L-Università ta' Malta

MATSEC
Examinations Board

Sample Papers

SEC24 Physics

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Specimen Controlled Assessments Level 1-2

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL SAMPLE PAPER

SUBJECT:	**Physics**
PAPER NUMBER:	**Level 1 – 2**
DATE:	
TIME:	2 Hours

Answer **ALL** questions.

You are requested to show your working and to write the units where necessary.

When necessary, take g, acceleration due to gravity, as $10 m/s^2$.

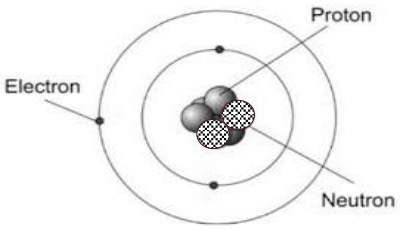
Density	$\rho = \frac{m}{V}$
Pressure	$p = \frac{F}{A}$ $\quad p = h \rho g$
Moments	Moment = F × perpendicular distance
Energy and Work	$PE = m g h$ $\quad KE = \frac{1}{2} m v^2$ $\quad W = F s$ $\quad P = \frac{E}{t}$
Force and Motion	resultant force = m a $\quad W = m g$ $\quad p = m v$ $\quad F = \frac{(mv-mu)}{t}$
	average speed = $\frac{\text{total distance}}{\text{total time}}$ $\quad v = u + a t$ $\quad s = (u + v)\frac{t}{2}$
	$v^2 = u^2 + 2 a s$ $\quad s = u t + \frac{1}{2} a t^2$
Waves	$\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$ $\quad \eta = \frac{\text{real depth}}{\text{apparent depth}}$
	Magnification = $\frac{\text{image height}}{\text{object height}}$ $\quad$ Magnification = $\frac{\text{image distance}}{\text{object distance}}$
	$v = f\lambda$ $\quad T = \frac{1}{f}$
Electricity	$I = \frac{Q}{t}$ $\quad V = I R$ $\quad P = I V$
	$E = Q V$ $\quad E = I V t$
	$R_{total} = R_1 + R_2 + R_3$ $\quad \frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$
Electromagnetism	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$ $\quad V_p I_p = V_s I_s$
Heat	$Q = m c \Delta\theta$
Radioactivity	$A = Z + N$
Other equations	Area of a triangle = $\frac{1}{2}$ b h $\quad$ Area of a trapezium = $\frac{1}{2}$ (a + b) h

Section A

Answer ALL questions

1. This question is about Static Electricity.

a. The diagram shows a simple model of the atom.



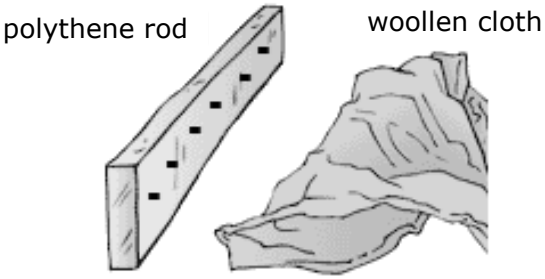
Match the following:

Electron	•		•	No charge
Proton	•		•	Negatively charged
Neutron	•		•	Positively charged

(3)

b. Mary charges a polythene rod as shown below. She rubs the rod with a woollen cloth. The polythene rod ends up with a negative charge. On the diagram below, draw the overall charge left on the woollen cloth.

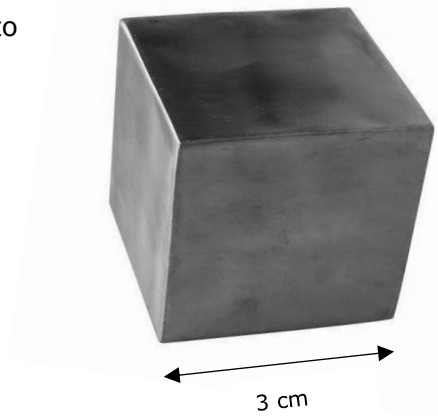
(1)



(Total: 4 marks)

2. This question is about measurements

Steve has a shiny regularly shaped metal cube. He wishes to determine the material it is made from experimentally.



a. The instrument used to measure a side of the cube is called a _____. (1)

b. One side of the cube is 3 cm long. Underline the correct volume of the cube from the following:

$6cm^3$ $9cm^3$ $27cm^3$ (1)

c. The mass of the metal cube is measured using a _____ balance. (1)

d. The cube has a mass of 243 g. Use the volume chosen in part b. to calculate the density of the metal cube.

