

Visit
FREETESTPAPER.com
for more papers



Website: freetestpaper.com



[Facebook.com/freetestpaper](https://www.facebook.com/freetestpaper)



[Twitter.com/freetestpaper](https://twitter.com/freetestpaper)

4E
5N

BEDOK GREEN SECONDARY SCHOOL

Preliminary Examination 2016

SCIENCE (PHYSICS/CHEMISTRY)

Paper 1 Multiple Choice

Additional Materials: Multiple Choice Answer Sheet

4E
5N

5076/1

30 August 2016

1 hour

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.

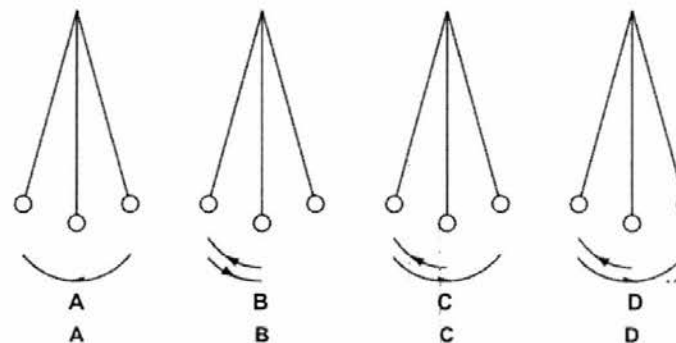
There are **forty** questions on this paper. Answer **all** questions.
For each question there are four possible answers **A**, **B**, **C**, and **D**. Choose the **one** you consider correct
and record your choice in **soft pencil** on the optical mark sheet.

Read the instructions on the optical mark sheet very carefully.

Each correct answer will score one mark.
Any rough working should be done in this booklet.

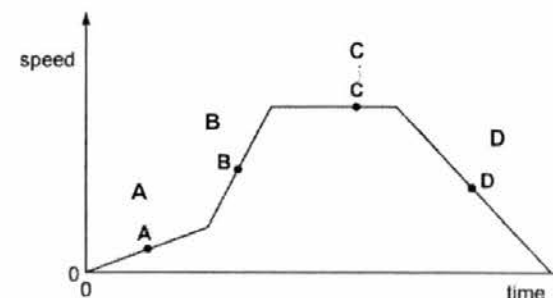
A copy of the Data Sheet and the Periodic Table is given on page 16 and 17 respectively.

- What of the following instrument gives the most accurate value for the internal diameter of a test tube?
A a measuring tape
B a metre rule
C a micrometer screw gauge
D vernier calipers
- The diagrams show a simple pendulum at the ends and centre of its swing.



Which labelled arrow shows the motion of the pendulum during one period?

- The speed-time graph shows the journey of a train.

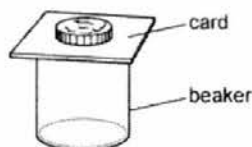


At which point does the acceleration have the lowest value?

- 4 When his parachute is fully opened, a parachutist falls towards the ground at a constant speed.

Under these conditions, which statement is correct?

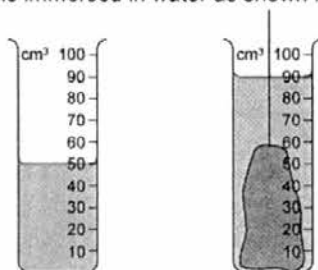
- A There is no force acting on the parachutist.
 B The upward force on the parachute is equal to the weight of the parachutist.
 C The upward force on the parachute is less than the weight of the parachutist.
 D The upward force on the parachute is greater than the weight of the parachutist.
- 5 A coin is placed on top of a beaker, as shown.



If the card is pulled away quickly, the coin does not move sideways but falls into the beaker.

Which property of the coin makes this possible?

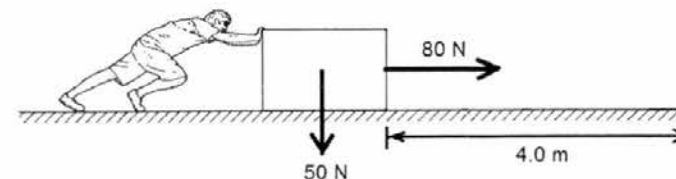
- A density
 B inertia
 C mass
 D volume
- 6 An object of mass 100 g is immersed in water as shown in the diagram.



What is the density of the material from which the object is made?

