

NAME:	CLASS:	INDEX NO:
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QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2018

SECONDARY 4 EXPRESS/5 NORMAL (ACADEMIC)

Parent's Signature:

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**SCIENCE (PHYSICS, CHEMISTRY)**

Paper 1 Multiple Choice

**5076/01**

**14 Sep 2018**

**1 hour**

Additional Materials: Multiple Choice Answer Sheet

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**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name and index number on the Answer Sheet in the spaces provided.

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.

A copy of the Periodic Table is printed on page 16.

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

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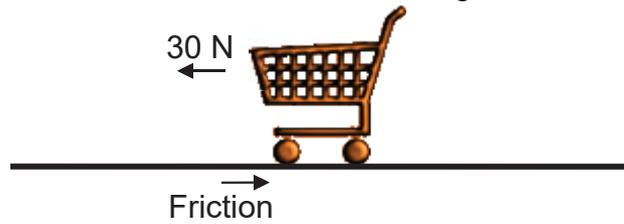
This document consists of **10** printed pages.

Setters: Mr Jimmy Ong, Mr Enrico Tan (Phy)

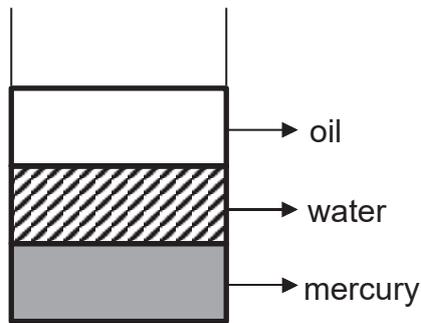
**[Turn over**



- 4 A trolley of mass 10 kg was pushed with a force of 30 N. If it moves with a constant speed of 0.5 m/s, what is the force of friction acting on the trolley?



- A 0 N  
 B 15 N  
 C 25 N  
 D 30 N
- 5 The following diagram shows the position of mercury, oil and water in a clear glass container.



Which of the following lists is arranged in ascending order of density?

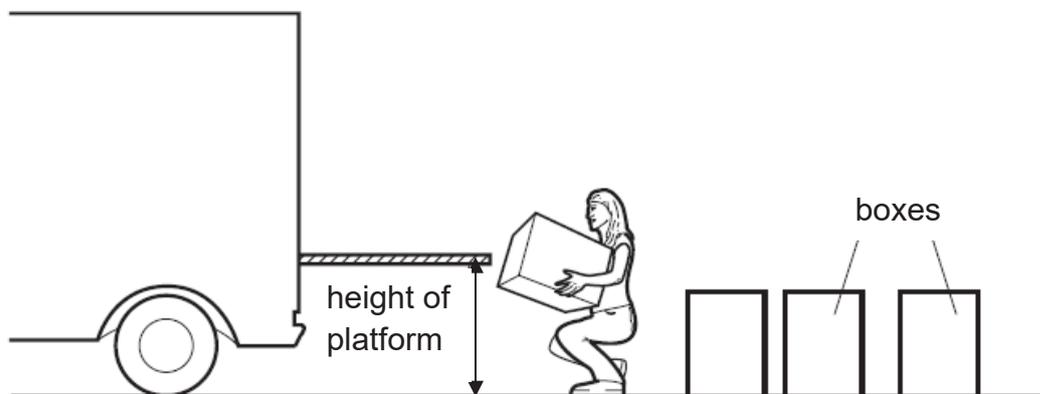
- A water, mercury, oil  
 B mercury, water, oil  
 C oil, water, mercury  
 D oil, mercury, water
- 6 Which of the following are typical characteristics of an unstable object?

	base	center of gravity
A	narrow	high
B	narrow	low
C	wide	high
D	wide	low

7 Gavin is attempting to cross a frozen lake which is covered with only a very thin layer of ice on the surface. Which of the following is the **best** method to cross the lake without cracking the ice?

- A tip-toe lightly and slowly across the surface
- B run as fast as he can across the surface before it cracks
- C lie flat on the thin ice and push himself across the surface
- D remove all unnecessary heavy objects and walk normally across the surface

8 A person lifts boxes of equal weight onto a platform.



Which quantity will not affect the total work done by the person?

- A the weight of the boxes
- B the number of boxes lifted
- C the time taken to lift the boxes
- D the height of the platform above the ground

9 Substance X has a melting point of  $-98\text{ }^{\circ}\text{C}$  and a boiling point of  $65\text{ }^{\circ}\text{C}$ .

Which statement best describes the motion and arrangement of the particles of substance X at a temperature of  $0\text{ }^{\circ}\text{C}$

- A They vibrate about their fixed positions.
- B They slide past one another at high speeds.
- C They move freely and randomly at high speeds.
- D They slide past one another and have no fixed positions.

10 A piece of ice cube feels cool to the skin when touched.

Which of the following best explains why?

- A Heat is transferred from the skin to the ice cube.
- B Heat is transferred from the ice cube to the skin.
- C Coldness is transferred from the ice cube to the skin.
- D Coldness is transferred from the skin to the ice cube.

11 Boiling and evaporation are different processes.

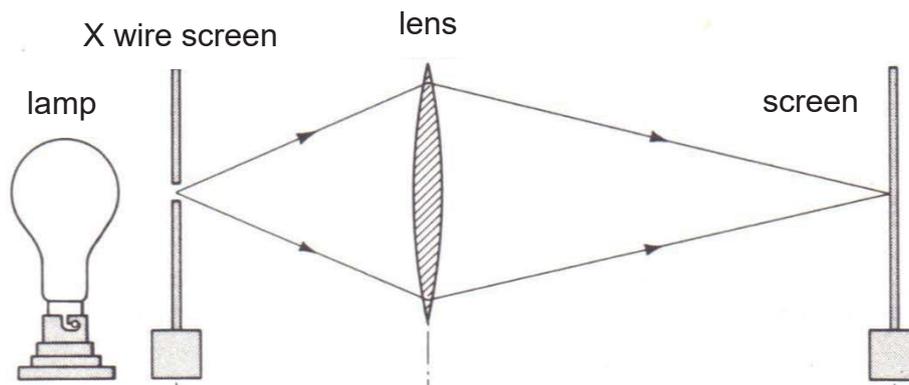
Which of the following shows their differences accurately?

