Name: | Class | Index Number

Jurong West Secondary School

Preliminary Examinations 2016

40

PHYSICS

5059/1

Secondary Four Express

Paper 1

24 August 2016

1045 – 1145

1 hour

Candidates answer on the Optical Answer Sheet.

Additional Materials: Optical Answer Sheet

READ THESE INSTRUCTIONS FIRST

Do not turn over the page unless you are asked to do so.

Write in soft pencil.

Write your name, class and index number in the spaces provided at the top of this page and the Optical Answer Sheet.

Do not use correction fluid.

There are **forty** questions on this paper. Answer **all** questions. For each question, there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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 question paper.

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

After checking of answer script		
Checked by	**Signature**	**Date**
Student		

This document consists of **18** printed pages.

1 A micrometer is used to measure the thickness of a piece of gold bar. With the jaws closed, the micrometer reading is as shown in Fig. 1.1. With the gold bar, the micrometer reading is shown in Fig. 1.2. What is the thickness of the gold bar?

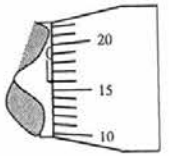


Fig. 1.1

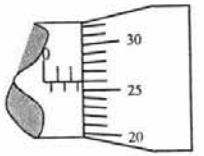


Fig. 1.2

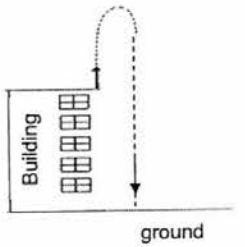
A 2.60 mm

B 2.92 mm

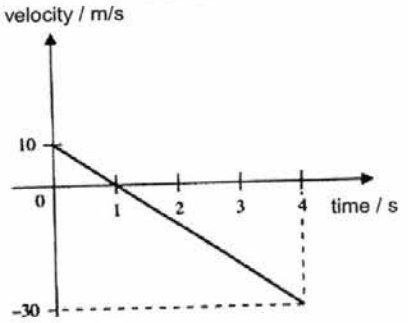
C 3.00 mm

D 5.10 mm

2 A stone is thrown up vertically from the top of a building and reaches the ground after 4 seconds.



The graph below shows the change in velocity of the stone from 0 to 4 s. What is the height of the building?



A 35 m

B 40 m

C 45 m

D 50 m

3 When his parachute is just opened, a parachutist falls towards the ground with reducing speed. Under these conditions, which of the following statements is correct?

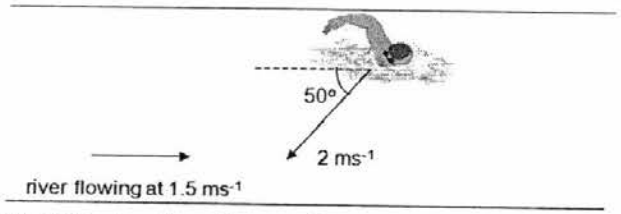
A There are no forces acting on the parachutist.

B The upward force on the parachute is equal to the weight of the parachutist.

C The upward force on the parachute is greater than the weight of the parachutist.

D The upward force on the parachute is less than the weight of the parachutist.

4 A man swimming at 2 m/s sets out at 50° to the bank of a river as shown below. The river is flowing at 1.5 m/s so that it carries him downstream.



Which of the following shows the possible resultant velocity of the man?

A 0.5 m/s
B 1.6 m/s
C 3.5 m/s
D 3.8 m/s

5 A motorist travelling at 1 m/s can bring his car to rest in a distance of 10 m. If he had been travelling at 3 m/s, what is the distance required to bring the car to rest by having the same deceleration?

A 10 m
B 15 m
C 30 m
D 90 m

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

A Gravitational field strength of the earth is independent of location.

B Gravitational fields cause forces on objects because they are charged.

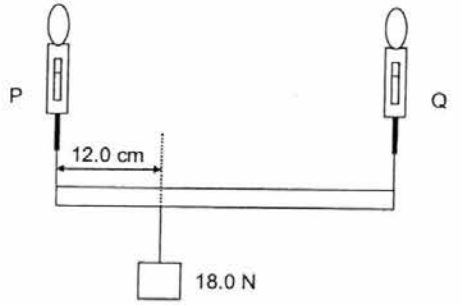
C The gravitational field attraction of the Earth acts towards the centre of the Earth.

D The gravitational field strength on the Moon is less than that on Earth because there is no atmosphere on the Moon.

7 Brass is made of a mixture of two metals — copper and zinc. For 100 cm^3 of brass, 20 cm^3 consists of copper, while 80 cm^3 is made up of zinc. Given that the densities of copper and zinc are 8.9 g/cm^3 and 7.1 g/cm^3 respectively, determine the average density of brass.

A 7.46 g/cm^3
B 8.00 g/cm^3
C 53.0 g/cm^3
D 746 g/cm^3

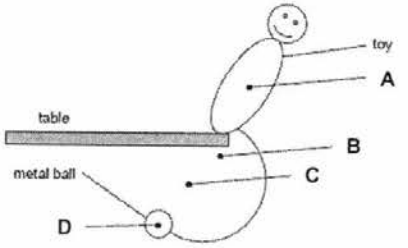
8 A load of 18.0 N is placed on a light rod which is suspended from two Newton meters P and Q as shown in the diagram below. The length of the rod is 36.0 cm.



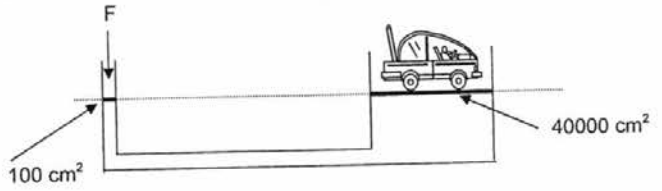
Which of the following shows the correct readings on **P** and **Q**?

	P	Q
A	6.0 N	12.0 N
B	9.0 N	9.0 N
C	12.0 N	6.0 N
D	18.0 N	18.0 N

9 The diagram below shows a toy balanced on the edge of a table and at rest. The toy has a metal ball attached to it. Where is the centre of gravity of the toy?



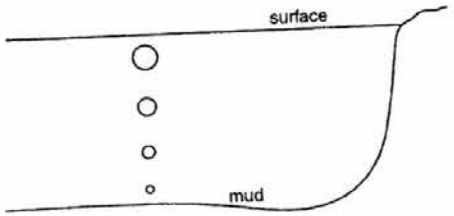
10 The diagram below shows a hydraulic press used to raise a 4000 kg car on a piston of 40000 cm^2. The area of the small piston is 100 cm^2.



If the efficiency of the hydraulic press is 80%, what is the minimum force, F required to raise the car?

A 80 N
B 100 N
C 125 N
D 3200 N

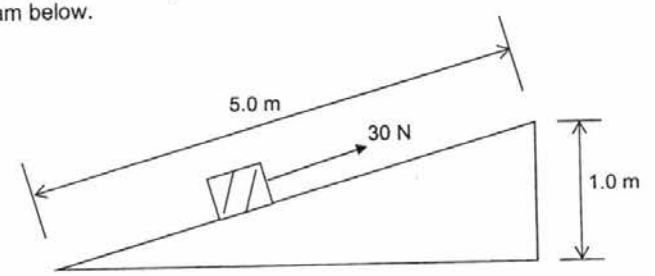
11 Bubbles of gas, escaping from the mud at the bottom of a deep lake, rise to the surface. As the bubbles rise, they get larger.



Which of the following statements is correct?

A Air pressure in the bubbles decreases.
B Water pressure on the bubbles increases.
C Atmospheric pressure on the bubbles decreases.
D Frequency of collision between air particles in the bubbles increases.

12 A wooden box of 10 kg is pushed up a slope by 30 N force as shown in the diagram below.



Calculate the total work done against friction when the box travelled 5.0 m from the bottom of the slope to the top of the slope.

A 50 J
B 100 J
C 150 J
D 300 J

13 At what speed must a ball be thrown vertically upwards to reach a maximum height of 25 m?

A 5 m/s
B 7 m/s
C 16 m/s
D 22 m/s

14 A car is driven along a level road. The total energy input from the petrol is 80 kJ, and the car wastes 45 kJ of energy. What is the efficiency of the car?

A 28%
B 36%
C 44%
D 56%

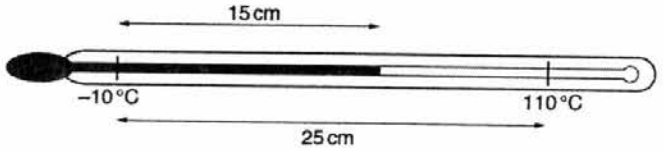
15 A gas is heated in a sealed container. Which of the following does **not** increase?

A The average kinetic energy of the gas molecules.
B The average distance between the gas molecules.
C The average force exerted by the gas on the walls of the container.
D The number of collisions of gas particles on the walls of the container.

16 Smoke particles are observed to be in random movement. This is caused by

A convection currents in air.
B collision between air particles.
C collision between smoke particles.
D collision on the smoke particles by the air particles.

17 The diagram shows a mercury-in-glass thermometer. The distance between the –10 °C and the 110 °C markings is 25 cm.



At which temperature is the end of the mercury thread 15 cm from the –10 °C mark?

