Candidate Name: _____

Class:	
Index No:	

Chong Boon Secondary School
Preliminary Examination 2017
Secondary 4 Express / 5 Normal (Academic)
Science (Physics, ~~Chemistry~~)
Paper 1 Multiple Choice   **5076/01**

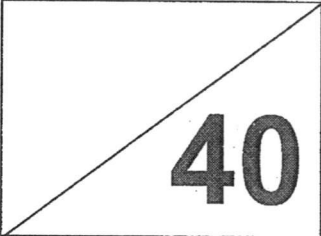| 29th Aug 2017 (Tuesday)	1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THIS INSTRUCTIONS FIRST

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

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 Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Periodic Table is printed on **page 17**.
The use of an approved scientific calculator is expected, where appropriate.
The total marks of this paper is 40.

For Examiner's Use
40

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This document consists of **10** printed pages and 2 blank pages.

1   In the diagram below, a micrometer is used to measure the diameter of a ball bearing

The corrected reading is 4.65 mm.
What is the zero error of this micrometer?

A   -0.52 mm   B   -0.02 mm

C   +0.02 mm   D   +0.52 mm

2   The graph below shows the speed of a car as it accelerates from rest. During part of this time the acceleration is uniform.

What is the size of this uniform acceleration?

A   5 m/s²   B   10 m/s²

C   15 m/s²   D   40 m/s²

3   A car of mass 1000 kg is moving on a road with an acceleration of 2.0 m/s².
     What is the driving force of the engine if the car experiences a constant resistance of 1000 N?

A   500 N   B   1000 N

C   2000 N   D   3000 N

4   The table shows the results of an experiment in which a sample of solid is placed in four different liquids.

liquid	density of liquid kg/m³	observation
paraffin	700	sinks
pure water	1 000	sinks
sea water	1 100	float
mercury	14 000	float

Which of the following best describes the density of the solid?

A   between 700 kg/m³ to 1000 kg/m³

B   between 1000 kg/m³ to 1100 kg/m³

C   exactly 700 kg/m³

D   exactly 1000 kg/m³

5   The diagram below shows a man in a small boat.

Why does the boat become less stable when the man stands up?

A   The centre of gravity of the man and boat is higher.

B   The centre of gravity of the man and boat is lower.

C   The total weight of the man and boat becomes higher.

D   The total weight of the man and boat becomes lower.

6 A man pushes a box weighing 50 N across a floor. He exerts a force of 80 N and the box moves 4.0 m in 5.0 seconds.
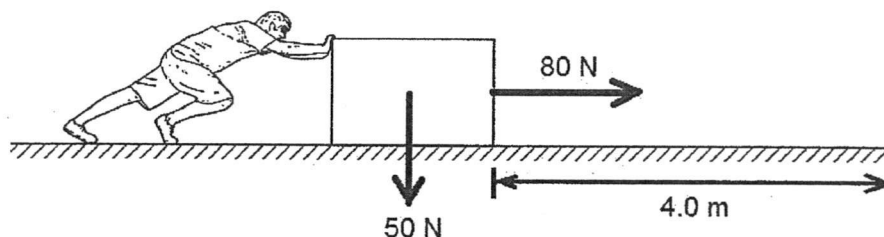
What is the average power developed by the man?

A 40 W **B** 64 W **C** 1 000 W **D** 1 600 W

7 The outlet of a glass syringe is sealed so that air is trapped below the piston as shown in the diagram below.
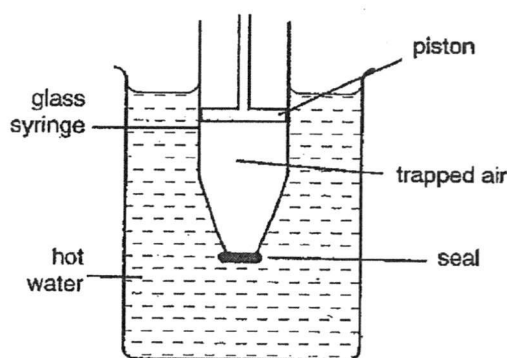

Which of the following explains why the piston begins to rise when the syringe is placed in hot water?
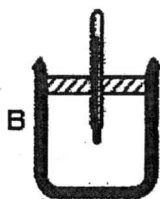
A Convection is occurring inside the syringe.

B The glass is expanding.

C The molecules of trapped air are getting bigger.

D The trapped air molecules are hitting the piston more often with greater force.

8   Four metal cans are identical except for the colour and texture of their outer surfaces. The same amount of tap water is poured into each can.
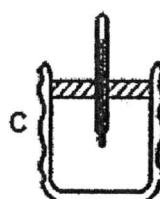
Which can will give the highest temperature reading after being put in the sun for a period of time?
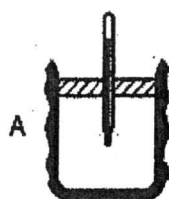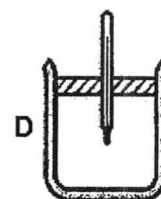

A	B	C	D
black, rough surface	black, shiny surface	white, rough surface	white, smooth surface

9   When a liquid evaporates, some of its molecules escape from the surface and the temperature of the liquid changes.

Which of the following describes the escaping molecules and change in temperature of the liquid?

	escaping molecules	temperature of liquid
A	high energy	decreases
B	high energy	increases
C	low energy	decreases
D	low energy	increases