	Boiling	Evaporation
A	No bubbles are formed	Bubbles are formed
B	Occurs throughout the liquid	Only occurs at the surface
C	Occurs at 100 °C	Occurs at any temperature
D	Requires energy source	Requires heat source

12 What is meant by the term *wavefront*?

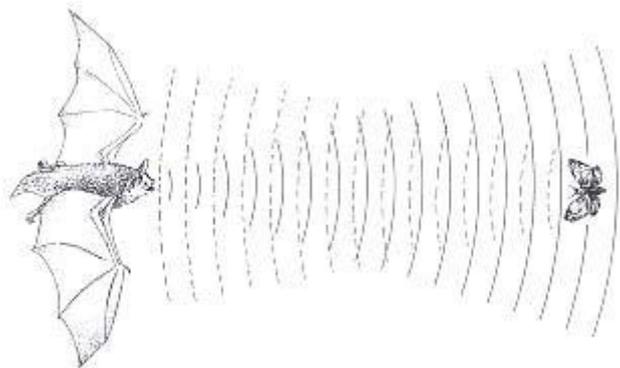
- A half the distance between crest and the trough
- B a line joining the points of the same phase on a wave
- C the distance between two successive crests of a wave
- D the time taken to complete a full oscillation of the wave

- 13 A lamp produces a sharp image of an X wire on a screen through a thin converging lens



How does the image change as the lens is moved closer to the lamp?

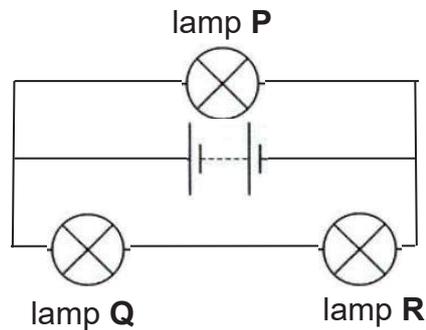
- A The image becomes virtual.
  - B The image becomes brighter.
  - C The image on the screen becomes blurred.
  - D The image on the screen becomes more focussed.
- 14 Bats use echolocation to locate their prey. A bat hears the echo that bounced off the moth 2.2 ms after it emits its call.



Assuming the speed of sound is 330 m/s, what is the distance between the bat and the moth?

- A 75 mm
- B 150 mm
- C 363 mm
- D 726 mm

- 15 Which of the following is the SI units for charge?
- A Ampere  
B Coulomb  
C Joules  
D Watts
- 16 The potential difference across a bulb is 12 V and 100 C of charge flows through it.  
Calculate the amount of light and thermal energy dissipated by the bulb.
- A 0.12 J  
B 8.33 J  
C 120 J  
D 1200 J
- 17 The diagram shows three identical lamps **P**, **Q** and **R** connected in a circuit.



Which row shows how the brightness of lamp **P** and **Q** will change if lamp **R** is removed?

	brightness in lamp P	brightness in lamp Q
A	no change	dimmer
B	no change	brighter
C	dimmer	brighter
D	brighter	dimmer

- 18 The switch of a fan is connected incorrectly along the neutral wire.

Which of the following statements about the operation of the fan is/are correct?

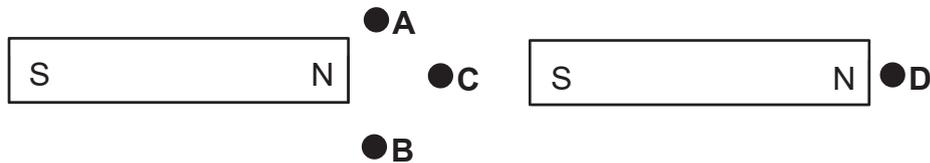
- I. The fan would still operate when the switch is closed.
- II. The fuse of the fan would melt under normal working condition when the switch is closed.
- III. The fan would still be connected to the high voltage source when the switch is opened.

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

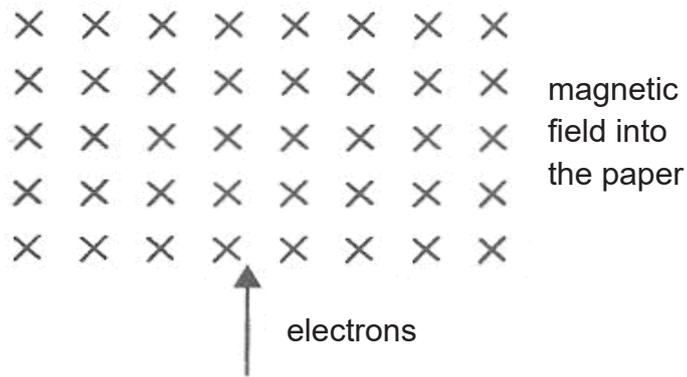
- 19 Two bar magnets are placed near each other with their poles as shown.

A student plots the resultant field lines with a compass.  
The Earth's magnetic field can be ignored.

At which point does the compass point towards the top of the page?



- 20 An electron beam is directed into a uniform magnetic field. The magnetic field lines are flowing into the paper.



How would the electron beam be affected?

- A It will deflect out of the paper.
- B It will deflect to the left.
- C It will deflect to the right.
- D It will slow down but will not change direction.

**END OF PAPER**

# The Periodic Table of the Elements

		Group																																																																																														
I	II	III	IV	V	VI	VII	0																																																																																									
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18	19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36	37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54	55 Cs caesium 55	56 Ba barium 56	57 La lanthanum 57	58-71 Lanthanoid series	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 Rn radon 86	87 Fr francium 87	88 Ra radium 88	89 Ac actinium 89	90-103 Actinoid series	91 Th thorium 90	92 Pa protactinium 91	93 U uranium 92	94 Pu plutonium 94	95 Am americium 95	96 Cm curium 96	97 Bk berkelium 97	98 Cf californium 98	99 Es einsteinium 99	100 Fm fermium 100	101 Md mendeleevium 101	102 No nobelium 102	103 Lr lawrencium 103	104 Rf rutherfordium 104	105 Db dubnium 105	106 Sg seaborgium 106	107 Bh bohrium 107	108 Hs hassium 108	109 Mt meitnerium 109	110 Ds dubnium 110	111 Rg roentgenium 111	112 Cn copernicium 112	113 Nh nihonium 113	114 Fl flerovium 114	115 Mc moscovium 115	116 Lv livermorium 116	117 Ts tennessine 117	118 Og oganeson 118
1 H hydrogen 1											1 H hydrogen 1																																																																																					
												4 He helium 2																																																																																				

Key

a	X
X	
b	

a = relative atomic mass  
 X = atomic symbol  
 b = proton (atomic) number

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2018

SECONDARY 4 EXPRESS / 5 NORMAL (ACADEMIC)

Parent's Signature:

**SCIENCE (PHYSICS, CHEMISTRY)**

Paper 2 Physics

**5076/02**

**11 Sep 2018**

**1 hour 15 minutes**

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your name and index number on all the work you hand in.  
 You may use an HB pencil for any diagrams, graphs, tables or rough working.  
 Write in dark blue or black pen.  
 Do not use staples, paper clips, glue or correction fluid.

