Name: ..... ( ) Class: Sec .....

St. Gabriel's Secondary School

2017 'O' Level Preliminary Examination

Subject	:	**Physics**
Paper	:	**5059/1**
Level/Stream	:	**Sec 4 Express**
Duration	:	**1 hour**
Date	:	**29/08/2017**
Setter	:	**William Ng**

Additional material: *Multiple Choice Answer Sheet*

READ THESE INSTRUCTIONS FIRST

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

Do not open this booklet until you are told to do so.

Paper 1:

There are 40 questions in 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 multiple choice answer sheet. Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

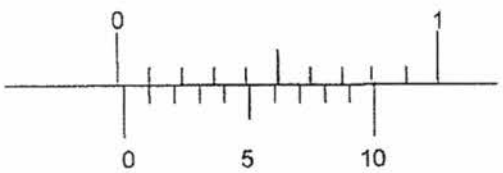
Target Set:	
	40

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

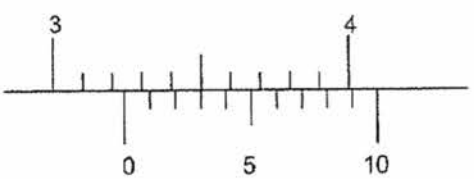
PAPER 1 (40 Marks)

Each question is provided with **four** possible answers. Select the most appropriate answer and **shade** your choice on the **Multiple Choice Answer Sheet** provided.

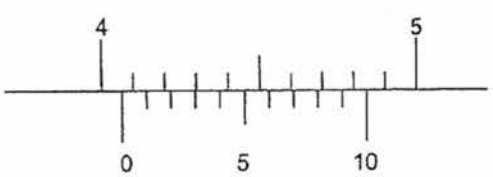
1 The diagrams show the readings on a vernier calliper when it is used to measure the thickness of three books, A, B and C.



Reading with nothing in betwee



Reading with books A and B



Reading with books A, B and C

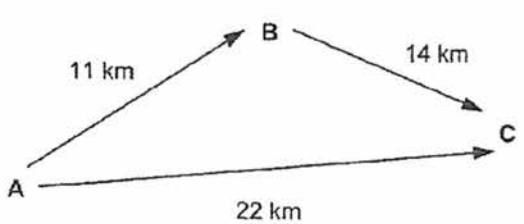
What is the thickness of book C?

A 0.78 cm **B** 0.79 cm **C** 1.21 cm **D** 1.22 cm

2 Which quantity represents the longest length?

A 500 000 mm **B** 5×10^{7} µm **C** 0.00005 Mm **D** 5×10^{-2} km

3 A train moves from town A to town B in 22 minutes and stops for 5 minutes for passengers to board. It then takes 27 minutes to travel from town B to town C. The diagram below shows the path of the train. What is the magnitude of its average velocity for the entire journey?



A 6.8 m/s **B** 7.7 m/s **C** 8.5 m/s **D** 14.5 m/s

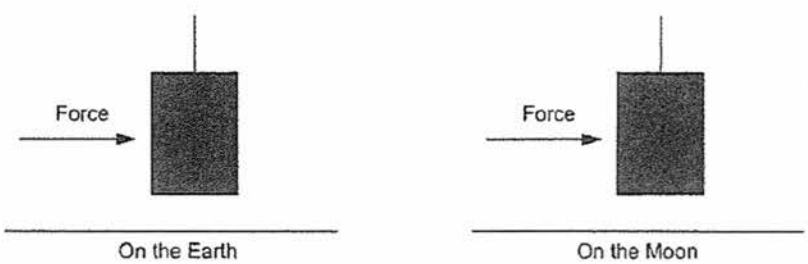
4 When a 2 kg block of wood is pushed along a surface with its side measuring 5 cm x 10 cm in contact with the table, the frictional force measured is *f*. When the same 2 kg block of wood is pushed on its other side measuring 1 cm x 5 cm, what is the frictional force measured?

A 1/5 *f* B *f* C 5 *f* D 25 *f*

5 2 000 kg of iron is melted and mixed with 3.0 m^3 of molten zinc. If the density of molten iron and zinc are 7 500 kg/m^3 and 7 100 kg/m^3 respectively, what is the approximate density of the mixture?

A 71.33 kg/m^3 B 73.33 kg/m^3
C 7133 kg/m^3 D 7300 kg/m^3

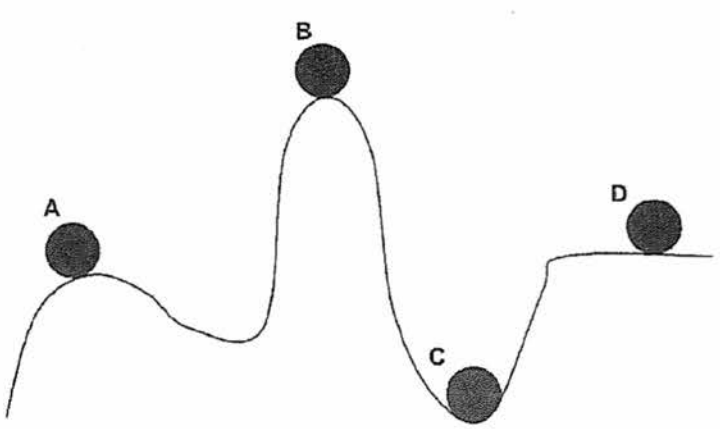
6 A block of concrete is hung on a rope close to the surface of the Earth. An identical piece of concrete is hung in the same way close to the surface of the moon. A sideway force is applied to both blocks of concrete.



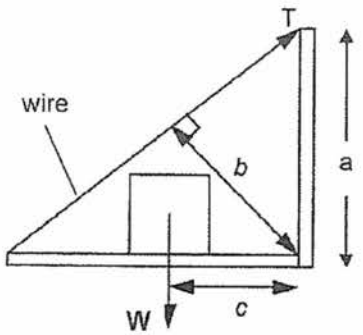
Compared to the block of concrete hanging on Earth, the block of concrete on the Moon moves

A more easily, as it has less mass
B more easily, as it has less weight
C with the same ease, as it has the same mass
D with the same ease, as it has the same weight

7 The diagram below shows four balls. Which of them is in a state of neutral equilibrium?

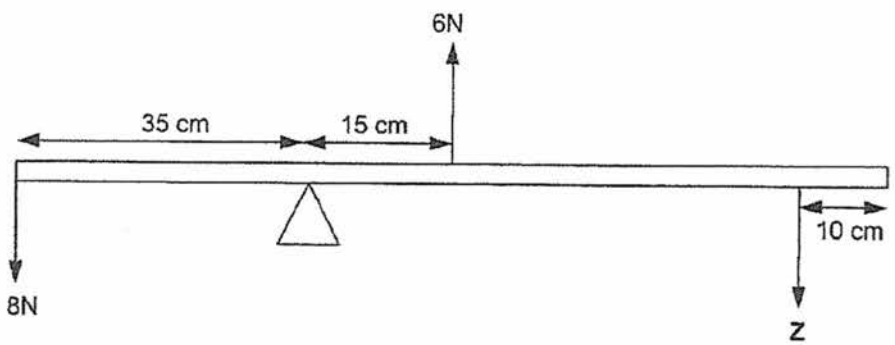


8 The diagram shows a L-shaped book shelf supporting a block of wood with weight W. What is the value of the tension in the wire, T?



A W x c/a B W x a/c C W x c/b D W x b/a

9 In order to keep the one metre long beam balanced, what should the value of Z be?

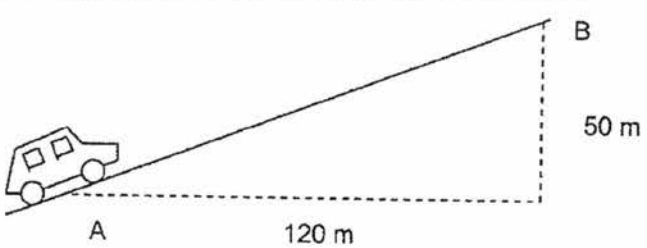


A 4.75 N B 6.73 N C 19.0 N D 37.0 N

10 The pressure of air in a sealed gas syringe increases when heated. Which of the following statement explains this phenomenon?