A 50 °C
B 60 °C
C 62 °C
D 72 °C

18 John dips his left hand into alcohol, and his right hand into water. Both liquids are at same temperature.

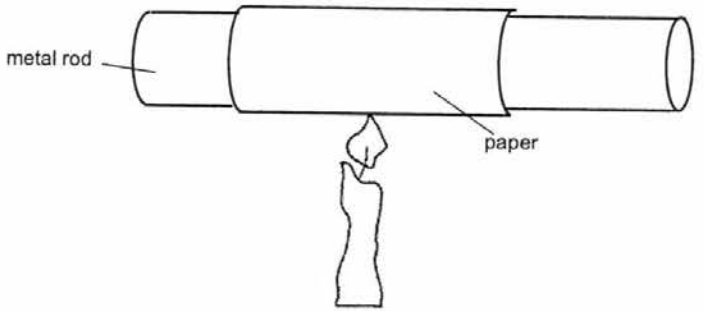
Which of the following statements best explains why alcohol makes the hand feel cooler?

A Alcohol has a lower boiling point than water.
B Alcohol evaporates more readily than water.
C Alcohol is a better conductor of heat compared to water.
D Alcohol has a higher specific latent heat of vaporisation than water.

19 Which of the following is most suitable for measuring rapidly changing temperatures?

A water thermometer
B mercury thermometer
C resistance thermometer
D thermocouple thermometer

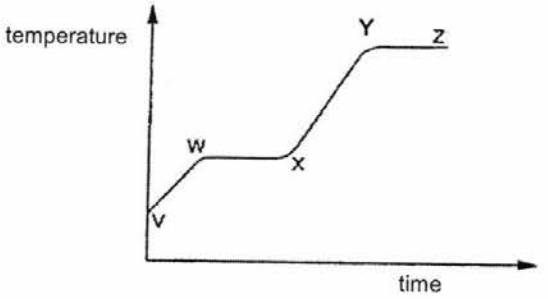
20 The figure below shows a piece of paper wrapped around a metal rod and placed above a candle flame. It was observed that the paper did not catch fire even when it was placed above the flame for some time.



Which statement best explains why this happened?

A The flame is not hot enough.
B The paper has high specific heat capacity.
C The metal rod conducts thermal energy away.
D The hot air rises and does not stay around the paper.

21 The diagram below shows the temperature-time graph of substance **P**.



Which of the following statements best explains what is happening to substance **P** between **X** and **Y**?

A The distance between molecules of **P** increases.
B Heat is absorbed by **P** to change from solid to liquid state.
C Heat is given out by **P** to change from solid to liquid state.
D The molecules of **P** break free from their intermolecular bonds.

22 Which of the following is/are true about boiling and evaporation?

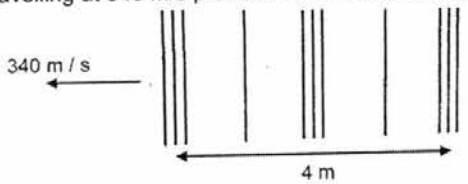
i) Evaporation takes place at any temperature but boiling does not.

ii) Evaporation takes place only at the surface of the liquid but boiling takes place throughout the liquid.

iii) The temperature of the liquid changes during evaporation but remains constant during boiling.

A ii only
B ii and iii only
C i and ii only
D All of the above

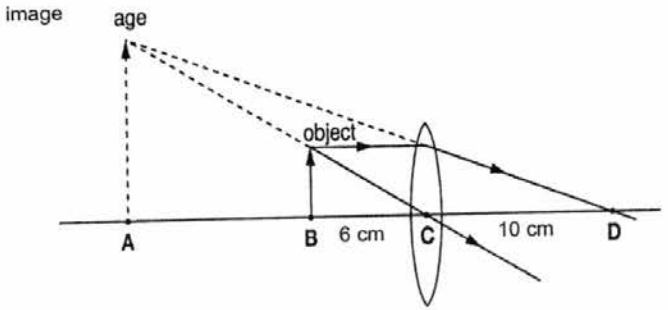
23 A sound wave travelling at 340 m/s produces the waveform shown below.



What is the frequency of the sound wave?

A 85 Hz
B 170 Hz
C 340 Hz
D 680 Hz

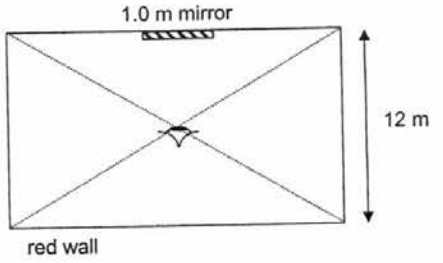
24 The diagram below shows a converging lens used as a magnifying glass when the object is at 6 cm from the centre of the lens. The distance between BC is 6 cm while the distance between CD is 10 cm.



What are the properties of the image when the object is now placed at 12 cm away from the lens?

A real and upright
B diminished and real
C enlarged and inverted
D virtual and enlarged

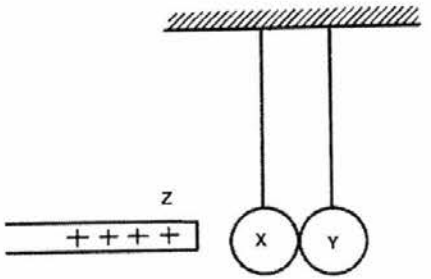
25 A painter stood at the centre of a rectangular room and looked into a 1.0 m long mirror.



What was the length of the red wall that the painter could see?

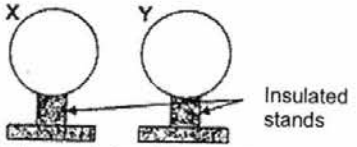
A 1.0 m
B 2.0 m
C 3.0 m
D 6.0 m

26 As shown in the figure below, a positively charged rod is brought near two neutral spheres **X** and **Y**, which are in contact. **Y** is then momentarily earthed (not shown in figure). **Z** is removed. What happens to the charge distribution on **X** and **Y**?



	X	Y
A	negative	neutral
B	negative	positive
C	positive	positive
D	positive	neutral

27 A conducting sphere **X** is charged positively. The sphere **X** is touched with a similar sphere **Y**, which is initially neutral. The spheres **X** and **Y** are then separated.

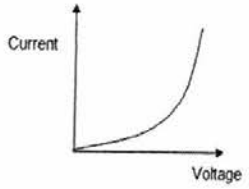


What are the types of charges left on **X** and **Y**?

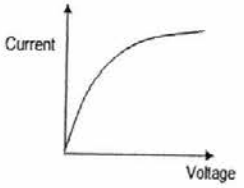
	X	Y
A	negative	positive
B	positive	positive
C	positive	neutral
D	neutral	positive

28 Which of the following graphs best represents how the current varies with the voltage of a semiconductor diode?

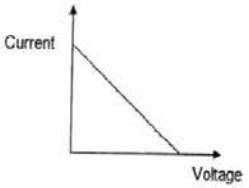
A



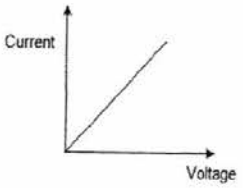
C



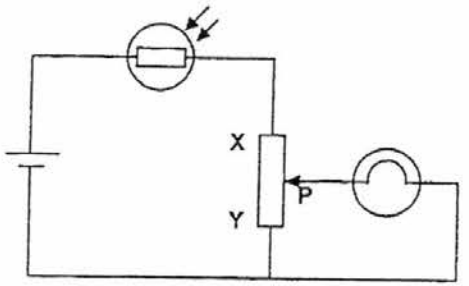
B



D



29 In the diagram, when is the lamp brightest?



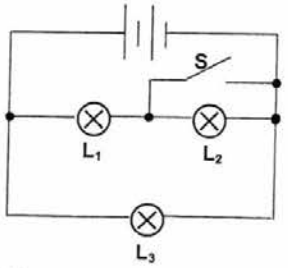
A The LDR is covered and P is moved to X.

B The LDR is covered and P is moved to Y.

C Light is incident on the LDR and P is moved to X.

D Light is incident on the LDR and P is moved to X.

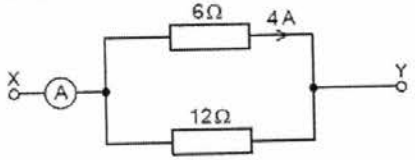
30 A circuit is set up as shown below.



What will happen to the brightness of the three lamps if switch **S** is closed?

	L_1	L_2	L_3
A	increases	increases	decreases
B	decreases	increases	unchanged
C	increases	decreases	increases
D	increases	decreases	unchanged

31 Two resistors of 6 Ω and 12 Ω are arranged in parallel. A potential difference is connected across the terminals X and Y. The current in the 6 Ω resistor is 4 A.



What is the current in the ammeter?

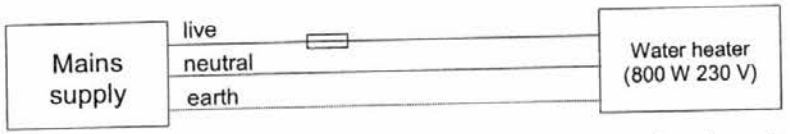
A 4 A
B 6 A
C 8 A
D 12 A

32 An electric kettle is accidentally dropped onto the floor and the impact caused the live wire to make contact with the metal case.

The electric kettle is connected to the mains through a proper 3-pin plug with a fuse. What will happen when the circuit is switched on?

A The wire will heat up.
B The circuit will be cut off automatically.
C The current will flow to the Earth continuously.
D The metal case will become live and dangerous.

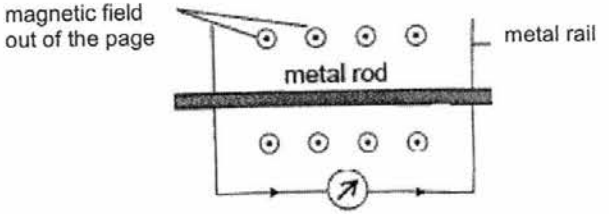
33 The diagram shows the three wires of an electrical mains supply connected to an electric water heater rated at 800 W 230 V.



