ii) Describe how the design of the storage tank reduces heat loss to the surroundings by conduction and radiation.

[2]

