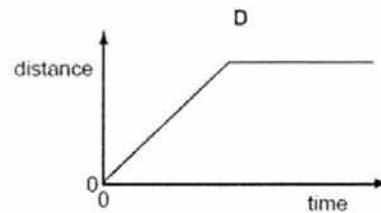
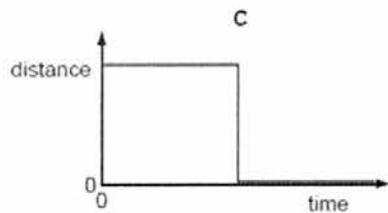
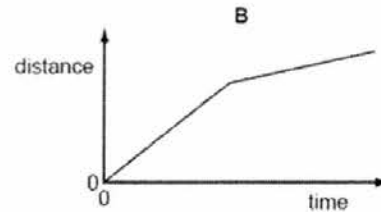
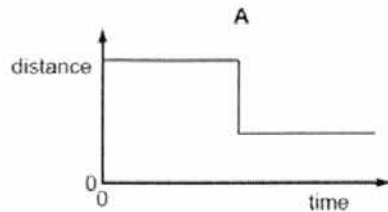


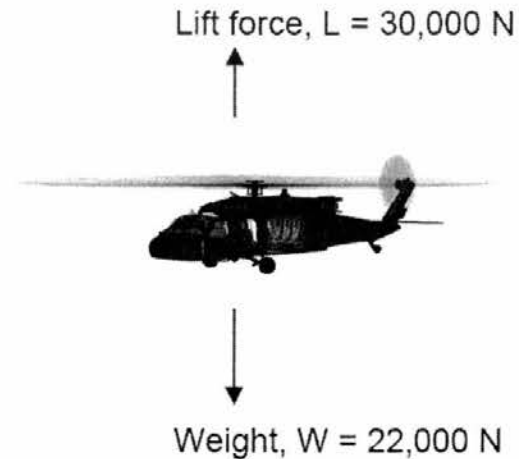
1 Which of the following statements is correct?

- A The diameter of the Earth is about  $1 \times 10^7$  m.
- B The wavelength of X-ray is about  $1 \times 10^{-5}$  m.
- C The length of a bus is about  $1 \times 10^2$  m.
- D The thickness of human's hair is about  $1 \times 10^{-3}$  m.

2 A free-fall parachutist falls at a constant speed. He then opens his parachute and continues to fall to Earth at a lower, constant speed. Which diagram shows how the distance fallen by the parachutist varies with time?



3 The diagram shows a helicopter with the forces acting on it at an instant. (Take  $g = 10$  N/kg)



The helicopter has an acceleration of

- A  $0.363$  m/s<sup>2</sup>.
- B  $3.64$  m/s<sup>2</sup>.
- C  $23.6$  m/s<sup>2</sup>.
- D  $800$  m/s<sup>2</sup>.

4 A sealed balloon filled with helium is released and it rises into the sky away from the surface of the Earth. During this time, what happens to the mass and weight of the helium in the balloon?

	mass	weight
A	decreases	decreases
B	Increases	increases
C	unchanged	decreases
D	unchanged	increases

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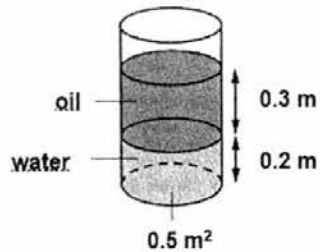
for more papers

- 5 Three objects are cut from the same sheet of aluminium. They are of different shapes but they all have the same mass.



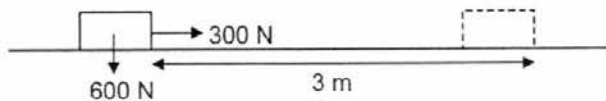
Which object has the greatest density?

- A the disc  
 B the square  
 C the rectangle  
 D all have the same density
- 6 A drum of base area  $0.5 \text{ m}^2$  is filled with a layer of water  $0.2 \text{ m}$  deep and a layer of oil  $0.3 \text{ m}$  deep as shown in the diagram. The weight of the water and the oil are  $1000 \text{ N}$  and  $1200 \text{ N}$  respectively.



What is the pressure on the base of the tank?

- A 1250 Pa    B 2500 Pa    C 4400 Pa    D 5000 Pa
- 7 When a  $300 \text{ N}$  force is applied to a box weighing  $600 \text{ N}$ , the box moves  $3 \text{ m}$  horizontally.



What is the work done?