What are the voltage and current in the neutral and earth wires when the water heater is switched on and working normally?

	Neutral	Earth
A	230 V, 3.5 A	230 V, 3.5 A
B	0 V, 3.5 A	0 V, 3.5 A
C	0 V, 0 A	0 V, 0 A
D	0 V, 3.5 A	0 V, 0 A

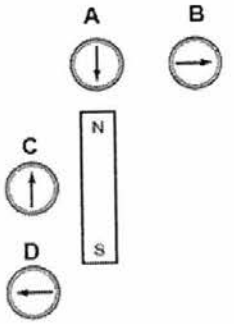
34 The figure below shows a metal rod supported by metal rails. The rod is also inside a magnetic field pointing out of the page.



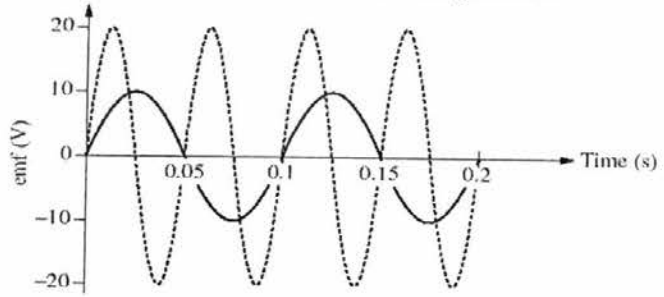
Which direction should the rod be moved to produce an induced current as shown in the diagram?

A into the page
B out of the page
C towards the top of the page
D towards the bottom of the page

35 Four plotting compasses are placed near a bar magnet as shown in the figure below. Which plotting compass is shown pointing in the correct direction?



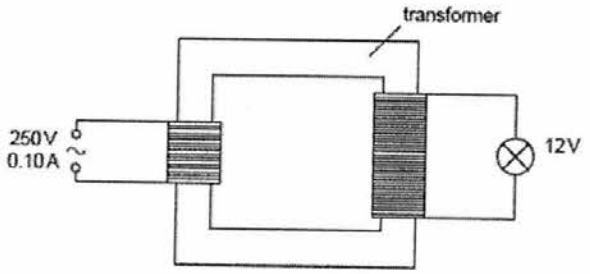
36 In the figure below, the solid curve shows how the e.m.f. produced by a simple a.c. generator varies with time. The dashed curve is the output from the same generator after a modification has been made to the generator.



Which modification was made to produce the result shown by the dashed curve?

A The area of the coil was doubled.
B The strength of the magnet was doubled.
C The number of turns in the coil was doubled.
D The speed of rotation of the coil was doubled.

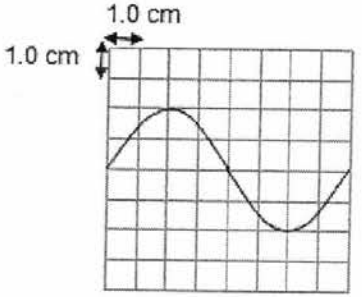
37 A transformer is used to operate a 12 V lamp from a 250 V mains supply.



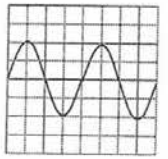
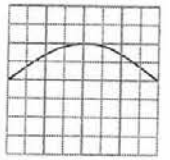
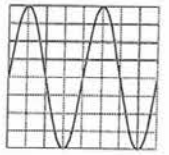
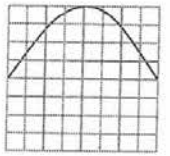
Given that the mains current is 0.10 A and the efficiency of the transformer is 75 %, calculate the current in the lamp.

A 1.56 A
B 2.08 A
C 2.78 A
D 3.12 A

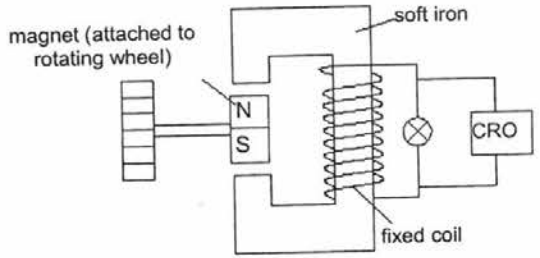
38 The figure below shows the trace of a signal on a cathode ray oscilloscope (C.R.O.) with the time base setting at 1.0 ms/cm.



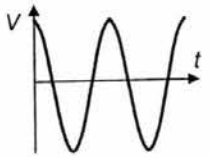
If the time base setting is changed to 2.0 ms/cm and the Y-gain remains unchanged, which of the following shows the correct trace on the C.R.O.?

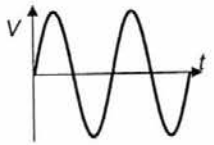
A 
C 
B 
D 

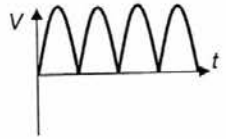
39 The figure below shows a coil of wire wound on a piece of soft iron. A magnet is placed at the gap of the iron as shown in the figure. When the magnet rotates, the C.R.O. registers a potential difference across the lamp.

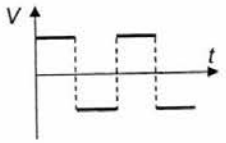


Which of the following shows the display on the C.R.O. as the magnet completes two revolutions? Assume that the magnet starts rotating from the position as shown in the figure above.

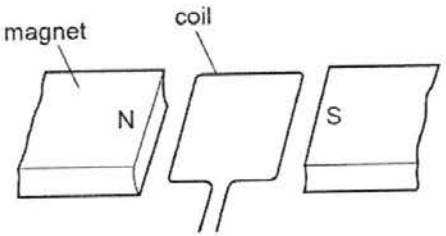
A


C


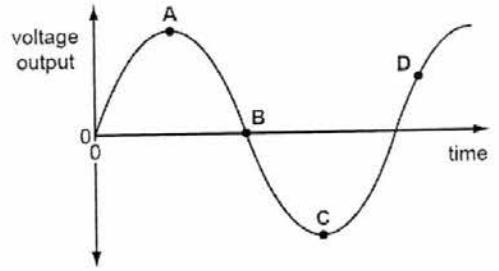
B


D


40 The figure shows part of an a.c. generator when its coil is in a horizontal position.



The graph below shows the voltage output of the generator plotted against time.



Which point on the graph corresponds to the position of the coil after it has turn 90°?

End of Paper

Name:	Class	Index Number

Jurong West Secondary School

Preliminary Examinations 2016

80

PHYSICS

5059/2

Secondary Four Express

Paper 2

17 August 2016

0800 – 0945

1 hour 45 minutes

Candidates answer on the Question Paper.

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs, tables or rough working. Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate. You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions in the spaces provided.

Section B
Answer all **three** questions, the last question is in the form of either/or. Answer **all** questions in the spaces provided.

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

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

After checking of answer script		
Checked by	**Signature**	**Date**
Student		

Section A

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

1 Fig. 1.1 shows the velocity of a car over a period of 30 seconds. The car's velocity is 0 m/s at 0 s and 15 s. The mass of the car is 3000 kg.

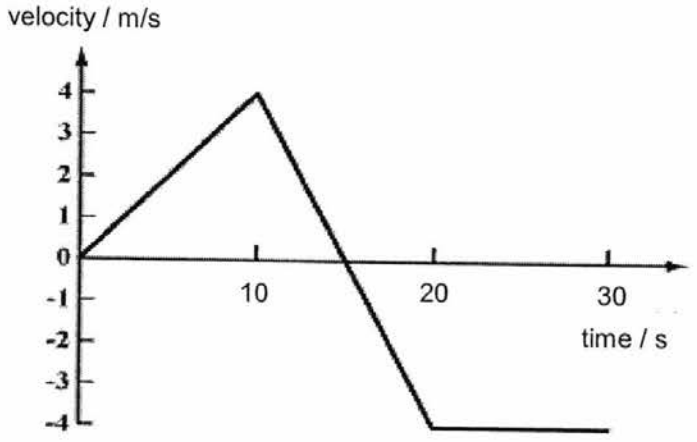


Fig.1.1

(a) For the first 10 seconds,

(i) describe the motion of the car;

..... [1]

(ii) calculate the acceleration of the car;

acceleration = ... [1]

(iii) calculate the frictional force acting on the car if the engine force of the car is 2000 N.

frictional force = ... [2

(b) (i) State one difference between speed and velocity.

.....

[1]

(ii) Determine the change in speed of the car between 10 s and 20 s.

.....

[1]

(iii) Determine the change in velocity of the car between 10 s and 20 s.

.....

[1]

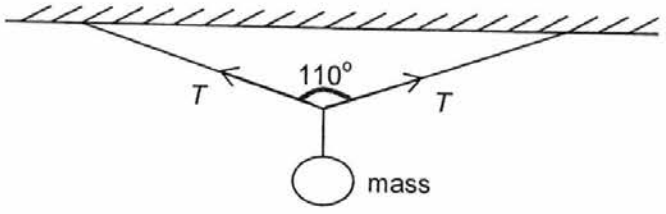
(c) Calculate the distance travelled by the car when its speed is decreasing.

distance travelled = ... [1]

(d) Determine the time when the car return back to its starting position.

time = ... [2]

A mass of weight 100 N is supported by two strings as shown below. The tension in each string is equal to T N. By means of a vector diagram, find the value of the tension, T. The diagram below is not drawn to scale.



scale used = ...

tension T = ... [3]

A 52 g uncooked rice ball is placed into a beaker containing 250 cm^3 of water. The water level rises to read 300 cm^3. Heat is supplied to the beaker of water as shown in Fig. 3.1. The density of water is 1.0 g/cm^3.

