Geylang Methodist School (Secondary)
Preliminary Examination 2015

5076/01
SCIENCE (PHYSICS, CHEMISTRY) 5116/01

Paper 1 Multiple Choice — Sec 4 Express
Sec 5 Normal (A)

Additional materials Optical Answer Sheet — 1 hour

Setter : Mr Yip Cheng Hou — 1 September 2015

READ THESE INSTRUCTIONS FIRST

Write in soft pencil

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

Write your name, index number and class on the Optical Answer Sheet in the spaces provided

There are **forty** questions on this paper Answer **all** questions For each question there are four possible answers **A, B, C** and **D**

Read the instructions on the Optical 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

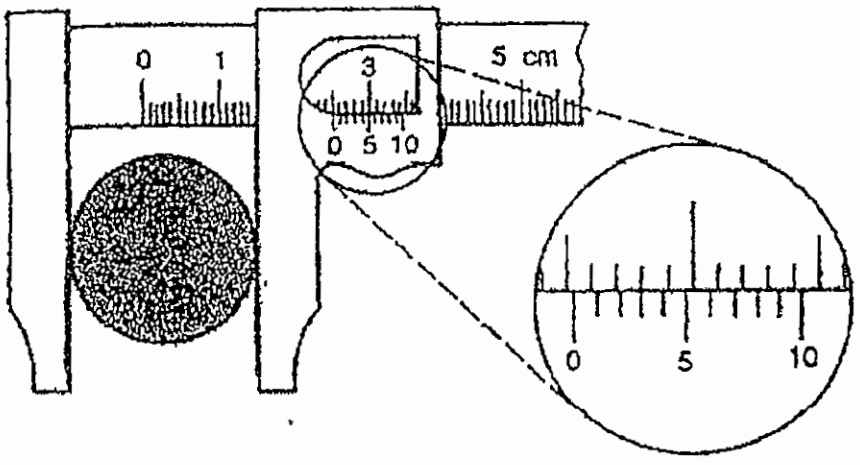
Gravitational field strength is assumed to be 10 N/kg unless otherwise specified

A copy of the Periodic Table is printed on page XX

This document consists of XX printed pages and X blank pages

[Turn over

1 The diagram shows an enlargement of vernier calipers set to measure the diameter of a beaker



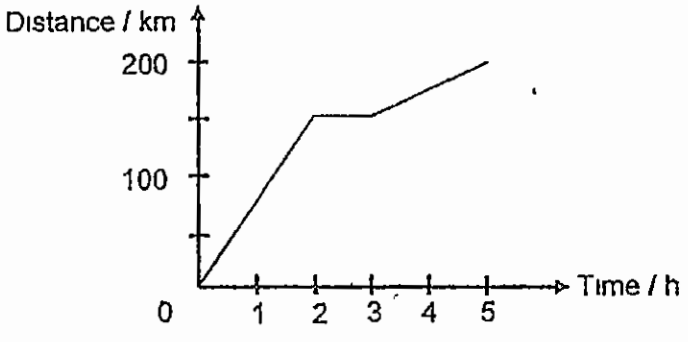
If the instrument has no zero error, what is the reading of the diameter?

A 1 53 cm B 2 03 cm C 2 53 cm D 2 58 cm

2 A car accelerates from 4 m/s to 16 m/s in 6 s What is the acceleration?

A 1 m/s^2 B 2 m/s^2 C 3 m/s^2 D 6 m/s^2

3 The distance-time graph below represents a car journey.



The average speed of the 5 hour journey was

A 40 km/h B 50 km/h C 130 km/h D 200 km/h

4 The acceleration of free fall on the Moon is 1 6 m/s^2 whereas on Earth is 10 m/s^2. A rock of weight 2 N from the Moon is brought back to Earth

What is the weight of the rock on Earth?

A 1 25 N B 2 N C 10 N D 12 5 N

5 Which of the following expressions **cannot** be used to calculate force?

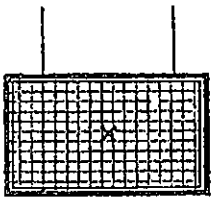
A force = work done x distance

B force = pressure x area

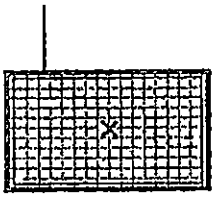
C force = moment – distance

D force = acceleration x mass

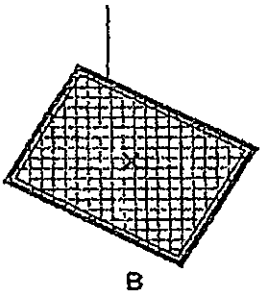
6 A picture frame, with the centre of gravity at X, hangs from two strings as shown in the diagram below



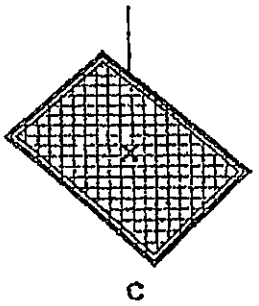
Which one of the following diagrams shows how the picture frame hangs when one of the strings breaks?