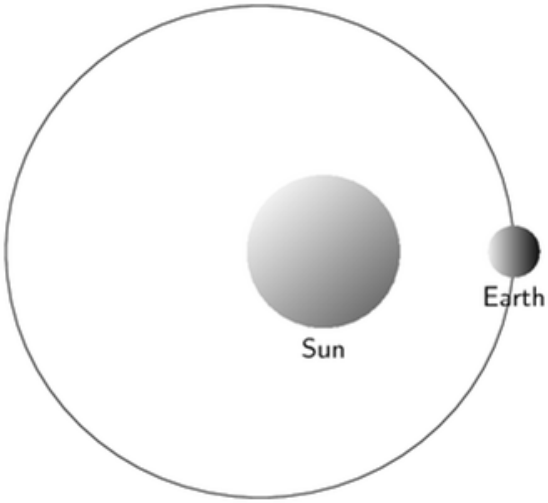
_____

_____ (2)

(Total: 5 marks)

3. This question is about the Earth and the Universe

The diagram shows the orbit of the Earth around the Sun.



On the figure:

a. Label with an 'X' the side of the Earth that is in darkness.
b. Draw the position of the Earth six months later.
c. Draw an arrow to show the direction of the force of gravity that keeps the Earth orbiting the Sun.

(Total: 3 marks)

4. This question is about Radioactivity

a. In the table below, tick off (✓) the penetrating power of **each** type of radioactive radiation.

Radiation	**Penetrating power**		
	Low	**Medium**	**High**
Gamma			
Alpha			
Beta			

(3)

b. The paragraphs below provide some information about nuclear waste disposal. Complete the paragraphs by choosing missing words from the list.

concrete harm buried safe

Radioactive waste can give out three types of radiation; alpha, beta and gamma. Exposure to any of these three radiations can _____ any living organism. Various ways have been suggested for _____ disposal of the waste.

The waste could be sealed in steel drums or _____ blocks. It could then be kept at power stations or dumped at sea. It could also be _____ in the ground, either close to the surface or deep down in rocks.

(4)

(Total: 7 marks)

5. This question is about Current Electricity

a. Figure 1 shows a diagram of a circuit which includes a cell, a resistor, an ammeter and a switch.

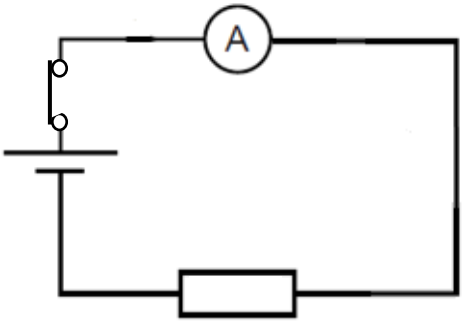


Figure 1

i. On the diagram, label:

- the cell with a letter C;
- the resistor with a letter R. (2)

ii. On the diagram above:

- indicate the positive terminal of the battery with a "+";
- draw the direction of current flowing in the circuit.

(2)

b. The current flowing through the resistor is 0.4 A. The resistor has a resistance of 5 Ω. Calculate the voltage across the resistor.

_____

_____

(2)

(Total: 6 marks)

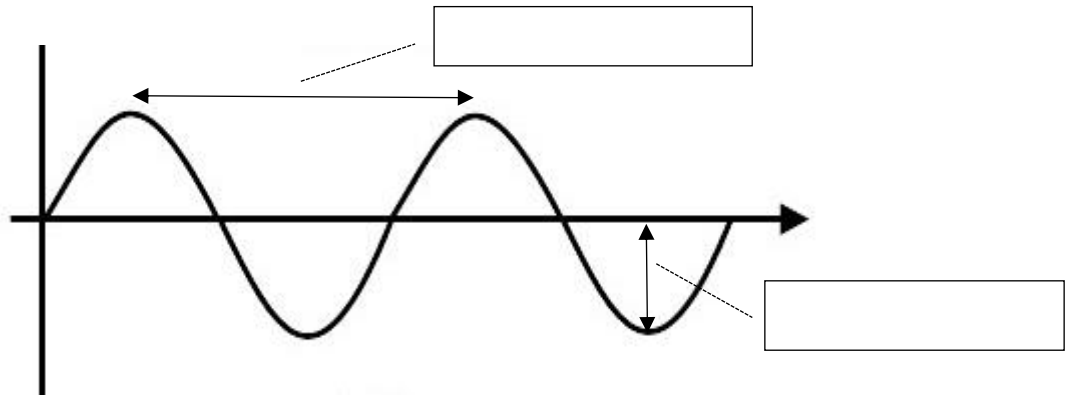
6. This question is about Waves

a. Complete the following:

i. _____ is an example of a longitudinal wave; (1)

ii. _____ is an example of a transverse wave. (1)

b. The diagram below represents a wave.



i. On the above diagram, fill in the boxes given to indicate which of the arrows represent:

- the amplitude of the wave; (1)
- wavelength of the wave. (1)

ii. The frequency of a wave is 0.1Hz. Calculate the periodic time of this wave.

_____

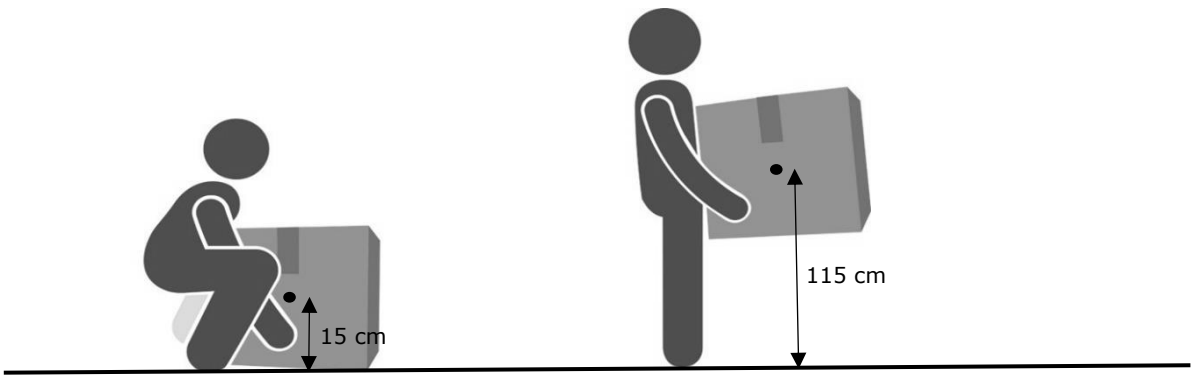
_____

(1)

(Total: 5 marks)

7. This question is about Energy

a. A man lifts a box of mass 20 kg as shown in the diagram below.



i. The Law of Conservation of Energy states that:

_____

_____

(1)

ii. Calculate the gravitational potential energy gained by the box.

_____

_____

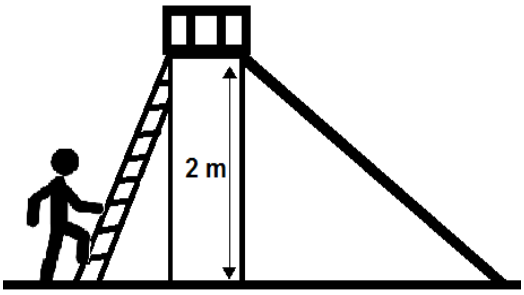
_____

(3)

iii. The man accidentally drops the box. State the types of energy when the box reaches the following stages:

- Just before it hits the ground; _____ (1)
- Just after it hits the ground; _____ and _____ (2)

b. A child of mass 30 kg climbs up a ladder 2 m high, to slide down the slide as shown in the figure.



i. What is the weight of the child?

_____

_____

_____ (1)

ii. Determine the work the child must do to reach the top of the slide.