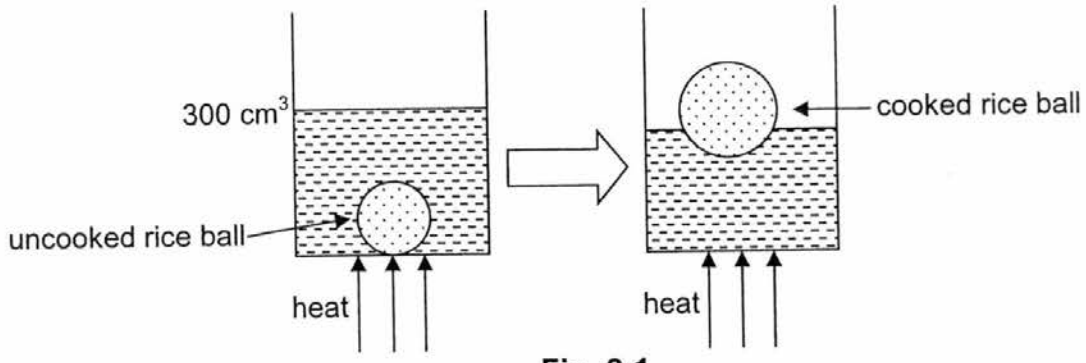


Fig. 3.1

(a) Calculate the density of the uncooked rice ball.

density = ... [1]

(b) The volume of the rice ball increases by 10% when it is cooked. By showing appropriate calculations, explain why the rice ball floats on water when it is cooked.

.....

.....

[2]

Fig. 4.1 shows a forked tube contains air in one branch and vacuum in the other. The density of mercury is 13600 kg/m^3. The figure is not drawn to scale.

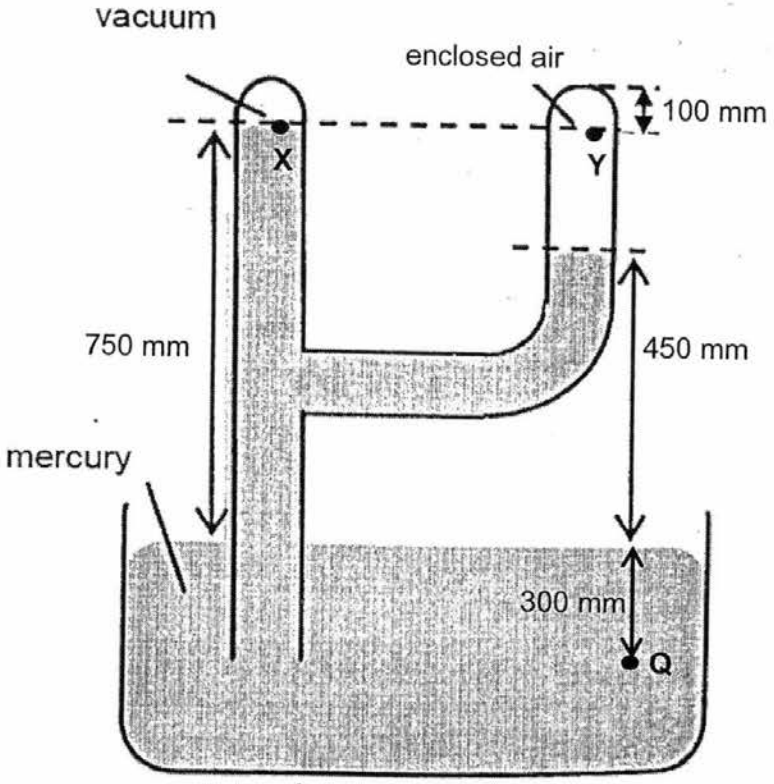


Fig. 4.1

(a) (i) State the pressure of the enclosed air

pressure = ... [1]

(ii) State the atmospheric pressure.

pressure = ... [1]

(b) Compare the magnitude of the pressure at point X and point Y.

..... [1]

(c) Calculate the total pressure acting at point Q, 300 mm below the mercury reservoir as shown in Fig. 4.1. Give your answer in Pa.

pressure = ... [2]

Fig. 5.1 shows an ice cube of mass 30 g, at 0 °C, added to 200 g of water in a cup.

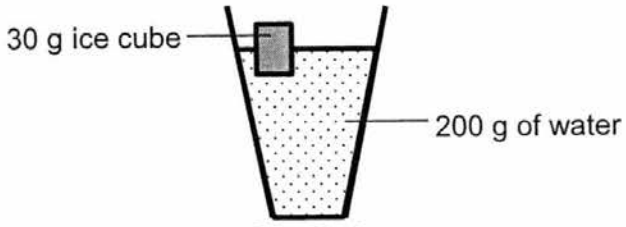


Fig. 5.1

The specific latent heat of ice is 336 J/g and the specific heat capacity of water is 4.2 J/(g°C).

(a) Explain the meaning of "*the specific heat capacity of water is 4.2 J/(g°C)*"

.....

..... [1]

(b) Describe how the ice cube at the surface of the water is able to cool all the water in the cup.

.....

.....

.....

..... [2]

(c) All the ice melts after some time and the final temperature of the water is 15 °C.

(i) Calculate the total energy absorbed by the 0 °C ice cube until it reaches the final state.

energy = ... [2]

(ii) Hence, calculate the initial temperature of the water.

initial temperature = ... [2]

Fig. 6.1 shows the variation of the resistance of a thermistor with temperature.

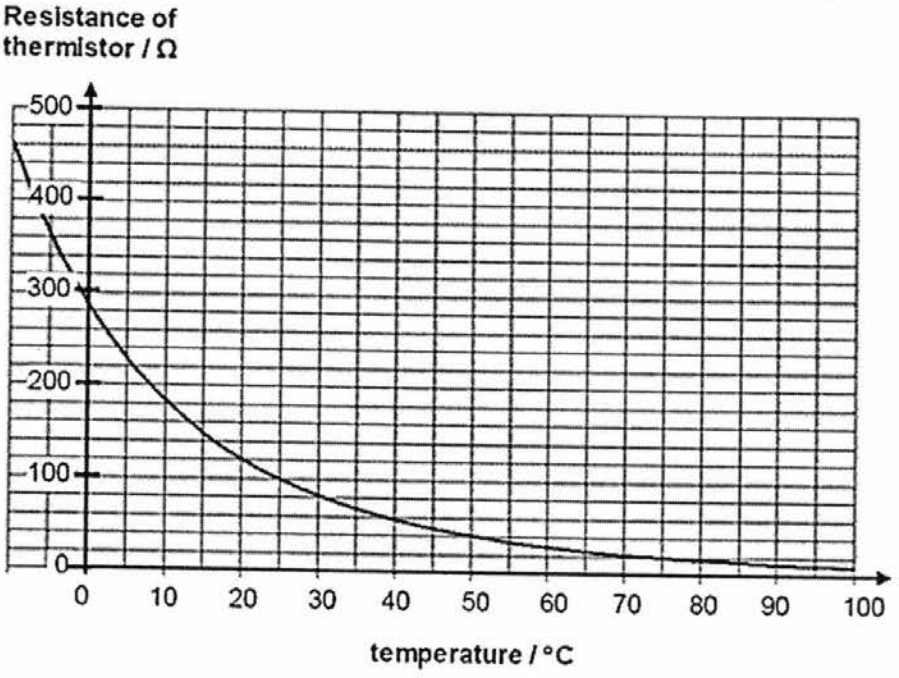


Fig. 6.1

A student uses the thermistor and sets up a circuit as shown in Fig.6.2. The e.m.f. of the battery is 6 V. The bulb used in the circuit has the rating of 3.5 V, 0.10 A. The temperature of the surroundings is 25 °C throughout the experiment.

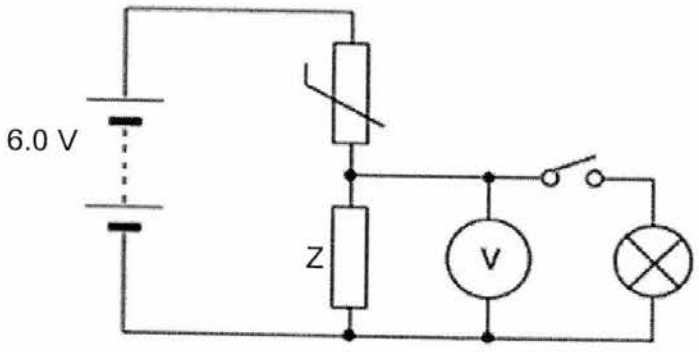


Fig. 6.2

(a) Define e.m.f.

.....

..... [1]

(b) Calculate the resistance of the light bulb.

resistance = ... [2]

(c) When the switch is open, the voltmeter reads 2.5 V.

(i) Calculate the current flowing through the battery.

current = ... [2]

(ii) Hence, calculate the resistance of resistor Z.

resistance = ... [1]

(d) Describe and explain how the brightness of the bulb changes as the surrounding temperature increases.

.....

.....

.....

.....

..... [3]

7 Fig. 7.1 shows only six components of the electromagnetic spectrum.

infrared	X-rays	gamma ray	radio waves	microwave	ultraviolet

Fig. 7.1

(a) State one component of the electromagnetic spectrum that is not listed above.

..... [1]

(b) State the component of the electromagnetic spectrum that is used for satellite television.

.....[1]

(c) Gamma rays are used in hospitals for cancer treatment. State two properties of gamma rays that enable them to be used in cancer treatment.

.....

.....

.....[2]

(d) State one property that distinguish electromagnetic spectrum from all other waves.

.....