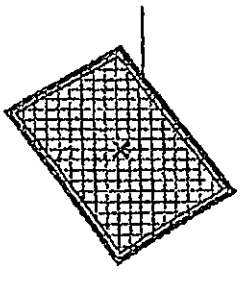
A



B



C



D

7 A man, of weight 800 N, walked on a level ground for 5 m followed by going up some steps 2 m high.

What is the total work done against gravity?

A 400 J B 1600 J C 4000 J D 5600 J

8 Which of the following examples is the least pressure exerted?

A A bare-footed person standing on the beach.

B A sharp needle lying on a table

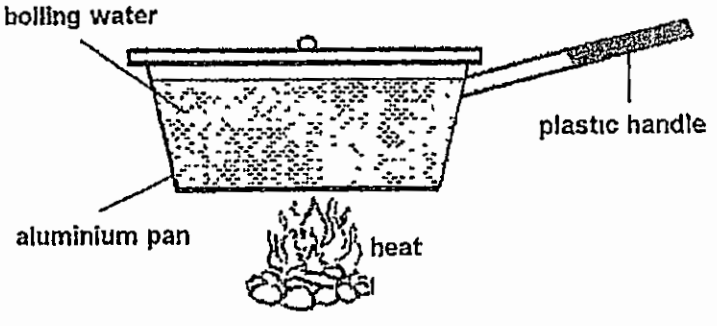
C A knife cutting a piece of meat

D A boy sitting on a chair with two legs

9 Which gives the states of matter in which molecules, at a given temperature, have the highest speed and the greatest force of attraction between them?

	Molecules with the highest speed	Greatest force between molecules
A	solid	solid
B	solid	gas
C	gas	solid
D	gas	gas

10 The diagram below shows water being boiled in a pan



Name the main process(es) by which heat passes from the bottom of the pan to the handle

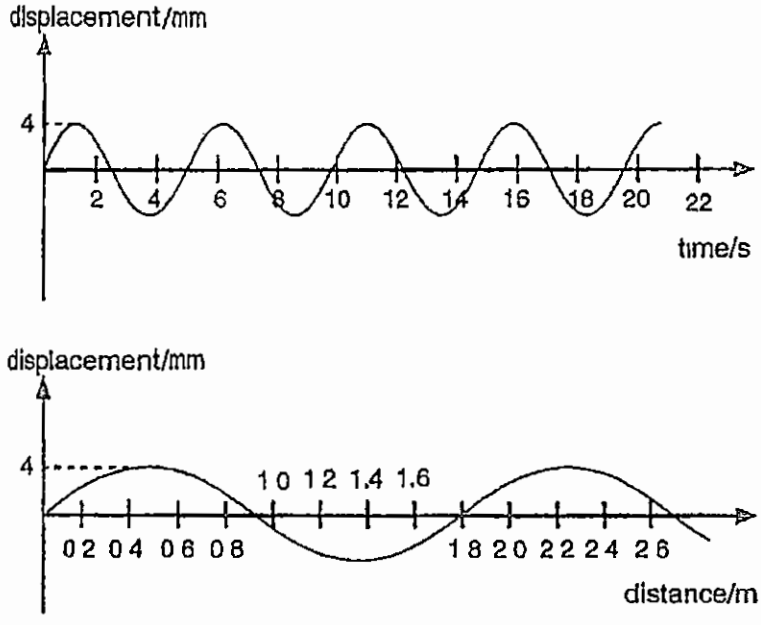
A conduction only
B convection only
C radiation only
D radiation and convection

11 Which of the following substances is/are suitable to be used in a liquid-in-glass thermometer for measuring temperature between -30 °C to 80 °C?

Substance	Freezing point	Boiling point
X	-20 °C	100 °C
Y	-70 °C	120 °C
Z	-120 °C	70 °C

A X only B Y only C Z only D X and Z

Questions 12 to 14 refer to the information provided below on a sound wave



12 What is the amplitude of the sound?

A 0 004 m **B** 0.008 m **C** 4 m **D** 8 m

13 What is the frequency of the sound?

A 0 2 Hz **B** 1 8 Hz **C** 5 Hz **D** 10 Hz

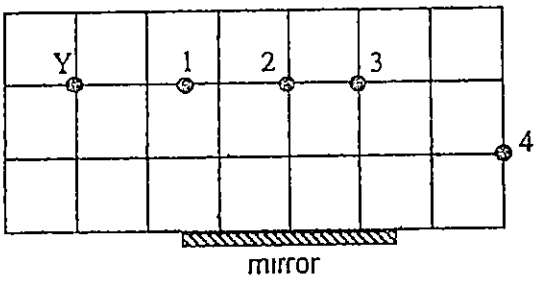
14 Which of the following changes correctly if the sound becomes louder and lower pitch?