_____

_____

(2)

(Total: 10 marks)

Section B

8. Ana boils water in an electric kettle containing a heating element at the bottom.

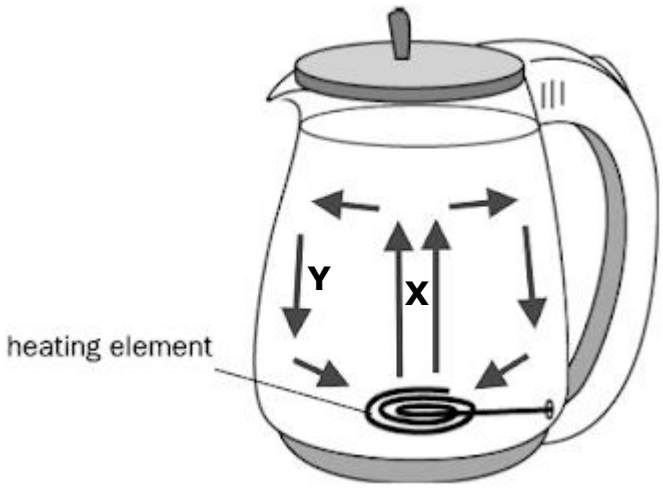
a. State whether the following statements are True (T) or False (F). (4)

	Statement	True [T] or False [F]
i.	The heating element heats the water by radiation.	
ii.	The circulation of water creates a convection current in it.	
iii.	Ana feels heat coming off the shiny kettle surface. This is due to radiation emitted from it.	
iv.	Putting a towel round the kettle keeps the water warm for a longer period of time.	

b. The diagram below shows the process by which water is being heated. Underline the correct answer.

i. At point X (hot/cold) water rises. (1)

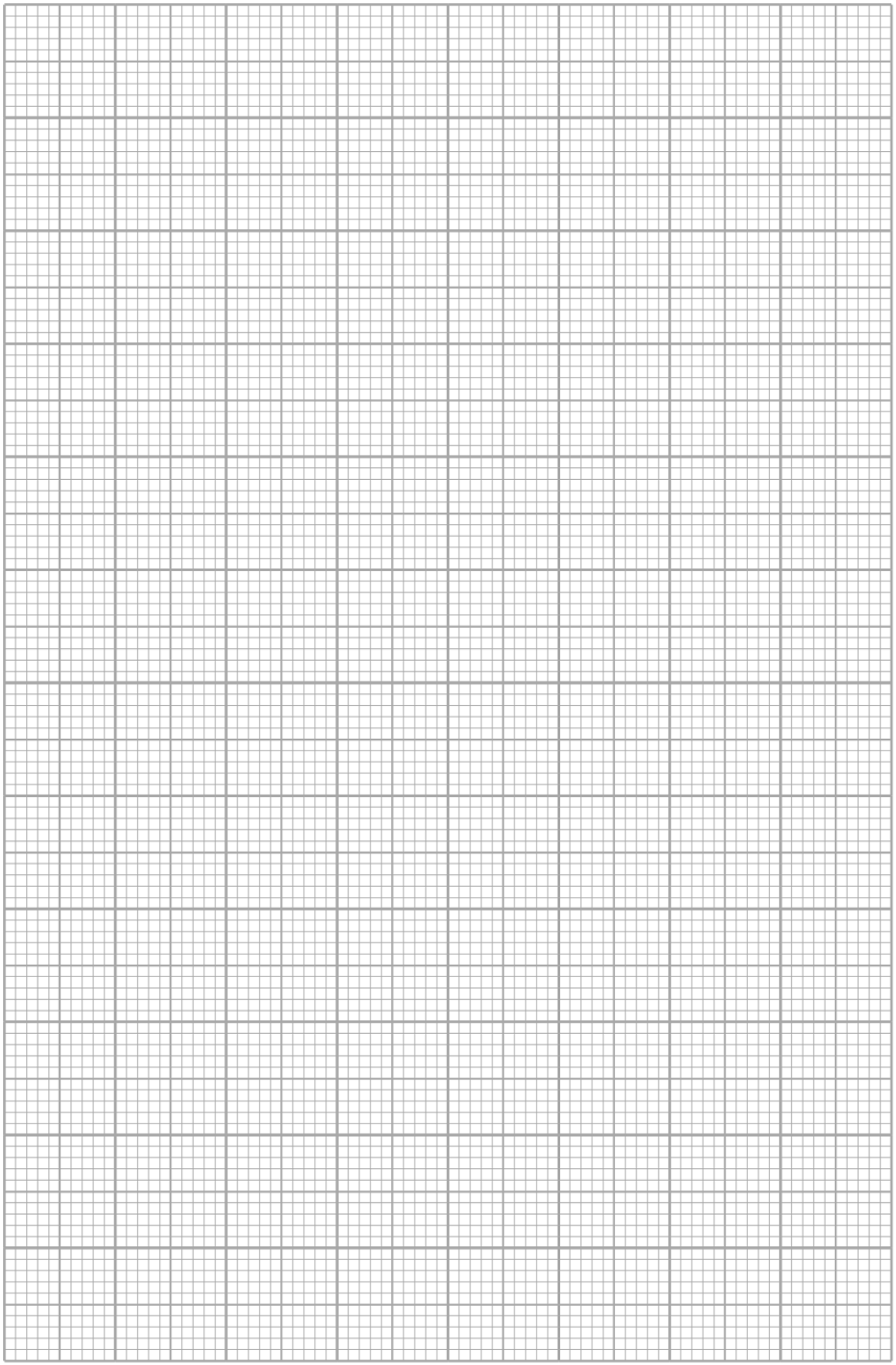
ii. At point Y (hot/cold) water sinks. (1)