.....[1]

8 Fig. 8.1 shows part of the lighting circuit of a house. The lamps are identical.

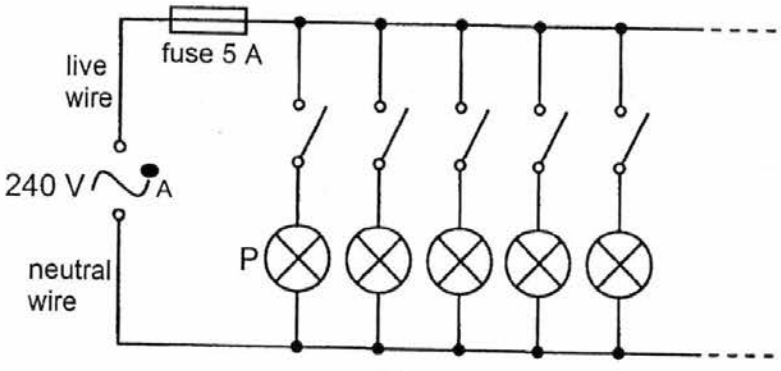


Fig. 8.1

(a) Describe how a fuse works.

.....

.....[1]

(b) Explain why the fuse is connected to the live wire rather than the neutral wire.

.....

.....

.....[2]

(c) Each lamp has a power of 40 W.

(i) Calculate the current flowing through the fuse when all five lamps are switched on.

current = ... [2]

(ii) All 5 lamps are turned on for 5 hours a day. The cost of 1 kWh is 20 cents. How much does it cost to use the lamps for one month? (Assume that there are 30 days in a month).

cost = ... [2]

(d) When all the switches are closed, lamp P needs to be dimmer than the other lamps. Suggest how the circuit can be modified for this to be done.

.....

..... [1]

Section B

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

The last question is in the form of an either/or and **only one of the alternatives** should be attempted.

9 Esther and Brian are doing an experiment to determine the speed of sound. Esther holds a starting pistol and Brian stands some distance away with a stopwatch as shown in Fig. 9.1.

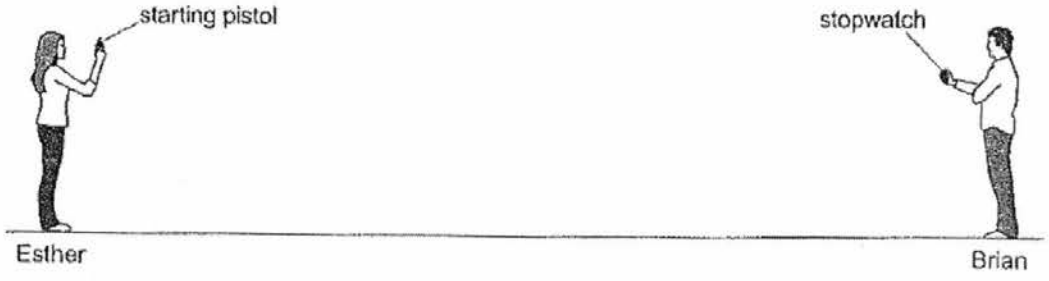


Fig. 9.1

Esther fires the gun. Brian starts the stopwatch when he sees the flash from the starting pistol and stops the timing when he hears the bang. They measure the distance between them and repeat the experiment at different distances.

Table 9.1 shows the results they obtained at different distances.

distance / m	time / s
100	0.36
200	0.67
400	1.38
600	1.94
800	2.60

Table 9.1

(a) Using data from Table 9.1, explain why the time taken when the distance is 200 m is not exactly double the time taken when the distance is 100 m.

.....

..... [1]

(b) Calculate the speed of sound when the distance between Esther and Brian is 600 m.

speed = ... [1]

(c) Using Table 9.1, state with explanation which of their results is likely to be the most accurate.

.....

.....

.....

..... [2]

(d) Esther suggested that their result would be improved if they repeated the experiment with their position swapped around and taking average of the readings. Suggest why repeating the experiment with the above suggestion might make the result more reliable and accurate.

.....

.....

.....

..... [2]

(e) In another occasion, the same experiment is carried out by Esther and Brian on a mountain with very high altitude. Table 9.2 shows the readings obtained.

Distance / m	time / s
100	0.52
200	0.81
400	1.50
600	2.05
800	2.75

Table 9.2

Suggest a reason why the time taken at the same distance is different from results in Table 9.1.

.....

..... [2]

(f) (i) In a music concert, Esther listened to the music played using a piano. While listening, she realized that the frequency of the notes does not affect the speed of sound. Explain how she came to this conclusion.

.....

..... [1]

(ii) Esther noticed that the wall beside her seat is covered with soft fabric. Explain how this feature improves her experience in the concert from a scientific point of view.

.....

..... [1]

10 Fig. 10.1 shows an uniform ladder leaning against a wall. The bottom of the ladder is 1.0 m from the wall. The top of the ladder is 3.0 m above the ground. The mass of the ladder is 11 kg.

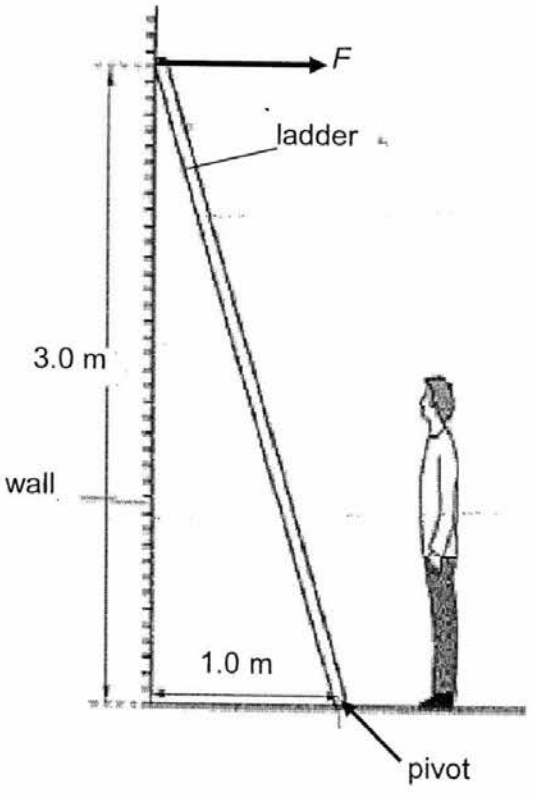


Fig. 10.1

(a) Draw the direction and location of the weight of the ladder with an arrow in the figure above.

[1]

(b) Determine the perpendicular distance between the weight of the ladder and the pivot.

perpendicular distance = ... [1]

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

force, F = ... [3]

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

.....

.....

.....

.....

..... [3]

(e) Name the force that stops the bottom of the ladder from slipping along the ground and draw the direction and location of this force on Fig. 10.1.

..... [1]

(f) Suggest how the force mentioned in (e) may be increased to make using the ladder safer.

.....

..... [1]

'HER

(a) A longitudinal wave is travelling in a long slinky spring. Particles 1 to 11 of the spring are at their equilibrium positions as shown in Part (I) of Fig. 11.1. Part (II) shows the positions of particles at a particular instant the wave is travelling along the spring.

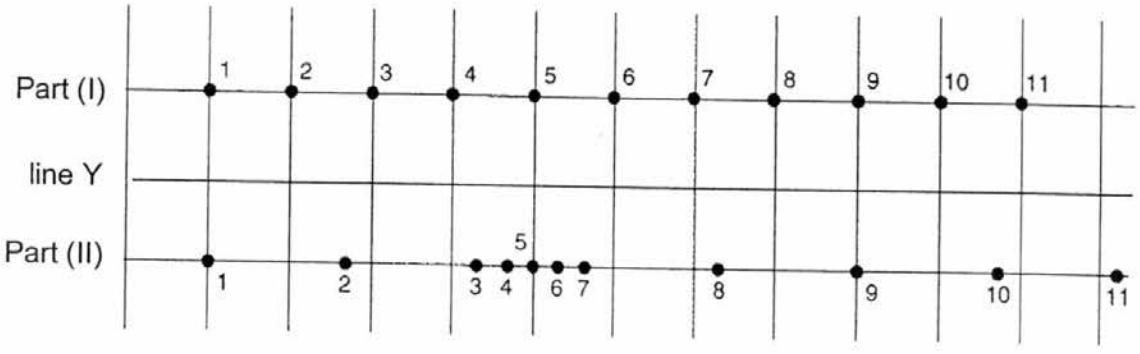


Fig. 11.1

(i) Which particle in Part (II) represents the centre of compression?

..... [1]

(ii) On Part (II) of Fig. 11.1, mark a distance equal to the wavelength. Indicate the distance as λ.

[1]

(iii) On Part (II) of Fig. 11.1, mark a distance equal to the amplitude. Indicate the distance as x.

[1]

(iv) The time taken for one complete oscillation of a particle is 2 s. Mark the positions of particles 1 to 11, one second after Part (II) on line Y.

[2]

(b) Fibre optic cables are used in the provision of broadband services. Fig. 11.2 shows a cross-section of one part of the cable with a ray of light entering the core at point **A** from air. The ray of light is reflected at point **B**.

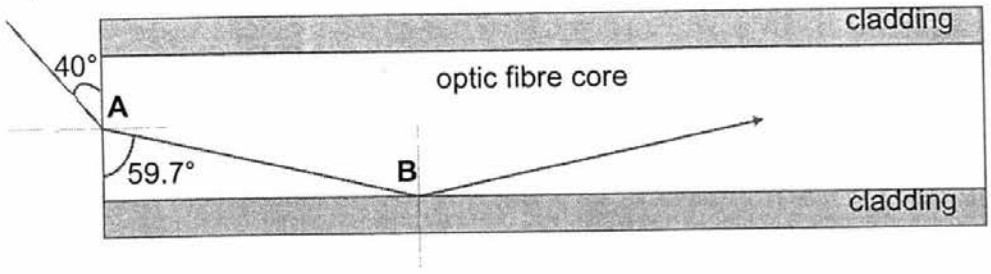


Fig. 11.2

(i) Calculate the refractive index of the optical fibre core.

refractive index = ... [2]

(ii) State the phenomenon at point **B** and describe how the cladding provides a condition for this to take place.