10 The diagram shows two divergent rays of light from an object O being reflected from a plane mirror.

At which position will the image be formed?
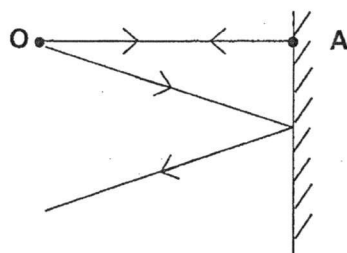
11   The displacement-distance and displacement-time graphs are shown for a water wave in an ocean.
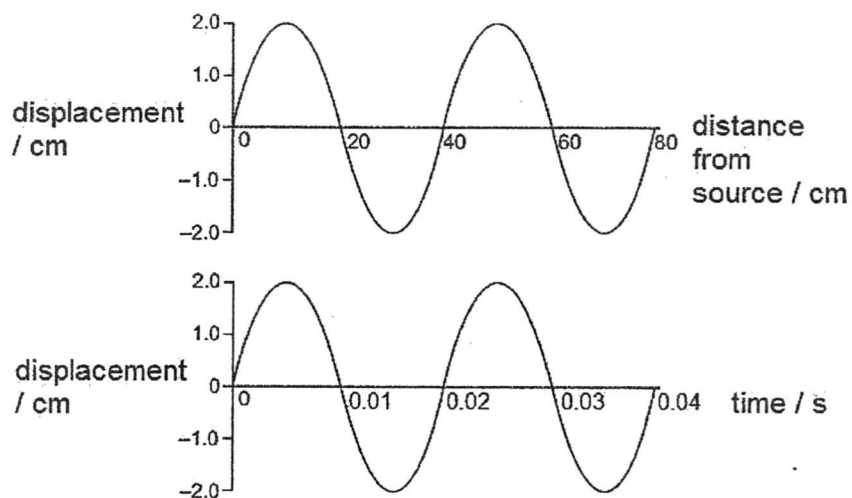
What is the speed of the water wave?

A   100 cm/s   B   1 000 cm/s

C   2 000 cm/s   D   4 000 cm/s

12   Which of the following electromagnetic waves is commonly used to sterilise medical equipment?

A   infra-red   B   microwaves

C   ultraviolet   D   visible light

13 The diagrams show how an ultrasound is being used to find the distance between a ship and the sea bed. The speed of ultrasound in water is 1500 m/s.
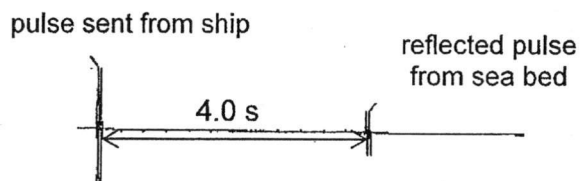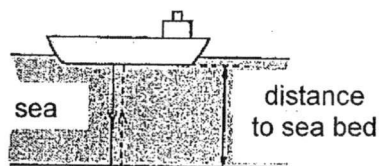
What is the distance between the ship and the sea bed?

A   1500 m   B   3000 m

C   6000 m   D   12 000 m

14 A polythene rod repels an inflated balloon hanging from a nylon thread.

What charges must the rod and the balloon carry?

A   The balloon is charged but the rod is not.

B   The rod and the balloon carry like charges.

C   The rod and the balloon carry opposite charges.

D   The rod is charged but the balloon is not.

15 A wire has a resistance of 16 Ω. A second wire, made of the same material, has half the length and half the cross-sectional area.

What is the resistance of the second wire?

A   2 Ω   B   4 Ω
C   16 Ω   D   64 Ω

16   Current flows in two resistors connected in series as shown in the diagram below. A_1 and A_2 are the readings on the ammeters. V_1 and V_2 are the readings on the voltmeters.
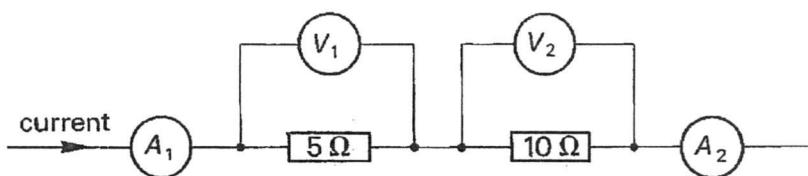
Which of the following correctly describes the ammeter and voltmeter readings?

	ammeter readings	voltmeter readings
A	A_1 is equal to A_2	V_1 is equal to V_2
B	A_1 is equal to A_2	V_1 is less than V_2
C	A_1 is greater than A_2	V_1 is equal to V_2
D	A_1 is less than A_2	V_1 is less than V_2

17   Which of the following appliances, used on a 240 V mains supply, will melt its fuse?

	appliance	fuse
A	100 W lamp	1.0 A
B	1 kW vacuum cleaner	5.0 A
C	2 kW heater	8.0 A
D	3kW electric cooker	13.0 A

18   A plug is wrongly wired as shown in the diagram below. It is connected to an old vacuum cleaner which has a metallic case.

blue   brown

green &
yellow
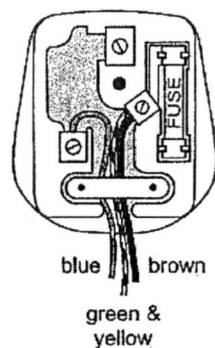
What will be the effect of using the plug wired in this way?

A   The fuse in the plug will blow.

B   The metal case will be live.

C   The neutral wire will melt.

D   The vacuum cleaner will catch fire.