- A 0.4 g/cm^3 B 0.9 g/cm^3 C 1.1 g/cm^3 D 2.5 g/cm^3

- 7 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

- 8 A liquid boils and turns into a gas at a fixed temperature.

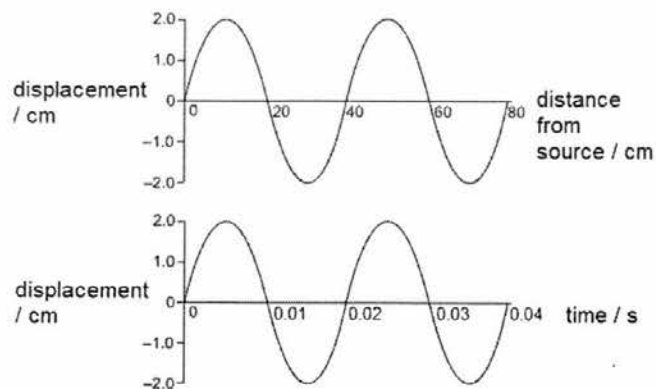
Which statement is correct?

- A The molecules expand.
 B The molecules move faster.
 C The molecules loses energy.
 D The molecules move further apart.

- 9 Which of the following correctly describes the natures of sound, light and radio waves?

	sound	light	radio
A	longitudinal	transverse	longitudinal
B	longitudinal	transverse	transverse
C	transverse	longitudinal	longitudinal
D	transverse	longitudinal	transverse

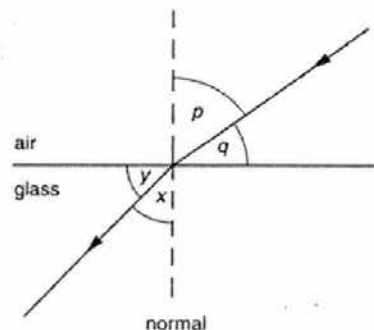
- 10 The displacement-distance and displacement-time graphs are shown for a water wave in an ocean.



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

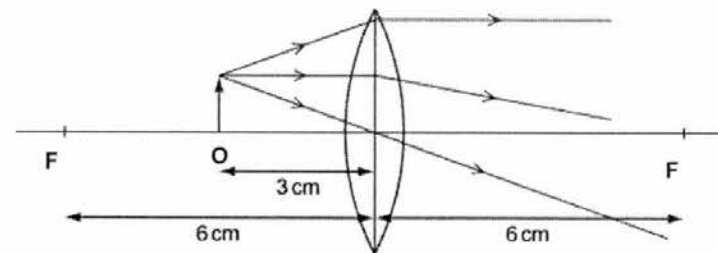
- 11 The diagram shows a ray of red light passing from air into glass.



Which ratio gives the refractive index for red light?

- A $\frac{\sin p}{\sin x}$
 B $\frac{\sin p}{\sin y}$
 C $\frac{\sin q}{\sin x}$
 D $\frac{\sin q}{\sin y}$

- 12 The diagram shows an object O placed 3 cm away from a converging lens of focal length 6 cm.



What type of image is produced?

- A real, upright and diminished
 B real, inverted and magnified
 C virtual, upright and magnified
 D virtual, inverted and diminished

- 13 Which of the following shows the increasing order of the speed of sound in different media?

	slowest $\longrightarrow$ fastest		
A	air	steel	water
B	air	water	steel
C	steel	water	air
D	steel	air	water

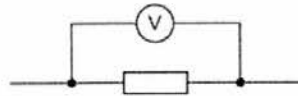
- 14 Two notes are played on a piano. The second note has a higher pitch but is softer. Which of the following is true of the amplitude and frequency of the second note?

	amplitude	frequency
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

- 15 A lightning flash carries 25 C of charge and lasts for 0.01 s. What is the current?

A 0.0004 A B 0.25 A C 25 A D 2 500 A

- 16 A voltmeter is connected across a resistor in an electrical circuit.



What does the reading on the voltmeter measure?

- A the work done in driving 1 A of current through the resistor
 B the work done in driving 1 C of charge through the resistor
 C the work done in driving 1 J of energy through the resistor
 D the work done in driving 1 W of power through the resistor
- 17 A constant-voltage source is connected to a resistor which has a current I through it. Two more identical resistors are then added in series with the first.

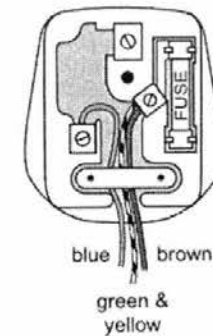
What is the current now?