.....

.....

..... [2]

(iii) Before fibre optic cables are used to provide broadband services, copper cables are used to transmit electrical signals to provide internet services. State one advantage of using fibre optic cables.

.....

..... [1]

(a) Fig. 11.1 shows a type of motor. PQ and RS are solenoids. The solenoids and the coil ABCD are connected in parallel to a battery.

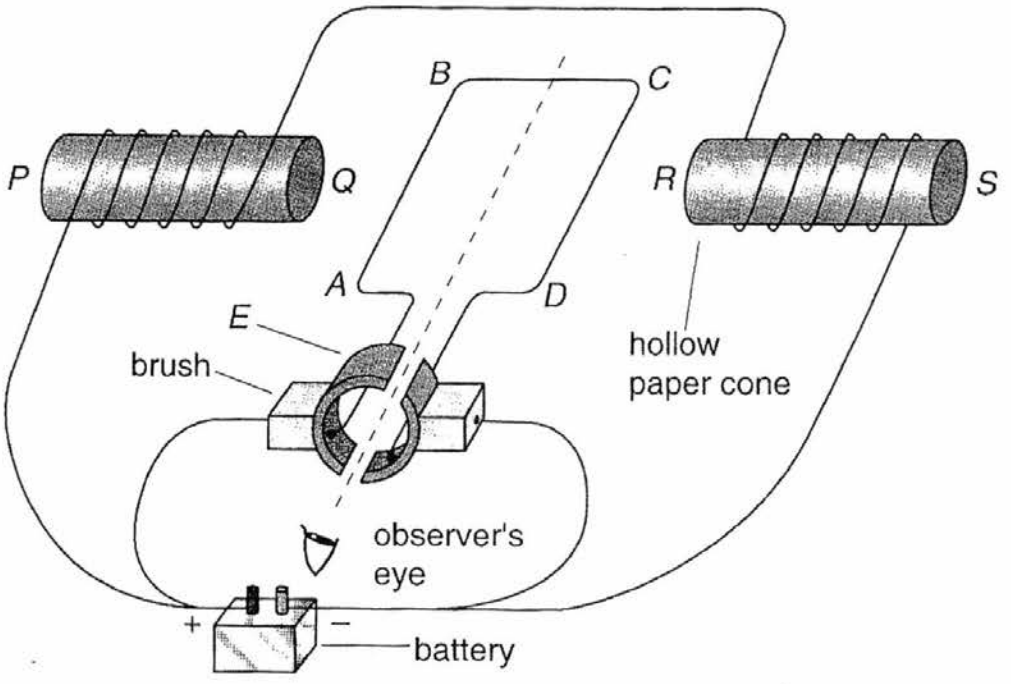


Fig. 11.1

(i) State the polarity at end Q.

.....[1]

(ii) State the direction of rotation of the coil as seen by the observer.

.....[1]

(iii) Name component *E* and explain its function.

.....

.....

.....[2]

(b) Fig. 11.2 shows a coil connected to a cathode ray oscilloscope (C.R.O). and a belt that carries a series of magnets placed vertically with regular spacing of 3.0 cm.

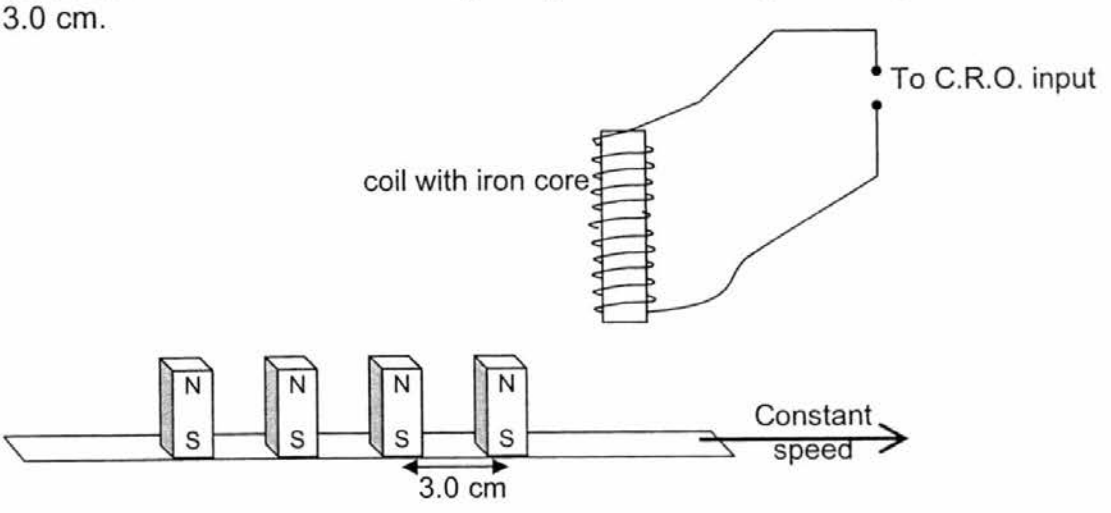


Fig. 11.2

Fig. 11.3 below shows the C.R.O. displaying the induced e.m.f in the coil as the magnets move past under the coil. The Y-gain of the C.R.O. is set to 3 mV/cm and the time-base setting is 100 ms/cm.

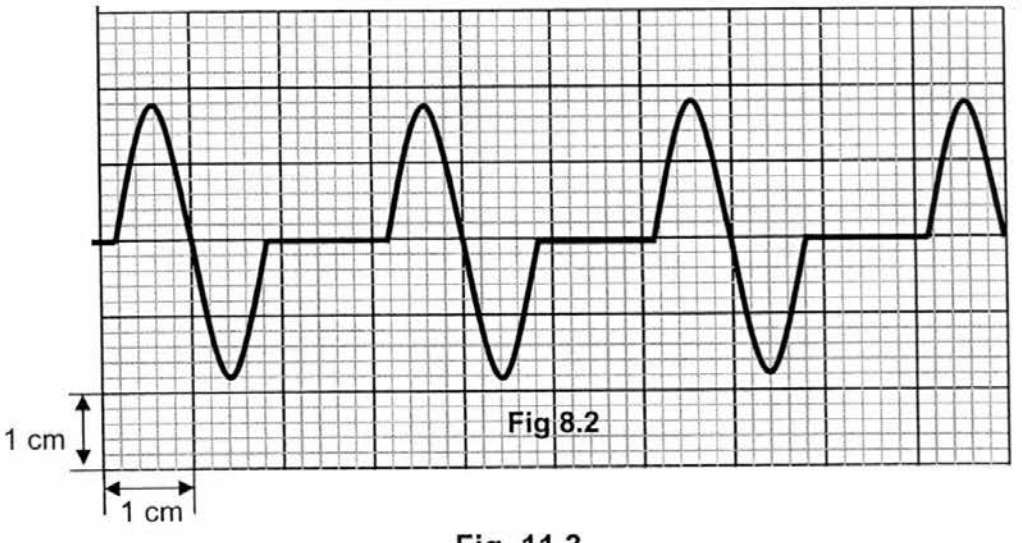


Fig. 11.3

(i) Explain why an e.m.f. is induced when a magnet passes under the coil.

.....

..... [1]

(ii) Explain why each pulse of e.m.f induced consists of two opposite directions.

.....

.....

.....

..... [2]

(iii) Determine the amplitude of the induced e.m.f..

amplitude = ... [1]

(iv) Determine the frequency of the pulse.

frequency = ... [2]

End of Paper

Jurong West Secondary School

Prelim 2016

Total: 40

Secondary 4 Express

PHYSICS

PAPER 1 PHYSICS

5059/1

Time 1 hour

Marking Scheme

1	**A**	21	**A**
2	**B**	22	**D**
3	**C**	23	**B**
4	**B**	24	**C**
5	**D**	25	**C**
6	**C**	26	**B for Bonus (void)**
7	**A**	27	**B**
8	**C**	28	**A**
9	**B**	29	**C or D**
10	**C**	30	**D**
11	**A**	31	**B**
12	**A**	32	**B**
13	**D**	33	**D**
14	**C**	34	**D**
15	**B**	35	**B**
16	**D**	36	**D**
17	**C**	37	**A**
18	**B**	38	**A**
19	**D**	39	**A**
20	**C**	40	**B**

'partnerinlearning'

Class | Index Number

Name: **'partnerinlearning'**

Jurong West Secondary School

Preliminary Examinations 2016

80

PHYSICS

5059/2

Secondary Four Express

Paper 2

17 August 2016

0800 – 0945

1 hour 45 minutes

Candidates answer on the Question Paper.

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs, tables or rough working. Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate. You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions in the spaces provided.

Section B
Answer all **three** questions, the last question is in the form of either/or. Answer **all** questions in the spaces provided.

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

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

After checking of answer script		
Checked by	**Signature**	**Date**
Student		

This document consists of **20** printed pages.

Section A

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

1 Fig. 1.1 shows the velocity of a car over a period of 30 seconds. The car's velocity is 0 m/s at 0 s and 15 s. The mass of the car is 3000 kg.