19   A solenoid carrying a current is used to demagnetise a bar magnet.
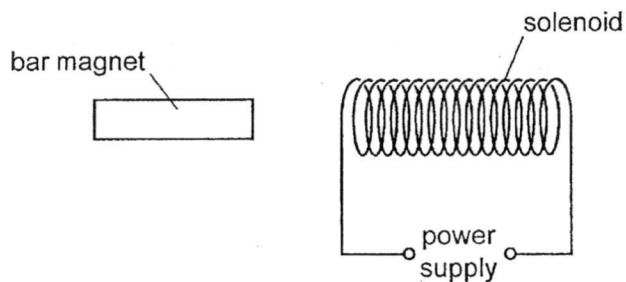
Which conditions achieve demagnetisation?

	current through solenoid	movement of bar magnet
A	a.c.	around the solenoid quickly
B	a.c.	through the solenoid slowly
C	d.c.	around the solenoid quickly
D	d.c.	through the solenoid slowly

20   The diagram below shows a current in a conductor in a magnetic field.
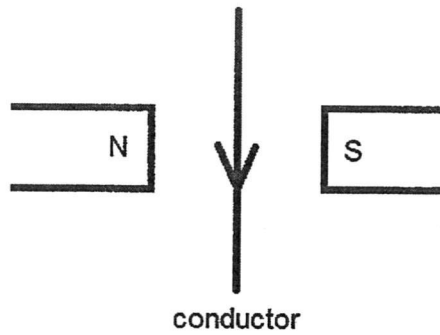
conductor

What is the direction of the force on the conductor?

A   into the page

B   out of the page

C   towards the bottom of the page

D   towards the top of the page

Candidate Name: _____

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Chong Boon Secondary School
Preliminary Examination 2017
Secondary 4 Express/5 Normal (Academic)

Science (Physics)   **5076/02**

Paper 2

11th Sep 2017 (Monday)	1 hour 15 minutes

Additional Materials:

READ THESE INSTRUCTIONS FIRST

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

1. There are two sections in this paper

    Section A
    Answer all questions
    Write your answers in the spaces provided

    Section B
    Answer any **two** questions.
    Write your answers on the spaces provided.

Information to Candidates

1. The number of marks is given in brackets [ ] at the end of each question or part question.
2. Candidates are reminded that all quantitative answers should include appropriate units.
3. Candidates are advised to show all working in a clear and orderly manner, as marks are awarded for sound use of physics than for correct answers.
4. Electronic calculators are allowed to be used.
5. Unless otherwise stated, you are to take g, the acceleration due to gravity, to be 10 ms⁻²

For Examiner's Use
65

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*This document consists of **14** printed pages (including the cover page) and **2** blank pages.*

SECTION A [45 Marks]
Answer **ALL** questions. Write your answers in the spaces provided.

1   A motorcycle accelerates along a straight section of a track from a speed of 40 m/s to maximum speed. Fig. 1.1 is the speed-time graph for the motorcycle along the straight section of the track

Fig. 1.1
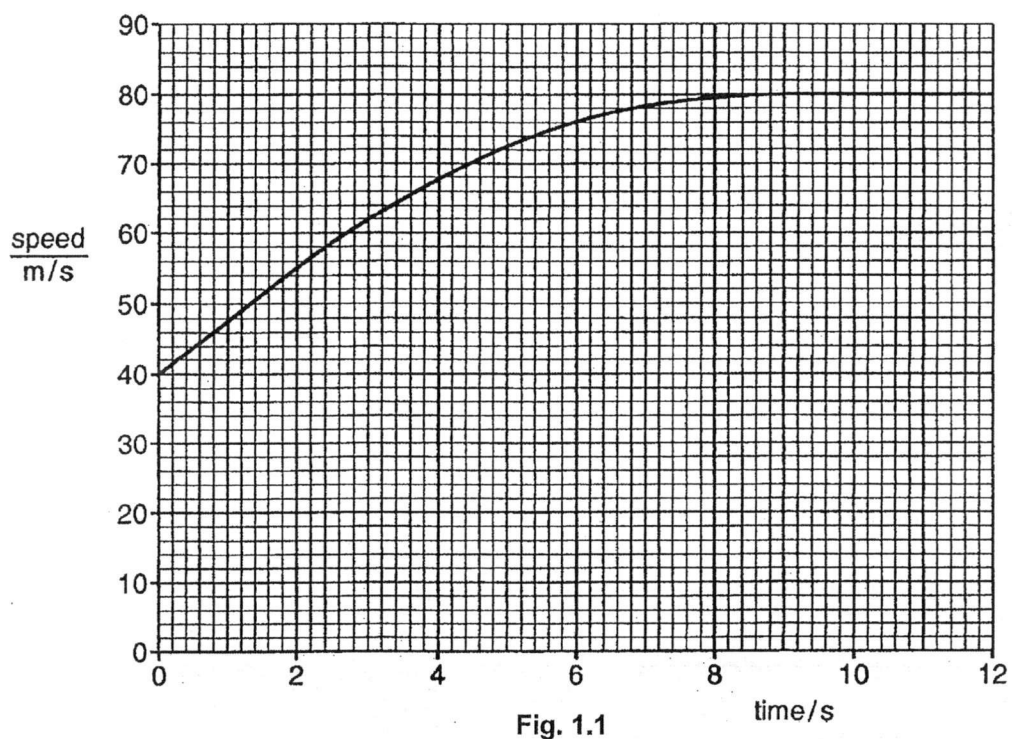
(a)   For the time 0 s to 2.0 s, determine the acceleration of the motorcycle.

acceleration = ... m/s² [2]

(b)   Calculate the distance travelled by the motorcycle at constant speed.

distance = ...m [1]