A Heating creates more air particles
B The average mass of air particles increased
C The air particles expanded in size
D The speed of the air particles increased

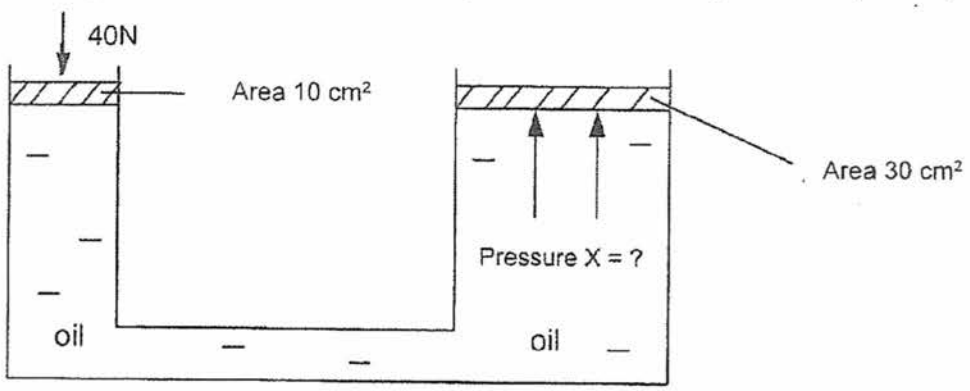
11 A 2000 kg car is travelling on a hill at a constant speed of 10 m/s.



If the frictional force along AB remains constant at 1000 N, what is the work done against friction when the vehicle travels from A to B?

A 100kJ B 130kJ C 1000kJ D 1230kJ

12 The diagram shows a force of 40 N acting on the 10 cm² small piston of a hydraulic jack.



What is the pressure X on the larger piston?

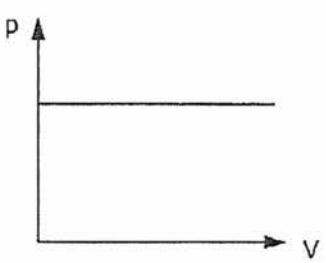
A 1.33 N/cm² B 4 N/cm² C 12 N/cm² D 120 N/cm²

13 Brownian motion can be studied by observing movement of smoke particles in air using a microscope. What causes Brownian motion?

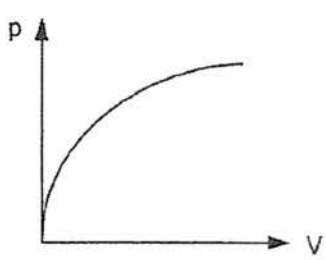
A Convection current in the air
B Collisions between smoke particles
C Movement of smoke particles
D Collisions between air particles and smoke particles

14 Which of the following graphs shows the relationship between pressure, P, and volume , V, according to Boyle's Law?

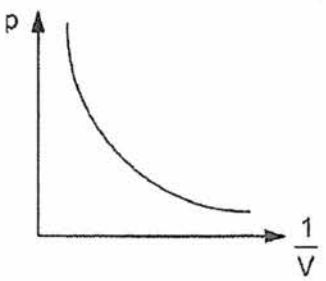
A



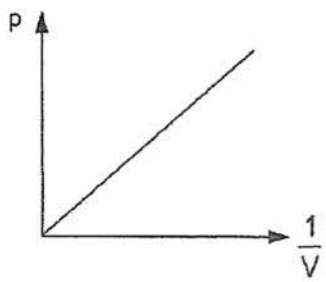
B



C



D



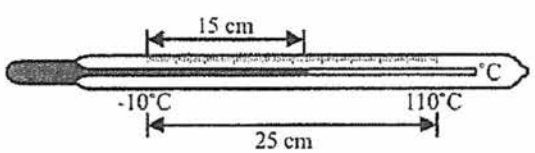
15 Heat from the sun is transmitted to Earth via radiation. This heat is transmitted in radiation via

A microwaves
B visible light
C vibration of air particles
D infra-red waves

16 In calibrating a thermocouple thermometer, one of its junctions is kept in melting ice and the other junction in boiling water. The ammeter reads 600 μA and the pointer points to the right. If the junction which was previously in boiling water is now inserted into another substance that is 30°C, what will be the reading on the ammeter and in which direction will the pointer point?

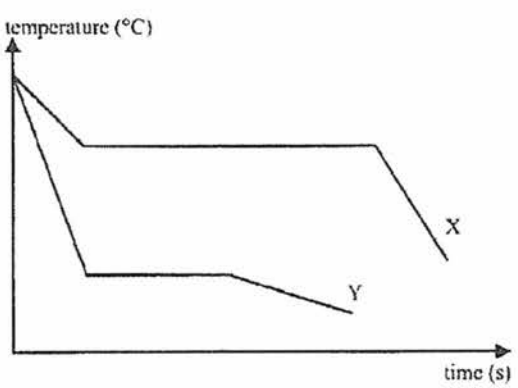
	Ammeter reading/μA	Pointer direction
A	420	Right
B	420	Left
C	180	Right
D	180	Left

17 The diagram shows a mercury-in-glass thermometer. The distance between the -10°C and the 110°C markings is 25 cm. At what 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 Two liquids, X and Y, are cooled in air. Their cooling curves are shown below.



If liquids X and Y have the same mass, which of the following statements is/are correct?

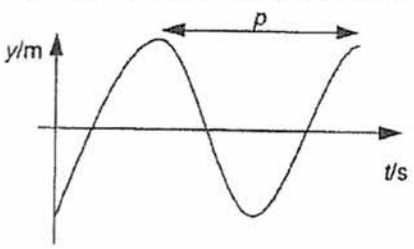
I X has a higher melting point than Y
II X has a larger specific latent heat of fusion than Y
III Liquid X has a greater specific heat capacity than liquid Y.

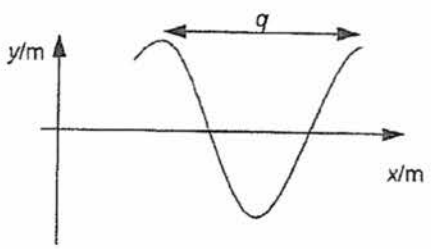
A I only B II only C I and II only D All of the above

19 In cars, a coolant is used to help dissipate the heat from the engine to the other parts of the car. The liquid that is used as a coolant in motor car engines should have a

A high specific heat capacity
B low specific heat capacity
C high specific latent heat of vaporization
D low specific latent heat of vaporization

20 A particular wave can be represented by the following graphs:

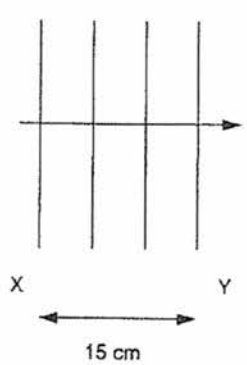




What is the speed of the wave?

A q/p B p/q C pq D 1/pq

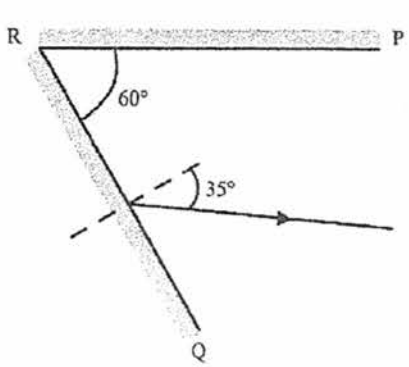
21 The figure below shows a parallel water wave travelling in a ripple tank . The wavefront at X travels to Y in 5.0 s.



What is the frequency of the water?