	Frequency	**Amplitude**
A	Decreases	Decreases
B	Increases	Decreases
C	Decreases	Increases
D	Increases	Increases

15 Which of the following correctly describes the three types of waves?

	Ultrasonic Waves	**Microwaves**	**Gamma rays**
A	Longitudinal	Radar	Longest wavelength
B	Longitudinal	Detect fracture bones	Shortest wavelength
C	Transverse	Satellite communications	Highest frequency
D	Transverse	Cooking	Lowest frequency

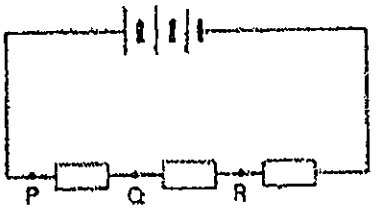
16 A person stands at point Y as shown in the diagram below



Which of the pins will the person be able to see in the mirror?

A 1 and 2 B 3 and 4 C 1, 2 and 3 D 2, 3 and 4

Questions 17 and 18 refer to the circuit below showing three 2 Ω resistors connected in series to a battery. An ammeter connected at P shows 5 A



17 How many coulombs of charges flow through P, Q and R in one second?

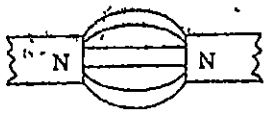
	P	Q	R
A	5	3	1
B	5	5	5
C	1	3	5
D	3	3	3

18 What potential difference will a voltmeter show if it is connected across

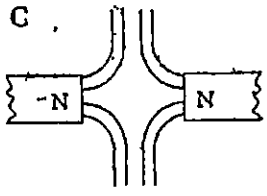
	P and Q	Q and R	Battery
A	10 V	6 V	2 V
B	10 V	10 V	10 V
C	2 V	6 V	10 V
D	10 V	10 V	30 V

19 Which of the following shows the magnetic field between two N-poles?

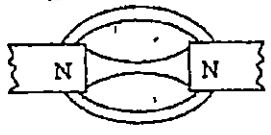
A



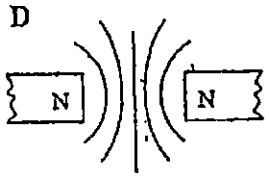
C



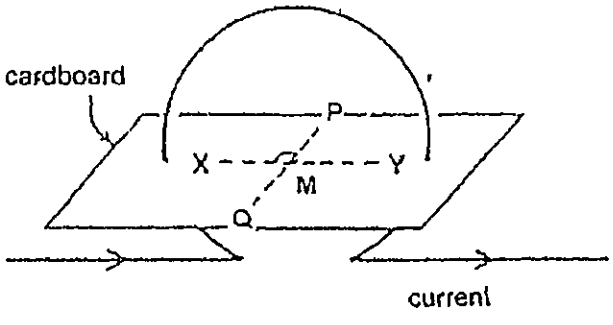
B



D



20 When a compass is placed at point M on the cardboard shown below, where will the north pole of the compass needle point towards?



A X B Y C P D Q

END OF PAPER

Geylang Methodist School (Secondary)
Preliminary Examination 2015

Candidate Name			
Class		Index Number	

5076/02

SCIENCE

Sec 4 Express
Sec 5 Normal (A)

Paper 2 Physics

Additional materials Writing papers

1 hour 15 minutes

Setter : Madam Sharifah Noor Osman

31 July 2015

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in
Write in dark blue or black pen on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid

Section A
Answer **all** questions
Write your answers in the spaces provided on the question paper

Section B
Answer any **two** questions on the writing papers provided Begin your answer to Section B on a new and separate sheet of writing paper.

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

At the end of the examination, hand in both Sections A and B separately

Acceleration due to gravity, g, is assumed to be 10 ms^{-2} unless otherwise specified

For Examiner's Use	
Section A	/ 45
Section B	/ 20
Total	/ 65

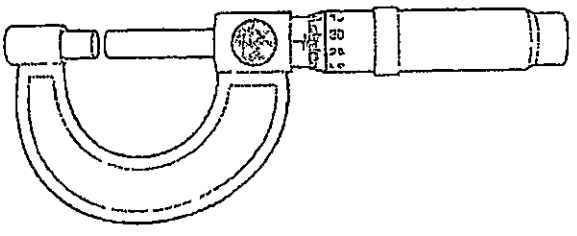
This document consists of 15 printed pages and 1 blank page.

[Turn over

SECTION A

Answer ALL questions in this section in the spaces provided

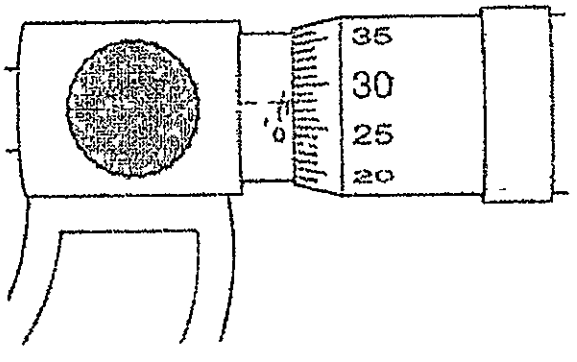
1 (a) Fig 1 1 shows a micrometer screw gauge A student checks that there is no zero error on this micrometer.