2   In an experiment, a 5 kg block is initially at rest as shown in Fig. 2.1. In regions AB and BC, the surfaces are frictionless. An external force of 12 N is acting on the block.
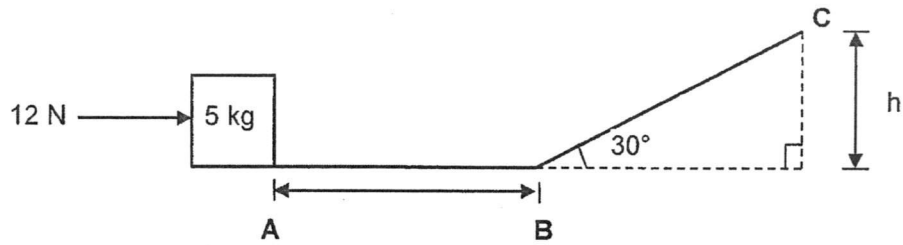
Fig. 2.1

(a)   Find the acceleration of the block in region AB.

acceleration = ...m/s² [2]

(b)   If it takes 0.9 s for the block to travel from point A to point B, find the velocity of the block at point B

velocity = ...m/s [2]

(c)   Calculate the kinetic energy of the block at point B.

kinetic energy = ...J [1]

(d)   If the 12 N force is removed at point B and the block continues to move to point C before it comes to a momentary stop, calculate the height, h.

h = ...m [2]

3   A block has mass of 10 kg on Earth.

  (a)   Calculate the weight of the block.

weight of block = ...N [2]

  (b)   The block is teleported to Krypton, a planet with a gravitational field strength twice that of Earth. Calculate the mass and weight of the block on Krypton.

mass of block = ...kg [1]

weight of block = ...N [1]

4   Fig. 4.1 shows a simple tool to punch holes in a sheet of material. The handle is pushed down to produce the hole.
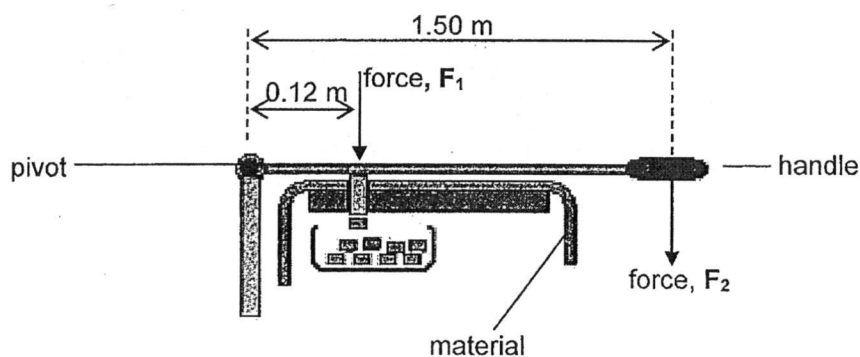
Fig. 4.1

  (a)   Calculate the punch force F_1 produced when the applied force, F_2 is 2.0 N.

force F_1 = ... N [2]

4 **(b)** Describe and explain one way we can modify the tool so that it can be used to punch through a tougher material using the same force, F_2 of 2.0 N.

....

....

....

....[2]

5 Fig 5.1 shows a motor in a crane slowly lifting a 50 kg bucket of rubble. The bucket was initially 5 m above the ground, and the motor raises it through a vertical height of 10 m in 2 minutes before stopping.
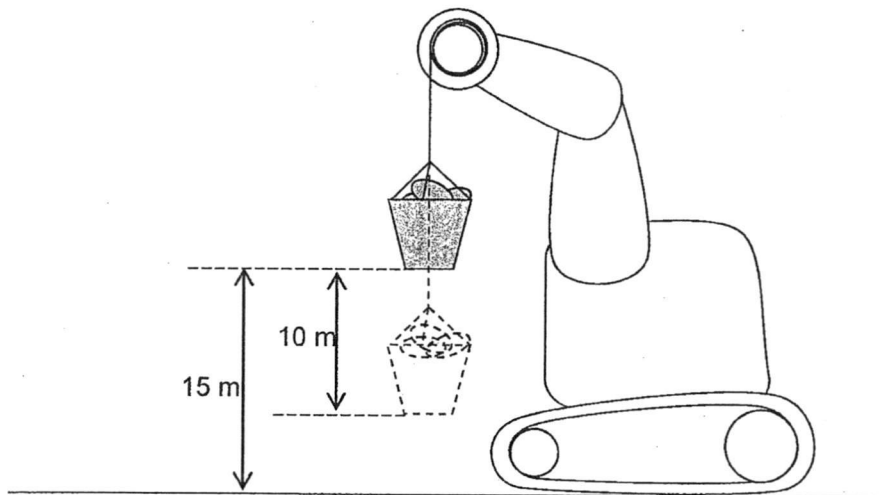
Fig. 5.1

(a) **(i)** Calculate the increase in gravitational potential energy of the bucket from its initial position.

increase = ... J [2]

(ii) Calculate the power of the motor in the crane to lift the bucket.

power = ... W [2]

5 **(b)** The cable holding the bucket snaps when the bucket is at rest 15m above the ground. Using the principle of conservation of energy, calculate the velocity of the bucket just before it hits the ground.

velocity = ... m/s [2]

6 Fig. 6.1 shows a cylinder filled with air. It is fitted with a freely moving piston.
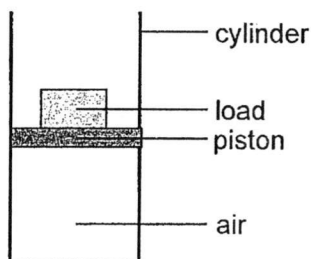
Fig. 6.1

(a) Explain, in terms of the motion of air molecules, how the air in the cylinder exerts a pressure on the piston.

....

....

....[1]

(b) Explain why the piston is pushed upwards when the cylinder is placed in hot water.

....

....

