Geylang Methodist School (Secondary)
Preliminary Examination 2016

5076/01

SCIENCE (PHYSICS, CHEMISTRY)

Paper 1 Multiple Choice

Sec 4 Express
Sec 5 Normal (A)

Additional materials: Optical Answer Sheet

1 hour

Setter : Mr Sng Peng Hock
Miss Ng Peck Suan

11 August 2016

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

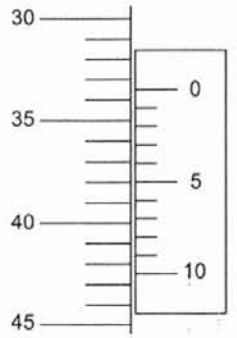
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

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 **18**.

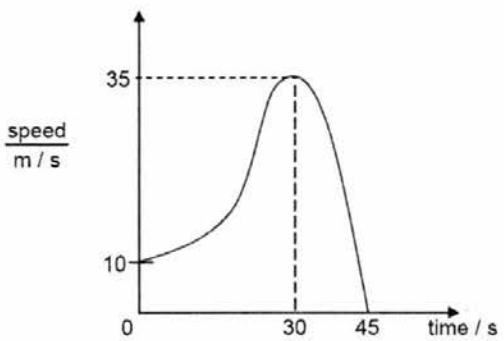
1 The diagram shows a vernier scale.



Which is the correct reading?

A 31.5 mm **B** 33.5 mm **C** 38.5 mm **D** 44.5 mm

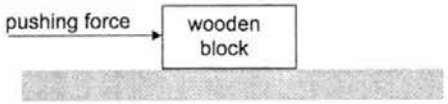
2 The speed-time graph of a car is shown below.



What is the acceleration of the car when time is 30 s?

A 0 m/s^2 **B** 0.83 m/s^2 **C** 0.86 m/s^2 **D** 1.17 m/s^2

3 The diagram below shows a wooden block being pushed across a table at constant speed.



Which statement is correct?

A The frictional force increases as the block moves at constant speed.

B The frictional force is equal and opposite to the pushing force.

C The frictional force is greater than the pushing force.

D The frictional force is less than the pushing force.

4 Which statement about gravitational field is correct?

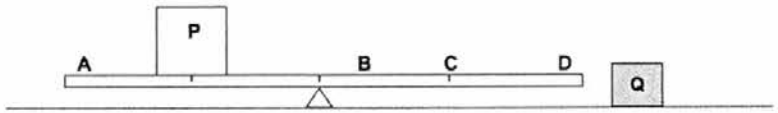
A There is no gravitational field in a vacuum.

B There is no gravitational field on the moon.

C The effects of gravitational field on magnetic and non-magnetic materials are the same.

D The gravitational field is the same for all regions in space.

5 A uniform beam is pivoted at its midpoint. Cube **P** is placed on the beam as shown and cube **Q**, which is smaller in size, has the same density as cube **P**.



At which position should cube **Q** be placed so as to balance the beam horizontally?

6 To prevent large trucks from sinking into the ground at a construction site, large wooden boards are placed on the ground for the trucks to go over.

How does this prevent the trucks from sinking?

A The boards increase the surface area of the ground.

B The boards increase the contact area between the trucks and the ground.

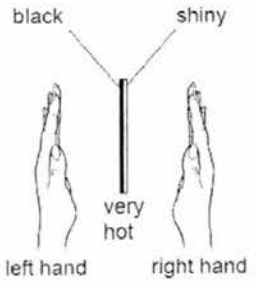
C The boards decrease the force acting the ground.

D The boards are harder than the ground.

7 How long will a motor with an output power of 2000 W take to lift a 320 kg container vertically upwards with uniform speed for 26 m?

A 4.2 s **B** 16.3 s **C** 41.6 s **D** 162.5 s

8 The diagram below shows a thick copper plate that is very hot. One side is black, the other is shiny. A student places her hands the same distance from each side. Her left hand feels warmer than her right hand.



Which statement is the correct conclusion from the experiment?

A The black side is hotter than the shiny side.

B The black side radiates more radiant heat

C The shiny side is cooling down faster than the black side.

D The shiny side radiates more radiant heat.

9 Which of the following statements describe the kinetic model of matter during boiling?

A The forces of attraction between particles became very strong.

B The distance between particles became closer.

C The particles became orderly arranged.

D The particles initially slide past one another but changed to moving freely at high speed in random directions.

10 Which statement about boiling and evaporation is true?

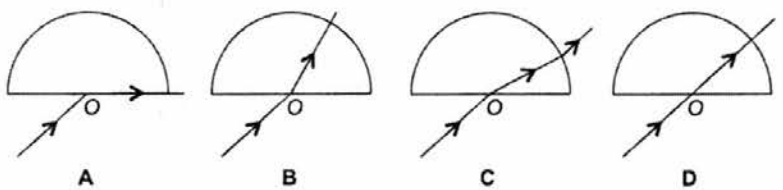
A Liquids do not evaporate when it is below room temperature.

B Liquids require heating in order to evaporate.

C Bubbles are formed during boiling whereas no bubble is formed during evaporation.

D Bubbles are formed during evaporation whereas no bubble is formed during boiling.

11 Which of the following diagrams shows the possible path of a light ray incident at centre *O* of a semi-circular glass block?



12 A ripple tank is creating a water wave with a frequency of 4 Hz.

Which of the following statements describes correctly how the water wave will change when the frequency of the ripple tank doubles?

A The wavelength of the water wave reduces by half.

B The amplitude of the water wave doubles.