- A $\frac{I}{4}$
 B $\frac{I}{3}$
 C I
 D $4I$
- 18 A wire has a resistance of $16\ \Omega$. A second wire, made of the same material, has half the length and twice the cross-sectional area.

What is the resistance of the second wire?

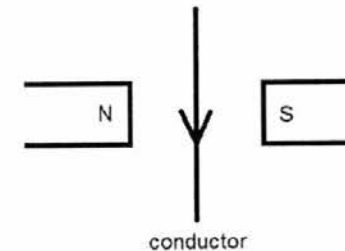
A $2\ \Omega$ B $4\ \Omega$ C $16\ \Omega$ D $64\ \Omega$

- 19 A plug is wrongly wired as shown. It is connected to an old vacuum cleaner which has a metal case.



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

- A The neutral wire will melt.
 B The metal case will be live.
 C The fuse in the plug will blow.
 D The vacuum cleaner will catch fire.
- 20 The diagram shows a current in a conductor in a magnetic field.



What is the direction of the force on the conductor?

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

Name:	Register Number:	Class:	For examiner's use
-------	------------------	--------	--------------------------

4E
5N



BEDOK GREEN SECONDARY SCHOOL

Preliminary Examination 2016

SCIENCE (PHYSICS)

Paper 2

Candidates answer on the Question Paper.
No Additional Materials are required.

30 August 2016

1 hour 15 minutes

4E
5N

5076/2

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions in the spaces provided on the Question Paper.

Section B

Answer any **two** questions.

Write your answers in the spaces provided on the Question Paper.

Candidates are reminded that **all** quantitative answers should include appropriate units.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of physics than for correct answers.

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

For Examiner's Use	
A [30 marks]	
B [20 marks]	
Total [50 marks]	

This document consists of 16 printed pages including the cover page.
© BGSS 2016
No part of this document may be reproduced in any form or transmitted in any form or by any means without the prior permission of Bedok Green Secondary School.

For
examiner's
use

[Turn

Section A [45 marks]

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

- 1 Fig. 1. Structure of a solar heating system.

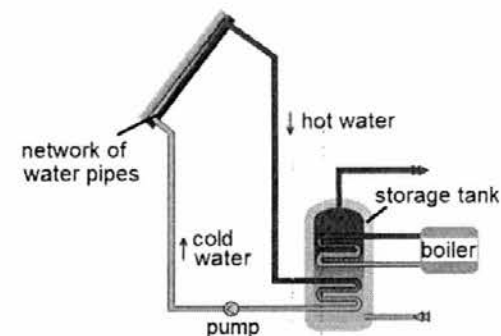


Fig. 1.1

- (a) Name the process by which energy is transferred
- (i) from the Sun to the pipe,
..... [1]
- (ii) from the pipe to the water flowing in the pipe.
..... [1]
- (b) Explain why the material used to make the pipe is copper and the network of pipes is painted black.
..... [2]

- 2 Elephants are often deployed in logging operations to transport fallen logs to a collection point. Fig. 2.1 below shows a log with chains attached to it and pulled by two elephants in the directions indicated.

Fig. 2.1 is not drawn to scale.

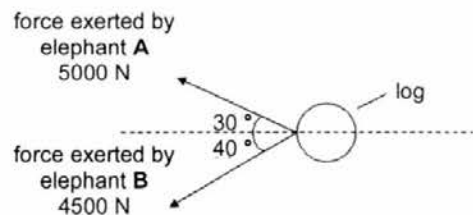


Fig. 2.1

Draw a suitable scale diagram to determine the magnitude and direction of the resultant force exerted by the two elephants on the log.

scale:

magnitude of resultant force:

direction of resultant force: [4]

- 3 Electromagnetic waves have many applications.

- (a) Complete Table 3.1 to state the region of the electromagnetic (e.m.) spectrum used for each of the applications.

application	region of e.m. spectrum
forgery detection	
intruder alarm	
medical inspection	

Table 3.1

[3]

- (b) State which type of electromagnetic wave that you have named in Table 3.1 has the longest wavelength.

..... [1]

- (c) State one property that all electromagnetic waves have in common.

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

- 4 Fig. 4.1 shows a hydraulic device that is used to lift cars.