....[2]

(c) In Fig.6.1, the piston is held stationary due to the force exerted by the air pressure in the cylinder and the weight of the load.
Calculate the mass of the load needed to balance the piston when the pressure exerted by the air is 15 Pa and the area of the piston is 0.10 m².

mass = ...kg [2]

7   Fig. 7.1 shows the position of object R and its corresponding image, P formed on the wall.
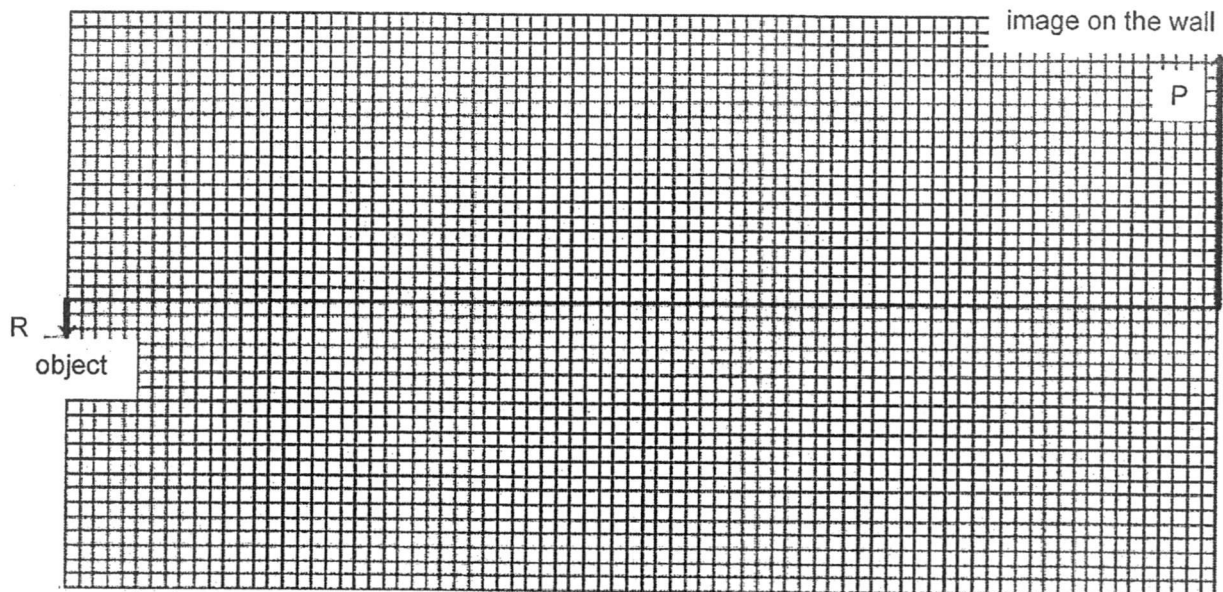
Fig. 7.1   scale : 1 cm represents 12 cm

(a)   On Fig. 7.1, draw a light ray from point R to the image on the wall. Locate the position of the lens and label it **L**.   [2]

(b)   On Fig. 7.1, draw a second light ray from object **R** to its image. Locate the focal point of the lens and label it **F**.   [2]

(c)   Hence, determine the focal length of the lens.

focal length = ... [1]

8   (a)   State two differences between sound waves and light waves.

....

....

....

....

....[2]

8   (b)   Bats use echolocation to determine their surroundings in the dark. They send out a pulse of ultrasound, which will be reflected when it hits an object. They listen for the echo of this pulse, and are able to deduce the distance of the object from where they are located

Fig 8.1 shows a bat in a cave. It lets out a pulse of ultrasound of 5 kHz towards the back of the cave.
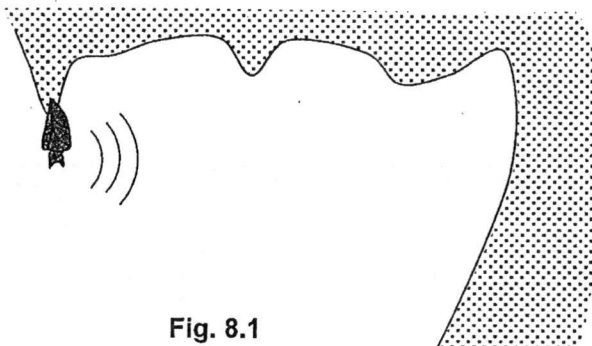
Fig. 8.1

(i)   Calculate the wavelength of the ultrasound pulse if sound travels at 330 m/s

wavelength = ... m [2]

(ii)   The pulse the bat sends out is reflected back 12 seconds after the pulse was sent out. Calculate the distance from the bat to the back of the cave.

distance to back of the cave = ... m [2]

9   Fig. 9.1 shows an electric circuit.
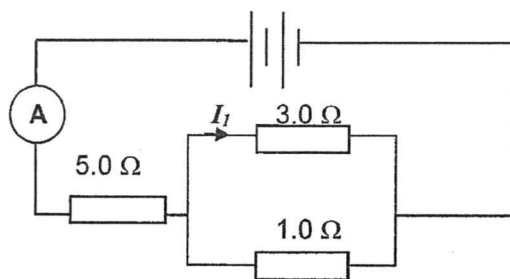
Fig. 9.1

(a) Calculate the effective resistance of the circuit.

effective resistance = ...Ω [1]

(b) Given that current I_1 is 0.50 A, find the reading in the ammeter.

ammeter reading = ...A [2]

(c) Calculate the e.m.f. of the battery.

e.m.f. = ...V [2]

Section B [20 Marks]
Answer **two** out of three questions.
Write your answers in the spaces provided.