C The period of the water wave doubles.

D The speed of the water wave doubles.

13 Which waves travel at the same speed in air?

A sound waves and radio waves

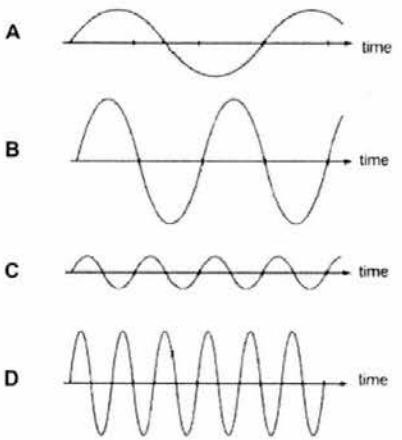
B sound waves and microwaves

C red light and infrared radiation

D ultrasound and ultraviolet radiation

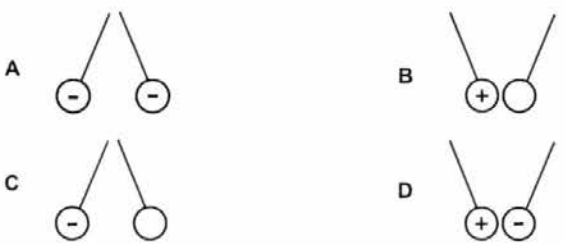
14 The diagrams represent the waves produced by four different sources of sound. The scales are the same for all diagrams.

Which sound has the highest pitch?



15 Eight spheres, four negatively charged, two positively charged and two neutral were paired and placed near one another.

Which of the following scenarios is not possible?

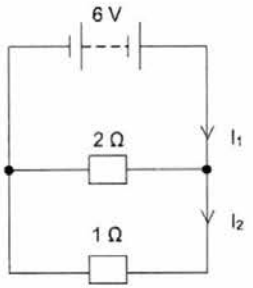


16 A wire of resistance R has length L and cross-sectional area A. The wire is then stretched to twice its length and half its cross-sectional area.

What is the resistance of the wire after it is being stretched?

A $\frac{1}{2}R$ **B** R **C** $2R$ **D** $4R$

17 Two resistors, 2 Ω and 1 Ω, are connected to a battery with E.M.F. of 6 V in an electrical circuit.



What is the current I_1 and I_2 in the circuit?

A $I_1 = 2$ A and $I_2 = 2$ A **B** $I_1 = 3$ A and $I_2 = 6$ A

C $I_1 = 9$ A and $I_2 = 3$ A **D** $I_1 = 9$ A and $I_2 = 6$ A

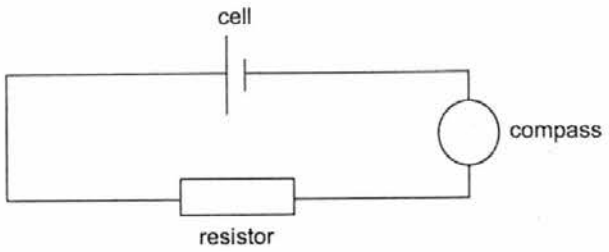
18 An electric coffee maker has a sticker at the back showing the following information:

220 – 240 V
50 – 60 Hz
675 W

What is the best fuse rating for a fuse used in the plug of the coffee pot?

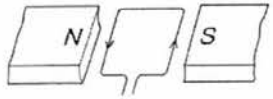
A 1 A **B** 3 A **C** 5 A **D** 13 A

19 The diagram shows a compass placed above a current carrying wire.



At which direction will the compass point towards? Ignore effects of the Earth's magnetic field.

20 A rectangular coil is placed between the poles of a magnet. A current passes through the coil, as shown.



What happens to the coil?

A It moves upwards.

B It moves downwards.

C It rotates clockwise.

D It rotates anticlockwise.

End of paper

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Geylang Methodist School (Secondary)
Preliminary Examination 2016

Candidate Name			
Class		Index Number	

SCIENCE **5076/02**

Paper 2 Physics **Sec 4 Express Sec 5 Normal (A)**

Additional materials : Writing papers **1 hour 15 minutes**

Setter : Mr Yip CH **28 July 2016**

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. Write your answers in the spaces provided on the question 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

SECTION A
Answer **ALL** questions in this section in the spaces provided.

1 A car travels at 15 m/s for 2 minutes. It then accelerates uniformly to a speed of 30 m/s in 1 minute. It travels at a uniform speed of 30 m/s for a further 7 minutes before decelerating non-uniformly to rest in 1.5 minutes

(a) On the grid of Fig. 1.1, plot the graph to show the variation with time of the speed of the car. [3]

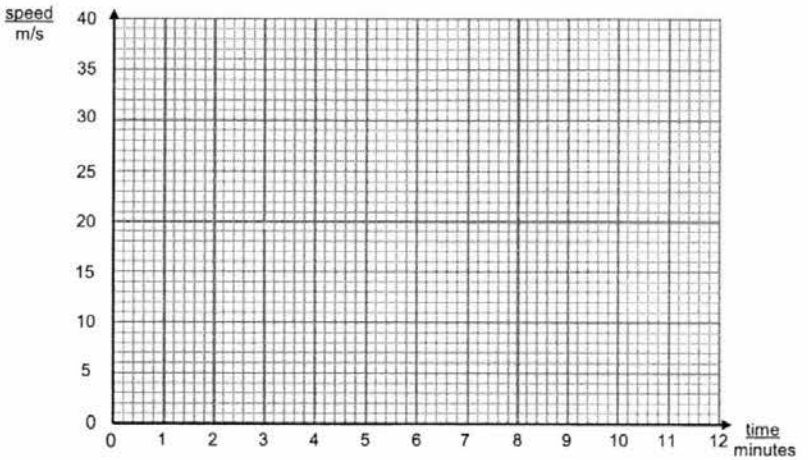


Fig. 1.1

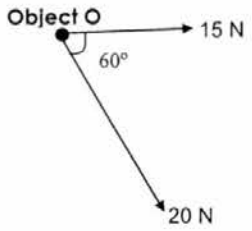
(b) Calculate the acceleration of the car as it increases its speed from 15 m/s to 30 m/s.