c. Ana records the temperature of the water at equal time intervals during heating. The following readings are noted.

Temperature / °C	20	40	60	80	100
Time / s	0	50	100	150	200

i. Plot a graph of Temperature on the y-axis against Time on the x-axis.
(4)



ii. From the graph:

- the room temperature is _____ °C; (1)
- the temperature of the water after 70 s is _____ °C. (1)

d. The boiling water is used for soup. Which items will feel warm to the touch if used to stir the soup? Tick off the correct answer(s) with an (X). (3)

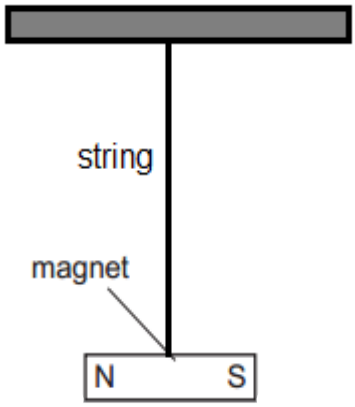
plastic spoon	
stainless steel ladle	
wooden spoon	
metal fork	
copper spoon	

(Total: 15 marks)

Section C

9. This question is about Electricity and Magnetism.

a. A magnet is suspended by a string as shown below.



i. Suggest a suitable metal to be used to make the permanent magnet shown in the figure above.

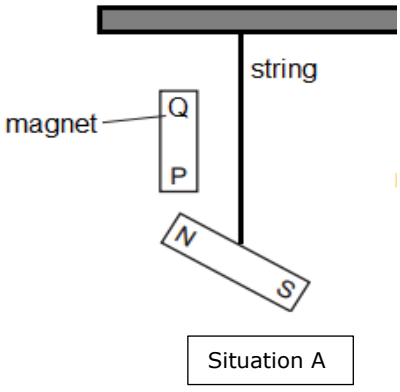
_____ (1)

ii. What do the letters N and S stand for?

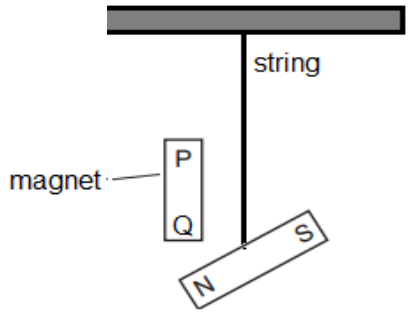
N _____ S _____ (2)

iii. In the space below draw the magnetic field pattern around the single bar magnet. Show also the direction of the magnetic field lines. (2)

b. Another bar magnet is brought close to the N pole of the suspended magnet. When end P is brought close, the suspended magnet is observed to tilt upwards (Situation A). When end Q of the bar magnet is brought close, the suspended magnet tilts away (Situation B).



Situation A



Situation B

i. Identify poles P and Q of the magnet.