Explain what is meant by a *zero error* on a micrometer

. . . . . [1]

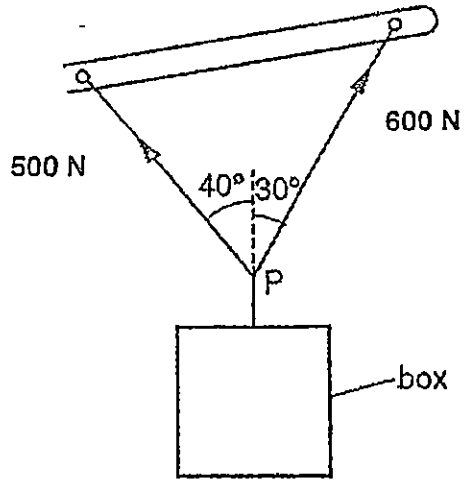
(b) The student uses the micrometer to determine the thickness, *t* of a sheet of paper The student folds the paper in half four times and measures the total thickness of the folded paper The micrometer reading is shown in Fig. 1 2



Calculate the thickness, *t* of a sheet of paper

t = ... [2]

2 Fig 2 1 shows the arm of a crane when it is lifting a heavy box



(a) By the use of a scale diagram (**not** calculation) of the forces acting at P, find the resultant of the two forces on the box

Use a scale of 1cm to represent 100 N

resultant of the two forces on the box = ... [4]

(b) Another box of weight 1600 N is raised vertically by 3 5 m

(i) State the principle of conservation of energy

. . . .

. . ..

. . ..

. . .. [2]

(ii) Calculate the work done on the box

work done = . [2]

(iii) The crane takes 4 5 s to raise this box by 3 5 m Calculate the power output of the crane

power output = ... [2]

3 Fig 3 below shows a metal can containing water with a tight fitting lid The can is heated by a flame

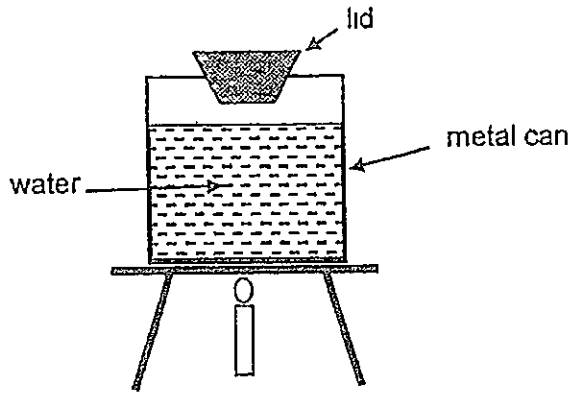


Fig. 3

(a) Using kinetic theory, describe the motion of air molecules in the can and when the can is heated

[3]

(b) Explain why the lid eventually flies off

[2]

4 Fig 4 shows a ray of light incident onto a glass block and the refracted ray in the block

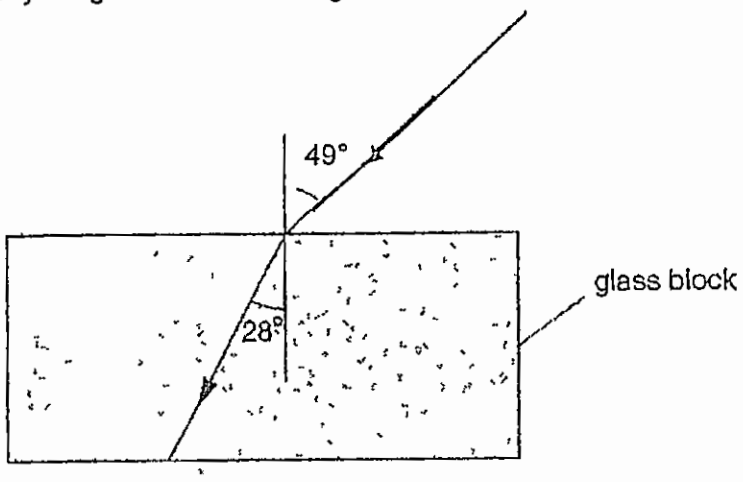


Fig. 4

(a) Calculate the critical angle of the glass used

critical angle = ... [4]

(b) Explain why the refracted ray emerges out from the glass block and not reflected into the glass.

. . . . . [2]

5 A ship is sinking in the dark as shown in Fig 5.

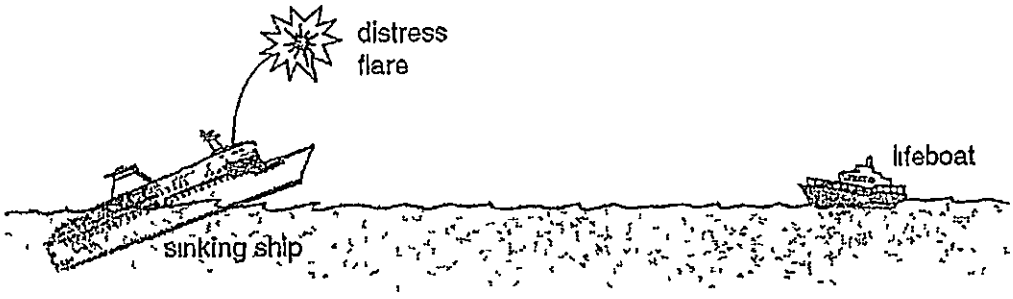


Fig. 5

The sailors on the ship fire a distress flare into the air It explodes with a bang and a bright flash of light