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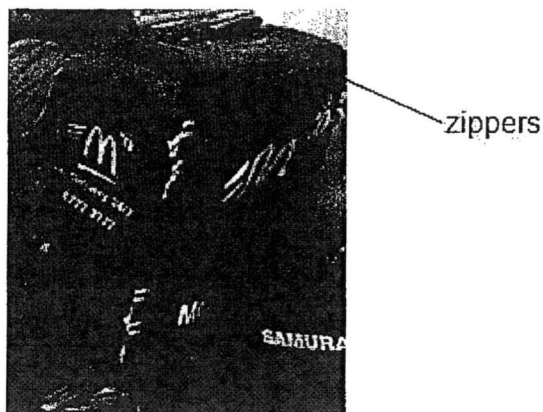
Fig. 10.1

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

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

....
....
....[2]

(ii) Explain how the zippers prevent heat loss.

....
....[1]

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

....
....
....
....[1]

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

....[1]

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

heating element across the top of the oven

metal wall

food

shelf

heating element across the bottom of the oven

metal wall
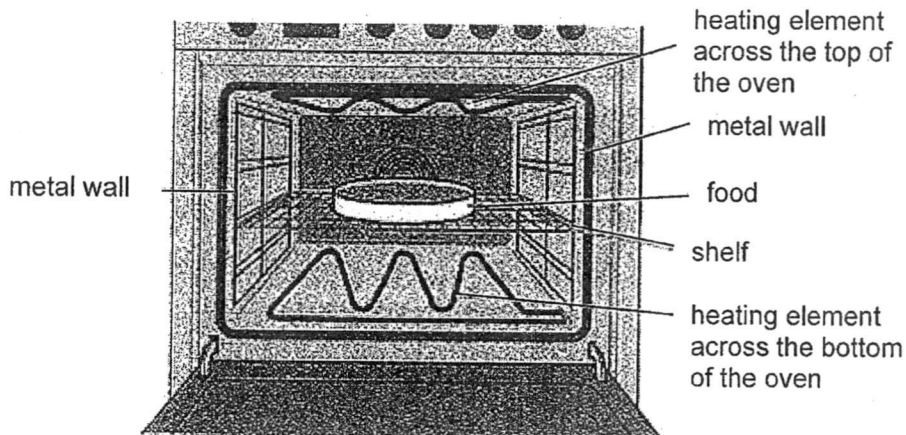
Fig 10.2

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

....

....

....

....

....

....[3]

11 (a) Clifton has a metallic conductor. He would like to do an experiment to find out the relationship between the potential difference across it and the current flowing through it.

(i) In the space below, draw a circuit diagram that could be used to determine relationship between values of the potential difference across the metallic conductor and its corresponding values of current. [3]

11 (a) (ii) The following set of data is obtained from the experiment

potential difference, V / V	current, I / A
0.0	0.0
1.0	0.5
2.0	1.0
3.0	1.5
4.0	2.0

Describe how you could determine the resistance of the metallic conductor from a graph plotted using the data obtained.

....

....

....[2]

(b) An electric oven, connected to the mains supply, is shown in Fig.11.1.
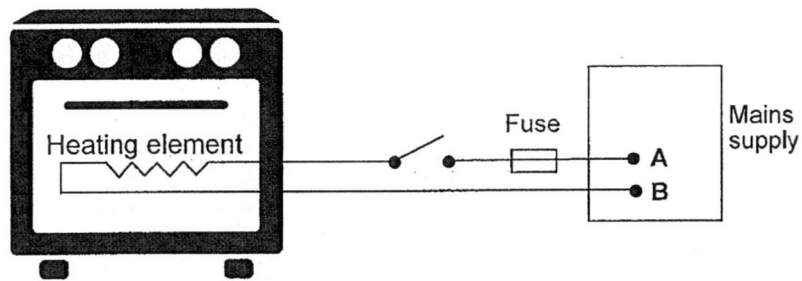
Fig 11.1

(i) State which wire, **A** or **B**, is the live wire of the mains supply. Explain your answer

....

....

....[2]

(i) The oven works at 2000 W and the mains supply is 240 V.
Fuse ratings available are 8 A, 10 A and 13 A. What would be a suitable rating for a fuse to be used? With aid of calculation, explain your answer.

....

....

....[2]

(ii) The oven has a metal casing. It has a third wire which is an added safety feature. Draw, on Fig. 11.1 how this third wire should be connected to the oven, and label the name of this wire. [1]

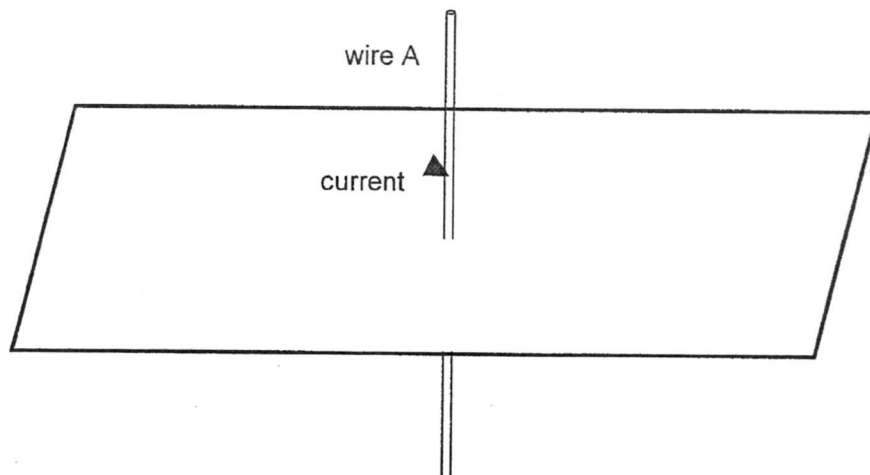12 **(a)** Fig 12.1 shows a current being passed through a long wire A.