- A 0 J    B 900 J    C 1800 J    D 2700 J

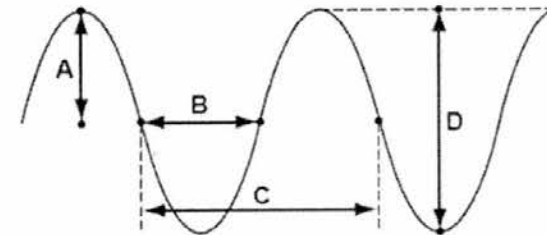
- 8 Which of the following colour combinations is suitable for the external wall of a house during the hot summer and the cold winter season?

	hot summer	cold winter
A	dark colour	dark colour
B	dark colour	light colour
C	light colour	dark colour
D	light colour	light colour

- 9 A substance consists of particles that are close together and sliding past each other. The average speed of the particles is gradually increasing.

Which best describes the substance?

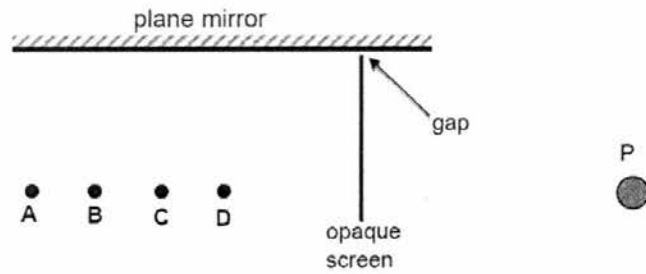
- A a gas being heated  
 B a liquid being heated  
 C a solid being heated  
 D a solid being melted
- 10 The diagram shows a wave.  
 Which labelled distance is the wavelength?



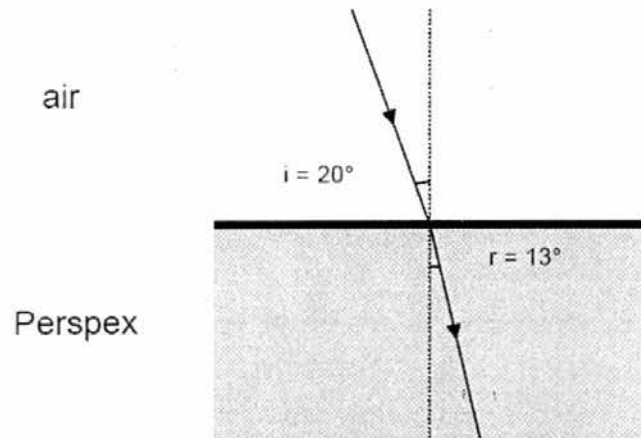
- 11 A research laboratory needs to sterilise some laboratory equipment. Which electromagnetic wave could be used?

- A infra-red  
 B microwaves  
 C ultra-violet  
 D visible light

- 12 A person P stands behind an opaque screen. Four lamps, A, B, C and D are placed in front of a mirror. Which lamp's image can P see?



- 13 The diagram shows a light ray entering a Perspex block.



What is the speed of light in the Perspex block? Assume light travels at  $3.0 \times 10^8$  m/s in air.

- A  $1.95 \times 10^8$  m/s  
 B  $1.97 \times 10^8$  m/s  
 C  $4.56 \times 10^8$  m/s  
 D  $4.62 \times 10^8$  m/s

[Turn over

- 14 An object, O, is placed 3 cm away from a converging lens of focal length 6 cm.

What type of image is produced?

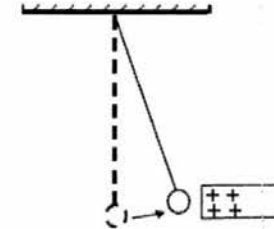
- A real, inverted and diminished  
 B real, inverted and magnified  
 C virtual, upright and diminished  
 D virtual, upright and magnified

- 15 Two notes are played on a piano. The second note is louder and has a higher pitch.

The second note is

- A higher in amplitude and higher in frequency.  
 B higher in amplitude and lower in frequency.  
 C lower in amplitude and higher in frequency.  
 D lower in amplitude and lower in frequency.

- 16 A small conducting sphere is suspended by an insulated thread. When a positively charged rod is brought near the sphere, the sphere is attracted as shown in the diagram.



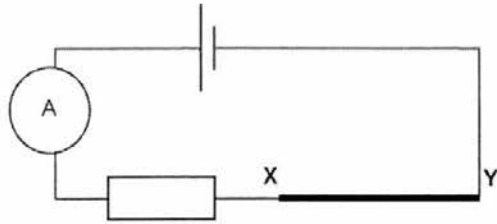
Which of the following is/are reasonable deduction(s)?

- The sphere may be positively charged.
- The sphere may be negatively charged.
- The sphere may be of neutral charge.