A 0.6 Hz B 1.7 Hz C 3.0 Hz D 5.0 Hz

22 The plane mirrors PR and QR are arranged at angle of 60° to each other. A ray of light is reflected from plane mirror QR at an angle of reflection of 35°. It was previously reflected from plane mirror PR. What is the angle of incidence at mirror PR?



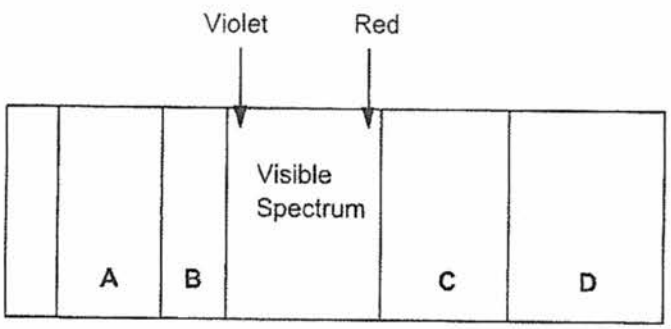
A 25° B 35°
C 45° D 65°

23 Which of the following statements about electromagnetic waves is/are correct?

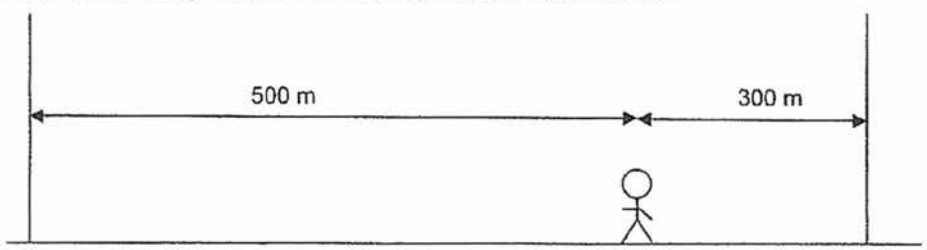
I The speed of electromagnetic waves is equal to the speed of light in a vacuum.
II Electromagnetic waves are longitudinal waves.
III Electromagnetic waves can travel through vacuum

A I only B II only C I and II only D I and III only

24 The diagram shows the electromagnetic spectrum with the ends of the visible spectrum marked. Which section of the electromagnetic spectrum has waves which have the shortest wavelength?

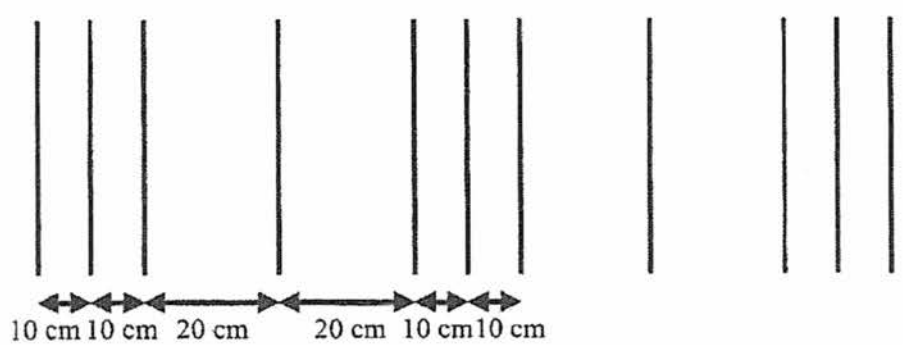


25 A man stands between two walls and fires a pistol. Given that the speed of sound in air is 330 ms^{-1}, how many echoes can the man hear for the first 5 s?



A 1 B 2 C 3 D 4

26 A sound wave travelling at 330 m/s produces the waveform shown below. The diagram below is not drawn to scale.



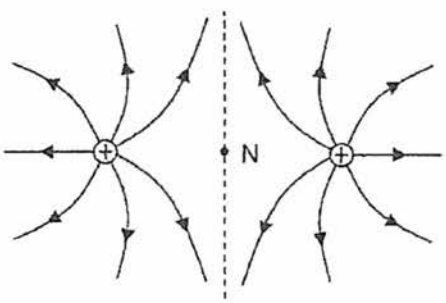
What is the frequency of the sound wave?

A 550 Hz B 825 Hz C 1110 Hz D 1650 Hz

27 What happens to a sound wave when the wavelength is doubled?

A The volume increases
B The volume decreases
C The pitch increases
D The pitch decreases

28 An electron is placed at point N in the electric field as shown below. Point N is mid-way between the two protons. The electron

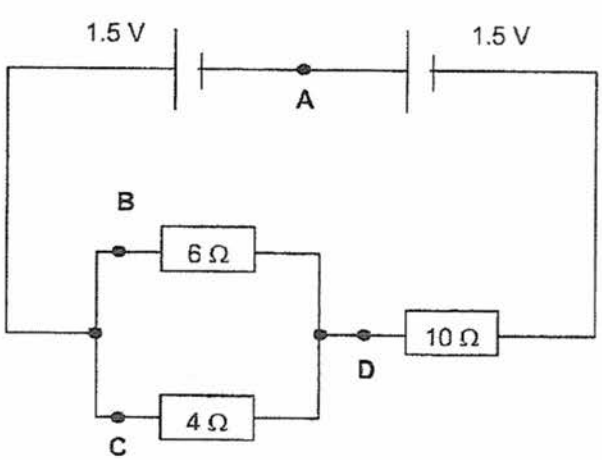


A moves upwards
B moves downwards
C does not move
D moves out of the plane of the paper

29 Why is tungsten preferred to copper when choosing the material for the filament of an electric light bulb?

A Tungsten has a lower resistance than copper
B Tungsten is less likely to combust
C Tungsten has a higher melting point than copper
D Tungsten is more malleable than copper

30 In the circuit shown, at which point, A, B, C or D, is the current the smallest?



31 One of the following electrical appliances has the largest working resistance. Which one is it?

	Electrical appliance	Power (W)	Voltage(V)
A	Washing machine	3000	250
B	Electric fan	750	240
C	Electric iron	120	240
D	Car headlamp	50	12

32 A fuse is connected to the neutral wire of a fan. Which of the following statement(s) is/are correct?

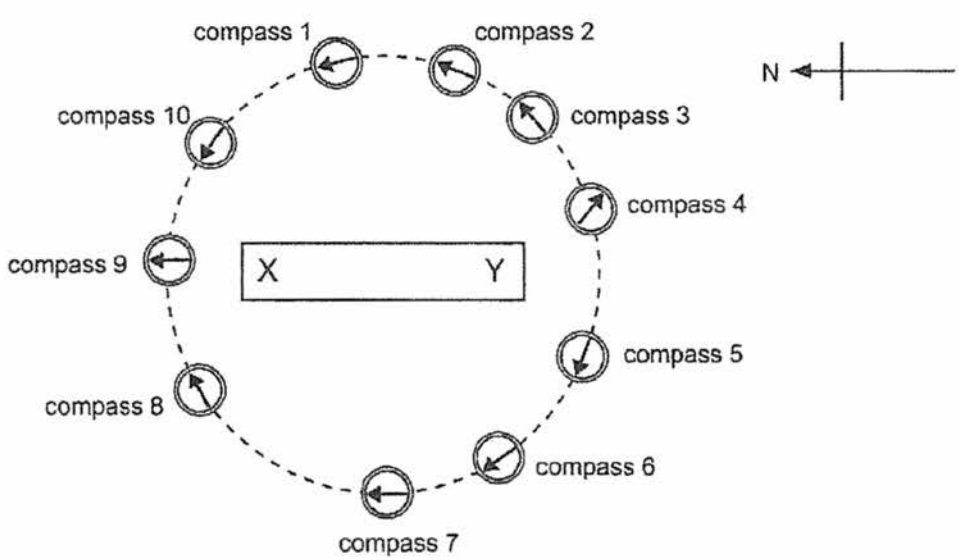
I The fan will not operate if the fuse blow
II The fan will be safe to touch when the fuse blow
III The fan will still be connected to the high voltage source when the fuse blow.