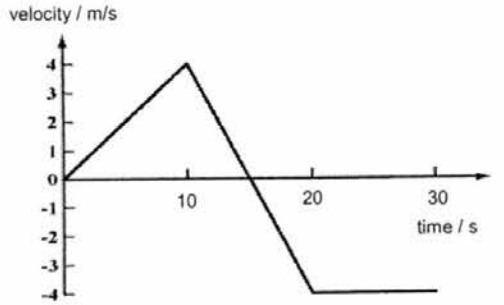


Fig.1.1

(a) For the first 10 seconds,

(i) describe the motion of the car;

..... [1]

(ii) calculate the acceleration of the car;

acceleration = ... [1]

(iii) calculate the frictional force acting on the car if the engine force of the car is 2000 N.

frictional force = ... [2]

(b) (i) State one difference between speed and velocity.

.....

[1]

(ii) Determine the change in speed of the car between 10 s and 20 s.

.....

[1]

(iii) Determine the change in velocity of the car between 10 s and 20 s.

.....

[1]

(c) Calculate the distance travelled by the car when its speed is decreasing.

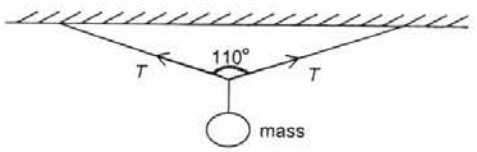
distance travelled = ... [1]

(d) Determine the time when the car return back to its starting position.

time = ... [2]

2 A mass of weight 100 N is supported by two strings as shown below. The tension in

each string is equal to T N. By means of a vector diagram, find the value of the tension, T. The diagram below is not drawn to scale.



scale used = ...

tension T = ...

3 A 52 g uncooked rice ball is placed into a beaker containing 250 cm^3 of water. T water level rises to read 300 cm^3. Heat is supplied to the beaker of water as shown Fig. 3.1. The density of water is 1.0 g/cm^3.

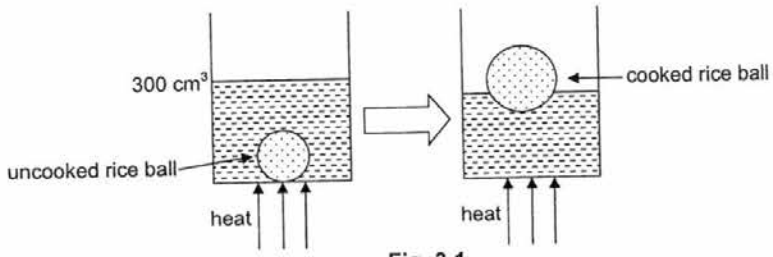


Fig. 3.1

(a) Calculate the density of the uncooked rice ball.

density = ... [1]

(b) The volume of the rice ball increases by 10% when it is cooked. By showing appropriate calculations, explain why the rice ball floats on water when it is cooked.

.....

..... [2]

4 Fig. 4.1 shows a forked tube contains air in one branch and vacuum in the other. The density of mercury is 13600 kg/m^3. The figure is not drawn to scale.

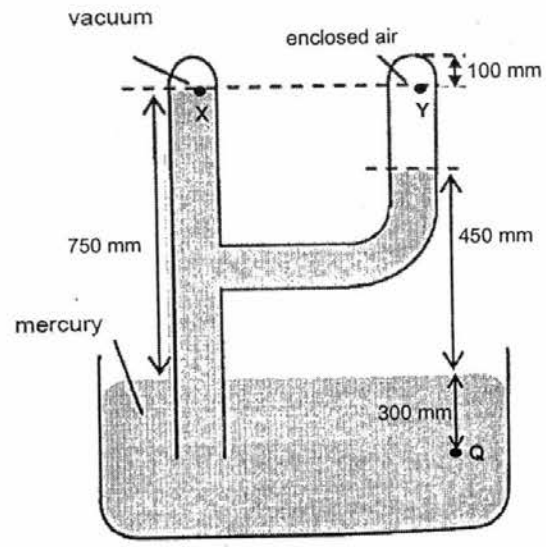


Fig. 4.1

(a) (i) State the pressure of the enclosed air

pressure = ... [1]

(ii) State the atmospheric pressure.

pressure = ... [1]

(b) Compare the magnitude of the pressure at point X and point Y.

..... [1]

(c) Calculate the total pressure acting at point Q, 300 mm below the mercury reservoir as shown in Fig. 4.1. Give your answer in Pa.

pressure = ... [2]

5 Fig. 5.1 shows an ice cube of mass 30 g, at 0 °C, added to 200 g of water in a cup.

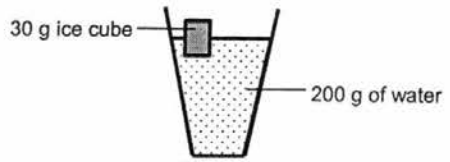


Fig. 5.1

The specific latent heat of ice is 336 J/g and the specific heat capacity of water is 4.2 J/(g°C).

(a) Explain the meaning of "*the specific heat capacity of water is 4.2 J/(g°C)*"

.....

..... [1]

(b) Describe how the ice cube at the surface of the water is able to cool all the water in the cup.

.....

.....

.....

..... [2]

(c) All the ice melts after some time and the final temperature of the water is 15 °C.

(i) Calculate the total energy absorbed by the 0 °C ice cube until it reaches the final state.

energy = ... [2]

(ii) Hence, calculate the initial temperature of the water.

initial temperature = ... [2]

6 Fig. 6.1 shows the variation of the resistance of a thermistor with temperature.

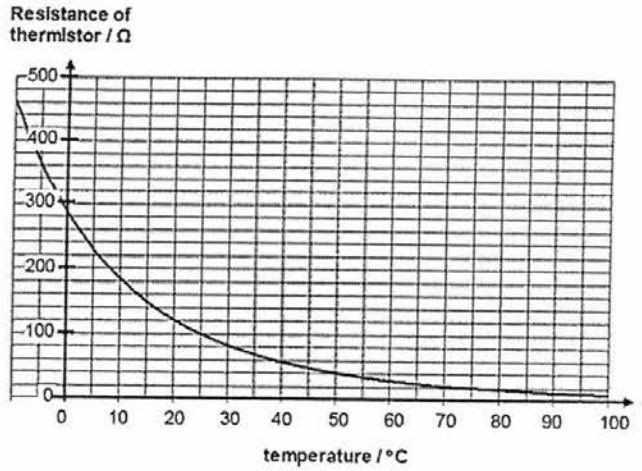


Fig. 6.1

A student uses the thermistor and sets up a circuit as shown in Fig.6.2. The e.m.f. of the battery is 6 V. The bulb used in the circuit has the rating of 3.5 V, 0.10 A. The temperature of the surroundings is 25 °C throughout the experiment.

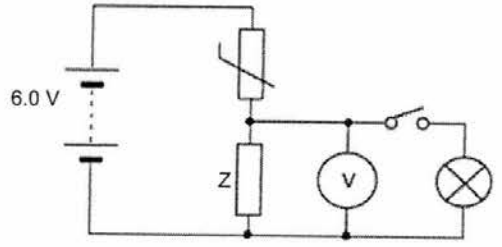


Fig. 6.2

(a) Define e.m.f.

.....

..... [1]

(b) Calculate the resistance of the light bulb.

resistance = ... [2]

(c) When the switch is open, the voltmeter reads 2.5 V.

(i) Calculate the current flowing through the battery.

current = ... [2]

(ii) Hence, calculate the resistance of resistor Z.

resistance = ... [1]

(d) Describe and explain how the brightness of the bulb changes as the surrounding temperature increases.

.....

.....

.....

.....

..... [3]

7 Fig. 7.1 shows only six components of the electromagnetic spectrum.

infrared	X-rays	gamma ray	radio waves	microwave	ultraviolet

Fig. 7.1

(a) State one component of the electromagnetic spectrum that is not listed above.

..... [1]

(b) State the component of the electromagnetic spectrum that is used for satellite television.

..... [1]

(c) Gamma rays are used in hospitals for cancer treatment. State two properties of gamma rays that enable them to be used in cancer treatment.

.....

.....

..... [2]

(d) State one property that distinguish electromagnetic spectrum from all other waves.

.....

..... [1]

8 Fig. 8.1 shows part of the lighting circuit of a house. The lamps are identical.

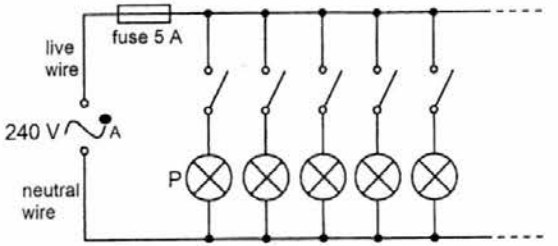


Fig. 8.1

(a) Describe how a fuse works.

.....

..... [1]

(b) Explain why the fuse is connected to the live wire rather than the neutral wire.

.....

.....

..... [2]

(c) Each lamp has a power of 40 W.

(i) Calculate the current flowing through the fuse when all five lamps are switched on.

current = ... [2]

(ii) All 5 lamps are turned on for 5 hours a day. The cost of 1 kWh is 20 cents. How much does it cost to use the lamps for one month? (Assume that there are 30 days in a month).

cost = ... [2]

(d) When all the switches are closed, lamp P needs to be dimmer than the other lamps. Suggest how the circuit can be modified for this to be done.

.....

..... [1]

Section B

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

The last question is in the form of an either/or and **only one of the alternatives** should be attempted.

9 Esther and Brian are doing an experiment to determine the speed of sound. Esther holds a starting pistol and Brian stands some distance away with a stopwatch as shown in Fig. 9.1.

Fig. 9.1

Esther fires the gun. Brian starts the stopwatch when he sees the flash from the starting pistol and stops the timing when he hears the bang. They measure the distance between them and repeat the experiment at different distances.