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

**Section A:**

Answer **all** questions.  
 Write your answers 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.

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.

For Examiner's Use	
<b>Section A</b>	<b>/45</b>
<b>Q</b>	<b>/10</b>
<b>Q</b>	<b>/10</b>
<b>TOTAL</b>	<b>/65</b>

This document consists of **16** printed pages.

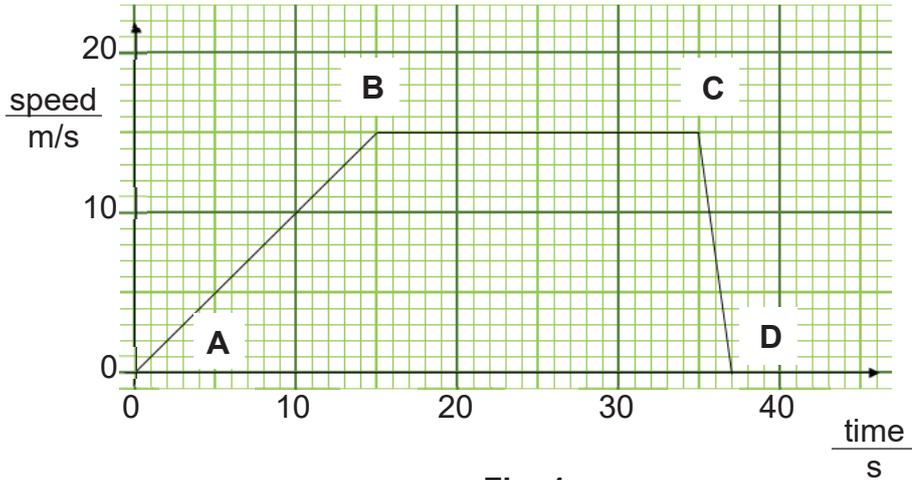
Setters: Mr Jimmy Ong, Mr Enrico Tan (Phy)

**[Turn over**

**SECTION A**

Answer **all** the questions in the spaces provided.  
The total mark for this section is 45.

**A1** Fig. 1 shows how the speed of a bicycle changes with time.



**Fig. 1**

(a) State the magnitude of the acceleration of the object between points **B** and **C**.

acceleration = ..... m/s<sup>2</sup> [1]

(b) Use your answer to (a) to describe the motion of the bicycle between points **B** and **C**.

.....[1]

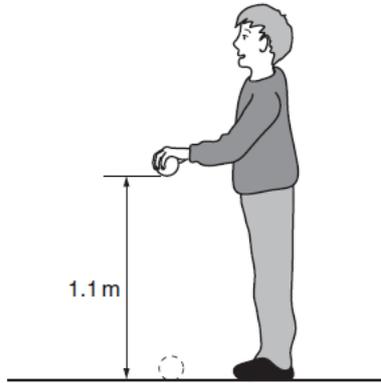
(c) Calculate, showing your working, the distance travelled by the bicycle between points **A** and **B**.

distance travelled = ..... m [1]

(d) Is it possible to tell the direction of the bicycle using the Fig. 1? If so, state the time period at which the bicycle is travelling in the reverse direction. If not, state the reason why it is not possible.

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

- A2** Fig. 2.1 shows a ball falling a distance of 1.1 m when David drops it. The mass of the ball is 0.50 kg. Ignore air resistance. The gravitational field strength is 10 N/kg.



**Fig. 2.1**

- (a) Calculate the decrease in gravitational potential energy of the ball as it falls through the 1.1 m.

decrease in potential energy = ..... J [1]

- (b) The ball bounces and only rises to a height of 0.80 m.

- (i) Calculate the energy lost during the bounce.

energy lost = ..... J [2]

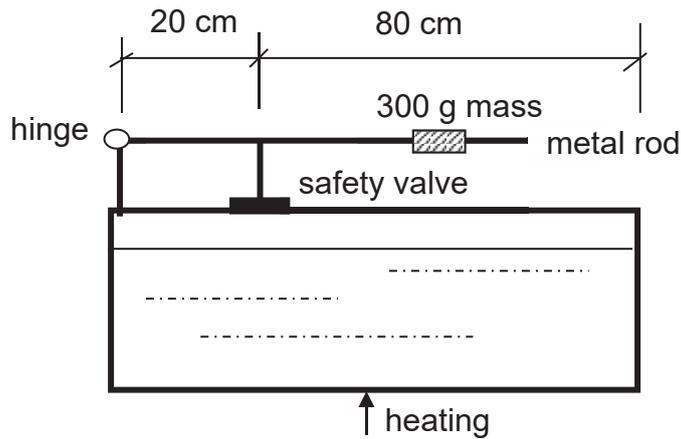
- (ii) Suggest one reason why energy is lost during the bounce.

..... [1]

- (c) After retrieving the ball, David throws the ball down from a height of 1.1 m with an initial kinetic energy of 9.0 J. Calculate the speed of the ball when it hits the ground.

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

**A3** Fig. 3.1 shows a pressure cooker with a safety valve.



**Fig. 3.1**

(a) Calculate the weight of the mass. Take  $g = 10 \text{ N/kg}$ .

weight = ..... N [1]

(b) The safety valve is designed to open when the pressure in the cooker is  $2500 \text{ Pa}$ . The area of the valve is  $0.003 \text{ m}^2$ .