A I and III only B II and III only C I and II only D I, II and III

33 If one unit of electrical energy costs 50 cents, what is the cost of operating a 200 W lamp for 6 hours and a 1 KW fan for 4 hours?

A $0.62 B $2.60 C $5.00 D $7.00

34 The figure shows the top view of a permanent magnet with ten compasses arranged on a dotted circle around it. The poles of the magnet are unknown and are labelled as X and Y.



Which one of the following statements is correct?

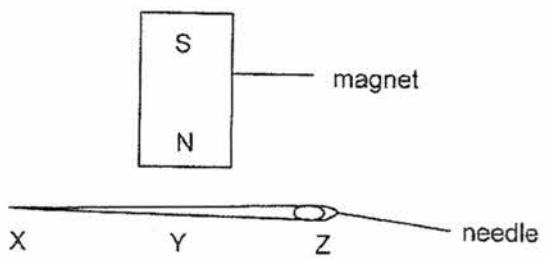
A Compass 1 is faulty
B Compass 9 is faulty
C Compass 5 is faulty
D Pole X is the north-pole and pole Y is the south-pole

35 Which of the following is a possible test to check if an unknown substance A is magnetised?

I Repulsion between substance A and another magnet
II Attraction between substance A and a non-magnet
III Attraction between substance A and another magnet.

A I only B III only C I and II D All of the above

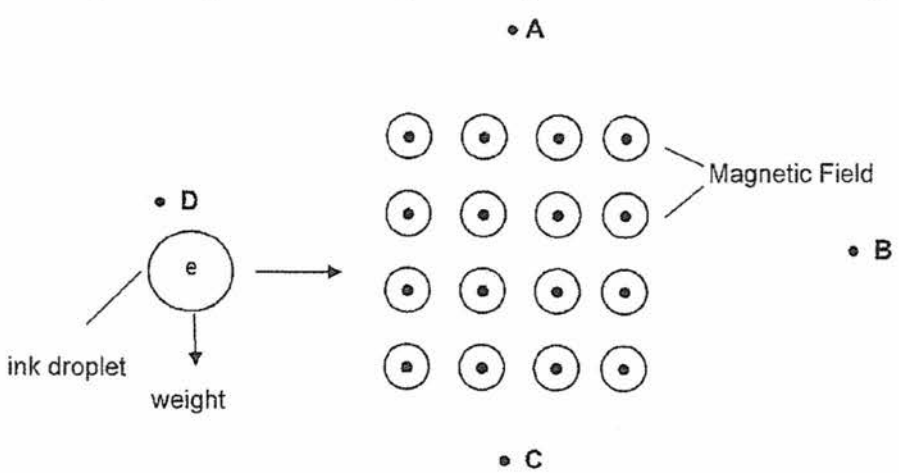
36 The diagram shows a magnet being used to pick up a steel needle. The north pole of this magnet is to the centre Y of the needle.



What are the poles induced in the needle at X, Y, and Z?

	pole induced at X	pole induced at Y	pole induced at Z
A	S	N	S
B	S	S	S
C	N	N	N
D	N	S	N

37 In an experiment to test the prototype of an inkjet printer, an ink droplet is negatively charged and ejected horizontally into a magnetic field as shown in the diagram below.

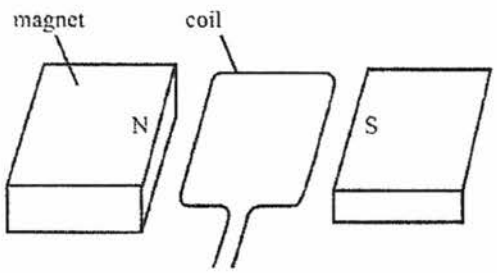


If the resulting magnetic force is 1 N and the mass of the ink droplet is 0.1 kg, at which point, A, B, C or D, would the ink droplet land at the end of the experiment?

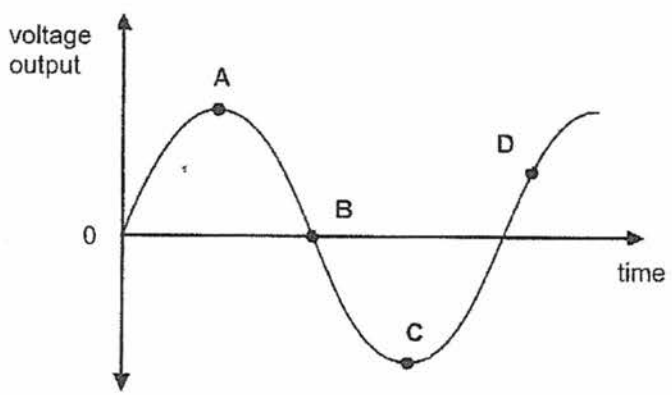
38 A coil of wire is rotating in a magnetic field. While rotating, it generates an alternating e.m.f. If the rate of rotation is increased, how will it affect the frequency and the peak value of the e.m.f.?

	Frequency	Peak Value
A	increases	increases
B	increases	Stay the same
C	decreases	increases
D	decreases	Stay the same

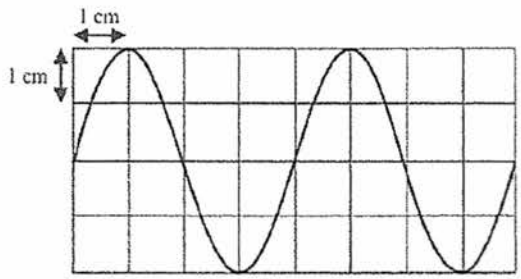
39 The diagram shows part of an a.c. generator when its coil is in a horizontal position.



The graph shows the voltage output plotted against time. Which point on the graph shows the coil in a vertical position?



40 The diagram shows a trace on an oscilloscope set at 1.0 V per cm on the vertical axis and 1.0 millisecond per cm on the horizontal axis. What is the peak voltage and frequency of the alternating voltage supplied across the Y-plates of the oscilloscope with the time-based turned on?



	Peak voltage (V)	Frequency (Hz)
A	1.5	250
B	1.5	500
C	2.0	125
D	2.0	250

[End of Paper]

Name: .....( ) Class: Sec .....

St. Gabriel's Secondary School

2017 'O' Level Preliminary Examination

Subject	:	**Physics**
Paper	:	**5059/2**
Level/Stream	:	**Sec 4 Express**
Duration	:	**1 hour 45 minutes**
Date	:	**29/08/2017**
Setters	:	**William Ng**

Additional materials: *NIL*

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your name, class and index number in the spaces provided above on this page.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
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.
The total marks for Section A is 50 marks.

Section B
Answer questions 9 and 10, and another question from **either** *question 11* **or** question 12
Write your answers in the spaces provided on the Question Paper.
The total marks for Section B is 30 marks.

All working must be clearly shown.
The number of marks is given in brackets [ ] at the end of each question or part question.

Target Set:	
	80

This question paper consists of **17** printed pages including this cover page.

Section A (50 marks)

Answer **ALL** the questions in the spaces provided.

1 **Fig.1.1** shows a motorcycle during a race.

Fig.1.1

The motorcycle accelerates along a straight section of the track from a speed of 40 m/s to maximum speed.

Fig.1.2 is the speed-time graph for the motorcycle along the straight section of the track.

