Candidate Name: _____ Class _____ Index No. _____

FUHUA SECONDARY SCHOOL

Secondary Four Express / Five Normal (Academic)

Preliminary Examination 2016

4E/5NA

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SCIENCE (Physics, Chemistry) 5076/01

Paper 1 Multiple Choice

29 August 2016
0750 – 0850
1 hour

Additional Materials: OMR and electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces provided on top of this page.
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.

There are **forty** questions in this section. 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 OMR sheet provided.

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.
A copy of the Periodic Table is printed on page 13 (for Chemistry only).
The use of an approved scientific calculator is expected, where appropriate.

Setters: Mr Tan Thiam Chye / Mr Wan Yan Ying **Vetters:** Mr Raymond Loh/ Mdm Hia Soo Ching

This question paper consists of **13** printed pages including this page.

1 Which of the following is a possible magnitude for the diameter of an atom?

A 1×10^{-3} m
B 1×10^{-6} m
C 1×10^{-10} m
D 1×10^{-16} m

2 A car travels for 1200 km in 20 hours. The details of the journey are shown below.

duration	distance covered
0 – 6 hours	400 km
6 – 8 hours	0 km (at rest)
8 – 16 hours	600 km
16 – 20 hours	200 km

Calculate the average speed of the journey.

A 50 km h^{-1}
B 60 km h^{-1}
C 75 km h^{-1}
D 100 km h^{-1}

3 Kevin drops a paper ball in air. What is going to happen to the speed and acceleration of the paper ball during the first few seconds of the fall?

	speed	acceleration
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

4 A box is being pushed across a horizontal ground at constant speed. If the push is stopped, the box will _____.

A continue to move at constant speed
B move at constant speed for a while and then slow down
C start slowing down
D stop immediately

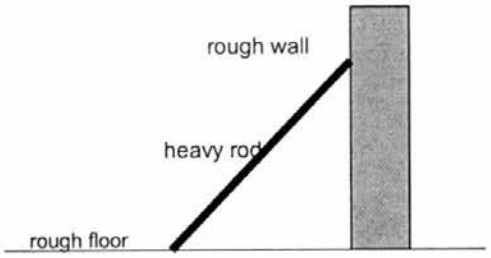
5 A man of mass 50 kg stands on a weighing scale in a lift. When the lift is ascending at a constant deceleration of 1.0 m s^{-2}, what is the reading on the weighing scale? (Given that g = 10 N kg^{-1})

A 60 N
B 450 N
C 500 N
D 550 N

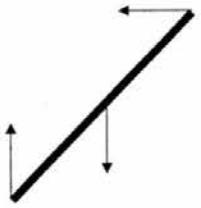
6 5000 kg of iron is melted and mixed with 2.0 m^3 of molten copper. If the density of molten iron and molten copper are 7.5 g cm^{-3} and 9.0 g cm^{-3} respectively, what is the approximate density of the mixture?

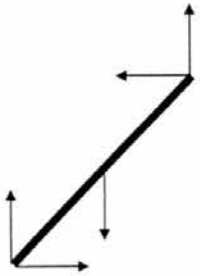
A 7.5 g cm^{-3}
B 8.3 g cm^{-3}
C 8300 kg m^{-3}
D 8600 kg m^{-3}

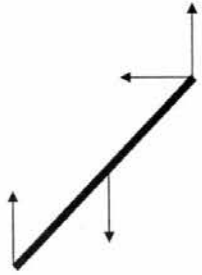
7 A uniform heavy rod is being kept in equilibrium by leaning against a rough wall as shown in the diagram below.

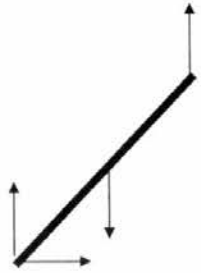


Which diagram shows the forces acting on the rod correctly?

A


C


B


D


8 Wind is moving air. It moves from _____.

A areas of high atmospheric pressure to low atmospheric pressure
B areas of low atmospheric pressure to high atmospheric pressure
C high land to low land
D low land to high land

9 A 100 g object drops from a 10 m building. What is the speed of the object when it is 4 m away from the floor? (Given that g = 10 m s^{-2})

A 4 m s^{-1}
B 6 m s^{-1}
C 8 m s^{-1}
D 11 m s^{-1}

10 A balloon gets bigger when it is left under the hot Sun because _____.

A the air molecules expand when the balloon is heated
B the air molecules inside it are exerting greater force onto each other without any increase in their kinetic energy
C the air molecules inside it are moving outwards
D the air molecules inside it move faster and collide with the balloon at a greater force

11 Rod X and Rod Y are both inserted into a furnace to burn. After some time, rod X is red hot at one end but rod Y still looks normal. Which rod would be safer to touch at the end which is outside the furnace?

A Rod X because rod X is a better conductor.
B Rod X because rod X is a better insulator.
C Rod Y because rod Y is a better conductor.
D Rod Y because rod Y is a better insulator.

12 Why does the temperature of a liquid drop during evaporation?

A Air takes away the thermal energy by conduction.
B Air takes away the thermal energy by radiation.
C The average energy drops due to the escape of the higher energy molecules into the air as vapour.
D The total energy drops due to liquid molecules escaping to the air as vapour.