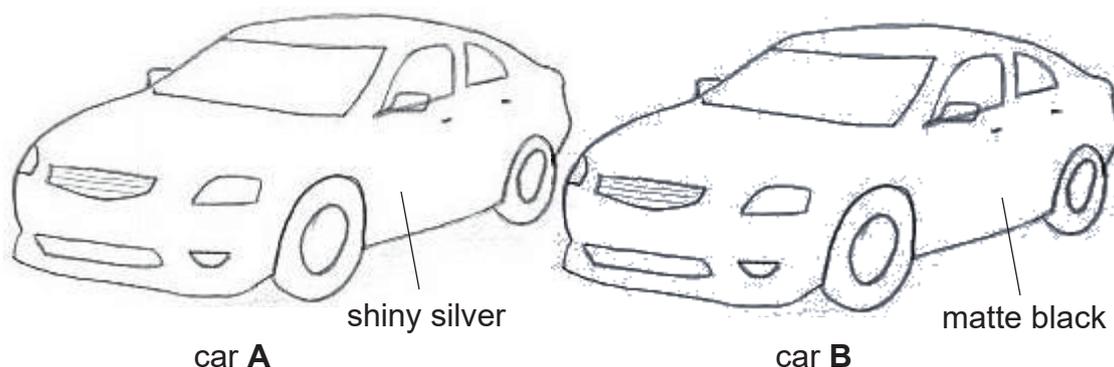
(i) Calculate the force applied on the safety valve due to the pressure in the cooker.

force = ..... N [2]

(ii) Taking moments about the hinge of the pressure cooker, determine the shortest distance the weight should be positioned from the hinge such that the safety valve remains closed.

distance = ..... cm [2]

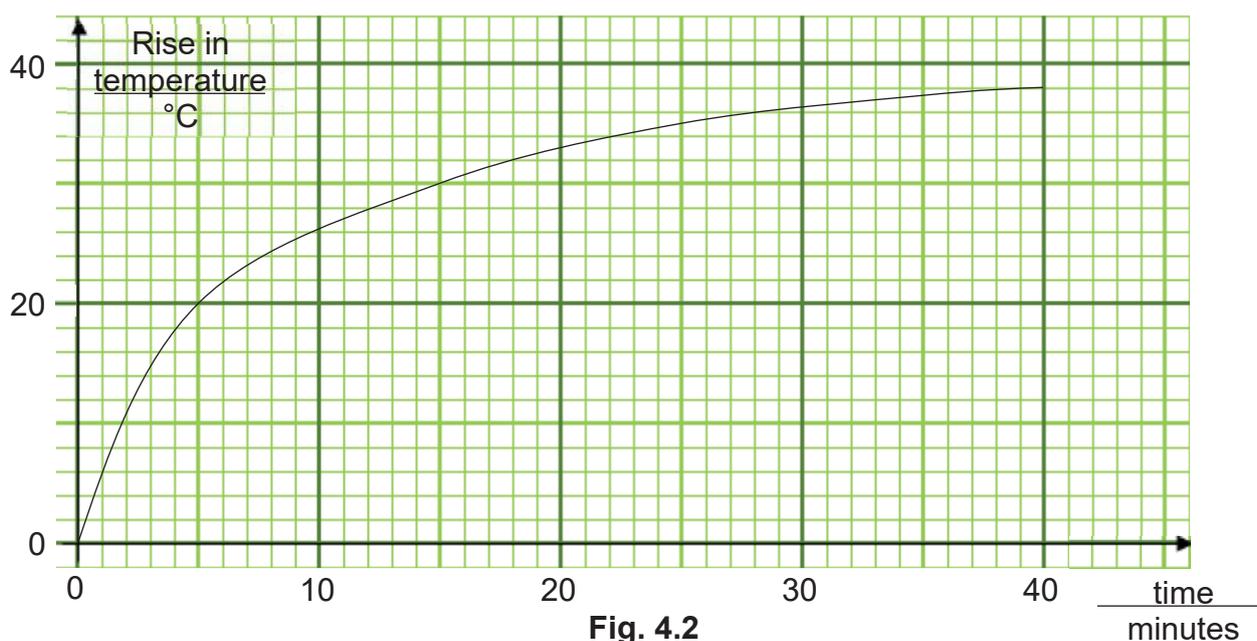
- A4** Two cars are parked next to each other in a hot, sunny afternoon as shown in Fig. 4.1.



**Fig. 4.1**

The cars are identical except that car **A** has a polished silver surface and car **B** has a matte (dull) black surface.

The rise in temperature of car **B** over time is shown in Fig. 4.2.

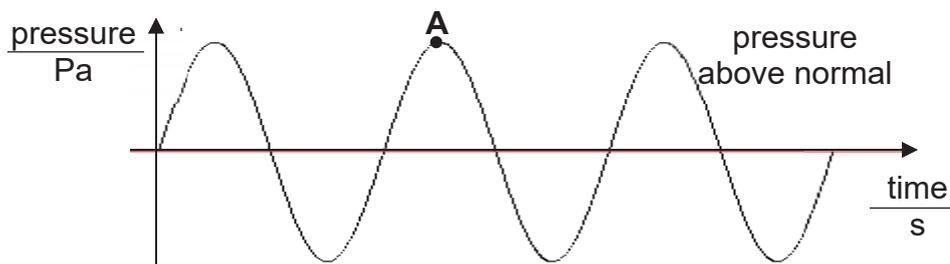


**Fig. 4.2**

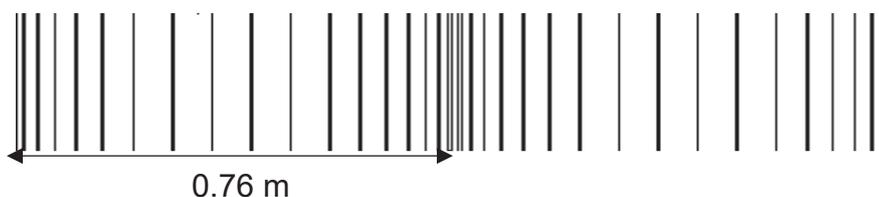
- (a) On Fig. 4.2, sketch the variation with time of the rise in temperature of car **A** for time between 0 and 20 minutes. [2]
- (b) The two words “shiny” and “silver” describe car **A**’s reflectiveness of light and colour respectively. State one more property that affects absorption and emission of radiant heat.