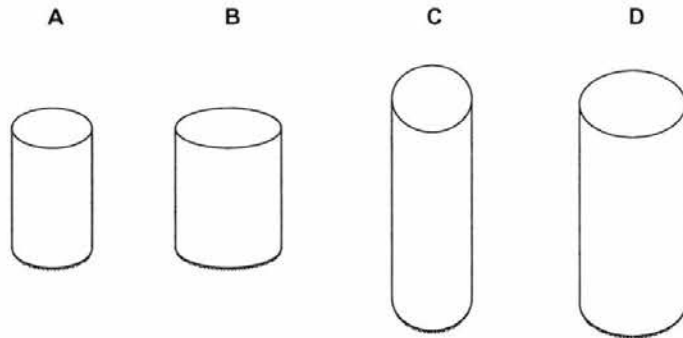
- A 1 only      B 2 only      C 1 and 3      D 2 and 3

[Turn over

- 17 The diagram shows a series circuit where the current is measured using an ammeter. Four wires of the same material are connected across XY one at a time and the current is recorded for each wire.



Which wire will result in the highest ammeter reading?

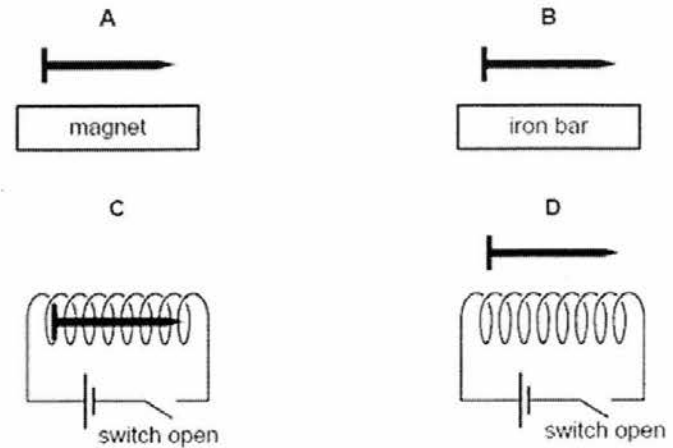


- 18 What happens when a 250 V, 2500 W water heater is connected to a mains supply using a plug fitted with a 5 A fuse?

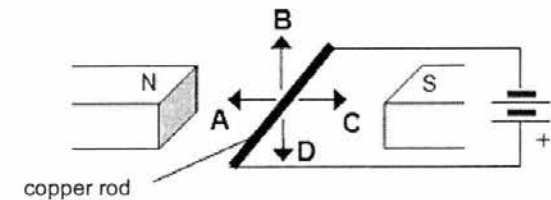
- A The fuse in the plug melts.
- B The heater burns out.
- C The heater runs at half power.
- D The heater works normally.

- 19 The diagrams show an iron nail in four different situations.

In which diagram will the nail become an induced magnet?



- 20 The diagram shows a copper rod between the poles of a horseshoe magnet. When the switch is closed, a current flows through the rod. In which direction will the rod experience a force?



**Section A [45 marks]**

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

1 Fig. 1.1 shows the electromagnetic spectrum.

Gamma Ray	F	G	Visible Light	Infra-red Radiation	Microwave	H
-----------	---	---	---------------	---------------------	-----------	---

**Fig. 1.1**

(a) Name the components **F**, **G** and **H** as well as their application.

	F	G	H
Name			
Application			

[3]

(b) The frequency of component **H** is 350 MHz. Determine its wavelength.

wavelength = ..... m [2]

Register No.	Class

Name \_\_\_\_\_

**BENDEMEER SECONDARY SCHOOL**  
**2016 PRELIMINARY EXAMINATION 2**  
**SECONDARY 4 EXPRESS / 5 NORMAL (ACADEMIC)**  
**SCIENCE (PHYSICS) PAPER 2**  
**5076/02**

**DATE : 29 Aug 2016**  
**DURATION : 1 hour 15 minutes**

**READ THESE INSTRUCTIONS FIRST**

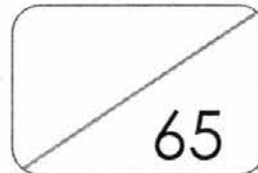
Write your name, class and register number on the work you hand in.  
 Write in dark blue or black pen.  
 You may use a 2B pencil for any diagrams or graphs.  
 Do not use paper clips, glue or correction fluid.

**Section A**  
 Answer **all** questions.

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

At the end of the examination, fasten all your work securely together.  
 The number of marks is given in brackets [ ] at the end of each question or part question.