acceleration = ...[2]

(c) Calculate the distance moved by the car between the 2nd and the 3rd minute.

distance = ...[3]

2 The diagram (not drawn to scale) shows two forces of magnitude 15 N and 20 N, acting on a small object **O** at an angle of 60°.



Draw a vector diagram to scale in order to determine the resultant force acting on object **O**. State the scale used. [4]

scale: 1 cm represents ..... N

resultant force = ... N

3 Fig. 3.1 shows a cylinder filled with water. The bottom of the cylinder rests on a block of ice at 0 °C.

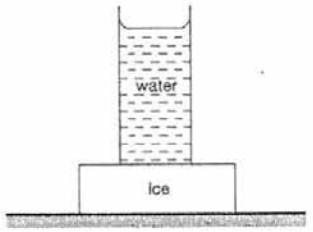


Fig. 3.1

Assume that the cylinder has been in place for a long time, and the room temperature is steady at about 30 °C.

(a) Name the main process of heat transfer between the water and the ice and state the direction with which heat transfer is occurring.

.....

..... [2]

(b) Explain why the temperature of the water near the top of the cylinder remains at about 30 °C.

.....

.....

..... [2]

4 Fig. 4.1 shows the image **I** of an object **O** produced by a converging lens **L**.

Fig. 4.1

(a) Complete Fig. 4.1 to show two rays passing from the object to the image. [2]

(b) Indicate on Fig. 4.1 the focal length of the lens and label it **L**. [1]

(c) State the characteristics of the image formed. [2]

.....

.....

(d) Name one use of this type of lens. [1]

.....

5 Ultrasound scanning is a technique used in the medical field to obtain information about the internal structure of the human body without the need for surgery.

An ultrasound of 3.0 MHz is beamed into a body from a transmitter placed on the body surface. The time taken for the sound reflected by different surfaces in the body to return to the transmitter is measured.

(a) The average speed of sound in the body is 1500 m/s. Calculate the wavelength of the ultrasound waves travelling in the body.

wavelength = ...[2]

(b) When a short pulse of the ultrasound is beamed into the body, a reflected sound wave is received by the transmitter 0.1 ms later. Calculate the distance from the body surface to the reflecting surface.

distance = ...[2]

(c) State **one** similarity and **one** difference between ultraviolet rays and sound waves.

.....

.....[2]

6(a) Figure 6.1 shows an arrangement that is used to remove dust particles from the smoke in a factory chimney

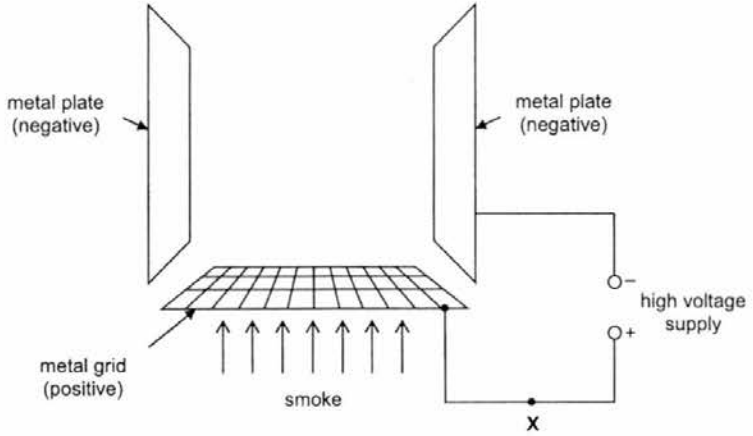


Fig. 6.1

When smoke passes through the metal grid, this results in the dust particles having a net positive charge.

(i) Explain how the dust particles end up with a net positive charge as they pass through the grid.

.....

.....

..... [1]

(ii) If 6 C of charges flow past **X** in 1 minute, calculate the current flowing through **X**.

current = ... A [2]

6(b) Fig. 6.2 shows a magnified view of very small dust particles suspended in still air, as seen under a microscope.

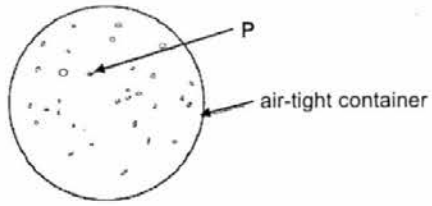


Fig. 6.2

(i) Draw a diagram to show how the particle labeled P would move as it is observed for a short time in **Fig 6.3** below. [1]

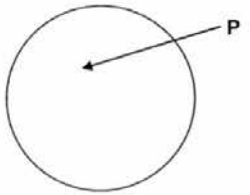


Fig. 6.3

(ii) With reference to dust particles and air particles, explain the movement which you have drawn.

.....

.....

.....[2]

(iii) Describe and explain how the movement would change when the temperature is increased.

.....

.....