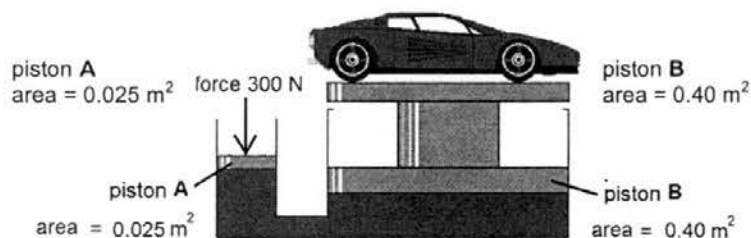


Fig. 4.1

A force applied at piston A causes a pressure. The liquid transmits this pressure to piston B which then causes a force to be exerted against the weight of the car. Both the pistons are assumed to have negligible weight.

- (a) The volume of the liquid does not change because liquids cannot be compressed. Using the kinetic model of matter, explain why liquids cannot be compressed.

.....

 [2]

- (b) A force of 300 N is exerted on piston A. The area of piston A is 0.025 m^2 . The area of piston B is 0.40 m^2 . Calculate

- (i) the pressure produced by piston A,

pressure = [2]

- (ii) the weight of the car.

- 5 Fig. 5.1 shows a skier of mass 80 kg standing at P. He moves from P to Q and takes off for his jump at Q. (gravitational field strength, $g = 10 \text{ N/kg}$)

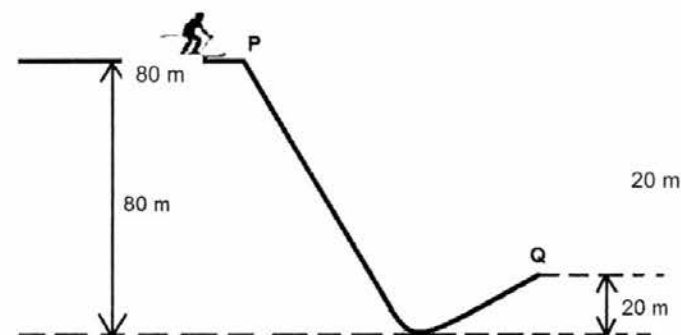


Fig. 5.1

- (a) Calculate the change in his gravitational potential energy between P and Q.

change in G.P.E. = [2]

- (b) If 75% of the change in his gravitational potential energy is converted into kinetic energy at Q, calculate

- (i) the kinetic energy of the skier at Q,

kinetic energy = [1]

- (ii) the speed at which he arrives at Q.

- 6 Fig. 6.1 shows one type of corkscrew used to open a bottle. The force required to lift the cork from the bottle is 60 N. The perpendicular distance of the line of action of this force to the pivot P is 3.0 cm. A force F is applied at the end of handle, 12.0 cm from the line of action of the pivot. Calculate the magnitude of the force F .

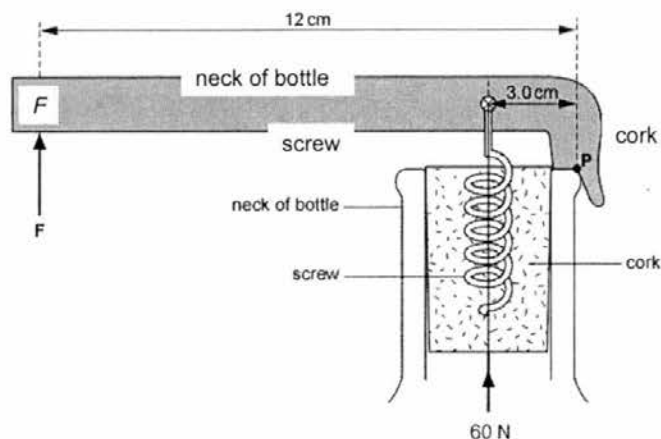


Fig. 6.1

The force required to lift the cork from the bottle is 60 N. The perpendicular distance of the line of action of this force to the pivot P is 3.0 cm. A force F is applied at the end of handle, 12.0 cm from the line of action of the pivot.

- (a) Using the principle of moments, calculate the magnitude of the force F .

$$F = \dots\dots\dots [2]$$

- (b) Explain why more force is required to open the bottle if the handle of the corkscrew is shorter than 12 cm.

.....

7

- Fig. 7.1 shows the set-up of an illusion where a candle is seen burning in a jar of water. The set-up is placed in a wooden box so that the compartment is kept dark and the image of the candle will be bright. The cross inside the jar filled with water marks the image of the candle.