P: _____ Q: _____ (2)

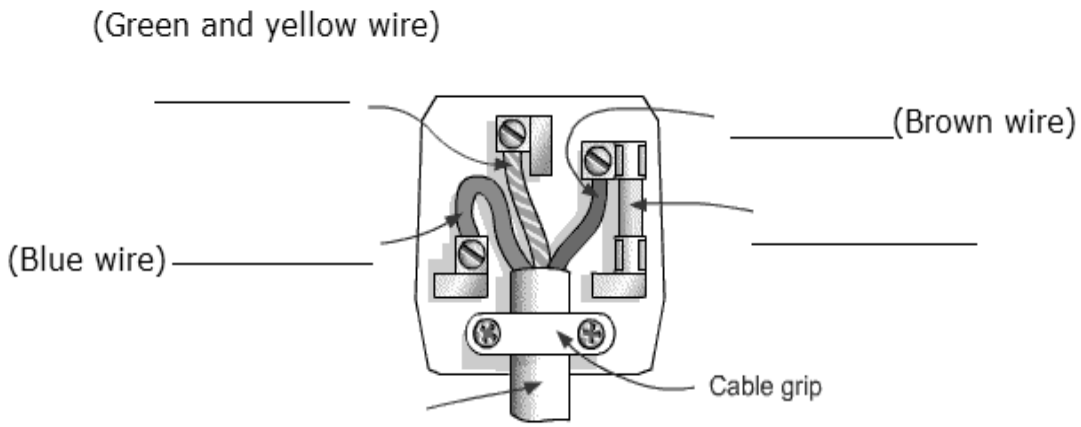
ii. Complete the following statement:

The above experiment shows that unlike poles _____ each other, whereas like poles _____ each other. (2)

c. The diagram below shows an electrical plug connected with three wires of different colours.

i. Fill in using the words given below. (4)

Neutral	Live	Earth	Fuse



ii. Explain why **each** wire above has a different colour.

_____

_____ (1)

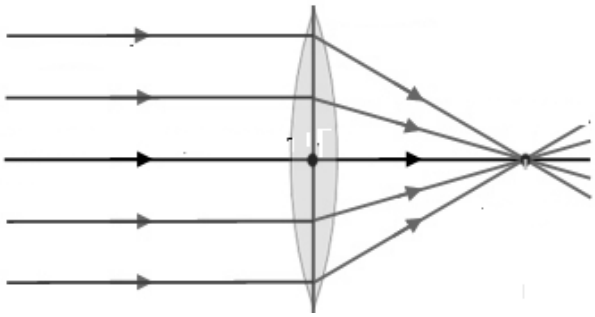
iii. State **ONE** safety feature found in the electrical plug.

_____ (1)

(Total 15 marks)

10. This question is about Waves.

a. The diagram below shows parallel rays passing through a lens.

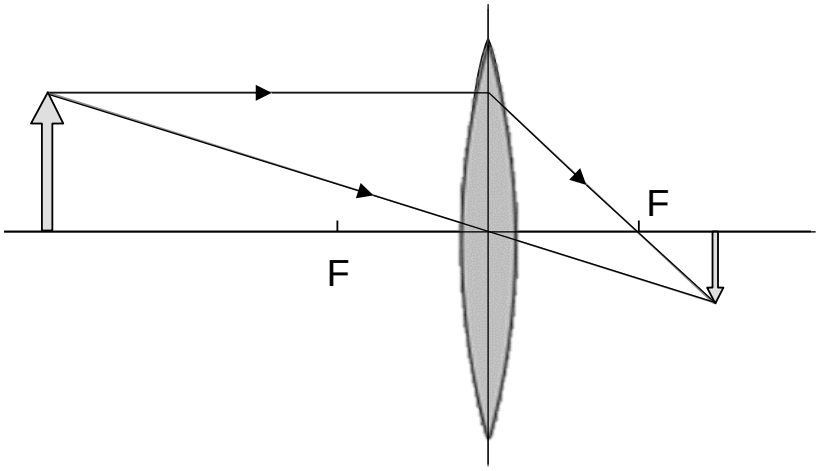


Underline the correct answer:

i. the lens shown in the diagram is a (convex / concave) lens; (1)

ii. the rays (converge / diverge) after passing through the lens. (1)

b. The diagram below is not drawn to scale.



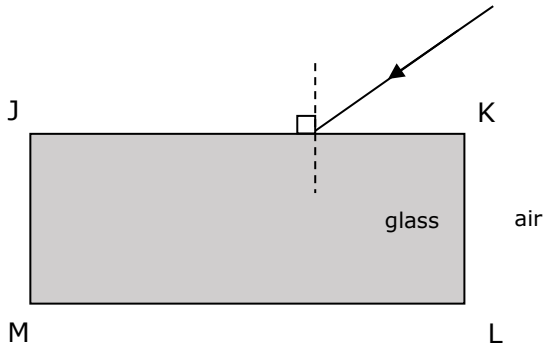
i. Mark on the diagram, the image height with the letters $\mathbf{h_i}$ and the object distance with the letter **u**. (2)

ii. Given the object height to be 4 cm and the image height 2 cm, calculate the magnification of the lens.