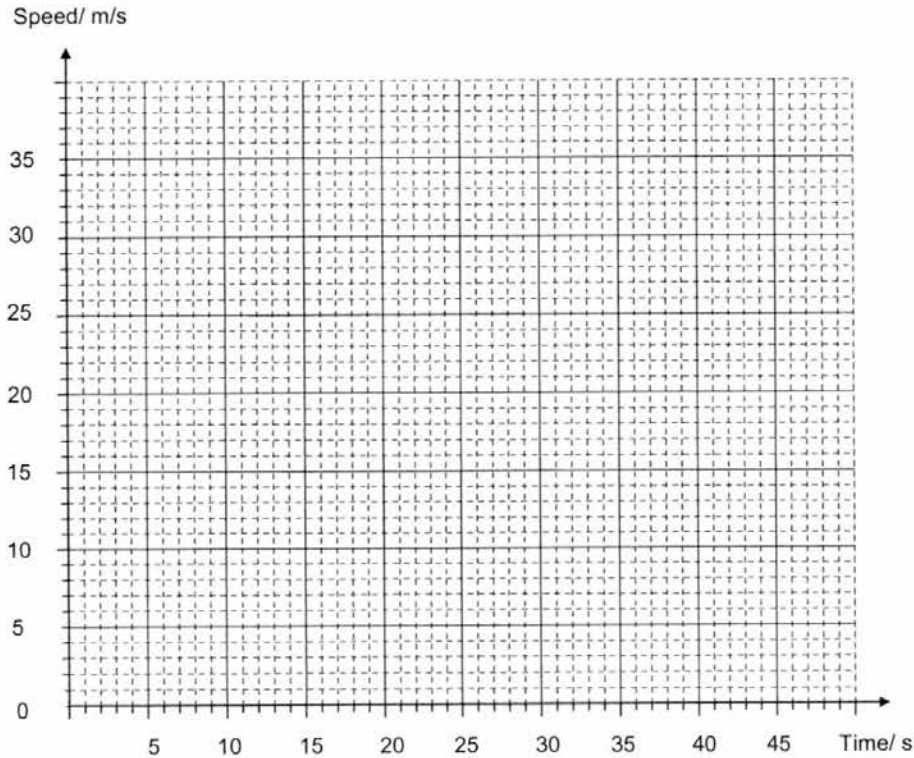


- 2 Amanda investigated the motion of a car at different times during part of a journey. She measured the speed of the car every 5.0 s. Fig. 2.1 shows her results.

Time/ s	Speed/ m/s
0	0
5.0	10
10.0	20
15.0	30
20.0	30
25.0	15
30.0	0

Fig. 2.1

- (a) Plot a graph of speed against time on the axes below.



[2]

[Turn over

- (b) Use your graph to calculate the distance travelled in the first 30 s.

distance travelled = ..... m [2]

- (c) If the mass of the car is 500 kg, calculate the net force acting on it in the first 15 s.

net force = ..... N [2]

- 3 Fig. 3.1 shows two uniform wooden blocks P and Q. Block Q weighs 6.0 N and is placed on top of block P.

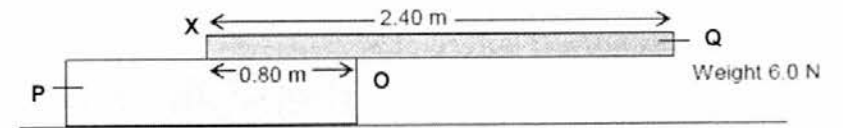


Fig. 3.1

- (a) On Fig. 3.1, indicate the weight of the block Q with an arrow labelled "W". [1]

[Turn over

(b) Predict and explain using moments, what happens to block Q after it is placed on block P.

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

(c) Calculate the minimum downward force that should be applied at point X of block Q such that block Q is in equilibrium.

minimum force = ..... N [2]

4 Fig. 4.1 shows an electric circuit.

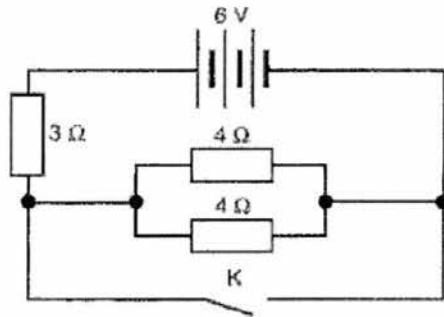


Fig. 4.1

[Turn over

(a) With the switch K open in the circuit, calculate

(i) the effective resistance of the circuit,

effective resistance = ..... Ω [2]

(ii) the current through the 3 Ω resistor,

current = ..... A [2]

(iii) the voltage across the 3 Ω resistor.

voltage = ..... V [2]

(b) If the switch K is closed, calculate the current through the 3 Ω resistor.

current = ..... A [2]

[Turn over

5 Fig. 5.1 shows how electrical charges are used in spray-painting of car doors.

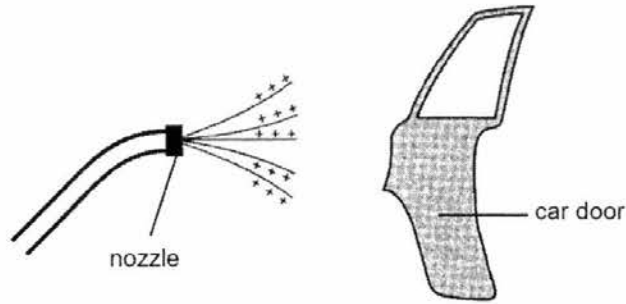


Fig. 5.1

As the paint droplets leave the nozzle, they are charged positively.