(a) A lifeboat crew hears the bang and sees the flash, but not at the same time State whether the banging sound or the flash reaches the lifeboat first Give a reason for your answer

[2]

(b) The time interval for the bang to reach the lifeboat is 3 2 s Show clear workings to determine how far away the lifeboat is from the flare Assume the speed of sound in air is 340 m/s

distance of lifeboat from the flare = [2]

6 A negatively charged rod is placed near sphere P P is repelled by the rod as shown in Fig 6

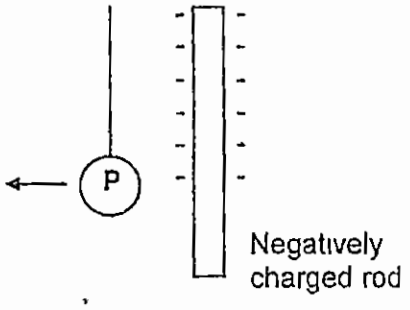


Fig 6

(a) Define an electric field

. . . . . [1]

(b) State the type of charge on sphere P

. . . . . [1]

7 Fig 7 shows a battery with a resistor connected across its terminals The e m f of the battery is 5 0 V

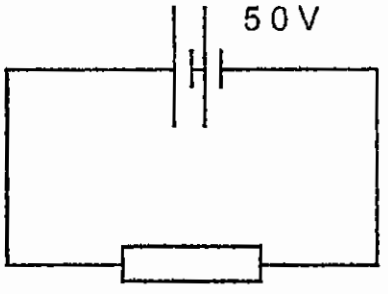


Fig. 7

(a) The battery causes 100 C of charge to flow through the circuit in 30 s

Calculate

(i) the current in the circuit,

current = ... [2]

(ii) the resistance of the circuit,

resistance = ... [2]

(iii) the electrical energy transformed in the circuit in 30 s

electrical energy = ... [2]

(b) Explain what is meant by the term *e m f. of the battery.*

. . . . . [1]

8 Fig 8.1 and Fig 8 2 show two views of a vertical wire carrying a current up through a horizontal card Points P and Q are marked on the card

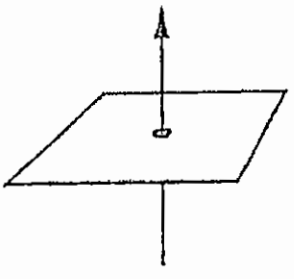
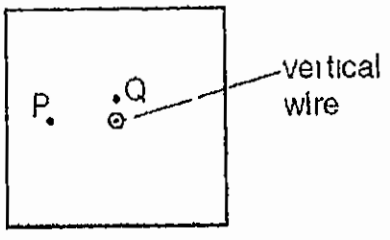


Fig. 8 1



view from above the card

Fig. 8.2

(a) On Fig 8 2

(i) draw a complete magnetic field line (line of force) through P and indicate its direction with an arrow,

(ii) draw an arrow through Q to indicate the direction in which a compass placed at Q would point [3]

(b) State the effect, if any, on the direction in which compass Q points when the current

(i) is increased in the wire,

. . . . [1]

(ii) direction is reversed in the wire

. . . . [1]

(c) Fig 8 3 shows the view from above of another vertical wire carrying a current up through a horizontal card A grid of 4 cm by 4 cm is drawn on the card Point W is 1 cm vertically above the top surface of the card

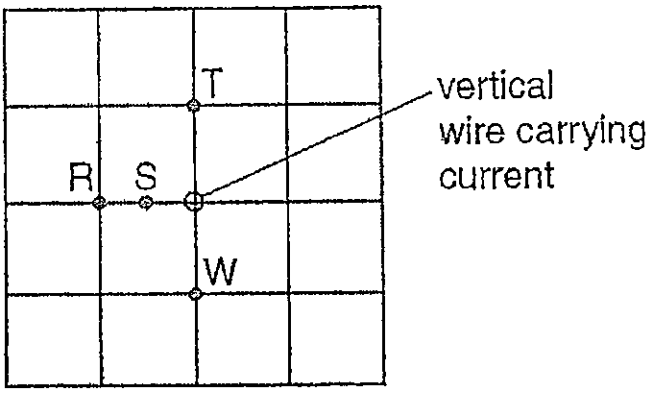


Fig. 8.3

Compare the magnetic field strength at S, T and W with the magnetic field strength at R Use one of the alternatives, **weaker, same strength** or **stronger** for each answer

at S . . ..

at T .. ..

at W . . . . [3]