_____

_____ (2)

c. The diagram below shows a ray of light incident on side JK of a glass block JKLM.



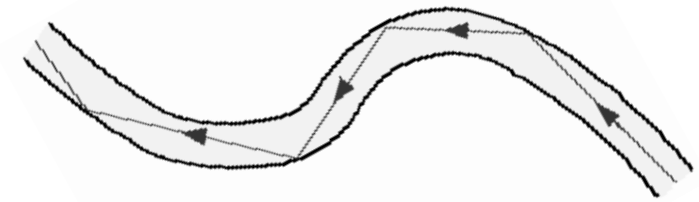
i. On the diagram:

- Mark the angle of incidence with the letter **i**. (1)
- Complete the ray of light as it passes through the glass block and out again. (2)

ii. Fill in:

As light enters the glass block, its speed _____. (1)

d. The diagram below shows a light signal travelling through an optical fibre made of solid glass.



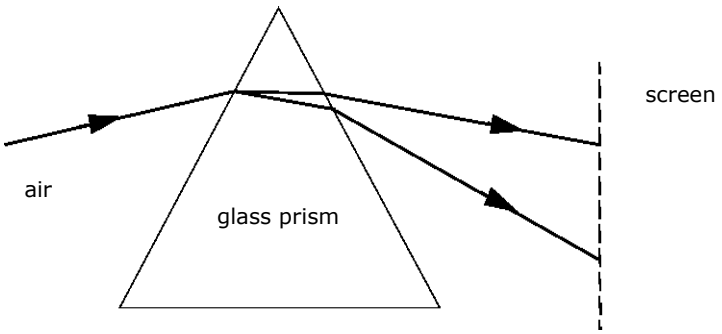
i. Underline **ONE** of the following terms which describes the path being taken by light inside the glass optical fibre. (1)

Total internal reflection **Refraction** **Dispersion**

ii. Give **ONE** use of the optical fibre.

_____ (1)

e. The diagram below shows white light passing through a prism and forming a spectrum.



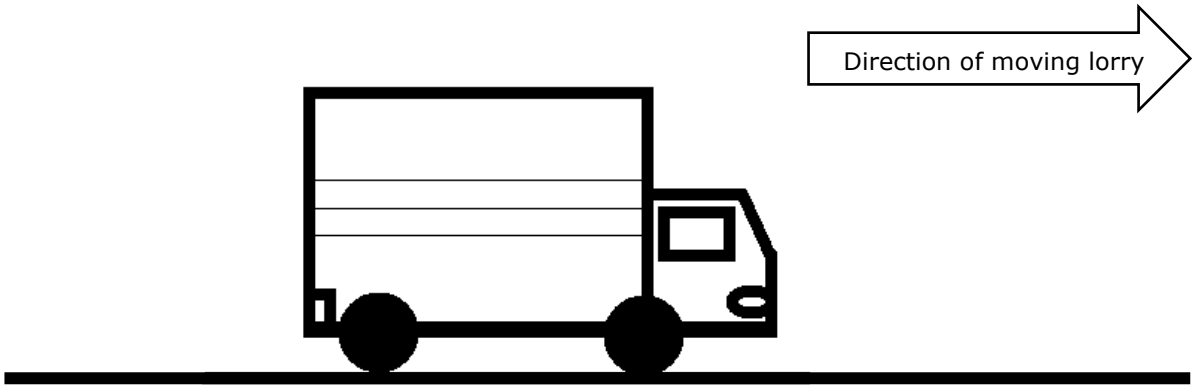
i. On the diagram above, label the red ray with the letter **R** and the violet ray with the letter **V**. (2)

ii. Underline **ONE** of the following terms which describes the path of light through a glass prism. (1)

Total internal reflection **Dispersion** **Reflection**

(Total: 15 marks)