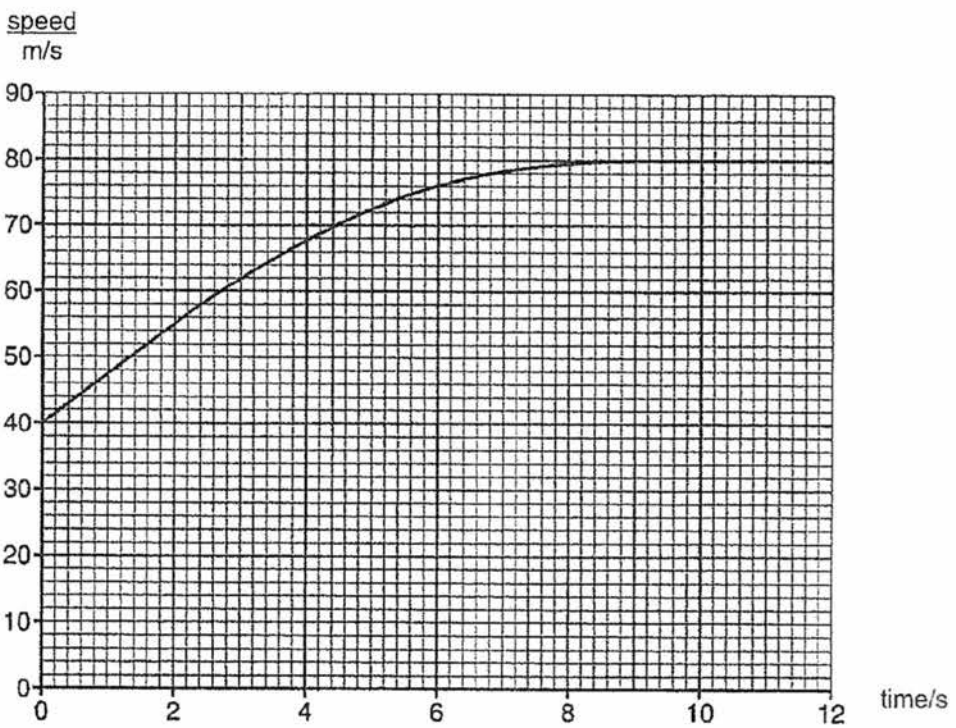


Fig. 1.2

The mass of the motorcycle is 180 kg.

(a) For the time 0 to 2.0 s, determine

(i) the acceleration of the motorcycle,

acceleration = ... [2]

(ii) the resultant force acting on the motorcycle.

force = ... [2]

(b) The driving force acting on the motorcycle remains constant throughout the 12 s spent on the straight section of the track.

(i) Using **Fig. 1.2**, state how the acceleration of the motorcycle changes during this time.

.....

.....

.....[1]

(ii) Explain, in terms of the forces acting, why the acceleration changes in this way.

.....

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.....[3]

2 Water is transported to a village in a tank pulled by a tractor.

Fig. 2.1 shows the tank being pulled by a tractor.

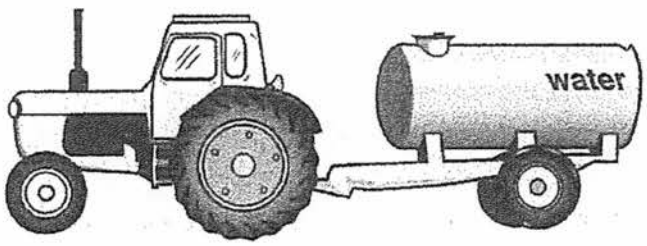


Fig. 2.1

The combined mass of the tractor and the tank is 4100 kg when the tank is empty and 6500 kg when the tank is full of water.

(a) The density of water is 1000 kg/m^3.

Calculate the volume of water in the tank when it is full.

volume = ... [2]

(b) At the start of the journey, the tractor and tank accelerates from rest along a straight horizontal road. As their speed increases, one form of energy is decreasing.

(i) State the name of the form of energy that is decreasing.

.....[1]

(ii) Explain what happens to this energy.

.....

.....

.....

.....[2]

(c) The village is located on a mountain at a vertical height of 850 m above the water supply. The gravitational field strength g is 10 N/kg.

Calculate the gravitational potential energy gained by the water as it is transported from the supply to the village.

energy gained = ... [2]

3 Fig. 3.1 shows a freezer for keeping food frozen.

Fig. 3.1

(a) The outside surface of the freezer is painted white.

Explain one advantage of having the outside surface of the freezer painted white.

.....

.....

.....

.....[2]

(b) (i) The lid of the freezer is closed and air at room temperature is trapped inside the freezer. The freezer is switched on.

State and explain, using ideas about molecules, what happens to the pressure of the air in the freezer, as it cools.

.....

.....

.....

.....

.....

.....[3]

(ii) When the freezer reaches its operating temperature, it is more difficult to open the lid. Explain why.

.....

.....

.....[1]

4 Light enters a parallel-sided glass block at A. The angles between the side of the block and the ray of light in air is 35°.

The light then strikes the edge of the block at B. **Fig. 4.1** shows the ray of light and the glass block.

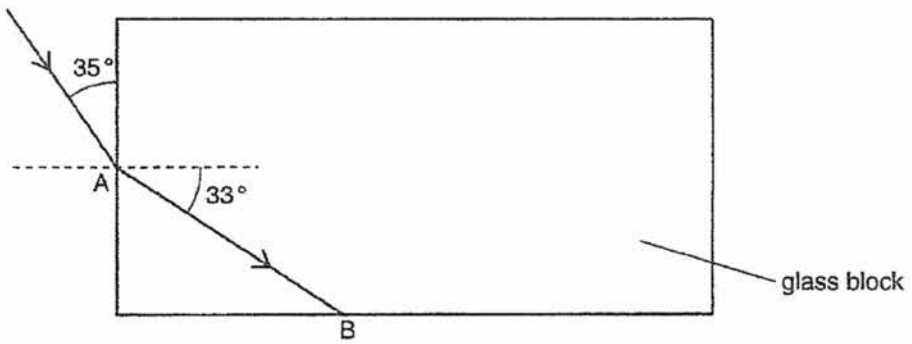


Fig. 4.1

The angle of refraction in the glass at A is 33°.

(a) Calculate the refractive index for light in the glass.

refractive index = ... [2]

(b) The light undergoes total internal reflection at B.

(i) State **two** conditions necessary for total internal reflection to occur.

.....

.....

.....

.....

.....[2]

(ii) On **Fig. 4.1**, continue the ray (need not be drawn to scale) to show the path of the light after total internal reflection at B and until it leaves the block. [1]

5 When a balloon is rubbed on hair, the balloon becomes negatively charged. The balloon is shown in **Fig. 5.1**

Fig. 5.1

(a) Explain how rubbing causes the balloon to become negatively charged.

.....

.....

.....

.....[2]

(b) Explain why the hair is pulled towards the balloon.

.....

.....

.....

.....

.....[2]

(c) Explain why it is important that the balloon is made from an electrical insulator.

.....

.....

.....[1]

(d) State one example where static electricity is useful.

.....

.....

.....[1]

6 The circuit of **Fig. 6.1** includes an ammeter, a 6.0 Ω resistor, a length of metal resistance wire and three 1.5 V cells connected in parallel.

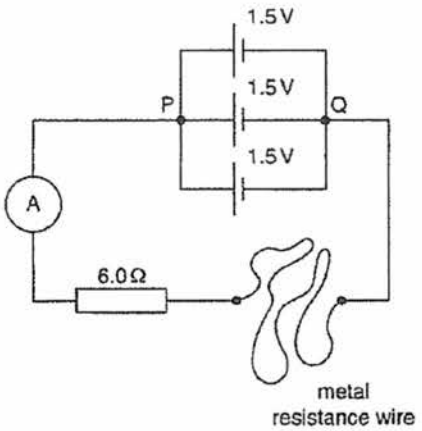


Fig. 6.1

(a) State

(i) one advantage of using cells in parallel rather than using a single cell.

.....

.....[1]

(ii) the potential difference (p.d.) between points P and Q in the circuit of **Fig. 6.1.**

p.d. = ... [1]

(b) **(i)** The ammeter in **Fig. 6.1** reads 0.075 A.

Calculate the resistance of the resistance wire.

resistance = ... [2]

(ii) The temperature of the metal resistance wire increases.
State and explain the effect of this temperature increase on the ammeter reading.