.....[2]

7 Fig. 7.1 shows an electrical circuit containing four resistors R_1, R_2, R_3 and R_4 connected to a 12 V cell.

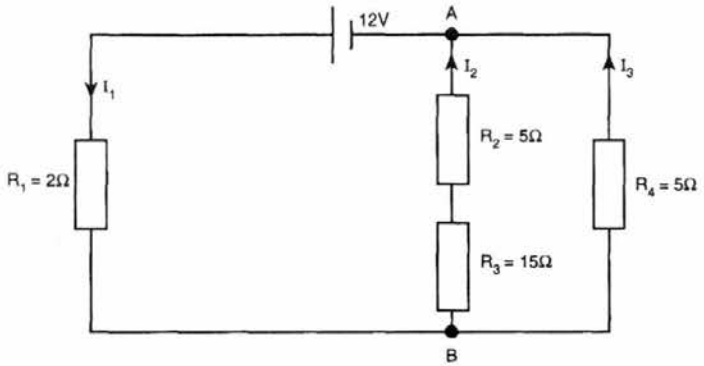


Fig. 7.1

Calculate

(a) the effective resistance of the circuit,

effective resistance = ... [2]

(b) the potential difference across R_1, R_2 and R_4,

p.d. across R_1 = ...

p.d. across R_2 = ...

p.d. across R_4 = ... [3]

8 Fig. 8.1 shows a simple ammeter. It consists of a bent copper wire ABCD that is suspended freely from two metal rings X and Y above the south pole of a magnet.

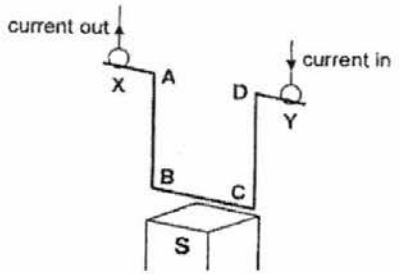


Fig. 8.1

(a) Indicate with an arrow the direction that section BC of the wire in Fig. 8.1 would move when the current flows in the direction shown above. [1]

(b) Briefly explain how the set-up in Fig. 8.1 could be used to measure current.

.....

.....[1]

(c) State and explain a change that could be made so that the set-up would be more sensitive to a small change in current.

.....

.....[2]

End of Section A

SECTION B

Answer any **two** questions.
Write your answers in the spaces provided on the question paper.

9(a) An iron rod is placed near to a bar magnet, as shown in Fig. 9.1.

Fig. 9.1

On Fig. 9.1,

(i) mark clearly the north pole and the south pole that are induced in the iron rod. [1]

(ii) draw the magnetic field between the bar magnet and iron rod. [1]

(b) State what is meant by magnetic field and the direction of force that the iron rod will experience.

.....

..... [2]

(c) The iron rod is removed and replaced by a charged plastic rod, as shown in Fig. 9.2.

Fig. 9.2

State and explain if anything will happen to the charged plastic rod.

.....

.....[2]

9(d) Fig. 9.3 shows two groups of materials.

Fig. 9.3

(i) Which group of materials above may be charged by rubbing it with a suitable dry cloth?

..... [1]

(ii) Two charged balls are placed close to a positively-charged rod as shown in Fig 9.4. One is attracted to the plate and one is repelled.

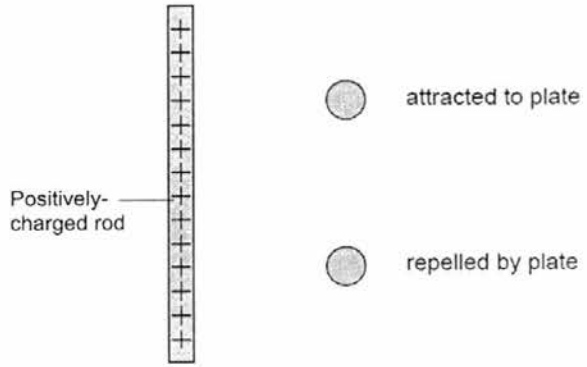


Fig. 9.4

Write a + sign on the ball that is positively charged and a – sign on the one that is negatively charged. [1]

(iii) State what is meant by an electric field.

.....

..... [1]

(iv) On Fig. 9.4, draw the electric field between the charged rod and the charged ball that is repelled. [1]

10 Fig. 10.1 shows the electrical wiring in a 240 V, 2200 W washing machine. The Earth wire is connected to the metal casing of the washing machine. Both the Live and Neutral wires are connected to its heating element.

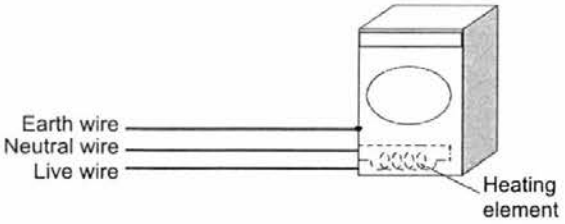


Fig. 10

(a) On which wire should the fuse be placed on? Explain your answer.

.....

.....[2]

(b) Describe how the Earth wire works in order to protect the user.

.....

.....

.....[2]

(c) State the current that flows in each of the wires when the washing machine is working normally. Show clear workings (if any).

current in Earth wire = ...
current in Neutral wire = ...
current in Live wire = ...[3]

(d) The washing machine is used 4 times a week. The time taken by the washing machine to complete 1 cycle of washing, rinsing and spinning is 1 hour 15 minutes. Assuming that the washing machine completes 1 full cycle each time it is being used, calculate the cost of using the washing machine in a week if the cost of a unit of electricity is 25 cents.

cost = ...[3]

11 (a) Fig. 11.1 shows a tower used for bungee jumping. Ignore air resistance.