13 A vibrator dipping into water in a ripple tank has a period of 0.5 s. The resulting wave has a wavelength of 0.02 m. What is the speed of the wave?

A $0.01\ m\ s^{-1}$
B $0.04\ m\ s^{-1}$
C $0.05\ m\ s^{-1}$
D $25\ m\ s^{-1}$

14 An object is placed 1.0 m from a plane mirror. How far is the image from the object?

A 0 m
B 0.5 m
C 1.0 m
D 2.0 m

15 Which colour comes immediately after green in the ascending order of frequency?

A blue
B yellow
C red
D violet

16 Which wall is the best to create echo?

A big stone wall
B big stone wall covered with algae
C small stone wall
D small stone wall covered with algae

17 After rubbing insulator X with insulator Y, insulator X repels a negatively charged rod. Which of the following statements is true?

A Electrons have moved from X to Y.
B Electrons have moved from Y to X.
C Protons have moved from X to Y.
D Protons have moved from Y to X.

18 As the temperature of a metallic conductor increases, _____.

A its resistance decreases because the ions in the conductor expand, making them more likely to obstruct and slow down the flow of electrons
B its resistance decreases because the ions in the conductor vibrate with bigger amplitude, making them more likely to obstruct and slow down the flow of electrons
C its resistance increases because the ions in the conductor expand, making them more likely to obstruct and slow down the flow of electrons
D its resistance increases because the ions in the conductor vibrate with bigger amplitude, making them more likely to obstruct and slow down the flow of electrons

19 What is the most appropriate fuse rating for a "240 V, 1.2 kW" heater?

A 3 A
B 5 A
C 10 A
D 13 A

20 Magnetic shield is used to protect some equipment from magnetic field. Which of the following is the best material for a magnetic shield?

A copper
B iron
C plastic
D steel

Candidate Name: _____ Class _____ Index No. _____

FUHUA SECONDARY SCHOOL

Secondary Four Express / Five Normal (Academic)

Preliminary Examination 2016

4E/5NA

SCIENCE (Physics, Chemistry) 5076/02

Paper 2 Theory

26 August 2016
0750 - 0905
1 hour 15 minutes

Additional Materials: Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces provided on top of this page.
Write in dark blue or black pen.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section A (45 marks)
Answer all questions.
Write your answers in the spaces provided.

Section B (20 marks)
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

Setter: Mr Tan Thiam Chye **Vetter:** Mr Raymond Loh

This question paper consists of **19** printed pages including this page.

Section A: Structured Questions [45 marks]
Answer **all** the questions in the spaces provided.

1 Fig. 1.1 shows the speed-time graph of a car. Its mass is 1200 kg.

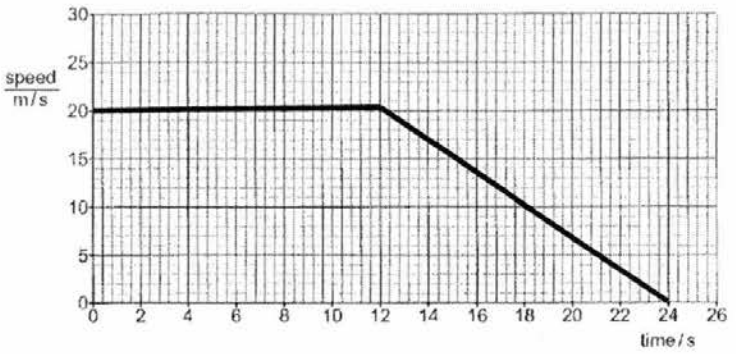


Fig. 1.1

(a) Calculate the distance travelled when the speed of the car is decreasing.

distance travelled = _____ [2]

(b) Calculate the constant braking force on the car during the final 12.0 s of the journey.

braking force = _____ [3]

(c) If the car's mass was increased during the final 12.0 s, explain how the stopping distance of the car would be affected if the braking force remained unchanged.

_____

_____

_____ [2]

2 Fig. 2.1 shows a boat being pulled by two tugboats using ropes. Each of the ropes has a tension of 120 kN.

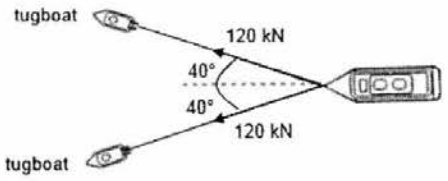


Fig. 2.1

(a) By means of a scaled diagram, determine the resultant force of the two tension forces that are acting on the boat.

[4]

(b) The ship is moving at constant speed. Explain in terms of forces why it moves at constant speed.

_____

_____

_____ [2]

3 A measuring cylinder contains 30 cm^3 of liquid. When a stone of weight 0.92 N is dropped into the liquid, it sinks to the bottom and the liquid rises to the 70 cm^3 graduation. (Given that g = 10 N kg^{-1})

(a) Calculate the mass of the stone.

mass = _____ [1]

(b) Calculate the density of the stone. Express your answer in S.I. unit.

density = _____ [2]

(c) Explain why it would not be possible to use this method to determine the density of wooden cork.

_____

_____

_____ [2]

4 The thinking distance is the distance a car travels while the driver sees a hazardous situation and moves his foot to the brake pedal. Fig. 4.1 shows how the thinking distance varies with the speed of the car.