End of Section A

SECTION B

Answer any **two** questions

Begin each question on a new and separate sheet of writing paper

9 When a car driver sees an emergency ahead, he applies the brakes During the reaction time the car travels at a steady speed and covers a distance known as the thinking distance. The braking distance is the distance travelled by the car after the brakes are applied

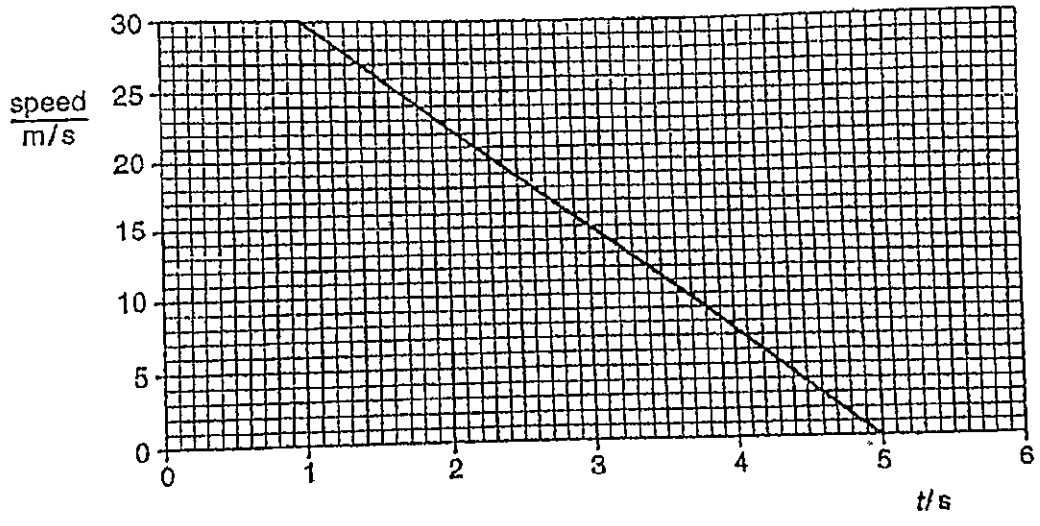


Fig. 9.1

Fig. 9.1 shows the speed-time graph of a car The driver sees the emergency at time t = 0 s The total mass of the car is 800 kg

(a) State the energy change that occurs as the car brakes [2]

(b) Determine

(i) the thinking distance, [1]

(ii) the braking distance, [1]

(iii) the deceleration of the car during braking [2]

(c) State and explain how the breaking distance is affected by

(i) using new tyres rather than badly worn tyres, [2]

(ii) having the car carrying a heavy load of passengers [2]

10 Fig 10 shows a heater to be connected to the mains supply The heater is rated at 240 V, 2 400 W

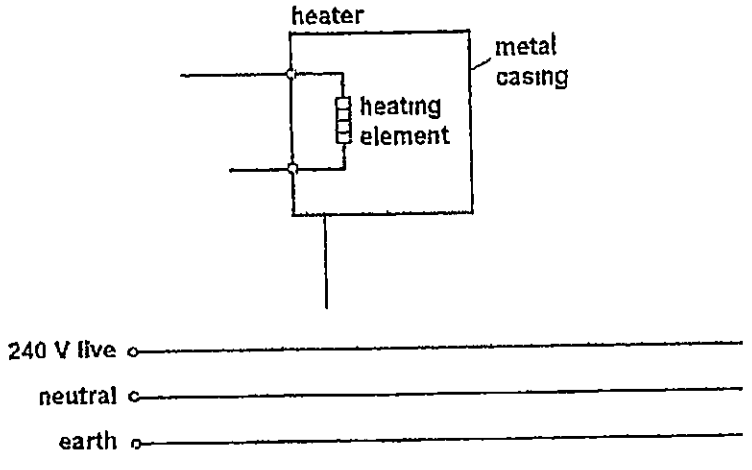


Fig. 10

(a) Complete Fig 10 to show how the wires of the heater should be connected to the mains [3]

(b) Draw a switch for the heater in Fig 10 [1]

(c) Draw a fuse for the heater [1]

(d) Describe briefly the use of a fuse in a circuit [1]
You are provided with four fuses of ratings 1 A, 5 A, 10 A, 13 A
Suggest a suitable fuse rating for the heater Show your workings clearly [2]

(e) Calculate the cost of switching on the heater continuously for five hours
The cost of a unit of electricity is 30 cents. [2]

11 (a) A joule meter measures the energy given out by the heater This experiment is conducted to determine the total amount of energy required to heat the liquid X from a temperature of 25 °C to 70 °C The heater is switched on for 300 s and then switched off The variation of temperature of the liquid X with time is plotted in the graph below