Table 9.1 shows the results they obtained at different distances.

distance / m	time / s
100	0.36
200	0.67
400	1.38
600	1.94
800	2.60

Table 9.1

(a) Using data from Table 9.1, explain why the time taken when the distance is 200 m is not exactly double the time taken when the distance is 100 m.

.....

..... [1]

(b) Calculate the speed of sound when the distance between Esther and Bria

600 m.

speed = ... [1]

(c) Using Table 9.1, state with explanation which of their results is likely to be the most accurate.

.....

.....

.....

..... [2]

(d) Esther suggested that their result would be improved if they repeated the experiment with their position swapped around and taking average of the readings. Suggest why repeating the experiment with the above suggestion might make the result more reliable and accurate.

.....

.....

.....

..... [2]

(e) In another occasion, the same experiment is carried out by Esther and Brian on a mountain with very high altitude. Table 9.2 shows the readings obtained.

Distance / m	time / s
100	0.52
200	0.81
400	1.50
600	2.05
800	2.75

Table 9.2

Suggest a reason why the time taken at the same distance is different from results in Table 9.1.

.....

..... [2]

(f) (i) In a music concert, Esther listened to the music played using a piano. While listening, she realized that the frequency of the notes does not

affect the speed of sound. Explain how she came to this conclusion.

.....

..... [1]

(ii) Esther noticed that the wall beside her seat is covered with soft fabric. Explain how this feature improves her experience in the concert from a scientific point of view.

.....

..... [1]

10 Fig. 10.1 shows an uniform ladder leaning against a wall. The bottom of the ladder is 1.0 m from the wall. The top of the ladder is 3.0 m above the ground. The mass of the ladder is 11 kg.

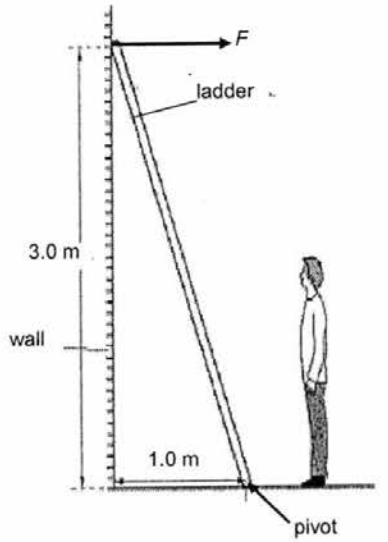


Fig. 10.1

(a) Draw the direction and location of the weight of the ladder with an arrow in the figure above.

[1]

(b) Determine the perpendicular distance between the weight of the ladder and the pivot.

perpendicular distance = ... [1]

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

force, *F* = ... [3]

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

.....

.....

.....

.....

..... [3]

(e) Name the force that stops the bottom of the ladder from slipping along the ground and draw the direction and location of this force on Fig. 10.1.

..... [1]

(f) Suggest how the force mentioned in (e) may be increased to make using the ladder safer.

.....

..... [1]

EITHER

11 (a) A longitudinal wave is travelling in a long slinky spring. Particles 1 to 11 of the spring are at their equilibrium positions as shown in Part (I) of Fig. 11.1. Part (II)

shows the positions of particles at a particular instant the wave is travelling along the spring.

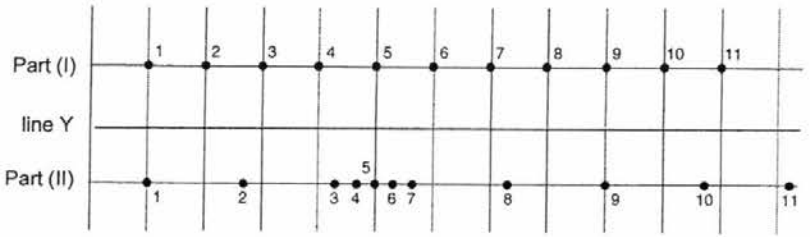


Fig. 11.1

(i) Which particle in Part (II) represents the centre of compression?

..... [1]

(ii) On Part (II) of Fig. 11.1, mark a distance equal to the wavelength. Indicate the distance as λ.

[1]

(iii) On Part (II) of Fig. 11.1, mark a distance equal to the amplitude. Indicate the distance as x.

[1]

(iv) The time taken for one complete oscillation of a particle is 2 s. Mark the positions of particles 1 to 11, one second after Part (II) on line Y.

[2]

(b) Fibre optic cables are used in the provision of broadband services. Fig. 11.2 shows a cross-section of one part of the cable with a ray of light entering the core at point **A** from air. The ray of light is reflected at point **B**.

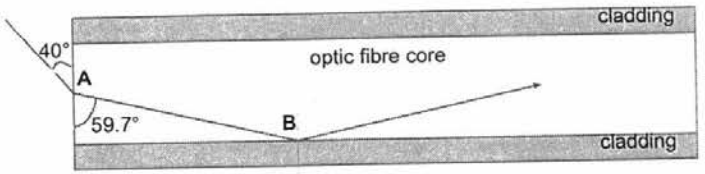


Fig. 11.2

(i) Calculate the refractive index of the optical fibre core.

refractive index = ... [2]

(ii) State the phenomenon at point **B** and describe how the cladding provides a condition for this to take place.

.....

.....

..... [2]

(iii) Before fibre optic cables are used to provide broadband services, copper cables are used to transmit electrical signals to provide internet services. State one advantage of using fibre optic cables.

.....

..... [1]

OR

11 (a) Fig. 11.1 shows a type of motor. PQ and RS are solenoids. The solenoids and the coil ABCD are connected in parallel to a battery.

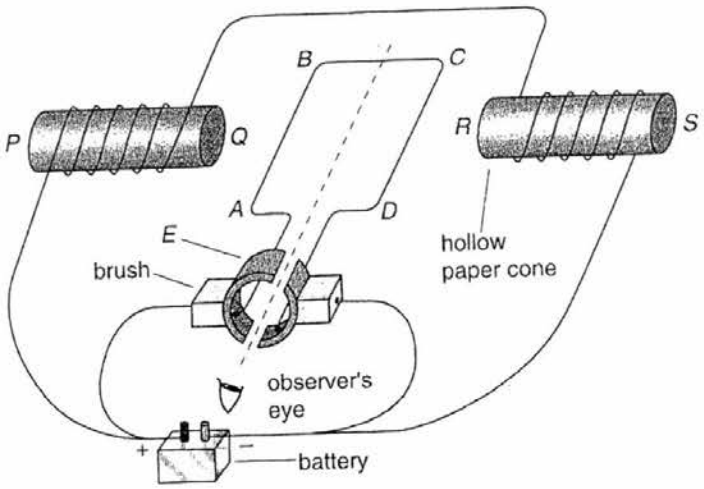


Fig. 11.1

(i) State the polarity at end Q.

..... [1]

(ii) State the direction of rotation of the coil as seen by the observer.

..... [1]

(iii) Name component *E* and explain its function.

.....

.....

..... [2]

(b) Fig. 11.2 shows a coil connected to a cathode ray oscilloscope (C.R.O). and a belt that carries a series of magnets placed vertically with regular spacing of 3.0 cm.

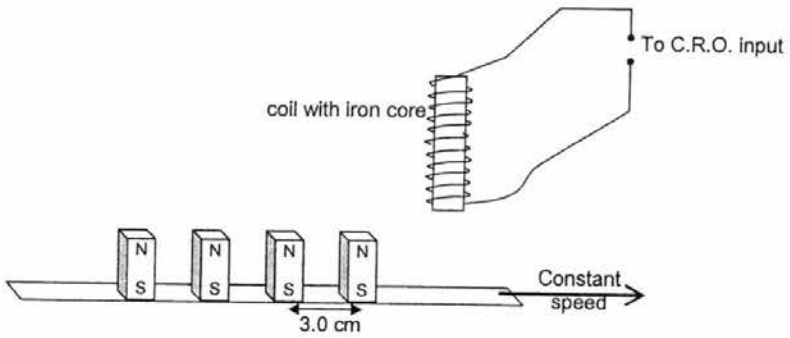


Fig. 11.2

Fig. 11.3 below shows the C.R.O. displaying the induced e.m.f in the coil as the magnets move past under the coil. The Y-gain of the C.R.O. is set to 3 mV/cm and the time-base setting is 100 ms/cm.

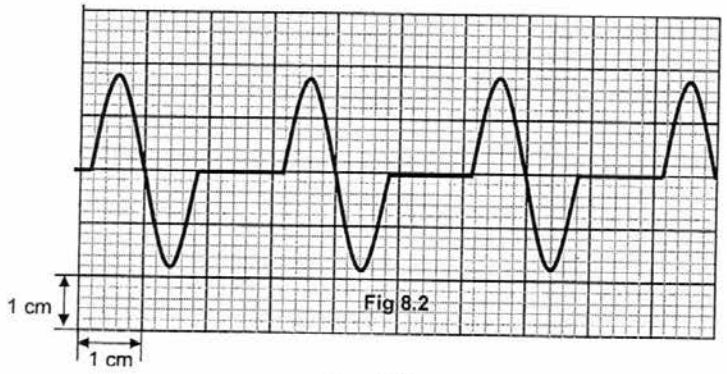


Fig. 11.3

(i) Explain why an e.m.f. is induced when a magnet passes under the coil.

.....

..... [1]

(ii) Explain why each pulse of e.m.f induced consists of two opposite directions.

.....

.....

.....

..... [2]

(iii) Determine the amplitude of the induced e.m.f..

amplitude = ... [1]

(iv) Determine the frequency of the pulse.

frequency = ... [2]

End of Paper