.....

.....

.....[2]

7 A potential divider is made from a light-dependent resistor(LDR) and a 6.0 kΩ fixed resistor. The potential divider is connected in series with a 12 V d.c. power supply and a voltmeter is connected across the 6.0 kΩ resistor. **Fig. 7.1** is the circuit diagram.

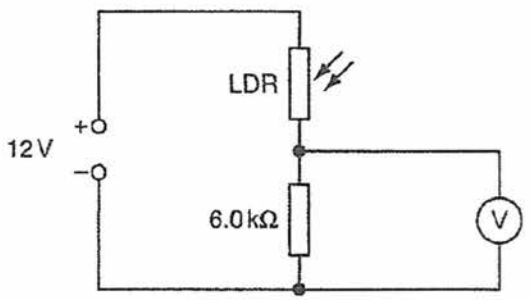


Fig. 7.1

A light shines on the LDR. The resistance of the LDR is 2.0 kΩ.

(a) Calculate

(i) the current in the LDR,

current = ... [2]

(ii) the reading of the voltmeter.

reading = ... [1]

(b) The brightness of the light on the LDR is gradually increased.

State and explain what happens to the reading on the voltmeter.

.....

.....

.....[2]

(c) Suggest a use for a potential divider made from an LDR and a fixed resistor.

.....

.....[1]

8 **Fig. 8.1** shows a transformer designed to operate a 1000 V motor in a machine.

The primary coil has 500 turns and the voltage supply is 200 V a.c.

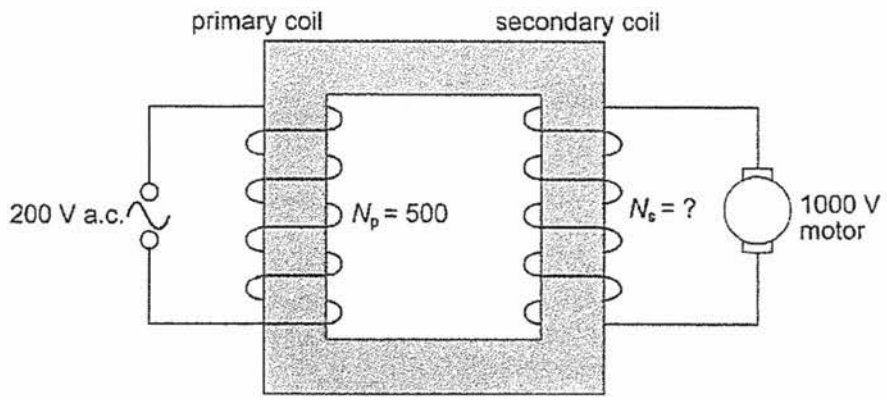


Fig. 8.1

(a) Find the number of turns (N_s) in the secondary coil.

N_s = ... [2]

(b) If the frequency of the voltage supply is 50 Hz, what is the frequency of the output voltage of the transformer?

frequency = ... [1]

(c) The current in the primary coil is 1 A. Find the current in the secondary coil if the efficiency of the transformer is 90%.

current = ... [2]

(d) Account for the energy loss in the transformer.

.....

.....[1]

Section B (30 marks)

Answer questions 9 and 10, and another question from either question 11 or question 12.

9 Some information is given below from the manufacturer of an electric car for use in a town.

	Car A with a load of 80 kg	Car B with a load of 160 kg
maximum speed	10.9 m/s	10.9 m/s
Initial acceleration	2.00 m/s^2	1.85 m/s^2

Mass of car without any load	900 kg
Furthest distance travelled by car at maximum speed without recharging	49 km
Average power produced by battery at maximum speed	4.24 kW
e.m.f. of battery	48 V
Maximum charging current	95 A

(a) (i) When the load in the car doubles from 80 kg to 160 kg, the initial acceleration of the car decreases slightly. Explain why the acceleration decreases but does not decrease by half.

.....

.....

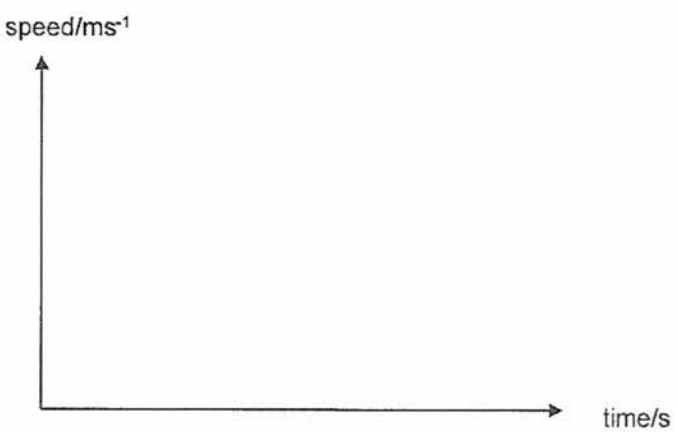
.....

.....

.....

.....[2]

(ii) Draw a sketch to show the motions of car A and car B in the axes given below. In your sketch, label the lines representing car A and car B and mark out any important values on the axes to represent the motion. [2]



9 **(b)** The car travels the furthest distance at the maximum speed without recharging.

Calculate

(i) the time taken,

time = ... [1]

(ii) the energy provided by the battery,

energy = ... [1]

(iii) the minimum time taken to fully recharge the battery,

time =..... [2]

(iv) State **one** assumption that you made in calculating **(iii)**.

.....

.....

.....

.....[1]

(c) Suggest **one** environmental advantage of using an electric car in a town.

.....

.....

.....[1]

10 Fig. 10.1a shows a room heater. **Fig. 10.1b** is a diagram of the electric circuit of the heater.

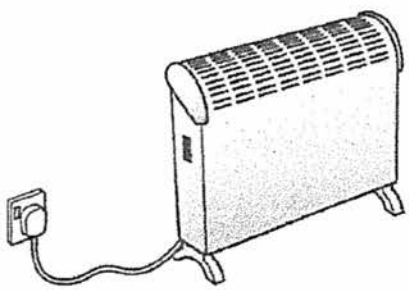


Fig. 10.1a

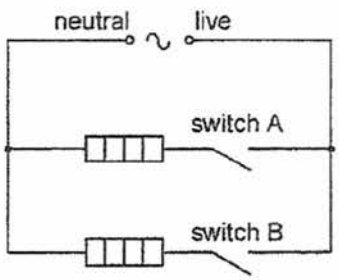


Fig. 10.1b

The fuse has not been drawn on the circuit diagram in **Fig. 10.1b.**

(a) (i) **On Fig. 10.1b**, draw the symbol for a fuse in the correct position. [2]

(ii) State which part of the heater is the earth wire connected to.

.....[1]

(iii) The earth wire reduces the chance of an electric shock if a fault develops in the room heater. Explain how an earth connection prevents an electric shock.

.....

.....

.....[2]

(b) **Fig 10.2** shows the power output of the room heater when each switch is closed.

	Power/W
Switch A only closed	600
Switch B only closed	
Both switches closed	2100

Fig 10.2

(i) Determine the power output of the room heater when only switch B is closed.

power output =..... [1]

(ii) The room heater is used with both switches closed for 2.5 hours.

Calculate the energy of the room heater

1. in kilowatt-hours,

energy = ... kWh [2]

2. in joules.

energy = ... J [2]

EITHER

11 **Fig. 11.1** shows a setup used to investigate motor effect.