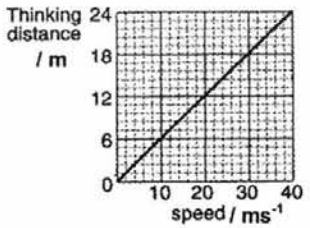


Fig. 4.1

A car has a mass of 3000 kg. It is travelling at 10 m/s when the driver notices a barrier ahead of the car and applies a braking force onto the brake pedal.

(a) Calculate the kinetic energy of the car when the driver noticed the barrier.

kinetic energy = _____ [2]

(b) State the principle of conservation of energy.

_____

_____

_____ [2]

(c) To which form(s) of energy is kinetic energy transformed when the brake is applied?

_____ [2]

(d) Given that the reaction time of the driver is the time taken for him to step on the brake pedal once he sees a hazardous situation, determine the reaction time of the driver.

reaction time = _____ [1]

5 Fig. 5.1 shows part of an electric grill.

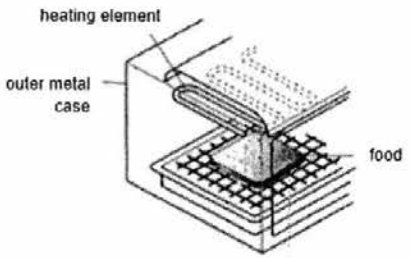


Fig. 5.1

(a) State the name of the main process by which thermal energy is transferred from the heating element to the food.

_____ [1]

(b) The heating element was first constructed using a shiny stainless steel material. The temperature reading of the air inside the grill with the shiny stainless steel material is shown in Fig. 5.2.

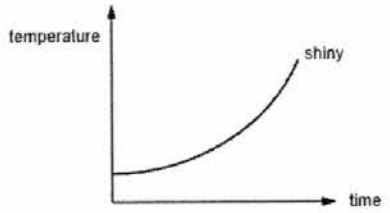


Fig. 5.2

The designer decided to change the heating element into a blackened stainless steel material and test the electric grill again.

(i) On Fig. 5.2, sketch how the temperature reading of the air inside the grill changes over time when the blackened stainless steel material is being used as the heating element. Assume the starting temperature of the air is the same. [1]

(ii) Explain the difference(s), if any, in the temperature-time graphs between the two different types of heating element.

_____

_____ [1]

6 Fig. 6.1 shows an object and its image formed by a thin converging lens.

Fig 6.1

(a) On Fig. 6.1 draw the ray(s) to locate accurately the following:

(i) optical centre (**C**), [1]

(ii) thin converging lens (**L**), [1]

(iii) principal focus (**F**). [1]

(b) State how the size of the image changes as the object is moved closer to the thin converging lens, until before it reaches the focal point.

_____

_____ [1]

7 Fig. 7.1 shows a sign at a supermarket that records down its daily energy consumption.

Fig. 7.1

(a) Calculate the daily energy consumption of the supermarket in joules.

daily energy consumption = _____ [2]

(b) The supermarket has a circuit that is used to multiple light bulbs. Each light bulb has a rating of 11 W, 240 V.

Fig. 7.2 shows a 13 A fuse used to protect the circuit.

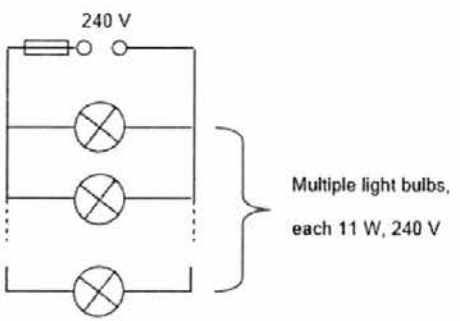


Fig. 7.2

(i) Explain what is meant by 'rating of 11 W, 240 V'.

_____

_____ [1]

(ii) Calculate the current in each light bulb and hence state the maximum light bulbs that can be tested at the same time without blowing the fuse.

current in each light bulb = _____ [1]

maximum number of light bulbs = _____ [1]

(iii) State the function of the fuse.

_____

_____ [1]

8 Fig. 8.1 shows an electromagnet made of soft iron that is used to operate an electric bell.

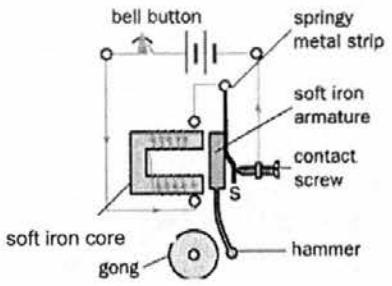


Fig. 8.1

(a) Describe and explain how the bell is able to ring continuously when the bell button is pressed.

[4]

(b) Fig. 8.2 shows the soft iron core of the electromagnet.

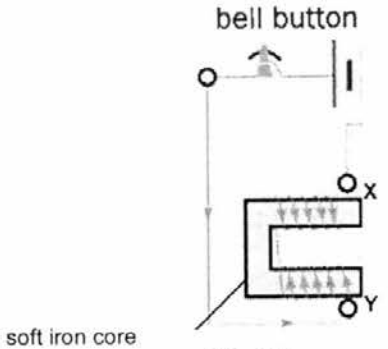


Fig. 8.2

(i) Draw in Fig. 8.2 above the magnetic field formed at the core between X and Y when the current flows. Label the poles of the electromagnet.