(a) Explain how charged paint droplets provide an even coating of paint on the car door.

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

(b) Fig. 5.2 shows a positively charged paint droplet. On Fig. 5.2, draw the electric field pattern due to the positive charge.

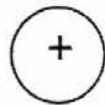


Fig. 5.2

[1]

[Turn over

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

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

6 Fig. 6.1 shows a current flowing in a coil of wire placed between a powerful magnet. The coil of wire is pivoted at A and D and is free to move.

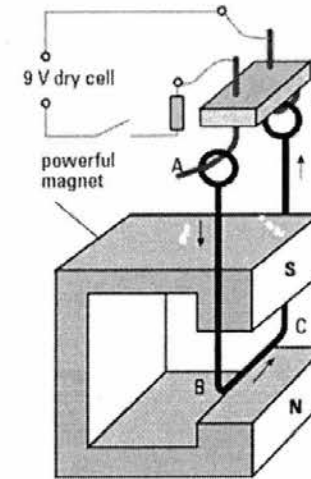


Fig. 6.1

(a) Fig. 6.2 shows the cross section of the wire BC with the current flowing into the page. Draw on Fig. 6.2 the resulting magnetic field due to the current.



Fig. 6.2

[1]

[Turn over

(b) State and explain what happens to the wire BC when the switch is closed.

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

(c) Suggest two ways in which the wire BC can be made to move in the opposite direction.

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

7 (a) Fig. 7.1 shows a person using a Mylar emergency blanket to keep himself warm when outdoor temperatures drop.



Fig. 7.1

Mylar blankets are manufactured by depositing vaporised aluminum onto both surfaces of a very thin plastic film. The resulting material is thin, flexible, shiny and waterproof. The Mylar blanket works by reducing a person's heat loss by radiation. It is also effective in reducing evaporation of perspiration because it is waterproof.

[Turn over

(i) Explain how the Mylar blanket can reduce a person's heat loss by radiation.

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

(ii) Explain how the Mylar blanket keeps a person warm by reducing evaporation.

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

(iii) A thick woolen blanket reduces a person's heat loss by minimizing a mode of heat transfer that the Mylar blanket cannot reduce.

State this mode of heat transfer and explain how it works in a woolen blanket.

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

(b) State one difference between evaporation and boiling.

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

[Turn over

- 8 Fig. 8.1 shows a ray of light incident on a triangular prism, ABC. The critical angle of the glass prism is  $43^\circ$ .

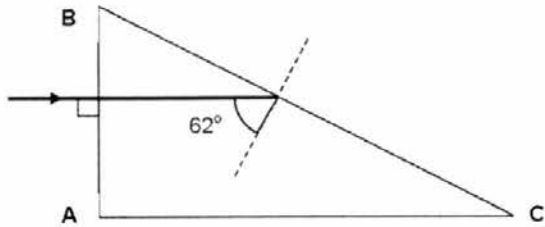


Fig. 8.1

- (a) Explain why the light ray did not emerge into the air from the face BC.

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

- (b) On Fig. 8.1, complete the path of the light ray until it emerges out of the glass prism. [2]

- (c) Calculate the refractive index of the glass.

refractive index = ..... [2]

[Turn over

Section B [20 marks]

Answer any TWO questions from this section.

- 9 (a) Kai Xiong holds a long rope and swings it sharply up and down to send waves along the rope. Fig. 9.1 shows the waves moving along the rope.

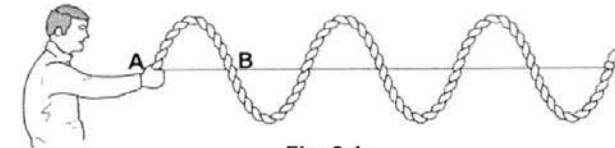


Fig. 9.1

- (i) Explain why the wave generated is a transverse wave.

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

- (ii) The distance between point A and point B is 95 cm. Calculate the speed of the wave if its frequency is 4.5 Hz.

speed = .....m/s [2]

- (b) Fig. 9.2 shows the waveform of the note from a bell.