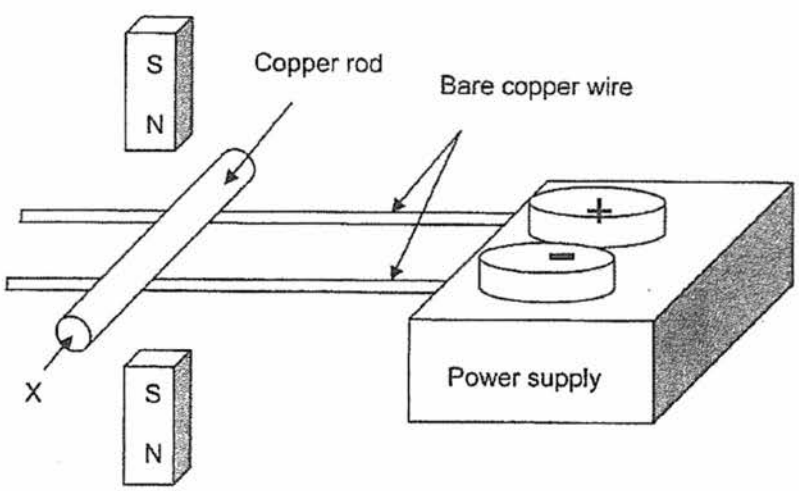


Fig. 11.1

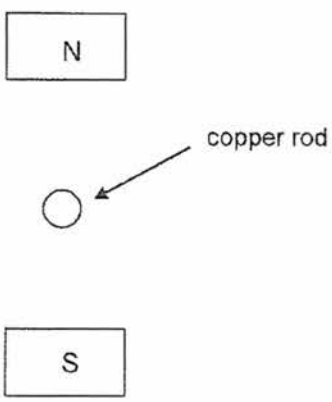
(a) Describe and explain what happens to the copper rod when the current is switched on.

.....

.....

.....[2]

(b) Sketch a drawing showing the magnetic field between the two magnets, looking from point X in **Fig. 11.1** when the power supply is switched on. Indicate also the direction of current flow in the copper rod. [3]



(c) Explain what happens when a 50 Hz alternating current is used in the power supply instead of a direct current.

.....

.....

.....

.....[2]

(d) A stream of protons and electrons enters a magnetic field in opposite directions and from the centre of the sides of the field. Draw the expected path of the protons and electrons, ignoring the attractive forces between the two particles. [3]

OR

12 The label on an electric kettle is marked 220 V, 4.8 kW. One such kettle contains 1.2 kg of water at 20°C. It takes 4 minutes to raise the temperature of the water to 100°C. It takes a further 3.5 minutes to boil away 0.17 kg of the water.

The specific heat capacity of water is 4200 J/kgK.

The specific latent heat of vaporization of water at 100°C is 2300 kJ/kg.

(a) State the meaning of 220 V, 4.8 kW.

.....

.....[2]

(b) Calculate:

(i) the energy output of the electric element in the kettle in 4 minutes.

energy output = ... [2]

(ii) the energy required to raise the temperature of the 1.2 kg of water from 20°C to 100°C.

energy required = ... [2]

(iii) the energy required to boil away 0.17 kg of water at 100°C.

energy required = ... [1]

(c) Estimate the energy supplied by the electric element

(i) during the first 4 minutes which was not used to increase the temperature of 1.2 kg of water from 20°C to 100°C,

energy = ... [1]

(ii) during the last 3.5 minutes which was not used to boil away the 0.17 kg of water.

energy = ... [1]

(d) Suggest why the energy loss in **(c)(i)** and **(c)(ii)** are different. You may describe the possible energy changes in the body of the kettle.

.....

.....

.....[1]

[END OF PAPER]

Marking Scheme & Markers Report : 2017 St. Gabriel's Secondary School Preliminary Examination

Paper 1

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

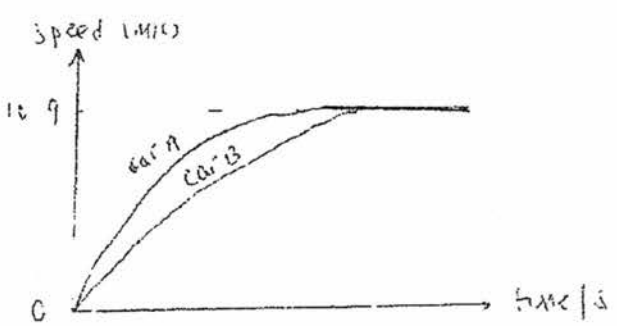
A = 10, B = 10, C = 10, D = 10

Paper 2, Section A

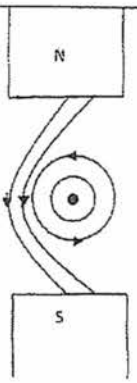
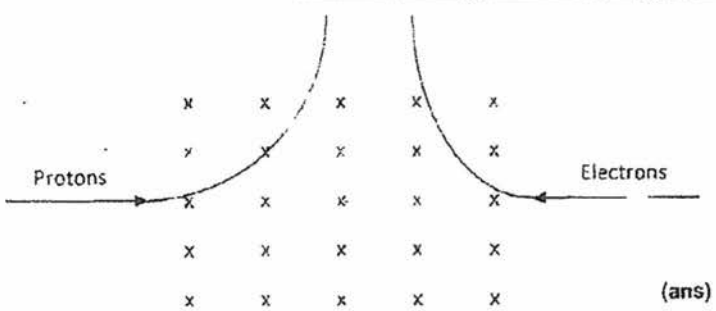
Question	Solutions	Marks / Remarks
1(a)(i)	(a) =(v-u)/t or $\Delta v/t$ or (55–40) /2 or equivalent values from graph = 7.5m/s^2	[1] [1]
1(a)(ii) **Markers Comments (MC)**	(F) = ma = 180 kg x 7.5 m/s^2 = 1350 N Q1(a) is very well-done. Majority of the students obtained full marks.	[1] [1]
1(b)(i) **MC**	acceleration decreases to zero. OR Some students break down the acceleration into 3 parts (i) 0 to 2.0s - constant acceleration (ii) 2.0 s to 8.0 s - decreasing acceleration (iii) 8.0 s to 12.0 s - zero acceleration Many students wrote **wrongly** that the acceleration is increasing at a decreasing rate. It **should be** called decreasing acceleration.	[1] Or [1] if all parts are correct. [1/2] if only 2 parts are correct
1(b)(ii) **MC**	air resistance/friction/drag mentioned air resistance/friction/drag increases (with speed) or resultant force decrease (with speed) finally, air resistance = driving force or resultant force is zero. Some students that that the resultant force decreases without explaining that the friction force increases with speed. Some students state that at the maximum speed, the resultant is zero without explaining that at that point the air resistance is equal to the driving force. Hence no credit were given.	[1] [1] [1]
2(a) **MC**	(V) = m/ρ (V) = 2400 kg/1000 kg/m^3 = 2.4 m^3 / 2.4 x10^6 cm^3 This question was very well-done. Majority of the students were correct.	[1] [1]

2b(i) MC	fuel/chemical (potential energy) Generally well done. No credit if they only mention potential energy.	[1]
2b(ii) MC	some energy converted to heat /thermal (energy) some energy converted to kinetic (energy of air or tractor) Not so well done. Many students only mention energy conversion to either kinetic energy or heat but not both. So they only obtained half the credits.	[1] [1]
2(c) MC	(GPE) = mgh = 2400 x 10 x 850 = 2.04×10^7 J Generally well-done.	[1] [1]
3(a) MC	poor absorber/ good reflector of (infra-red) radiation (not with poor emitter) less thermal energy absorbed. Generally well done except for a few who state poor radiator/ conductor instead of poor absorber and those that state both poor radiator and absorber.	[1] [1]
3(b)(i) MC	pressure decreases. molecules slow down less frequent/less violent(molecular) collision **with wall** Majority of the students obtained full credit with only a few exceptions whose answers were not complete.	[1] [1] [1]
3(b)(ii) MC	**pressure difference** causes a downward **force** on lid or pressure outside is greater than pressure inside. Only about half the students were correct. If the students do not mentioned about **pressure difference** or **force** they are unlikely to get any credit.	[1]
4(a)	(n) = sin i/sin r = sin 55°/ sin 33° = 1.5(2 s.f.) or 1.50 (3 s.f)	[1] [1]
4(b)(i)	angle of incidence greater than critical angle light travels from denser to rarer medium	[1] [1]
4(b)(ii) MC for Q4	reflected ray in correct direction to edge of block **and** no second TIR Quite well-done. Most students obtained full or almost full-marks.	[1]
5(a) MC	negative charge moves from hair/person/head to balloon electrons move from hair/person/head to balloon. Only **half** the students got full credits. Many students were unfamiliar with the mechanism of charging by friction.	[1] [1]
5(b) MC	hair is positive(at end) opposite charges attracts Generally fairly well-done. Quite a number of students did not obtained the full credit because they didn't state the physics principle that 'unlike charges attracts'.	[1] [1]