[2]

(ii) State why the core of the electromagnet is made of soft iron for the bell to work properly.

[1]

Section B: Free Response Questions [20 marks]

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

9 Fig. 9.1 shows a ladder learning against the wall. The bottom of the ladder is 1.0 m from the wall. The top of the ladder is 4.0 m above the ground.

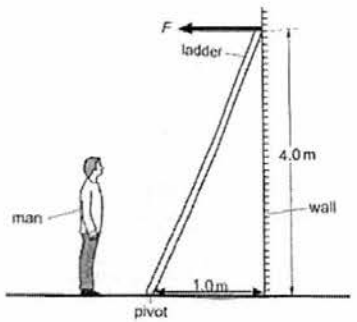


Fig. 9.1

The weight of the ladder is 110 N.

(a) Draw on Fig. 9.1 the line of action of the weight of the ladder and determine the perpendicular distance between the line of action of the weight and pivot.

perpendicular distance = _____ [2]

(b) Explain what is meant by the 'moment of a force'.

_____

_____ [1]

(c) Calculate the value of the force, F, between the wall and the top of the ladder.

F = _____ [2]

(d) A man steps on the ladder and slowly climbs to the top. Suggest with explanation how force F changes, if at all, as the man climbs up the ladder.

_____

_____

_____

_____

_____

_____ [3]

(e) Name and draw the force that stops the ladder from slipping along the group on Fig. 9.1.

[1]

(f) Suggest how this force may be increased to make the use of the ladder safer.

_____

_____ [1]

10 (a) Delivery bags are designed to ensure food that is delivered remain hot. Fig. 10.1 shows a delivery bag.

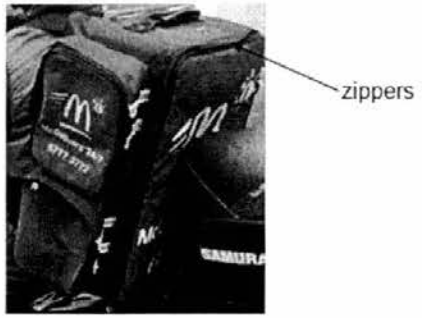


Fig. 10.1

The delivery bag has thick polyester (foam) insulation to ensure maximum thermal retention. In addition, heavy duty zippers provide a secure closure.

(i) Describe and explain how the polyester (foam) insulation prevents heat loss.

_____

_____

_____

_____ [2]

(ii) Explain how the zippers prevent heat loss.

_____

_____ [1]

(iii) What colour should the inner surface of the bag be? Explain your answer.

_____

_____

_____ [2]

(iv) When the food is placed in a vacuum bag, heat can still be transferred to its surroundings. State the main method of heat transfer in this scenario.

_____ [1]

(b) Fig. 10.2 shows the inside of an oven.

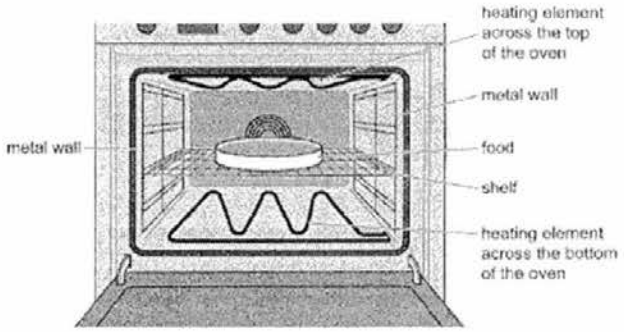


Fig. 10.2

Explain how thermal energy is transferred from the heating element to the food being cooked.

_____

_____

_____

_____

_____

_____

_____

_____ [4]

11 (a) Electromagnetic waves comprise of electric and magnetic fields that oscillate at 90° to each other.

Fig. 11.1 shows the variation of the electric field in ultraviolet (UV) radiation. It is produced by a lamp used for identifying minerals.

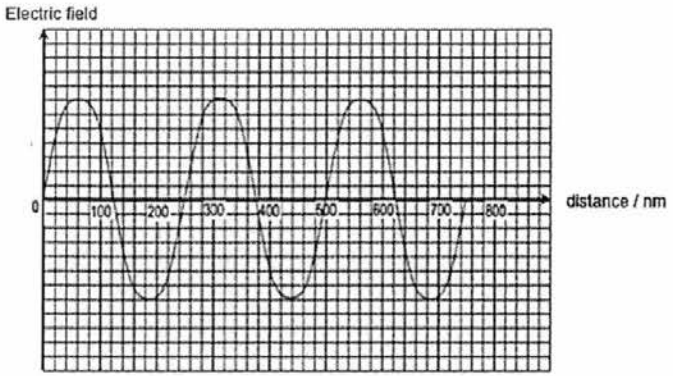


Fig. 11.1

(i) Determine the wavelength of the radiation produced from readings obtained from the graph.

_____ [1]

(ii) Many minerals are fluorescent, which means that they can absorb ultraviolet light and emit visible light. This is due to the change in the energy level of electrons in the minerals. Collectors of minerals and precious stones often use ultraviolet light to help them identify the minerals.
Fig. 11.2 shows the spectrum of white light arranges in ascending order of wavelength.