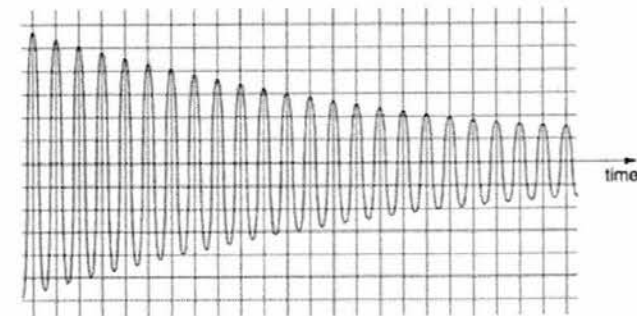


Fig. 9.2

[Turn over

- (i) State and explain the change to the sound of the bell over the period of time.

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

- (ii) Explain how the waveform shows that the pitch of the sound from the bell remains unchanged.

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

- (c) Fig. 9.3 shows how a sound wave can be produced. Particle **A** represents an air molecule situated between the loudspeaker and a listener.

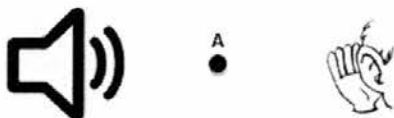


Fig. 9.3

- (i) Describe the behavior of the particle **A** as the sound wave travels from the loudspeaker to the listener.

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

- (ii) Name another wave motion where the particles in the medium behave in a similar manner as particle **A**.

.....[1]

- (d) Two students **A** and **B** are trying to use echoes to determine the speed of sound in air. Student **A** has two blocks of wood that make a loud sound when banged together. Student **B** has a stopwatch. They stood 240 m from the school wall as shown in Fig. 9.4.

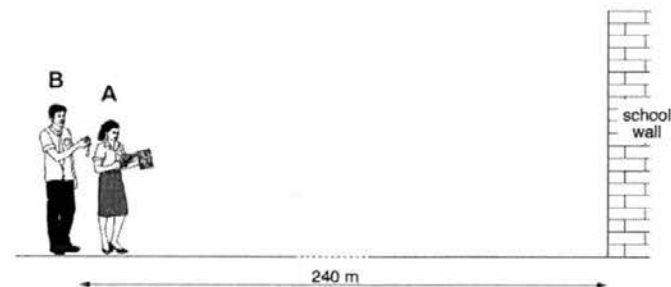


Fig. 9.4

Student **A** bangs the blocks together and at the same time **B** starts the stopwatch. **B** stops the stopwatch when he hears the echo. The watch reads 1.6 s. Determine the speed of sound.

speed = .....m/s [2]

10 A simple pendulum is made by hanging a metal ball of mass 0.2 kg from a point P. The pendulum is pulled from its rest position, A, by a 4.0 N force to position B, as shown in Fig. 10.1.

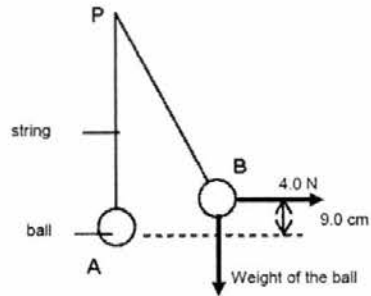


Fig. 10.1

(a) Calculate the tension in the string when the pendulum is in rest position A.

tension = .....N [1]

(b) Draw a scale diagram of the pendulum to find the tension in the string when the pendulum is in position B.

scale = .....  
 tension = .....N  
 [3]

[Turn over

(c) Calculate the gain in gravitational potential energy as the ball is moved from A to B. (Take  $g = 10 \text{ N/kg}$ )

gain in gravitational potential energy = ..... J [2]

(d) The ball is then released and it swings freely.

(i) Calculate the maximum speed attained by the ball.

maximum speed = ..... m/s [2]

(ii) State one assumption you have made in obtaining the maximum speed in (d)(i).

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

(e) It takes 0.5 s for the ball to travel from A to B. Calculate the period of the pendulum.

period = ..... s [1]

[Turn over

- 11 The table lamp shown in Fig. 11.1 is made of plastic. It has only 2 wires in the cable. The lamp has a power rating of 15 W and is used on a 120 V supply.



Fig. 11.1

- (a) State which wire, Earth, Live or Neutral is not needed in the cable for the table lamp to work.

..... [1]

- (b) The lamp is safe to use even though it has only two wires because it is double insulated. Describe how the double insulation keeps the lamp safe.

.....

.....

.....