..... [1]

**A5** Fig. 5.1 shows how the pressure changes with time, at a sound receiver, for a sound wave. Point A is at an instant where the pressure is the highest. Fig. 5.2 shows position of air particles in the sound wave as it passes through.



**Fig. 5.1**



**Fig. 5.2**

- (a) Sound is type of wave.  
Describe the behaviour of sound waves that make it a “wave” making reference to its energy transfer and particles.  
.....  
..... [2]
- (b) The sound wave has a frequency of 432 Hz.  
State the meaning of “frequency of 432 Hz” in the context of a sound wave.  
..... [1]
- (c) Calculate the speed of this sound wave.  
  
speed = ..... m/s [2]
- (d) On Fig. 5.2, circle a region on the wave where it corresponds to the pressure at point A. [1]
- (e) A sound wave with a high maximum pressure corresponds to a high amplitude in the sound wave.  
State how a sound with high amplitude affects the type of sound heard.  
..... [1]

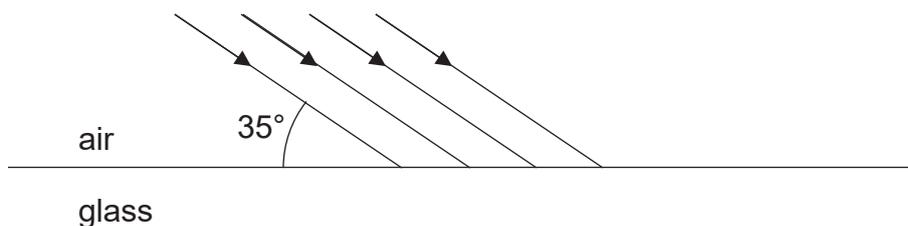
**A6** A parallel beam of light shines on the surface of a glass block.

(a) Glass has a higher refractive index than air.

State the effect on the speed of light as light travels from a medium of lower refractive index to a medium of higher refractive index.

.....[1]

(b) The beam of light hits the surface of the glass at an angle of  $35^\circ$  to the surface of the glass as shown in Fig. 6.1.



**Fig. 6.1**

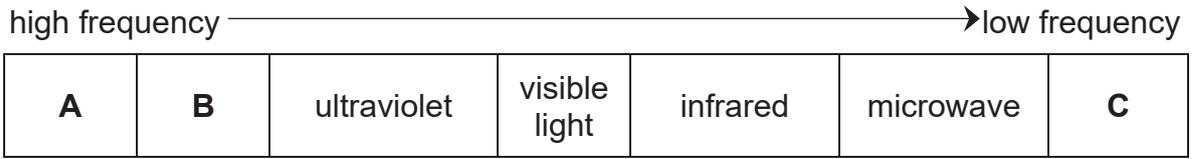
Parallel rays of light strike the surface of the glass block from directly above it.

(i) Calculate the angle of refraction, given that the refractive index of glass is 1.5. Round your answer to the nearest  $1^\circ$ .

angle of refraction = .....  $^\circ$ [3]

(ii) Hence, complete the diagram on Fig. 6.1 to show the path of the light in the glass. [1]

**A7** Fig. 7 shows regions of the electromagnetic spectrum in order of decreasing frequency. Some regions are identified by letters.



**Fig. 7**

**(a) (i)** State one property of waves in regions **A** and **C** that is common among waves in both regions.

.....[1]

**(ii)** State how waves in region **A** are different from that of waves in region **C** (other than having higher frequencies).

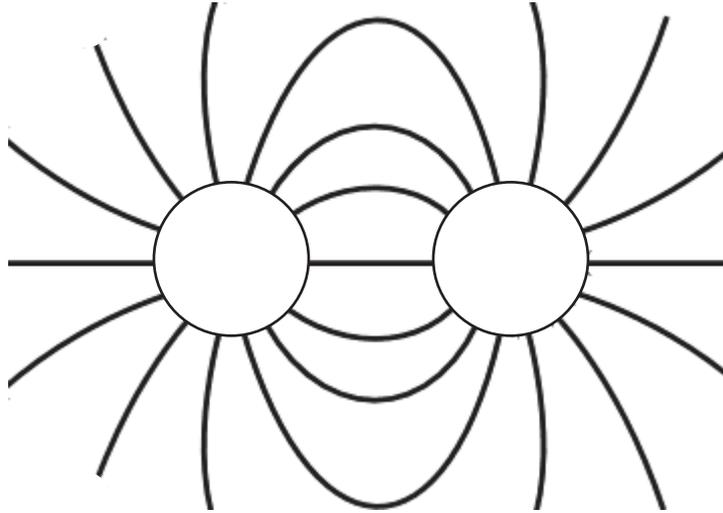
.....[1]

**(b)** For each device, state which component of the electromagnetic spectrum is used.

sunbed .....

cooking .....[2]

- A8** Fig. 8 shows the electric field pattern between two isolated point charges. The direction of the field and the polarity of the charges are unknown.