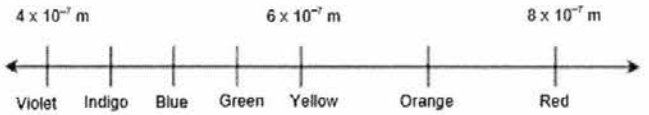


Fig. 11.2

A pure sample of unknown mineral X was placed under an ultraviolet lamp. Under the lamp, the colour of X was observed to be reddish orange.

Based on the spectrum given in Fig. 11.2, estimate the wavelength of light emitted by X.

_____ [1]

(iii) Fig. 11.3 gives the colour of some minerals when placed under the ultraviolet lamp.

Mineral	Colour
Calcite	Orange-red
Diamond	Green
Fluorite	Blue-green
Gypsum	Pale violet / white
Ruby	Red
Talc	Cream / pale yellow
Zircon	Orange

Fig. 11.3

Suggest a possible identity of X.

_____ [1]

(iv) Compare the speed of ultraviolet light produced by the lamp with the speed of light emitted by X.

_____

_____ [1]

(b) State a medical use for each of the following:

(i) ultraviolet rays,

_____ [1]

(ii) visible light, and

_____ [1]

(iii) infrared rays.

_____ [1]

(c) State **three** ways in which light waves are different from sound waves.

_____

_____

_____

_____

_____ [3]

---End of Paper---

Fuhua Secondary School
Secondary 4E5N
Science (Physics)
Preliminary Examinations 2016

Paper 1

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

Paper 2

1. (a) Distance travelled = 0.5 x 12 x 20 M1
= 120 m A1

(b) acceleration = (0 – 20)/12
= - 1.67 M1

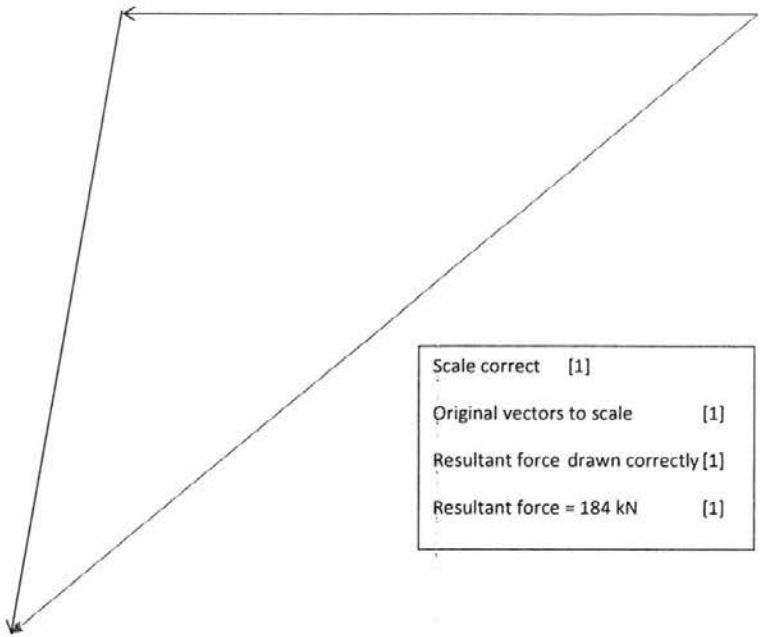
braking force = ma M1
= 1200 (1.67)
= 2000 N A1

(c) as mass increases, inertia of the car increases A1
Since braking force remains unchanged, stopping distance will increase A1

Alternative:

Braking force remains unchanged, mass increases
Therefore acceleration decrease, takes longer time to stop, hence stopping distance increases

2. (a)



Note: Students stated a scale that was different from the scale that they use to draw. Students will be awarded for the scale that they use, but the rest of the question will be penalised since they don't draw according to scale.

(b) The forces acting on the ship are balanced A1
No net resultant force acting on the ship, hence constant speed A1

3. (a) W = mg
0.92 = m (10)
m = 0.092 kg A1

(b) density = m / v
= 0.092 / ((70 – 30)/1000000) M1
= 2300 kg / m^3 A1

(c) volume of the wooden cork measured will be inaccurate as the cork floats on the surface A1

density of the cork will be inaccurate A1

4. (a) K.E. = 0.5 x 3000 x 10^2 M1
= 150 000 J A1

(b) energy cannot be created nor destroyed, can only be converted from one form to another A1

total energy in an enclosed system is constant A1

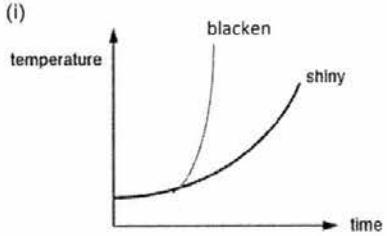
(c) thermal energy A1

sound energy A1

(d) reaction time = 6 / 10
= 0.6 m A1

5. (a) radiation A1

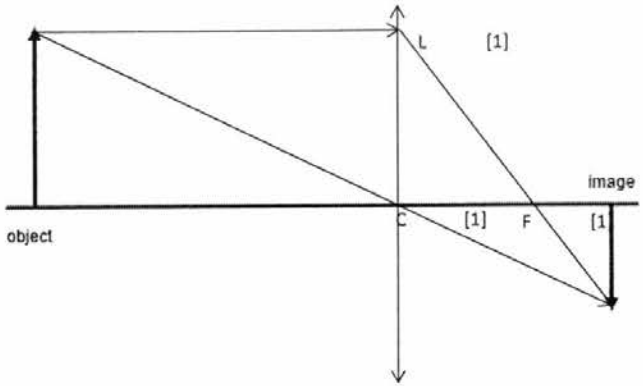
(b) (i)