..... [2]

- (c) Determine the value of the fuse that should be used in the plug of this lamp. Fuse ratings available are 1 A, 3 A, 5 A and 13 A.

fuse rating = ..... A [2]

[Turn over

- (d) One kWh of electricity costs \$0.30. Calculate the cost of using the table lamp for 1 day.

cost = \$..... [2]

- (e) Draw a circuit diagram to show how three of these lamps are connected to the mains supply so that each lamp can be switched on separately. Include a fuse to protect the entire circuit.

[3]

End of Paper

Bendemeeer Secondary School  
 2016 Preliminary Examination 2  
 Secondary Four Express / Five Normal (Academic)

Science (Physics)  
 Paper 1 [20 mark]

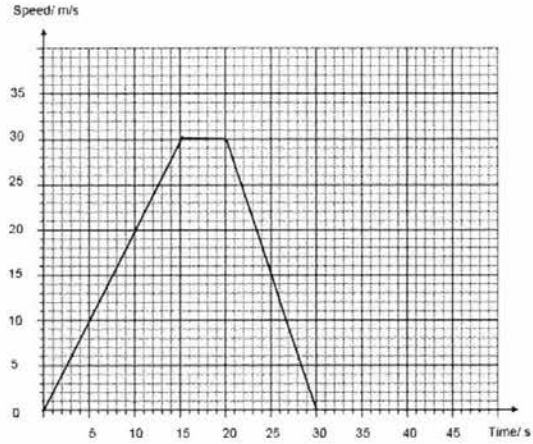
Mark Scheme

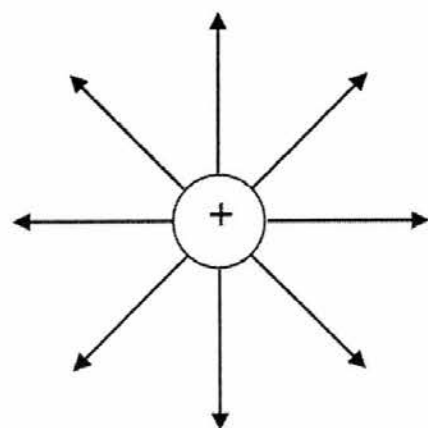
1	A	11	C
2	B	12	B
3	B	13	B
4	C	14	D
5	D	15	A
6	C	16	D
7	B	17	B
8	D	18	A
9	B	19	A
10	C	20	D

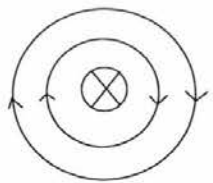
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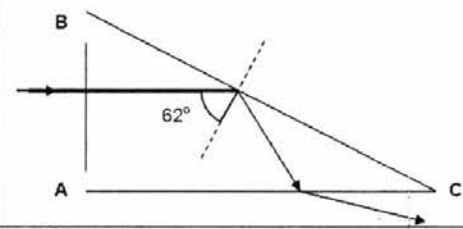
Paper 2  
 Section A [45 marks]

		Section A				Marks
1	(a)		F	G	H	3 [1/2 mark for each blank]
		Name	X-ray	Ultra-violet	Radio	
		Application	For medical examination (x-ray imaging for health of bone structures)	For forgery detection/sun tanning bed/sterilizing equipment.	For transistor radios. Over-air televisions.	
	(b)	Wavelength = $v/f = 3 \times 10^8 / 350 \times 10^6 = 0.857 \text{ m}$				1 1

		Section A	Marks
2	(a)	Points plotted correctly Straight line used to join points	1 1
			
	(b)	Distance travelled $= \frac{1}{2} \times (5+30) \times 30$ $= 525\text{m}$	1 1
(c)	$a = 30/15 = 2 \text{ m/s}^2$ $F = ma$ $= 500 (2)$ $= 1000\text{N}$	1 1	
3	(a)	Weight <b>W</b> is drawn from centre of block.	1
	(b)	It will topple/ rotate clockwise. The weight will cause a clockwise moment about point <b>O</b> .	1 1
	(c)	In equilibrium about point <b>O</b> , Sum of anti-clockwise moments = sum of clockwise moments $F \times (0.80) = (6) (1.2 - 0.8)$ $F \times (6) (0.4) / 0.80$ $= 3.0 \text{ N}$	1 1