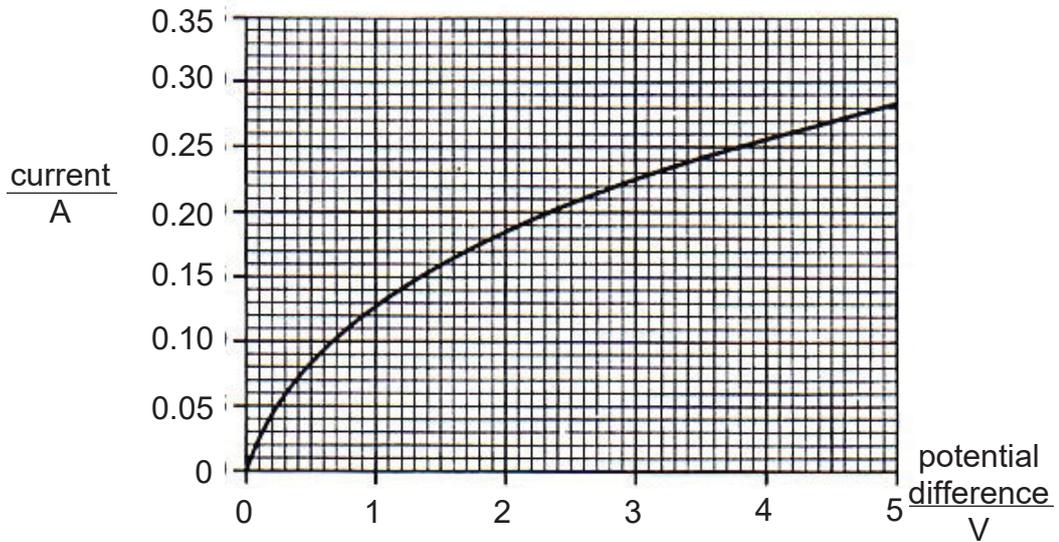
**Fig. 8**

- (a) On Fig. 8,
- (i) Label the possible polarities for both charges with a “+” and/or a “-” in the point charges. [1]
  - (ii) Using your answer to (a)(i), draw the directions of the electric field lines. [1]
- (b) The magnitude of the electrical charge for both point charges increases.

State two ways in which the electric field pattern would change.

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

**A9** Fig. 9.1 shows how the current in the filament of a lamp depends on the potential difference across it.



**Fig. 9.1**

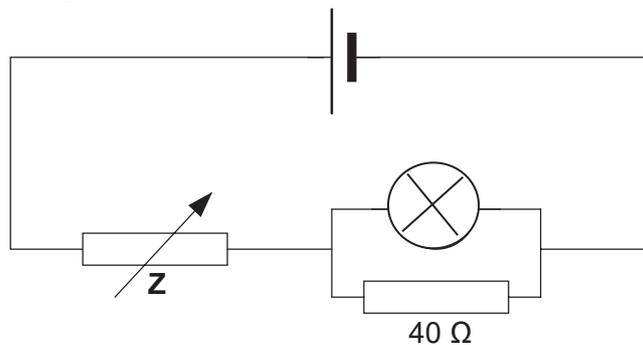
(a) Calculate the resistance of the filament when the current is 0.25 A.

resistance = .....  $\Omega$  [2]

(b) Explain how Fig. 9.1 shows that the resistance of the filament increases with temperature rise.

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

The lamp in Fig. 9.1 is connected in a circuit shown in Fig. 9.2.



**Fig. 9.2**

The current in the lamp is maintained at 0.25 A. Determine

- (i) the potential difference across the 40  $\Omega$  resistor,

potential difference = .....V [1]

- (ii) the current in the 40  $\Omega$  resistor,

current = ..... A [2]

**SECTION B**

Answer any **two** questions in this section.  
Write your answers in the spaces provided.

**B10** Fig 10.1 shows a Bunsen burner. Three spots are marked showing possible spots to place a spoon to be heated by the flame. An ice cube is placed on the spoon.

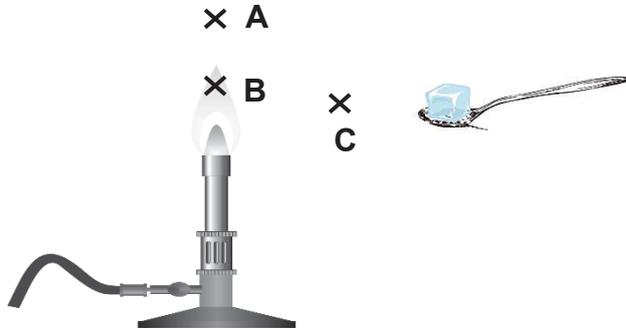


Fig. 10.1

(a) State the **main** process of transfer of thermal energy from the fire to the spoon when placed at :

point **A** : .....

point **B** : .....

point **C** : ..... [3]

(b) Fig. 10.2 shows the heating curve of the ice cube when placed at point **B**.

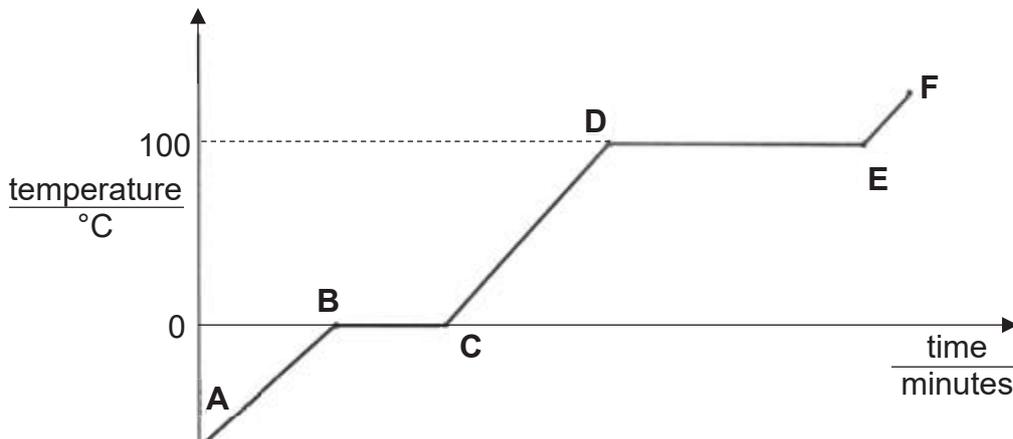


Fig. 10.2

(i) Explain, in detail, why the temperature of the ice cube remains constant between points **B** and **C** even though thermal energy is still being supplied to the ice cube.

.....  
 .....  
 ..... [3]

(ii) Describe the changes, if any, to the arrangement and to the motion of the molecules of water as it heats up from point **C** to point **D**.

.....

..... [2]

(c) (i) The water loses some mass even before it reaches 100°C. Assuming there was no spillage, state a reason for this loss.

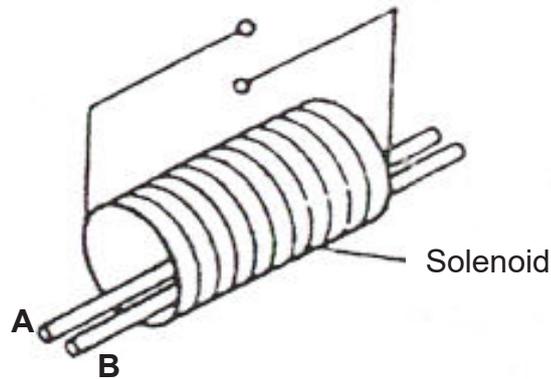
..... [1]

(ii) Explain why the reason you have mentioned in (c)(i) can happen before the water reaches boiling point.