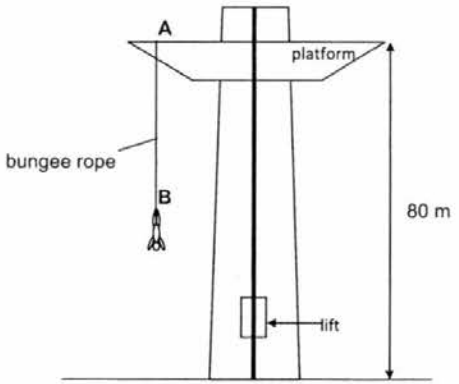


Fig. 11.1

A lift takes a man of mass 70 kg to a platform 80 m above the ground.

(i) Calculate the increase in the gravitational potential energy of the man from the ground to the platform.

increase in gravitational potential energy = ...[2]

(ii) The man jumps from A and reaches a maximum speed of 20 m/s at B. Calculate the maximum kinetic energy of the man at B.

maximum kinetic energy = ...[2]

(iii) Hence, calculate the length of the bungee rope when the man is at his maximum speed.

length = ...[2]

(b) Fig. 11.2 below shows a manual car park barrier.

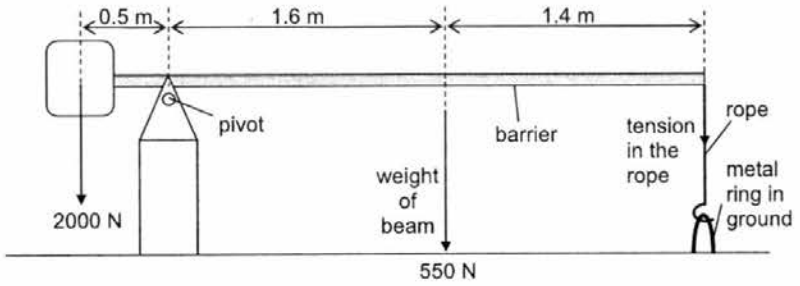


Fig. 11.2

(i) The weight of the barrier beam is 500 N and 1.6 m to the right of the pivot. Calculate the tension needed in the rope in order to keep the beam horizontal.

tension = ... [3]

(ii) Describe what will happen if the rope is suddenly detached from the metal ring.

.....

..... [1]

END OF PAPER

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Geylang Methodist School (Secondary)
Preliminary Examination 2016

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 : Mr Yip CH

28 July 2016

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

SECTION A
Answer **ALL** questions in this section in the spaces provided.

1 A car travels at 15 m/s for 2 minutes. It then accelerates uniformly to a speed of 30 m/s in 1 minute. It travels at a uniform speed of 30 m/s for a further 7 minutes before decelerating non-uniformly to rest in 1.5 minutes

(a) On the grid of Fig. 1.1, plot the graph to show the variation with time of the speed of the car. [3]

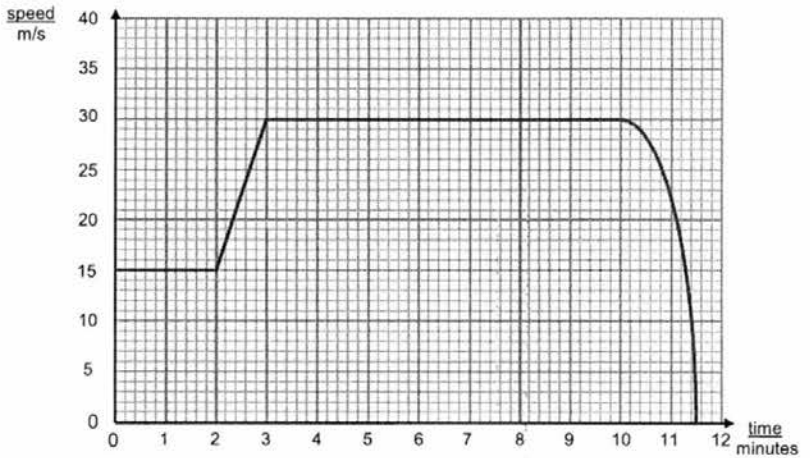


Fig. 1.1

(b) Calculate the acceleration of the car as it increases its speed from 15 m/s to 30 m/s.

$a = (v - u) / t$
$= (30 - 15) / 60$
$= 0.25\ m/s^2$

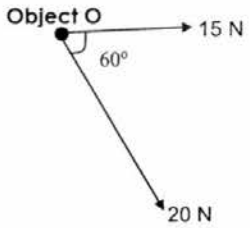
acceleration = ... [2]

(c) Calculate the distance moved by the car between the 2nd and the 3rd minute.

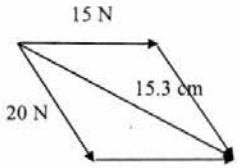
distance = area under graph
= ½ x (15+30) x 60
= 1350 m

distance = ... [3]

2 The diagram (not drawn to scale) shows two forces of magnitude 15 N and 20 N, acting on a small object **O** at an angle of 60°.



Draw a vector diagram to scale in order to determine the resultant force acting on object **O**. State the scale used. [4]



Scale :1 cm rep 2 N
Resultant force = 30.6 N

scale: 1 cm represents ..... N

resultant force = ... N

3 Fig. 3.1 shows a cylinder filled with water. The bottom of the cylinder rests on a block of ice at 0 °C.

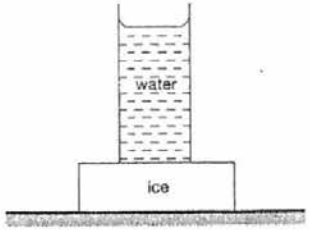


Fig. 3.1

Assume that the cylinder has been in place for a long time, and the room temperature is steady at about 30 °C.