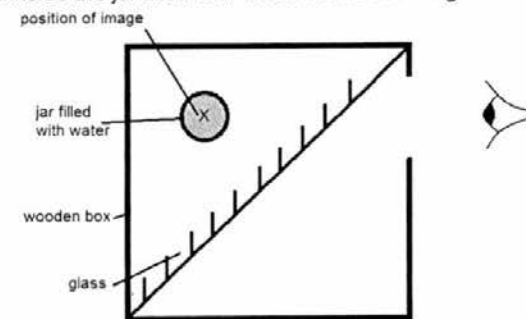


Fig. 7.1

- (a) On Fig. 7.1, mark with a cross the position of the candle so that it appears to burn in the jar of water. [1]
- (b) On Fig. 7.1, draw the single ray diagram to show how the light from the candle travels to the eye. [2]
- (c) Fig. 7.2 shows an alternative set-up, replacing the piece of glass by a glass prism.

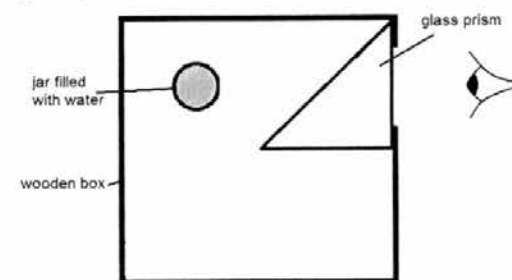


Fig. 7.2

Explain why this set-up might not work to show the same illusion.

.....

- 8 A circuit contains two resistors R_1 and R_2 connected in parallel to a battery. 2.4 A enters A_1 and A_2 are placed at different points in the circuit as shown in Fig. 8.1. [2]

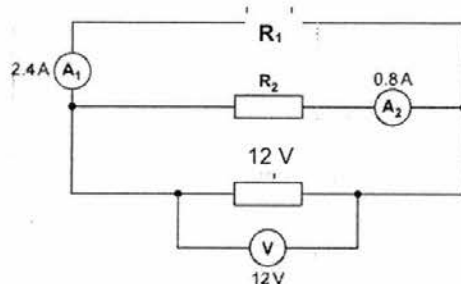


Fig. 8.1

The following readings are taken from the meters.

reading on the voltmeter = 12 V

reading on ammeter A_1 = 2.4 A

reading on ammeter A_2 = 0.8 A

- (a) Calculate the resistance of resistor R_1 .

resistance = [2]

- (b) Calculate the power dissipated in resistor R_2 .

power = [2]

- (c) Calculate the amount of energy transferred to resistor R_2 in 15 minutes.

energy = [2]

- (d) Calculate the combined resistance of the two resistors R_1 and R_2 connected in parallel.

resistance = [3]

- 9 Fig. 9.1 shows two conducting balls hung from insulating threads. Ball A is positively charged while ball B is negatively charged.

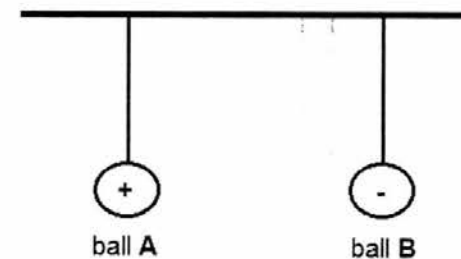


Fig. 9.1

- (a) Describe what happens when ball A is brought near to ball B without touching. Explain your answer.

.....

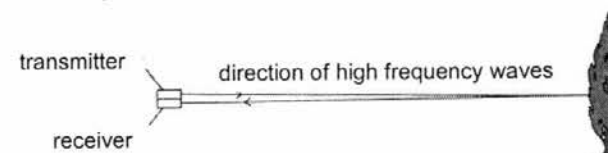
 [2]

- (b) On Fig. 9.1, draw the electric field between ball A and ball B. [1]

Section B [20 marks]

Answer any 2 questions in the spaces provided.

- 10 Fig. 10.1 shows a device, consisting of a transmitter and a receiver, is used on some cameras to determine the distance between the camera and an object.

**Fig. 10.1**

- (a) The transmitter gives out very high frequency sound waves that have a speed of 330 m/s. When the waves meet an object, they are reflected back to the receiver. The time between the waves being given out and received back is 0.20 s.
- (i) Calculate the distance from the device to the object.

distance = [2]

- (ii) The high frequency waves cannot be heard by a human being. State the minimum frequency of the waves that cannot be heard by a human being.

..... [1]

- (iii) Explain how sound waves travel through air.