Fig 12.1

Explain how the magnetic field caused by the current in wire A can be plotted using a plotting compass

....

....

....[2]

(b) On Fig. 12.1, sketch the magnetic field pattern caused by the current in wire A on the sheet [2]

(c) Suggest how the diagram showing the magnetic field will change when the current in wire A increases in magnitude. Explain your answer.

....

....

....[2]

(d) Fig 12.2 shows a long wire B, with the current flowing in the same direction as wire A.

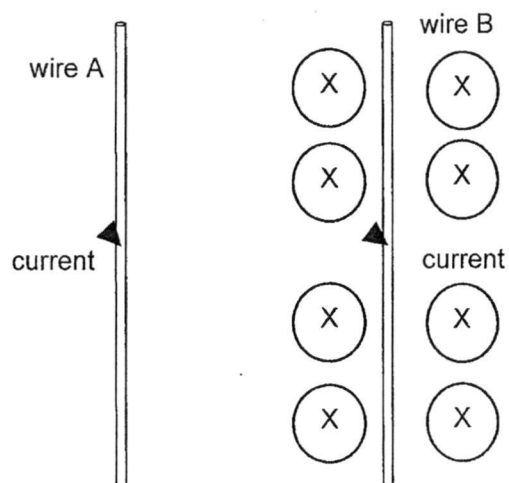(X) is the magnetic field produced by wire A

Fig 12.2

(i) Determine the direction of force acting on Wire B due to the magnetic field.

....

....[2]

(ii) Describe and explain what happens to the direction of force acting on wire B when:

1. the direction of current in wire B is reversed.

....

....[1]

2 the current in wire A is increased.

....

....[1]

END OF PAPER

Sec 4E/5 N(A) Science (Phy) Prelim 2017
Answer Scheme
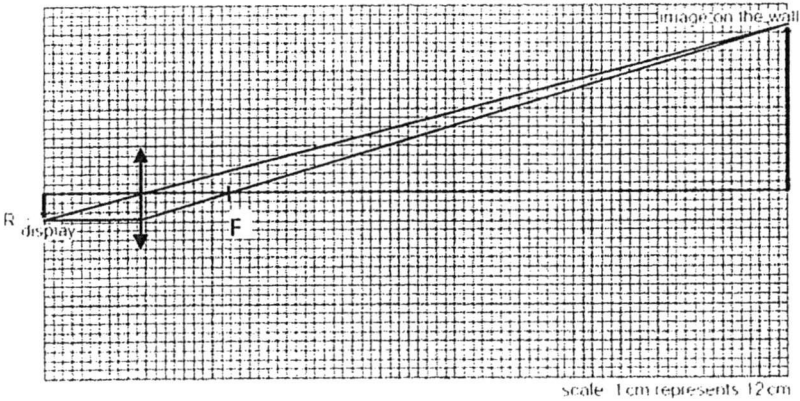
Paper 1
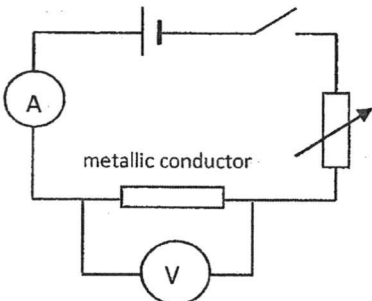
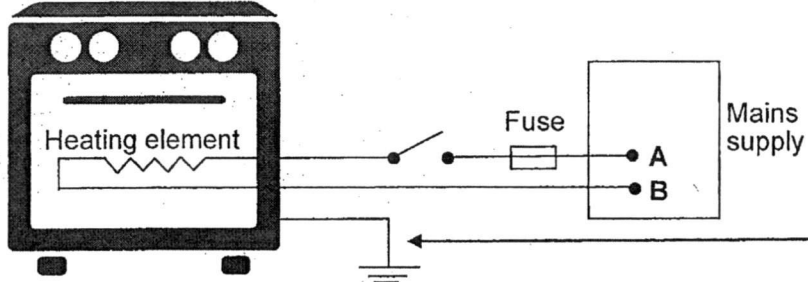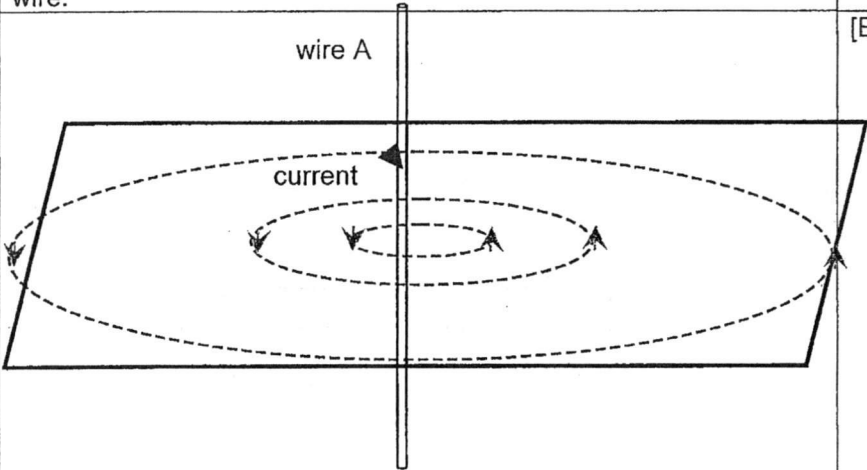|	
1. B	11. C
2. B	12. C
3. D	13. B
4. B	14. B
5. A	15. C
6. B	16. B
7. D	17. C
8. A	18. B
9. A	19. B
10. B	20. B