(a) Name the main process of heat transfer between the water and the ice and state the direction which heat transfer is occurring.

The main process is conduction and the direction is downwards

.....

.....[2]

(b) Explain why the temperature of the water near the top of the cylinder remains at about 30 °C.

Cold water sinks, and warmer water rises to the top, hence warm water remains on top while cold water remains at the bottom no convection current is set up.

.....

.....

..... [2]

4 Fig. 4.1 shows the image **I** of an object **O** produced by a converging lens **L**.

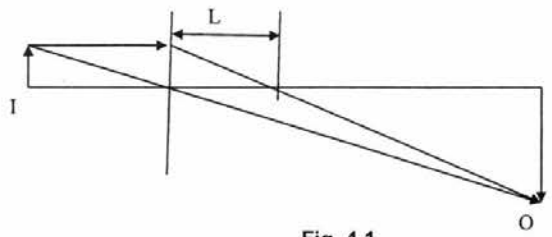


Fig. 4.1

(a) Complete Fig. 4.1 to show two rays passing from the object to the image. [2]

(b) Indicate on Fig. 4.1 the focal length of the lens and label it **L**. [1]

(c) State the characteristics of the image formed. [2]

Inverted, real, diminished

.....

.....

(d) Name one use of this type of lens. [1]

Camera / Eye

.....

5 Ultrasound scanning is a technique used in the medical field to obtain information about the internal structure of the human body without the need for surgery.

An ultrasound of 3.0 MHz is beamed into a body from a transmitter placed on the body surface. The time taken for the sound reflected by different surfaces in the body to return to the transmitter is measured.

(a) The average speed of sound in the body is 1500 m/s. Calculate the wavelength of the ultrasound waves travelling in the body.

$v = f\lambda$
$\lambda = 1500 / 3 \times 10^6$
$= 5 \times 10^{-4}$ m

wavelength = ...[2]

(b) When a short pulse of the ultrasound is beamed into the body, a reflected sound wave is received by the transmitter 0.1 ms later. Calculate the distance from the body surface to the reflecting surface.

$v = 2d / t$
$2d = v \times t = 1500 \times 0.1 \times 10^{-3}$
$d = 0.075$ m

distance = ...[2]

(c) State **one** similarity and **one** difference between ultraviolet rays and sound waves.

Similarity (any one of the following):
- **transfer energy,**
- **obeys wave equation, v =fλ,**
- **obey the laws of reflection**
- **obeys the laws of refraction**

Difference (any one of the following)
- **Ultraviolet ray is transverse wave but sound wave is longitudinal wave.**
- **Ultraviolet ray can travel through vacuum but sound cannot,**
- **The speed of ultraviolet is about 3 x10^8 m/s but speed of sound is about 300 m/s when travelling in air,**

.....

.....[2]

6(a) Figure 6.1 shows an arrangement that is used to remove dust particles from the smoke in a factory chimney

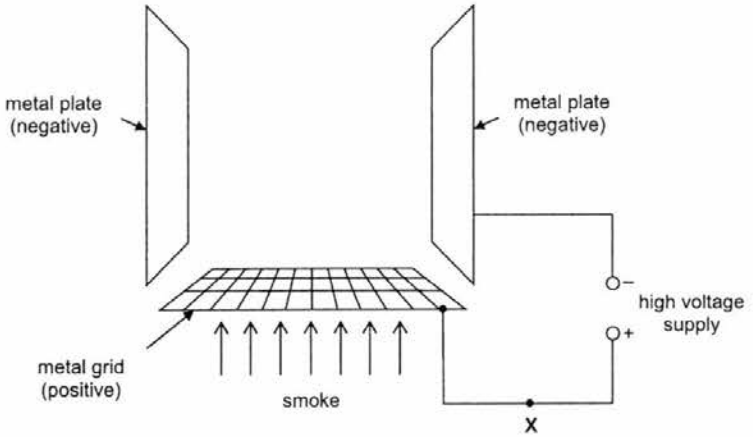


Fig. 6.1

When smoke passes through the metal grid, this results in the dust particles having a net positive charge.

(i) Explain how the dust particles end up with a net positive charge as they pass through the grid.

When the dust particles come into contact with the grid, they **lose electrons** to the grid. Thus the particles will have **less negative charges than positive charges** [B1] and end up with a new positive charge.

..... [1]

(ii) If 6 C of charges flow past **X** in 1 minute, calculate the current flowing through **X**.

I = Q / t
= 6 / (1 x 60)
= **0.1 A**

current = ... A [2]

6(b) Fig. 6.2 shows a magnified view of very small dust particles suspended in still air, as seen under a microscope.

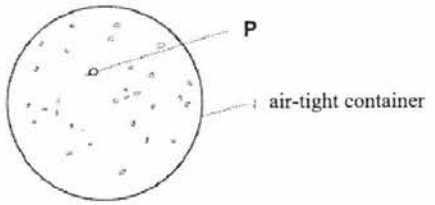


Fig. 6.2

(i) Draw a diagram to show how the particle labeled P would move as it is observed for a short time in **Fig 6.3** below. [1]

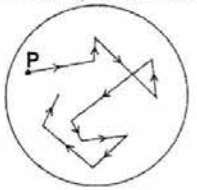


Fig. 6.3

(ii) With reference to dust particles and air particles, explain the movement which you have drawn.