.....

.....

.....

..... [2]

- (b) The high frequency sound wave can also be replaced by using a laser beam. Calculate the frequency of the laser beam used if the wavelength of this particular laser beam is 650 nm.

frequency = [2]

- (c) The power supplied to the transmitter is 0.006 kW. It is operated from a 12 V battery.

Suggest a suitable value of fuse rating to use in the circuit for the transmitter. Support your suggestion with a calculation.

fuse rating = [3]

- 11 Fig. 11.1 shows two rods of iron placed inside a solenoid. The solenoid is connected to a battery through a switch.

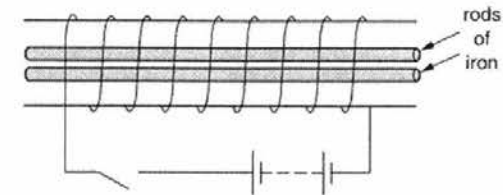


Fig. 10.1

- (a) (i) State what happens to the two rods when the switch is closed.

Explain your answer.

.....

.....

.....

.....

.....

.....[3]

- (ii) Suggest what will happen to the rods of iron when the direction of current flow in the solenoid is reversed.

Explain your answer.

.....

.....

.....

.....[2]

For
examiner's
use

- (b) The experiment in (a) is repeated with a steel rod replacing one of the iron rods. Describe and explain what you would expect to observe if the switch is open after some time.

..[2]

- (c) A solenoid can also be used in a circuit breaker. Fig. 11.2 shows one such circuit breaker.

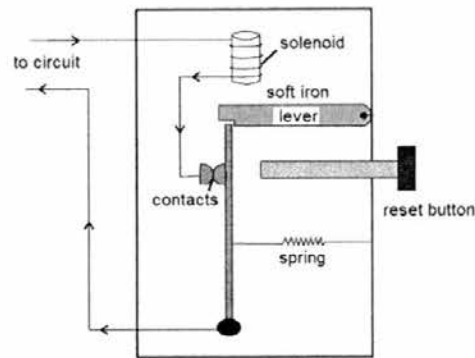


Fig. 11.2

Describe what happens when a large current flows through the circuit.

..[3]

[Turn Over

For
examiner's
use

- 12** Fig. 12.1 shows how the speed of a bicycle varies with time.

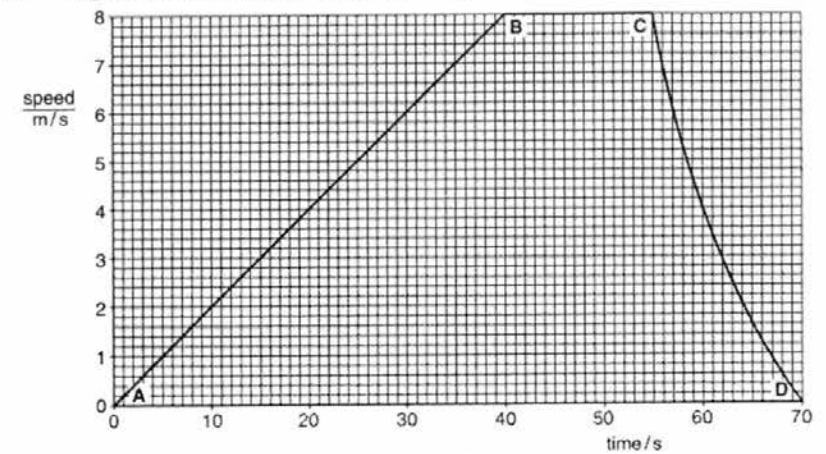


Fig. 12.1

- (a) Describe the motion of the bicycle between A and D.

[3]

- (b) State the part, or parts, of the journey where the forces on the bicycle are balanced. Explain your answer.

. [2]

[Turn Over]

- (c) Calculate the average acceleration of the bicycle between points **A** and **B**.

average acceleration = [2]

- (d) (i) Calculate the distance travelled by the bicycle between points **A** and **C**.

distance = [2]

- (ii) Hence calculate the average speed of the bicycle for the entire journey, given that the distance travelled between points **C** and **D** is 55 m.

average speed = [1]

~ End of Paper ~

BEDOK GREEN SECONDARY SCHOOL
SCIENCE DEPARTMENT
MARKING SCHEME
YEAR (2016)