.....

.....[1]

- A11 (a)** Two cylindrical iron rods, **A** and **B** are placed inside a solenoid that has a cross section in the shape of a circle as shown in Fig. 11.1. The solenoid is connected to a battery and a switch (not shown).



**Fig. 11.1**

- (i)** Describe and explain the observations on the iron rods when the switch is closed.

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

- (ii)** Describe and explain the observations on the iron rods when the switch is opened.

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

- (b) Fig. 12.2 shows a rectangular metallic coil **ABCD** carrying a current that is placed in a magnetic field. BC is 2 cm long.

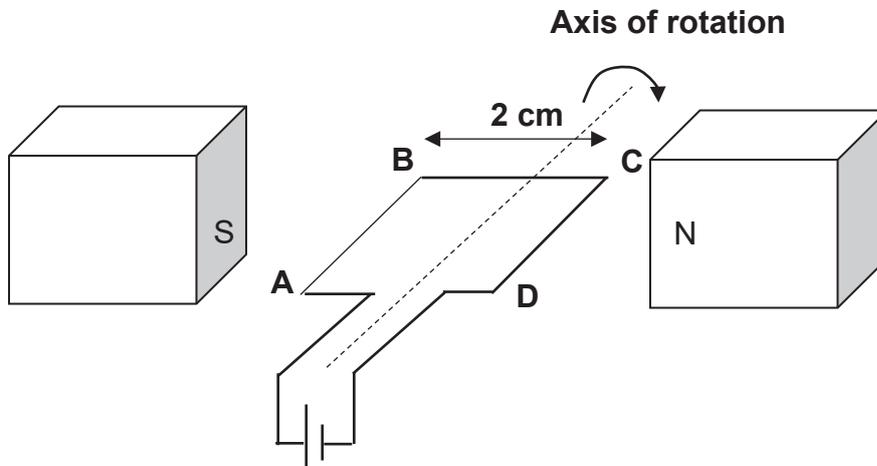


Fig. 12.2

- (i) Describe and explain the observations on the iron rods when the switch is closed.

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

- (ii) On Fig. 12.2, draw the force that is acting on

1. Section **AB**;
2. Section **CD**.

[1]

- (iii) Assuming the force acting on each section is 2 N, calculate the total moment generated on the coil ABCD.

Moment = ..... Ncm [2]

- (iv) The north and south pole positions are swapped. Describe how the forces acting on section **AB** and **CD** respectively will change, if any.

..... [1]

- (v) State one way to increase the magnitude of the force acting on section **AB** of the coil.

..... [1]

- A12** An electric kettle with power rating of 2.5 kW is connected to a 240 V mains supply by a flexible cable to a 3-pin plug.  
 State the names of the 3 wires found in the 3-pin plug and their respective colours in Table 12.1 [3]

Name of wire	Colour

**Table 12.1**

- (a) Calculate the current flowing in the circuit when the electric kettle is operating under normal condition.

current = ..... A [2]

- (b) Suggest a suitable fuse rating for this circuit. Explain your answer.

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

- (c) If the cost of electricity is \$0.23 per kWh, calculate the total cost of using the electric kettle for 1 hour every day for 1 week.

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

- (d) Suggest where a heating element should be placed in the electric kettle so that the water can be heated efficiently.

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

**END OF PAPER**



**QUEENSWAY SECONDARY SCHOOL**  
**Sec 4E5N Prelim Answers 2018**

**MCQ**

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

**Section A**

<b>1a</b>	The bicycle is travelling at constant speed from B to C then decelerates constantly to rest from C to D.	1 1
<b>1b</b>	Distance travelled = $\frac{1}{2} \times ((35 - 15) + 37) \times 15$ = 427.5 m = 428 m (3 s.f.)	1 1
<b>1c</b>	Average speed = $\frac{427.5m}{37s}$ = 11.6 m/s (3 s.f.)	1

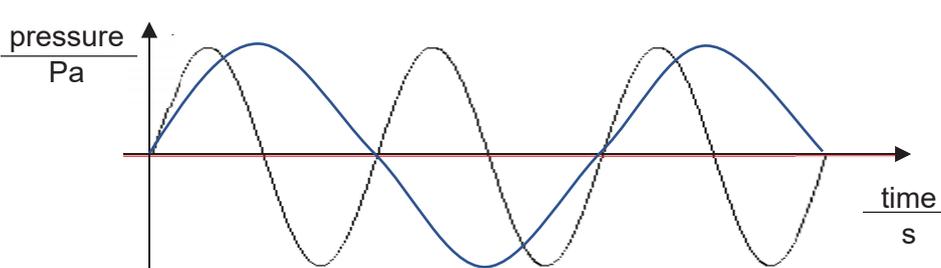
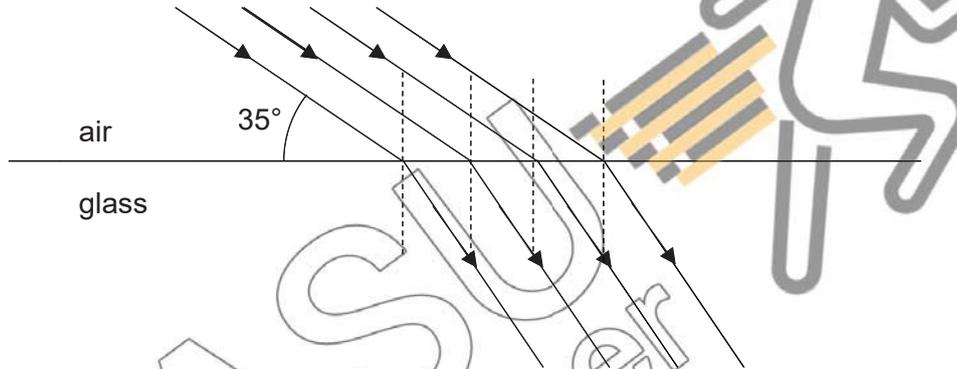
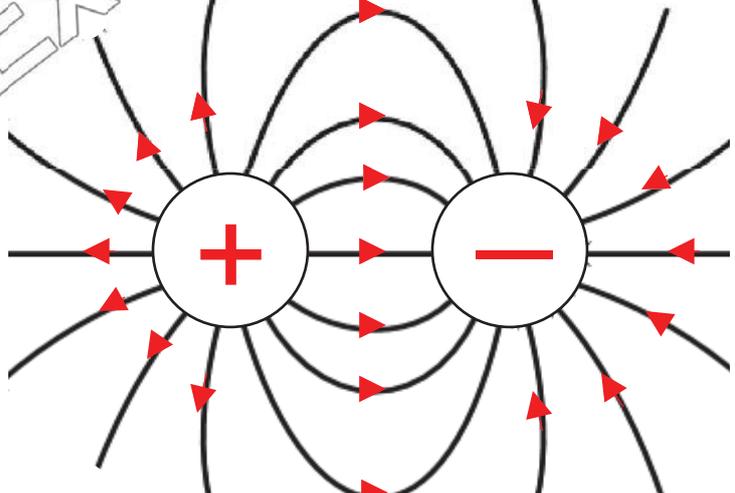
<b>2a</b>	loss in p.e. = $0.5 \times 10 \times 1.1 = 5.5 \text{ J}$	1
<b>2bi</b>	$5.5 - (0.5 \times 10 \times 0.8)$ = 1.5 J	1 1
<b>2bii</b>	energy lost as thermal/sound	1
<b>2c</b>	$5.5 + 9 = \frac{1}{2}(0.5)v^2$ $v = 7.62 \text{ m/s}$	1 1