The dust particles are constantly hit by fast moving air particles.
The dust particles **change direction** after each collision and **move randomly**.

..... [2]

(iii) Describe and explain how the movement would change when the temperature is increased.

The air particles will **gain kinetic energy** and **move faster**.
The dust particles will **move more vigorously**

..... [2]

7 Fig. 7.1 shows an electrical circuit containing four resistors R_1, R_2, R_3 and R_4 connected to a 12 V cell.

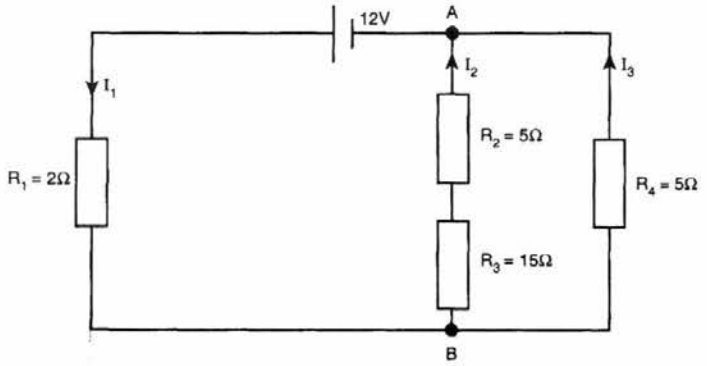


Fig. 7.1

Calculate

(a) the effective resistance of the circuit,

$$\frac{1}{R_s} = \frac{1}{20} + \frac{1}{5}$$

$$= \frac{5}{20}$$

$$R_s = 4\,\Omega \quad [1]$$

$R_T = 2 + 4 = 6\ \Omega$ **[1]**

effective resistance = ... [2]

(b) the potential difference across R_1, R_2 and R_4,

$$I_1 = \frac{V_T}{R_T'}$$

$$= \frac{12}{6}$$

$$= 2.0\,A \quad [1]$$

Hence p.d. across R_1 = 2 A x 2 Ω = 4 V [1]
I_2 = 5/25 x I_1 = 0.4 A, hence p.d. across R_2 = 0.4 A x 5 Ω = 2 V [1]
I_3 = 20/25 x I_1 = 1.6 A, hence p.d. across R_4 = 1.6 A x 5 Ω = 8 V [1]

p.d. across R_1 = ...

p.d. across R_2 = ...

p.d. across R_4 = ...

[3]

8 Fig. 8.1 shows a simple ammeter. It consists of a bent copper wire ABCD that is suspended freely from two metal rings X and Y above the south pole of a magnet.

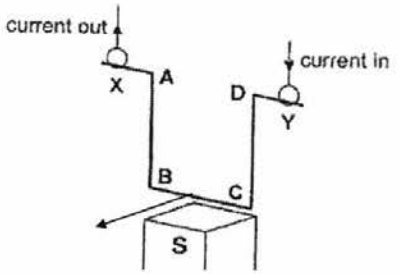


Fig. 8.1

(a) Indicate with an arrow the direction that section BC of the wire in Fig. 8.1 would move when the current flows in the direction shown above. [1]

(b) Briefly explain how the set-up in Fig. 8.1 could be used to measure current.

Size of force is related to size of current, force is greater when current is higher.

..... [1]

(c) State and explain a change that could be made so that the set-up would be more sensitive to a small change in current.

Use stronger magnet / use more coils; Greater force produced

.....[2]

End of Section A

SECTION B

Answer any **two** questions.
Write your answers in the spaces provided on the question paper.

9(a) An iron rod is placed near to a bar magnet, as shown in Fig. 9.1.

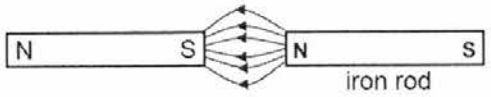


Fig. 9.1

On Fig. 9.1,

(i) mark clearly the north pole and the south pole that are induced in the iron rod. [1]

(ii) draw the magnetic field between the bar magnet and iron rod. [1]

(b) State what is meant by magnetic field and the direction of force that the iron rod will experience.
It is a region of space where a magnetic material experiences a magnetic force (1). The iron rod will experience an attraction towards the magnet (1).
.....
..... [2]

(c) The iron rod is removed and replaced by a charged plastic rod, as shown in Fig. 9.2.

Fig. 9.2

State and explain if anything will happen to the charged plastic rod.
Nothing (1). The charged plastic rod is not a magnetic material (1).
.....
..... [2]

9(d) Fig. 9.3 shows two groups of materials.

GROUP 1	GROUP 2
copper	plastics
iron	silk
gold	glass
aluminium	ebonite

Fig. 9.3

(i) Which group of materials above may be charged by rubbing it with a suitable dry cloth?
Group 2
..... [1]

(ii) Two charged balls are placed close to a positively-charged rod as shown in Fig 9.4. One is attracted to the plate and one is repelled.