SUBJECT: Science (Physics)
SETTER: Teo Chun Min
LEVEL: Sec 4E

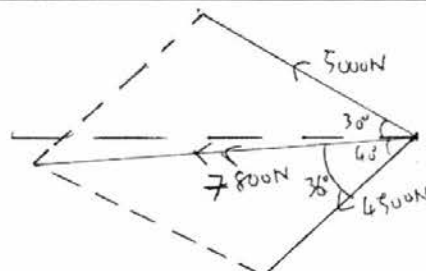
EXAM: Prelims

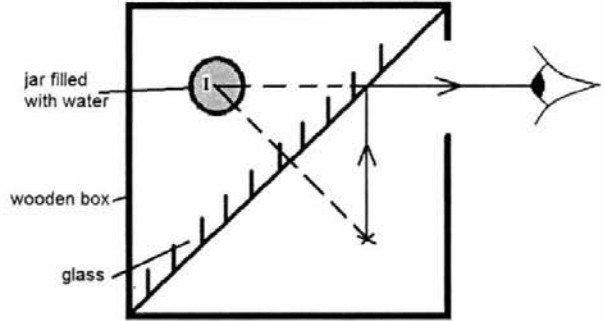
PAPER 1

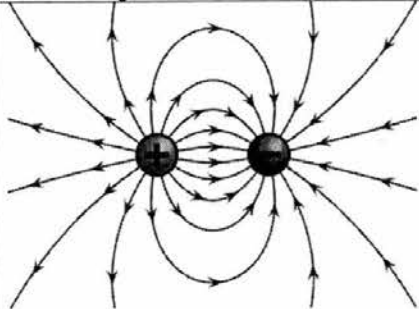
1	D	11	A
2	D	12	C
3	D	13	B
4	B	14	C
5	B	15	D
6	D	16	B
7	B	17	B
8	D	18	B
9	B	19	B
10	C	20	B

PAPER 2 – SECTION A (45%)

Qn	Answer	Sub marks	Total marks
1ai	radiation	1 m	1 m
1aii	conduction	1 m	1 m
1b	Pipe is made of copper because copper is a good conductor of heat thus heat transfer from pipe to water is fast.	1 m	2 m
	Pipes are painted black because black surfaces are good absorbers of radiant heat.	1 m	

2	 diagram with arrows, labels and angles shown appropriate scale magnitude 7 800 N direction 36° anti-clockwise from 4 500 N or 34° clockwise from 5 000 N	1 m 1 m 1 m 1 m	4 m								
3a	<table border="1"> <thead> <tr> <th>application</th> <th>region of e.m. spectrum</th> </tr> </thead> <tbody> <tr> <td>forgery detection</td> <td>ultraviolet</td> </tr> <tr> <td>intruder alarm</td> <td>infrared</td> </tr> <tr> <td>medical inspection</td> <td>X-ray</td> </tr> </tbody> </table> short forms are not accepted (UV, IR)	application	region of e.m. spectrum	forgery detection	ultraviolet	intruder alarm	infrared	medical inspection	X-ray	1 m 1 m 1 m	3 m
application	region of e.m. spectrum										
forgery detection	ultraviolet										
intruder alarm	infrared										
medical inspection	X-ray										
3b	infrared	1 m	1 m								
3c	All travel at the speed of 3×10^8 m/s in vacuum. All are transverse waves. All are able to transfer energy from one place to another. All show wave properties like reflection and refraction.	1 m ea	1 m								
4a	The particles in a liquid are closely packed. There is little space between each particle, thus they cannot move closer together.	1 m 1 m	2 m								
4bi	$P_A = F / A$ $= 300 / 0.025$ $= 12\,000 \text{ Pa}$	1 m 1 m	2 m								
4bii	$P_A = P_B$ $12\,000 = W / 0.40$ $W = 4\,800 \text{ N}$	1 m	2 m								
5a	change in GPE = mgh $= 80 \times 10 \times (80 - 20)$ $= 48\,000 \text{ J}$	1 m 1 m	2 m								
5bi	KE = 75% of GPE $= \frac{75}{100} \times 48\,000$ $= 36\,000 \text{ J}$	1 1 m									