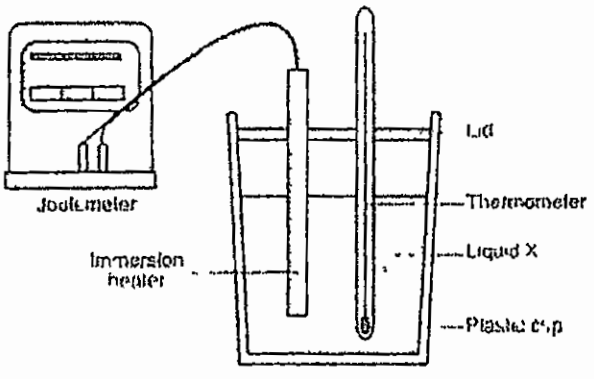


Fig. 11.1

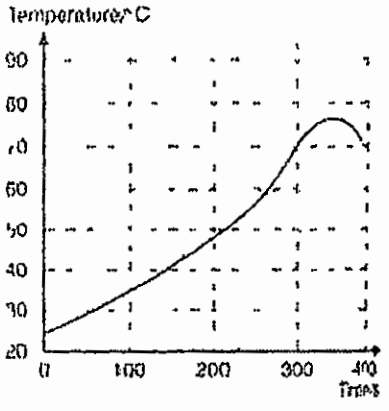


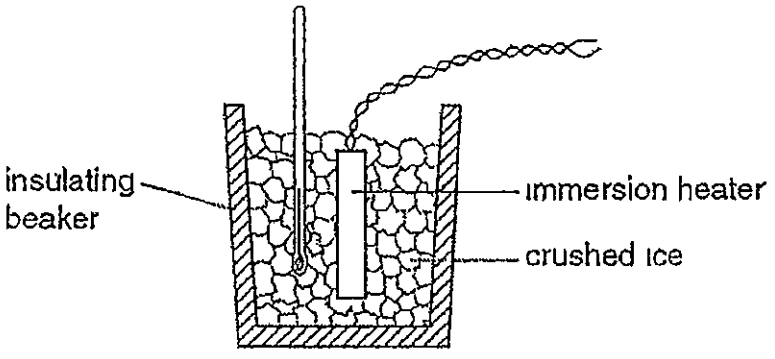
Fig. 11.2

(i) Explain the function of a lid and why the material is a plastic cup? [2]

(ii) Will it be more accurate if the outer layer of the plastic cup is painted black?
Explain why. [3]

(iii) Explain why the temperature of X continues to rise for a while after the
heater is switched off [2]

(b) An immersion heater is now put into some crushed ice at 0 °C The immersion heater is switched on



(i) Copy Fig 11 3 into your answer script, sketch the graph of temperature against time, up to the time when all the ice has melted [1]

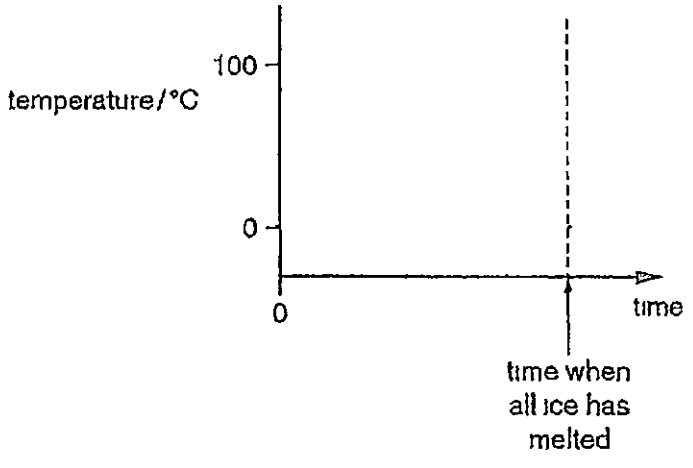


Fig. 11 3

(ii) The heater is left switched on after all the ice has melted, and the temperature rises. After some time, the temperature stops rising, even though the heater is still on.

Suggest why the temperature stops rising, even though the heater is still on [1]

State what happens to the energy received by the water whilst this is happening [1]

END OF PAPER

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Geylang Methodist School (Secondary)
Preliminary Examination 2015

Sec 4F5N Science(Physics) Syllabus 5116
Paper 1 Answers (GMSSphy2015)

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

Geylang Methodist School (Secondary)
Sec 4E 5NA Prelim SC(Phy) P2 Mark Scheme

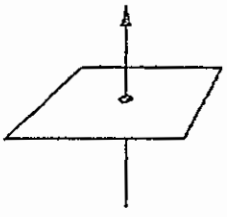
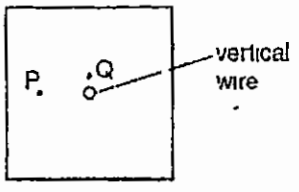
Paper 2