A1

(ii) The blacken stainless steel material reaches a higher temperature in a shorter time, as a black surface is a good emitter of radiant heat. A1

6. (a)



(b) The size of the image increases A1

7. (a) daily energy consumption = 2669 x 1000 x 60 x 60 M1
= 9608400000
= 9.61×10^9 J A1

(b) (i) it means that the energy used by the device is 11 J per second if the voltage supply is 240 V A1

(ii) current in each bulb = 11 / 240
= 0.0458 A A1

No. of bulbs = 13 / 0.0458
= 283 A1

(iii) To prevent excessive current flowing in the circuit A1

8. (a) current flows, soft iron magnetize A1
soft iron attracts soft iron armature A1
hammer hits gong, bell rings A1
contact between armature and contact screw opens, soft iron core demagnetize and armature returns to original position. Process repeats A1

(b) (i) magnetic field with direction [1]
Poles [1]

(ii) easily magnetise and demagnetise hence easier for the bell to work properly A1

9. (a) draw the position of weight correctly A1
0.5 m A1

(b) the product of the force applied and the perpendicular distance to the pivot A1

(c) F x 4 = 110 x 0.5 M1
F = 13.8 N (13.75 N)
A1

(d) F increases as the man climbs up the ladder A1

Applying Principle of Moments, sum of clockwise moments increases due to the man moving, hence anti-clockwise moments increases. A1

Perpendicular distance remains the same, hence F increases A1

(e) draw and label (friction) correctly A1

(f) apply a friction mat at the bottom of the ladder to increase the friction between the ladder and the floor A1

10. (a) (i) polyester contains air A1
which are poor conductors of thermal energy A1

(ii) prevents air from escaping, hence reducing heat loss due to convection A1

(iii) shiny white A1
poor absorber of radiant heat A1

(iv) radiation A1

(b) air near the bottom element heats up and rises, A1
cooler air near the food sinks A1
forming convection current A1

Radiation from both the top and bottom element A1

11. (a) (i) 250 nm A1

(ii) 7.5×10^{-7} m A1

(iii) calcite A1

(iv) the speed of both light in air is the same A1

(b) (i) sterilisation of medical equipment A1

(ii) endoscopy using optical fibre A1

(iii) ear thermometers A1

(c) sound cannot through vacuum A1
Sound and light travel at different speeds in the same medium A1
Sound is a longitudinal wave whereas light is a transverse wave A1

Candidate Name _____ Class | Index Number

FUHUA SECONDARY SCHOOL

Secondary Four Express & Five Normal (A)

Preliminary Examination 2016

E/NA

Science (Physics) **5076/05**

Paper 5 Practical Examination

DATE **31 Aug 2016**

DURATION **45 min**

No Additional Material is required.

INSTRUCTIONS TO CANDIDATES

Write your name and register number in the spaces provided on top of this page.
Write in dark blue/black pen in the spaces provided on the question paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in this paper. Write your answers in the space provided in the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
You are advised **not** to spend more than 45 minutes on this chemistry practical.

PARENT'S SIGNATURE	FOR EXAMINER'S USE	Highest Mark
	/ 15	Lowest Mark

Setter: Mr Tan Thiam Chye *Vetter: Mr Raymond Loh*

This question paper consists of 5 printed pages including this page.

1 In this experiment, you will determine the cross-sectional area of a piece of resistance wire using the apparatus shown in Fig. 1.1.

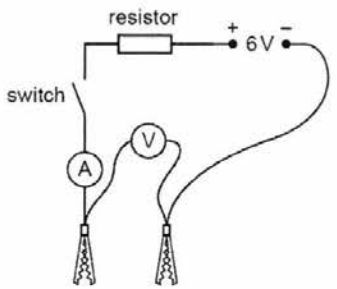


Fig. 1.1

(a) Referring to Fig. 1.1, connect one crocodile clip at the 0.0 cm point on the rule, with most of the length of the wire pointing along the rule. This will become point **X**.

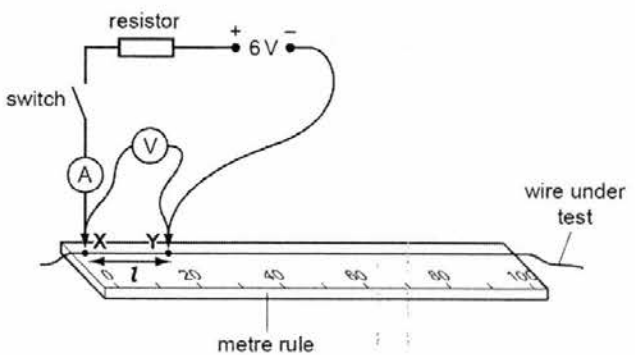


Fig. 1.2

(i) Complete the circuit by pressing the jockey firmly onto the resistance wire at Point **Y** as shown in Fig. 1.2. Make sure that the length, L, between point **X** and point **Y** is 10.0 cm.

(ii) Close the switch and read the current, I, on the ammeter and the potential difference, V, on the voltmeter. Record these readings in Table 1.1.