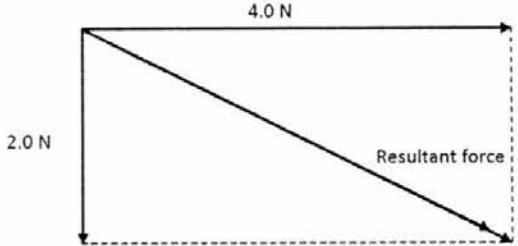
		Section A	Marks
4	(a)	(i) Effective resistance $= 3 + (\frac{1}{4} + \frac{1}{4})^{-1}$ $= 5 \Omega$	1 1
		(ii) Current = $V + R$ $= 6 + 5$ $= 1.2 \text{ A}$	1 1
	(iii) Voltage = $IR$ $= 1.2 \times 3$ $= 3.6 \text{ V}$	1 1	
	(b)	Effective resistance = $3 \Omega$ Current = $V + R$ $= 6 + 3$ $= 2 \text{ A}$	1 1
5	(a)	Since the droplets have the same positive charges, they will repel each other and spread out more. The car door should be given a negative charge/earthed, to attract the positively charged paint droplets.	1 1
	(b)		1
	(c)	An electric field is a region whereby an electric charge experiences an electric force.	1

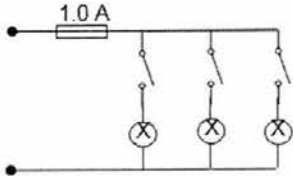
		Section A	Marks
6	(a)	Circular magnetic field lines in a clockwise direction  	1
	(b)	Wire BC moves to the right.	1
		Using Fleming's Left Hand Rule, when current (middle finger) flows into page, magnetic field (index finger) is upwards, the force (thumb) points to the right.	1
(c)	Switch poles and change cell/current direction	2	
7	(a)	(i) When the Mylar blanket is wrap around the body, the inner shiny surface, which is a poor absorber, [1] will absorb infrared radiation emitted by the body at a slower rate. [1] OR The outer shiny surface is a poor emitter [1], so radiant heat will be emitted to the surrounding at a lower rate. [1]	2
		(ii) When perspiration evaporates, it will remove heat from the body. By reducing evaporation due to higher humidity and less wind, the heat loss by the body is reduced.	1
	(iii) Conduction. Within the woolen blanket there are many air pockets. Air is a poor conductor of heat and will reduce heat loss by conduction. Furthermore the woolen blanket is thicker than the Mylar blanket	1	
		1	
(b)	Boiling occurs at a fixed temperature but evaporation takes place at any temperature. OR Boiling takes place throughout the liquid but evaporation only takes place on the surface [or any acceptable answer]	1	

		Section A	Marks
8	(a)	The angle of incidence is greater than the critical angle. The light is passing from an optically denser medium to optically less dense medium. The light ray thus undergoes total internal reflection.	1
	(b)	1m for reflected ray, 1 m for ray undergoing refraction  	2
		(c)	$n = 1/\sin c$ $= 1/\sin 43$ $= 1.47$
			1

## Section B [20 marks]

		Section B	Marks
9	(a)	(i) The direction of vibration of the particles is perpendicular to the direction of the wave propagation.	1
		(ii) $\lambda = 1.90 \text{ m}$ $v = f \lambda$ $= 4.5 \times 1.90$ $= 8.55 \text{ m/s}$	1
	(b)	(i) The sound gets softer The amplitude of the waveform decreases	1
		1	

		Section B	Marks
		(ii) The frequency of the waveform remains unchanged.	1
	(c)	(i) The particle A vibrates back and forth, parallel to the direction of the sound travel.	1
		(ii) Wave generated by a slinky coil being pushed back and forth.	1
	(d)	speed = $480/1.6$ = 300 m/s	1 1
10	(a)	$W = mg = (0.2\text{kg})(10) = 2.0 \text{ N}$	1
	(b)	 <p>Scale = 1cm:0.50 N [1] Correct diagram with labelling [1] Magnitude of tension = 4.5 N [1]</p>	3
	(c)	$E_p = mgh = (2)(0.09)$ = 0.18 J	1 1
	(d)	(i) K.E = 0.18 J $\frac{1}{2}mv^2 = 0.18 \text{ J}$ $\frac{1}{2}(0.2)v^2 = 0.18 \text{ J}$ $v^2 = 1.8$ $v = 1.34 \text{ m/s}$	1 1
		(ii) All the gravitational potential energy is converted to kinetic energy. <b>No energy is lost to the surrounding.</b>	1

		Section B	Marks
	(e)	period = 2.0 s	1
11	(a)	Earth	1
	(b)	The external casing is made of plastic and the internal live components are also insulated from the external casing. Unless these two independent layers fail, the users cannot get an electric shock	1 1
	(c)	$P = IV$ $I = 15 / 120$ $= 0.125 \text{ A}$ <p>Fuse rating = 1 A</p>	1 1
	(d)	$E = (15 / 1000) (24)$ = 0.36 kWh  Cost = $0.36 \times \$0.30 = \$0.11$	1 1
	(e)	<ul style="list-style-type: none"> <li>all the lamps are parallel</li> <li>switch drawn for each lamp</li> <li>Fuse at the same side of switches</li> </ul> 	1 1 1