NO /WRONG UNITS – DEDUCT ½ Marks
ACCEPT E C F

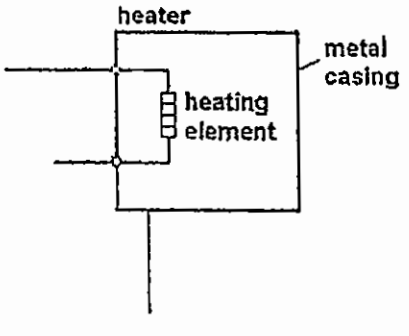
Section A

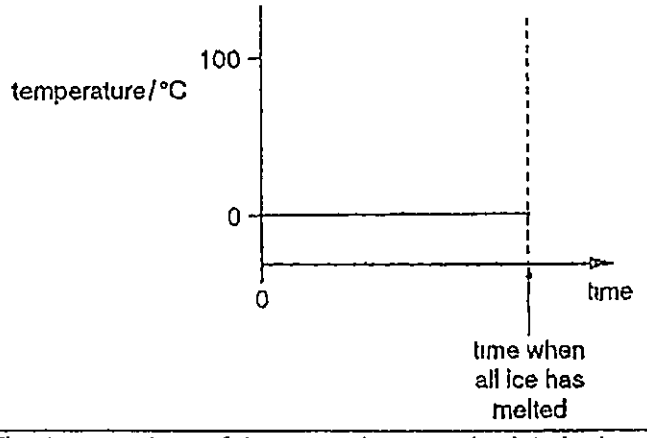
No.	Workings	Marks
1a)	Reading on scale is not zero when closed. / The horizontal line on the main scale (datum line) is not in line with the zero mark on the thimble scale	[1]
b)	1 28mm Thickness of paper = 1 28 / 16 = 0 080 mm	[1] [1]
2a)	Scale 1cm 100 N Correct shape (force of correct length) with correct directions Final answer 890 N Tolerance +/- 1%	[1] – deduct ½ if student use 1cm 200 N [1] [1] [1]

2b)	(i)It states that energy can never be created or destroyed It can only be transformed from one form to another with total energy remains the same	[1] [1/2] [1/2]
	(ii) W = F x d = 1600 x 3 5 = 5600 J	 [1] [1]
	(iii) P = W/t = 5600 / 4 5 = 1240 W	 [1] [1]
3a)	The air particles move randomly at high speeds When heated, the air particles gain KE and move faster The frequency of collisions with the walls of the metal increases	[1] [1] [1]
b)	The air particles collide with the walls of the metal can and exert a force since pressure is force per unit area The greater pressure and hence, larger force exerted by the air particles causes the lid to eventually fly off.	[1] [1]
4a)	n = sin i/ sin r = sin 49 / sin 28 = 1 61 c = sin^{-1} (1/ n) = sin^{-1} (1/ 1 61) = 38 5°	[1] [1] [1] [1]
b)	The angle of incidence in the denser glass medium is less than the critical angle calculated in 4(a) so total internal reflection cannot occur	[1] [1]
5a)	The flash reaches the lightboat first as light travels at a speed of 3 0 x 10^8 m/s, but sound travels at a speed of 330 m/s	[1] [1/2 , 1/2]
b)	D = s x t = 340 x 3.2 = 1 088 m	 [1] [1]
6a)	An electric field is a region whereby an electric charge experiences an electric force.	[1]
b)	Negative charges	[1]
7a(i)	I = Q/t = 100 / 30 = 3 3 A	 [1] [1]
(ii)	R = V /I = 5 0 / 3 3 = 1 5 Ohm	 [1] [1]
(iii)	E = VIt = 5.0 x 3 3 x 30= 495 J	[1] [1]
b)	Emf of a battery is work done by the source in driving a unit charge round a complete circuit.	[1]

8a)	(i) Circular magnetic field in an anticlockwise direction   view from above the card (ii) compass needle pointing to the left	[1] [1] [1]
b)	(i) No effect (ii) Points to the right	[1] [1]
c)	at S: stronger at T same strength at W same strength	[1] [1] [1]

Section B

9a)	Kinetic energy → heat energy & sound energy	[1]
b)	(i) TD = 30 x 1 = 30 m (ii) BD = 0 5 x 4 x 30 = 60 m (iii) deceleration = (u-v)/t = (30 – 0) / 4 = 7 5 m/s^2	[1] [2] [2]
c)	(i) Braking distance decreases because friction between the road and the tyres increases.	[1] [1]
	(ii) Braking distance increases because inertia is greater	[1] [1]
10	(a), (b) Switch of heater comes after fuse, (c) in live wire.  	[3], [1], [1]
	d) To prevent excessive current from flowing through the circuit	[1]

	e) P = IV → I = P/V = 2400/240 = 10 A Thus, 13 A fuse	[1] [1]
	f) Cost = total energy consumed x cost per kWh = (2 400) x 5 x 0.30 = (or 360 ¢)	[1] [1]
11a)	i) 1 The lid is to reduce heat loss to the surrounding by convection & evaporation 2 Plastic is a poor conductor of heat so it can reduce heat loss to the surrounding by conduction ii) No It will speed up the rate of heat loss to the surrounding as black is a good emitter of heat. The amount of heat released by the heater to the liquid X which is measured by joulemeter will not be the exact amount of heat absorbed by the liquid to cause a temp. rise iii) Although the electrical energy is no longer being transformed into heat energy, the heater is still at a higher temperature and heat continues to be transferred to liquid X from the heater until the heater cools to the same temperature as liquid X	[1] [1] [1] [1] [1] [1]
b)	i)  	[1]
	ii) The temperature of the water has reached its boiling point The energy absorbed is used to completely break the bonds between the water molecules	[1] [1]