[1]

(iii) Open the switch.

Table 1.1

length of wire, L / cm	potential difference, V / V	current, I / A	resistance, R / Ω
10.0			
20.0			

(iv) Repeat the procedure described in **(i)**, adjusting **Y** so that the length, L, is 20.0 cm. Close the switch and read the current, I, on the ammeter and the potential difference, V, on the voltmeter. Record these readings in Table 1.1.

[1]

(v) Open the switch.

(vi) Repeat **(i)** for 4 more sets of readings, for a range of L from 20.0 cm to 60.0 cm. For each length, L, record the current, I, and the potential difference, V, in Table 1.1.

[2]

(vii) Calculate the resistance, R, of each length of the resistance wire and enter the values in Table 1.1.

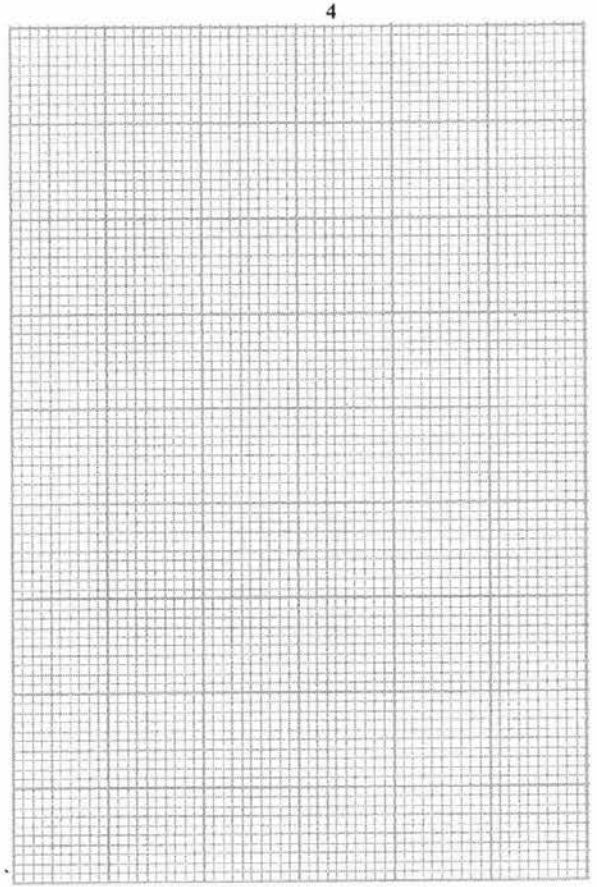
Use the formula below,

$$\text{resistance, } R = \frac{V}{I}$$

[1]

(viii) Open the switch.

(b) (i) Plot a graph of resistance, R, (vertical axis) against length of wire, L, (horizontal axis). Draw a best fit straight line that passes through the origin.



[3]

(ii) Find the gradient of the line and show your workings clearly either on the graph or below.

gradient = _____ **[2]**

(iii) Calculate the cross-sectional area, C, of the resistance wire using the formula given below,

$$C = \frac{0.00011}{gradient}$$

C = _____ [2]

(c) (i) Identify **one** significant source of error in this experiment.

_____

_____

_____ [1]

(ii) Suggest an improvement to the experiment that would reduce the error you identified in part **(c)(i)**.

Explain why your suggestion would reduce this error.

improvement

_____

_____

explanation

_____

_____

_____ [2]

1 In this experiment, you will determine the cross-sectional area of a piece of resistance wire using the apparatus in Fig. 1.1.

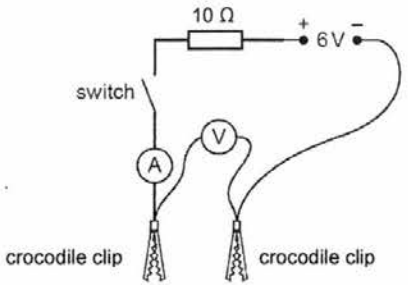


Fig. 1.1

(a) Referring to Fig 1.2, connect one crocodile clip at the 0 cm point on the rule, with most of the length of the wire pointing along the rule. This will become the point **X**.

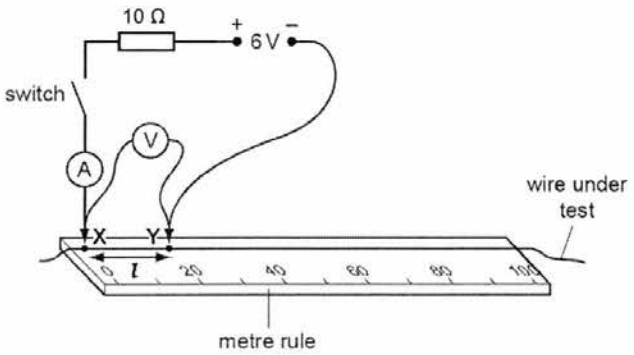


Fig. 1.2

(i) Complete the circuit by pressing the jockey firmly on to the resistance wire at point **Y** shown in Fig 1.2. Make sure that the length, l, between point **X** and point **Y** is 10.0 cm.

(ii) Close the switch and read the current, I, on the ammeter and the potential difference, V, on the voltmeter. Record these readings in Table 1.1. [1]

Ans: V and I reading for 10 cm, same order of magnitude as marker, and V > I

(iii) Open the switch.