5bii	$KE = \frac{1}{2}mv^2$ $36\,000 = \frac{1}{2} \times 80 \times v^2$ $v = 30\text{ m/s}$	1 m 1 m	
6a	By principle of moments Total clockwise moment = Total anti-clockwise moment $F \times (0.12) = 60 \times (0.03)$ $F = 15\text{ N}$	1 m 1 m	2 m
6b	If the handle is less than 12 cm, then the perpendicular distance of the force to the pivot will be reduced and thus the force applied had to increase in order for the clockwise moment to remain equal to the anti-clockwise moment about P to open the bottle.	1 m 1 m	2 m
7a	 position of cross (equidistant as the image to mirror)	1 m	1 m
7b	light rays with arrows dotted lines behind the glass	1 m 1 m	2 m
7c	Total internal reflection takes place. As the light ray would be travelling from an optically denser to optically less dense medium and the angle of incidence on the slanted side of the prism is greater than the critical angle.	1 m	2 m
8a	resistance of $R_1 = V/I$ $= \frac{12}{2.4 - 0.8}$ $= 7.5\ \Omega$	1 m 1 m	2 m
8b	P of $R_2 = VI$ $= 12 \times 0.8$ $= 9.6\text{ W}$	1 m 1 m	2 m
8c	Energy transferred to $R_2 = Pt$ $= 9.6 \times (15 \times 60)$ $= 8\,640\text{ J}$	1 m 1 m	2 m
8d	Resistance of $R_2 = V/I$ $= 12 / 0.8$ $= 15\ \Omega$	1 m	3 m

	$\text{Total } R = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1}$ $= \left(\frac{1}{7.5} + \frac{1}{15}\right)^{-1}$ $= 5\ \Omega$	1 m 1 m	
9a	Ball A and B will be attracted to each other. Unlike charges attract.	1 m 1 m	2 m
9b	 correct field and direction of arrow	1 m	1 m

SECTION B (20%) Choose 2 out of 3 questions

Qn	Answer	Sub marks	Total marks
10ai	$v = 2d / t$ $330 = 2d / 0.20$ $d = 33 \text{ m}$	1 m 1 m	2 m
10aii	20 000 Hz	1 m	1 m
10aiii	Sound waves are longitudinal waves which means that the air particles are vibrating backward and forward in a direction that is parallel to the direction of wave propagation. The layers of air particles are pushed together and pulled apart alternately creating a series of compressions and rarefactions which causes sound to move through air.	1 m 1 m	2 m
10b	$v = f\lambda$ $3 \times 10^8 = f (650 \times 10^{-9})$ $f = 4.62 \times 10^{14} \text{ Hz}$	1 m for c 1 m	2 m
10c	$P = VI$ $6 = 12 \times I$ $I = 0.5 \text{ A}$ fuse rating = 0.55 A or 0.60 A or 1 A	1 m 1 m 1 m	3 m
11a(i)	The two rods will move away from each other. As current flows through the solenoid, the iron rods become magnetised with both rods having the same poles on the same side. As like poles repel, the rods will move away from each other.	1 m 1 m 1 m	3 m
11a(ii)	As the direction of current flow reversed, the iron will still remain apart from each other. The change in direction of the current flow changes the direction of the magnetic poles induced in the iron rods. Since both rods change their magnetic poles, they will still repel each other.	1 m 1 m	2 m
11b	The two rods will be attracted to each other. As steel can be permanently magnetised, the change in direction of the current does not affect the magnetic poles of the magnetised steel rod. Thus, the iron rod will have a different magnetic pole from the steel rod causing them to become attracted as unlike poles attract.	1 m 1 m 1 m	2 m
11c	When too much current flows through the circuit, the current causes the solenoid to be strongly magnetised. This will cause the soft iron lever to be strongly attracted to the solenoid and break the contacts. This will open the circuit and stop the current flow.	1 m 1 m 1 m	3 m

Qn	Answer	Sub marks	Total marks
12a	From A to B, the bicycle is moving with a constant acceleration. From B to C, the bicycle is moving at a constant speed. From C to D, the bicycle is moving with a decreasing deceleration.	1 m 1 m 1 m	3 m
12b	Between B and C. When the bicycle is moving at a constant speed, the driving force and frictional force are equal. As $F = ma$, when the resultant force is zero, the acceleration is also zero.	1 m 1 m	2 m
12c	$a = \frac{v - u}{t}$ $= \frac{8 - 0}{40}$ $= 0.2 \text{ m/s}^2$	1 m 1 m	2 m
12di	distance travelled = area under v-t graph $= \frac{1}{2} (15 + 55) 8$ $= 280 \text{ m}$	1 m 1 m	
12dii	average speed = total distance / total time taken $= (280 + 55) / 70$ $= 4.79 \text{ m/s}$	1 m 1 m	