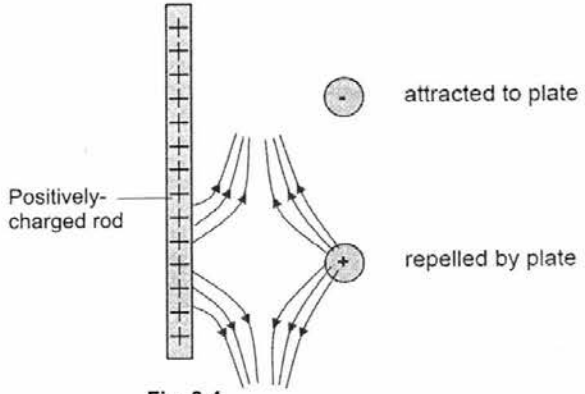


Fig. 9.4

Write a + sign on the ball that is positively charged and a – sign on the one that is negatively charged. [1]

(iii) State what is meant by an electric field.
It is a region of space where a charged object experiences an electric force (1).
.....
..... [1]

(iv) On Fig. 9.4, draw the electric field between the charged rod and the charged ball that is repelled. [1]

10 Fig. 10.1 shows the electrical wiring in a 240 V, 2200 W washing machine. The Earth wire is connected to the metal casing of the washing machine. Both the Live and Neutral wires are connected to its heating element.

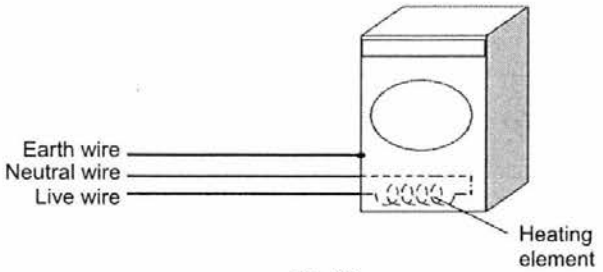


Fig. 10

(a) On which wire should the fuse be placed on? Explain your answer. [2]

Live wire. Machine will not be damaged by excessive current because the fuse melts and open circuit to stop it.

(b) Describe how the Earth wire works in order to protect the user. [2]

When a fault happens, the Earth wire provides a low resistance path for current to flow to ground. This prevents the metal casing from becoming live and causing the user an electric shock.

(c) State the current that flows in each of the wires when the washing machine is working normally. Show clear workings (if any).

$$I = \frac{P}{V}$$
$$= \frac{2200}{240}$$
$$= 9.17 \text{ A (3s.f.)}$$

current in Earth wire = **0 A**
current in Neutral wire = **9.17 A**
current in Live wire = **9.17 A** [3]

(d) The washing machine is used 4 times a week. The time taken by the washing machine to complete 1 cycle of washing, rinsing and spinning is 1 hour 15 minutes. Assuming that the washing machine completes 1 full cycle each time it is being used, calculate the cost of using the washing machine in a week if the cost of a unit of electricity is 25 cents. [3]

Total time of using washing machine = (1hr 15 min) x 4 = 5 hrs

Total Energy used = Pt
$= (2.2)(5)$
$= 11 \text{kWh}$

Cost = 11 × $0.25
= $2.75

11 (a) Fig. 11.1 shows a tower used for bungee jumping. Ignore air resistance

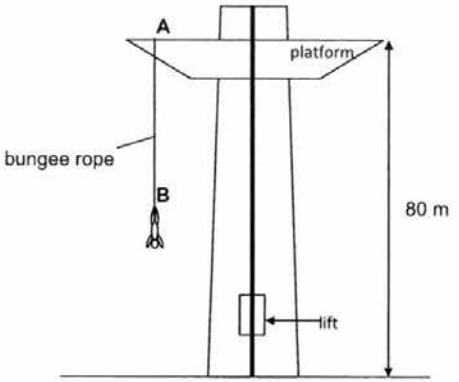


Fig. 11.1

A lift takes a man of mass 70 kg to a platform 80 m above the ground.

(i) Calculate the increase in the gravitational potential energy of the man from the ground to the platform.

GPE = mgh = 70 x 10 x 80
= 56000 J

increase in gravitational potential energy = ... [2]

(ii) The man jumps from A and reaches a maximum speed of 20 m/s at B. Calculate the maximum kinetic energy of the man at B.

KE = ½ mv² = ½ x 70 x (20)²
= 14000 J

maximum kinetic energy = ... [2]

(iii) Hence, calculate the length of the bungee rope when the man is at his maximum speed.

Loss in PE = 14000
70 x 10 x *l* = 14000
***l* = 20 m**

length = ... [2]

(b) Fig. 11.2 below shows a manual car park barrier.

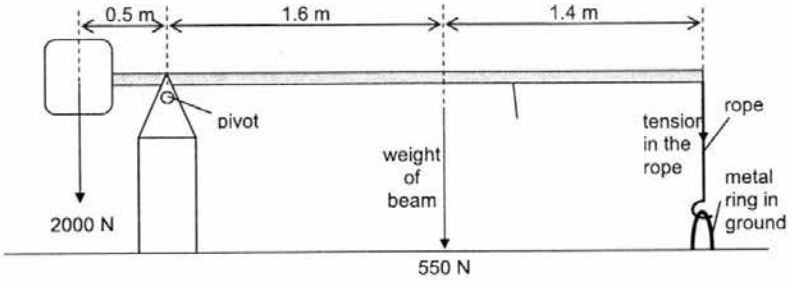


Fig. 11.2

(i) The weight of the barrier beam is 500 N and 1.6 m to the right of the pivot. Calculate the tension needed in the rope in order to keep the beam horizontal.

Since the barrier is in rotational equilibrium,
Taking moments about the pivot,
Sum of CWM = Sum of ACWM (1)
(T x 3.0) + (550 x 1.6) = (2000 x 0.5) (1)
T = 40 N (1)

tension = ... [3]

(ii) Describe what will happen if the rope is suddenly detached from the metal ring.
The beam turns anticlockwise.
.....
..... [1]

END OF PAPER

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