Table 1.1

length of wire l / cm	potential difference, V / V	current, I / A	resistance, R / Ω
10.0	0.5	0.36	1.39
20.0	0.8	0.35	2.29
30.0	1.0	0.34	2.94
40.0	1.3	0.32	4.06
50.0	1.6	0.30	5.33
60.0	1.8	0.27	6.67
	(1 d.p)	(2 d.p)	(3 s.f -> 2 d.p)

(iv) Repeat the procedure described in **(i)**, adjusting point **Y** so that the length, l, is 20 cm. Close the switch and read the current, I, on the ammeter and the potential difference, V, on the voltmeter. Record these readings in Table 1.1. [1]

Open the switch.
Ans: V and I reading for 20 cm, same order of accuracy as marker, and V > I

(v) Repeat **(i)** for a range of l from 20.0 cm to 60.0 cm. For each length, l, record the current, I, and the potential difference V, in Table 1.1. [2]

Open the switch.
Ans: V and I reading for 30, 40, and 100 cm, V increases and I *decreases down the table*

Note: -1 for inaccuracy in sf, units for all columns

(vi) Calculate the resistance, **R**, of each length of the resistance wire and enter the values in Table 1.1.

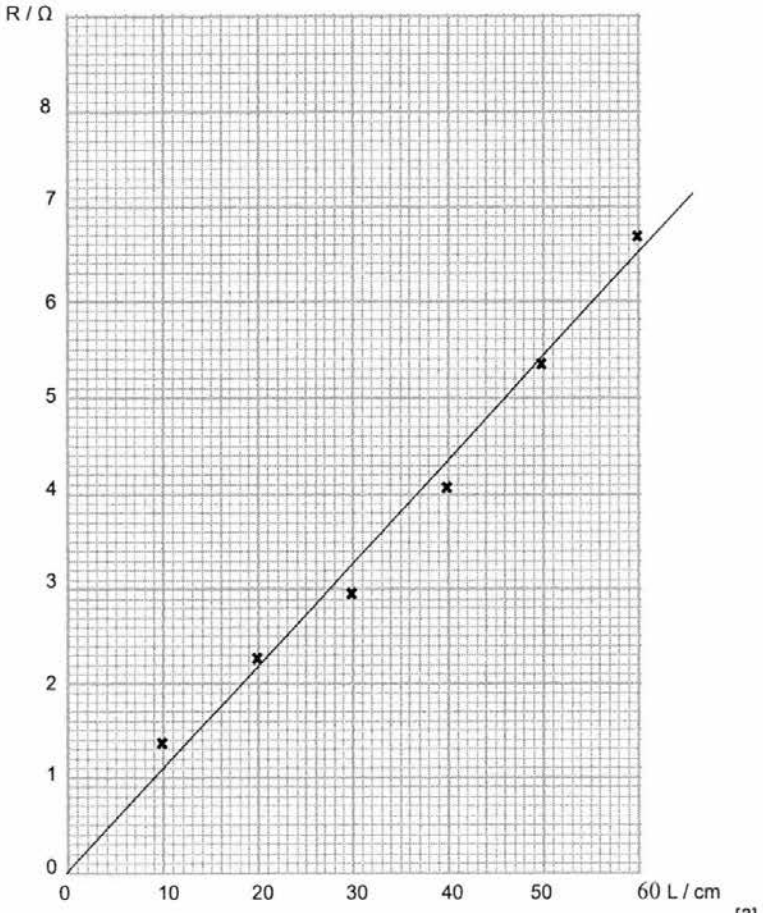
Use the formula below.

$$\text{resistance, } R = \frac{V}{I}$$

[1]

Ans: All R values calculated and 2 s.f./1 d.p

(b) (i) Plot a graph of resistance, **R**, (vertical axis) against length of wire, l. Draw a straight line of best fit. Your line should pass through the origin.



[3]

axis labels: correct labels of both axes [1]
points: 4 points plotted correctly within ½ square [1]
line: best fit straight line passing through origin within ½ square [1]

(ii) Find the gradient of the line and show clearly your working either on the graph or below.

working shown on graph or below graph [1]
gradient calculated correctly [1]

gradient = ...0.1074 .....[2]

(iii) Calculate the cross-sectional area, **C**, of the resistance wire using the formula given below.

$$C = \frac{0.000110}{\text{gradient}}$$

C calculated correctly to 2 or 3 s.f. [1]
C is within 10% of marker's result [1]
(0.000918 – 0.001122)

C = ...0.00102 (1.02 x 10^{-3}) ..... [2]

Note: No penalty for missing units

(c) (i) Identify **one** significant source of error in this experiment.

Error in reading the exact value of contact point between the crocodile clip and the wire due to the wide contact surface area of the clip.

OR Error in reading the accurate value of length of the wire due to the wire being slack.

OR any acceptable source of error [1]

.....[1]

(ii) Suggest an improvement to the experiment that would reduce the error you identified in part **(c)(i)**.

Explain why your suggestion would reduce this error.

improvement ... Straighten the wire by pulling the 2 ends of the wire just beyond the metre rule.

OR any acceptable improvement [1].....

explanation ... Straightened wire will give a more accurate reading of the length of the wire under examination.

OR any acceptable explanation [1].....

.....[2]