5(c)	charges/electrons • don't flow away • aren't conducted(to earth/person) stay on balloon/insulator MC This question is very poorly done. The charges that is built-up in this experiment is very small and will unlikely caused a spark or a large current to flow through the person if it was a condcutor.	[1]
5(d)	any sensible example e.g .photo-copier, electrostatic precipitator, flu ash removal, spray painting, printing, crop spraying, lightning fixes in atmosphere etc. MC Only about half the students were able to give an appropriate example. It is insufficient to mention painting instead of spray painting of objects.	[1]
6(a)(i)	last longer **or** one cell can be replaced without switching off the circuit. **or** if one cell fails the rest will still work MC Majority of the students were able to answer this question with a few exception.	[1]
6(a)(ii)	1.5 V MC Generally well-done	[1]
6(b)(i)	Total Resistance = V/I or 1.5/0.075 =20 Ω (R) = 20 - 6 = 14 Ω MC Quite a number of students forgot to subtract away the 6 Ω fixed resistance.	[1] [1]
6(b)(ii)	decrease resistance of wire increase MC Only half the students were correct. A number of students were unsure if the resistance increase or decrease when the temperature increases.	[1] [1]
7(a)(i)	(I) = V/R = 12 / 6000 + 2000 = 12/8000 =0.0015 A or 1.5 mA MC Quite a number of students forgot to change the resistance of the LDR of 2 kΩ to 2000 Ω and not 2Ω in their calculation and so obtained the wrong answer.	[1] [1]
7(a)(ii)	(v) = 6000/(6000+2000) x 12 = 9 V MC Generally well-done as ecf is also awarded for this.	[1]
7(b)	reading increases resistance of LDR falls MC Generally well-done except for those who thought that the reading decreases when resistance of LDR increases.	[1] [1]
7(c)	light meter/sensor **or** automatic light switch **or** something sensible MC Only slightly more than half the students where able to give an acceptable answer.	[1]

8(a) MC	Np/Ns = Vp/Vs 500/Ns = 200/1000 Ns = 2500 This question is very well-done	[1] [1]
8(b) MC	50 Hz Quite a number of students got this wrong because they thought that the frequency would be step up but it remains constant.	[1]
8(c) MC	$P_{output} = P_{input} \times 90\%$ (1000V)(Is) = (0.9)(200V)(1 A) Is = 0.18 A Majority were able to calculate this correctly.	[1] [1]
8(d) MC	Heat loss in the wire. Heat loss due to induced current in the core. Energy used for magnetisation of the core. Quite a number of students did not receive any credit because they did not explain clearly what causes the energy loss. It is insufficient to just mentioned that energy is loss as heat in the transformer without specifying clearly that heat is loss due to the resistance of the wire.	[1] Anyone on the stated list.
	Section B	
9(a)(i) MC	Assuming that the resultant force on the car is constant, then by Newton's 2nd law, the resultant force F is equal to the total mass of the car and its acceleration a. If the total mass of the car increases by two times, then we will expect the acceleration to decrease by half. However when the load is doubled, the total mass of the car increase by a factor of (900 + 160)/ (900 + 80) = 1.08 and not a factor of 2. Many students did not obtained any credits for this question as their answers did not relate to Newton's 2nd Law.	[1] [1]
9(a)(ii) MC	 Many of the students drew straight line instead of curve line for car A and B. Many students also forgot to label the lines to show which is car A and car B.	Correct label Car A [1/2] Car B [1/2] Correct Data 10.9 [1/2] 0 [1/2]

9(b)(i)	speed = distance travelled / time taken time taken = 49 000 / 10.9 = 4490 s (3 s.f.)	[1]
9(b)(ii)	energy provided by the battery = Power produced x time = (4.24 x 10^3) x 4495 = 1.91 x 10^7 J (3 sf)	[1]
9(b)(iii)	energy needed to recharge battery = current x e.m.f. x time 1.91 x 10^7 J = 95 A x 48 V x time(t) Hence minimum time taken to fully charge the battery, t = (1.91 x 10^7)/(95 x48) = 4200 s (2 s.f.)	[1] [1]
9(b)(iv) MC for 9(b)	No energy, such as heat, was lost to the surroundings during the charging of the battery. Students were generally able to do the calculations Q9(b). Ecf was also awarded for these questions.	[1]
9(c) MC	Electric cars do not emit polluting gases, unlike fuel cars that burn petroleum for energy. Generally well-answered	[1]
10(a)(i) MC	fuse symbol correct in live junctions before two elements Generally well-answered	[1] [1]
10(a)(ii) MC	the **metal** case / outside Generally well-answered. Quite a number of students were only given half the credit if they did not mentioned **metal** casing but only casing.	[1]
10(a)(iii) MC	live wire touches metal casing; live touches person, current goes to earth; current does not go through person, Many students did not get full credit because they failed to mentioned that when the live wire touches the metal casing will the current be transmitted to the earth wire instead of the person.	[1] [1]
10(b)(i) MC	1500 W Generally well-done	[1]
10(b)(ii) MC	1. E = 2.1 kW x 2.5 h = 5.25 kWh 2. E = 2100 W x 2.5 x 3600 s = 1.89 x 10^7 J Majority of the students were able to calculate the energy in kWh but quite a number were unable to convert it to Joules.	[2] [2]
Either MC	Not many students select to do the **Either** Question and those who did select this question did not do well overall.	
11(a) MC	The copper rod moves to the right. According to Fleming's left hand rule, the force acting on the copper rod points to the right. This was generally well-answered.	[1] [1]

11(b)		[2]
MC	Most of the students were unable to draw the magnetic field lines correctly. Some did not indicate the direction of the current in their diagrams.	
11(c)	The current in the copper rod changes direction at a rate of 50 Hz, causing the direction of the force to change accordingly. Hence the copper rod moves and changes its direction of motion 100 times per second.	[1] [1] [1]
MC	Many students did not obtained full credit for this question as they only state that the copper rod changes direction without giving any other details.	
11(d)		[1] protons deflect upwards [1] electrons deflect upwards [1] electrons deflects more than protons
MC	None of the students obtained the mark that showed that the electron deflects more than the protons	
OR	Majority of the students answered the OR questions and did fairly well in this question.	
11(a)	When supplied with a voltage of 220 V, the power output is 4.8 kW	[1] [1]
MC	This question was poorly answered by most students	
11(b)(i)	Energy = power x time = 4.8 x 1000 x 4 x60 =1152 kJ	[1] [1]
11(b)(ii)	Energy = 1.2 x 4200 x 80 =403.2 kJ	[1] [1]
11(b)(iii)	Energy = 0.17 x 230 000 = 391 kJ	[1]
11(c)(i)	1152 - 403.2 = 749 kJ(3sf)	[1]
11(c)(ii)	1152 - 391 = 761 kJ	[1]
MC	Most students were able to answer 11(b) & (c) fairly well.	

11(d) MC	As the kettle gets hotter, there will be increasing heat loss through conduction and convection. These make heating less effective, thus accounting for the increase in unused power in (c)(ii). No student gave the correct answer to this part of the question.	[1]
	END OF PAPER	