<b>3a</b>	Weight = $0.3 \times 10 = 3 \text{ N}$	1
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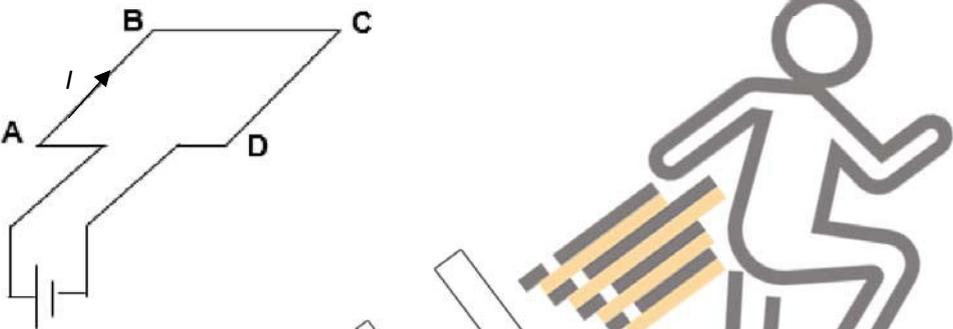
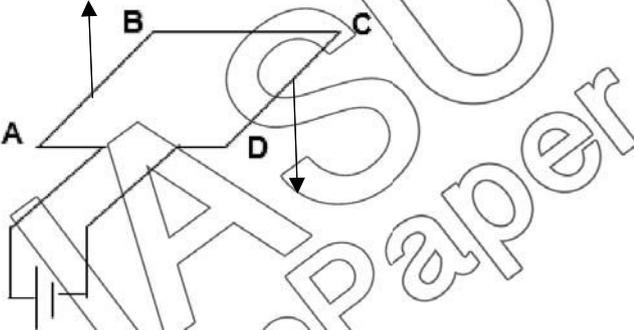
<b>3bi</b>	$F = 2\,500 \times 0.003$ $= 7.5\text{ N}$	1 1
<b>3bii</b>	ACWM = CWM $7.5 \times 20 = 3 \times d$ $d = 50\text{ cm from hinge}$	1
<b>3biii</b>	Force applied at safety valve will be higher. The weight should be moved further/ to the right.	1

<b>4a</b>	<p>Drawn graph must be below the given graph Drawn graph must have a similar shape to the given graph.</p>	1 1
<b>4b</b>	Surface temperature or surface area.	1

<b>5a</b>	Sound energy is transferred from particle to particle as the particles vibrate to and fro. They collide against each other, transferring the energy from one particle to the next.	1 1
<b>5b</b>	It means 432 oscillations of the sound wave is produced in one second.	1
<b>5c</b>	$v = f\lambda$ $v = 432 \times 0.76$ $= 328.32\text{ m/s}$ $= 328\text{ m/s (3 s.f.)}$	1 1
<b>5d</b>	<p>Any one correct region circled</p>	1

5e	 <p>Same amplitude but twice the period.</p>	1
6a	Speed of light decreases.	1
6b	$1.5 = \frac{\sin(90^\circ - 35^\circ)}{\sin r}$ $r = \sin^{-1}\left(\frac{\sin(55^\circ)}{1.5}\right)$ $r = 33^\circ \text{ (nearest degree)}$	1 1 1
6c	 <p>All lines drawn correctly at <math>33^\circ \pm 1^\circ</math></p>	1
7ai	Waves in both regions have a speed of $3.0 \times 10^8$ m/s.	1
7aii	Waves in region A have a shorter wavelength.	1
7b	sun tanning : ultraviolet barbecue : infra-red	1 1
8ai 8aii		



	Hence the two iron rods will not repel and will instead come close to each other at the bottom of the solenoid since the solenoid is cylindrically shaped.	
11bi		1
11bii		1
11biii	$2 \times 2$ $= 4 \text{ Ncm}$	1 1
11biv	The direction of the force will be reversed. The force at section <b>AB</b> will point downwards while the force at section <b>CD</b> will point upwards.	1
11bv	Increase the current or use a stronger North and South poles.	1

12a	Name of wire	Colour	3
	Live wire	Brown	
	Neutral wire	Blue	
	Earth wire	Green and Yellow	
12b	$I = 2500/240$ $= 10.4 \text{ A}$	1 1	
12c	Suitable fuse rating = 13 A The fuse rating should be slightly higher than the current flowing in the circuit for the fuse to work under normal working conditions of the electric kettle.	1 1	
12d	Total cost = $\$(0.23 \times 2.5 \times 7)$ $= \$4.03$	1 1	
12e	The additional earth wire in the 3-pin plug helps to redirect current away from the user and prevent an electric shock.	1	

The End