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Chong Boon Secondary School
Sec 4E/5 N(A) Science (Phy) Preliminary Exams 2017
Answer Scheme
Paper 2

Section A		Marks
1(a)	$a = \dfrac{55-40}{2}$ $= 7.5\ ms^{-2}$	[M1] [A1]
1(b)	d = 4x80 = 320 m	[A1]
2 (a)	F = ma 12 = 5a a = 2.4 m s^{-2}	[M1] [A1]
2 (b)	a = (v - u)/t 2.4 = (v - 0)/0.9 v = 2.16 m s^{-1}	[M1] [A1]
2 (c)	KE = ½ mv² = ½ (5) (2.16)² = 11.7 J	[A1]
2 (d)	KE lost = PE gained 11.7 = mgh h = 11.7/(5)(10) = 0.234 m	[M1] [A1]
3 (a)	W = mg = 10 x 10 = 100 N	[M1] [A1]
3 (b)	Mass = 10 kg Weight = m x (2g) = 200 N	[A1] [A1]
4(a)	F₁(0.12) = 2 (1.50) F₁ = 25 N [1]	[M1] [A1]
4(b)	lengthen the handle as moment is the product of force and the perpendicular distance from the pivot. By lengthening the handle, **the perpendicular distance is increased,** hence **increasing the force** acting on the tougher material.	[B1] [B1]
5 (a)(i)	PE = mgh = (50 kg) (10 m/s²) (10 m) =5000 J	[M1] [A1]
5 (a)(ii)	Power = Work Done/time taken Work Done = increase in potential energy = 5000 J Power = 5000 J/120 s = 41.7W	[M1] [A1]
5 (b)	By Principle of Conservation of Energy, PE = KE Mgh = ½ mv²	[M1]

	$v = \sqrt{2gh}$ $= \sqrt{2 \times 10 \times 15}$ $= 17.3$ m/s	[A1]
6 (a)	As the air molecules move randomly, the air molecules hit the piston and exert a force upon the impact. This force over the surface of piston will then give rise to pressure.	[B1]
6 (b)	The air molecules gain energy and move faster so that the frequency of the molecules hitting the piston increases. As a result, the increase in force over the same surface area gives rise to greater upward pressure and the piston moves upwards.	[B1] [B1]
6 (c)	$P = F/A$ $15 = F/0.10$ $F = 1.5$ N mass $= 1.5/10$ $= 0.15$ kg	[M1] [A1]
7(a),(b)	 scale 1 cm represents 12 cm Lens is 2.1 cm(+/- 0.1cm) from R and F is 1.6 cm(+/- 0.1) from L	B2 (drawing) B2 (drawing),
7 (c)	Focal length = <u>1.6</u> x 12 = <u>19.2</u> cm (Use candidate's answer)	A1
8(a)	Light travels at 3×10^8 m/s while sound travels at 300 m/s **in air.** OR Sound waves are longitudinal while light waves are transverse. OR Sound needs a medium but light does not	B1 B1
8 (b)(i)	$v = f\lambda$ $\lambda = \frac{330}{5000} = 0.066\ m$	[M1] [A1]
8 (b)(ii)	$v = \dfrac{2d}{t}$ where distance between bat and back of cave $d = (v \times t)/2$ $= 330 \times 6$ $= 1980$ m	[M1] [A1]
9 (a)	Effective R $= 5.0 + (1/3 + 1/1)^{-1}$ $= 5.75\ \Omega$	[A1]

9 (b)	Current in 1 Ω resistor = 0.5 x 3
	
	                 = 1.5 A
	Ammeter reading = total current in the circuit
	                 = 0.50 + 1.5
	                 =2.0 A
		[M1]
		
		[A1]

9 (c)	$V = I \times R$
	     = 2.0 x 5.75
	     =11.5 V (allow ecf)
		[M1]
		
		[A1]

10 (ai)	polyester contains air which are poor conductors of thermal energy	[B1] [B1]
10 (aii)	prevents air from escaping, hence reducing heat loss due to convection	[B1]
10 (aiii)	shiny white poor absorber of radiant heat	[B1] [B1]
10(aiv)	Radiation	[B1]
10(b)	air near the bottom element heats up and rises, cooler air near the food sinks forming convection current Radiation from both the top and bottom element	[B1] [B1] [B1] [B1]
11(a)	 Deduct one mark for 1-2 mssing components Deduct two marks for 3-4 mising components Deduct one mark for wrong connection of voltmeter or ammeter	
11 (aii)	Plot a graph of Potential Difference against Current and draw a straight line joining the points plotted The gradient of the straight line graph is the resistance of the metallic conductor	[B1] [B1]
11 (bi)	Wire A The Live wire is connected to the fuse / switch	[B1] [B1]
11 (bii)	$I = \dfrac{P}{V} = \dfrac{2000}{240}$ = 8.33 A Fuse rating is **10 A** as it has to be **slighly higher** than the operating	[A1]

	current.	[B1]
11 (biii)		B1
12 (a)	Place compass on the sheet. Mark the positions of the S and N ends of the compass needle Move the compass so that the S end of the need is at the previous N Repeat until a circle is formed. Repeat for different distances from wire.	[B1] [B1]
12 (b)	 wire A current (1 for direction) (1 for circle) (1 for near circles closer together)	[B3]
12 (c)	Circles become closer together. As the current in wire A increases in magnitude, the magnetic field becomes stronger.	[B1] [B1]
12 (di)	the force acts towards wire A or acts to the left	[B1]
12 (dii)	1. The force changes direction and points away from A by FLHR	[B1]
	2. Force does NOT change direction, still points towards wire A. Force increases as the strength of magnetic field by A increases.	[B1]