11. Air resistance, friction and the engine force are three forces acting on a moving lorry.

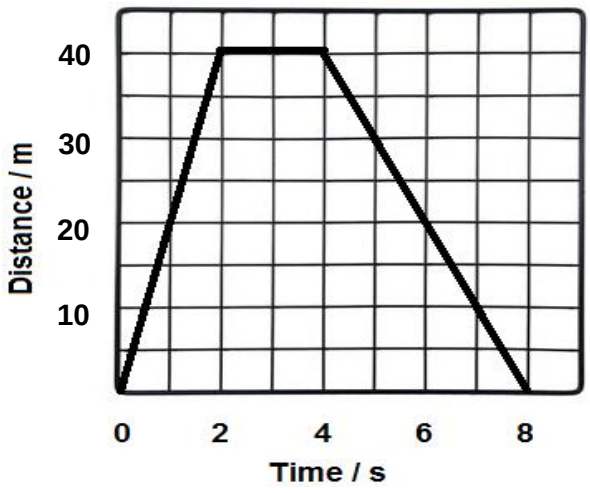


a. On the diagram, draw the above–mentioned forces acting on the lorry.
(3)

b. The lorry is travelling at constant speed. Mark with a ☑ the option from A, B, C and D which shows the motion of the lorry.
(2)

		Air Resistance:	Friction:	Engine force:
A	☐	2000 N	1000 N	3000 N
B	☐	2000 N	2000 N	5000 N
C	☐	3000 N	3000 N	3000 N
D	☐	3000 N	4000 N	6000 N

c. The Distance-Time graph below describes 8s of the lorry's motion.



i. Describe the motion between:

- 0 – 2 s;

_____

_____ (1)

- 2 – 4 s.

_____

_____ (1)

i. What is the speed of the lorry during the last 4 s?

_____

_____ (2)

ii. How far does the lorry travel in the first 4 s?

_____ (1)

iii. Determine the total distance travelled during the journey.

_____

_____ (2)

d. While driving the lorry, the driver notices an obstacle, applies the brakes and the lorry stops. The total stopping distance depends on the thinking distance and the braking distance.

i. Explain what is meant by thinking distance.

_____ (1)

ii. Underline **ONE** factor, from the list below, which increases the braking distance.

wet road **high friction road** **dry road** (1)

iii. Complete the following table:

Thinking distance	Braking distance	Stopping distance
15 m	18 m	

(1)

(Total: 15 marks)

END OF PAPER

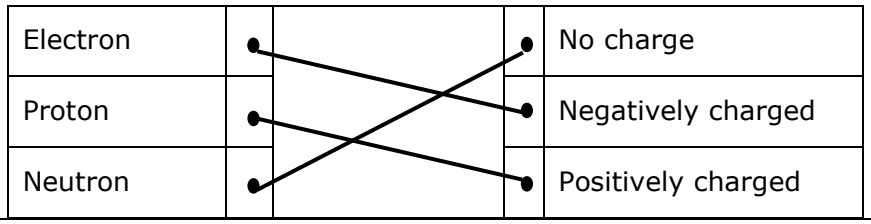
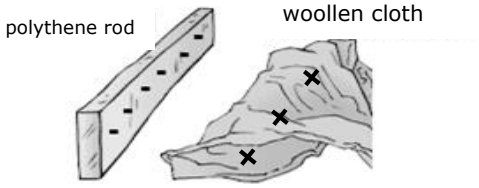
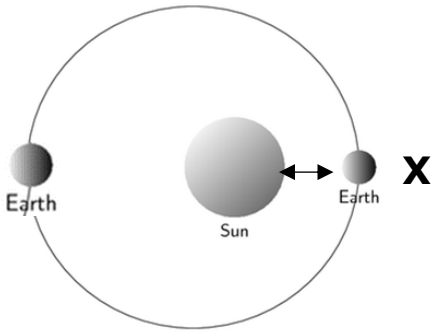
Specimen Controlled Assessments Level 1-2 Marking Scheme

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER MARKING SCHEME

SUBJECT:	**Physics**
PAPER NUMBER:	**Level 1 –2**
DATE:	
TIME:	2 Hours

Question			Suggested Answer/s	Marks	Remarks
1.	a.			3	
	b.			1	
			Total	**4**	
2.	a.		Ruler	1	
	b.		$27cm^3$	1	
	c.		lever	1	
	d.		Density = mass/volume = 243 /27 = 9 g/cm^3	 1 1	
			Total	**5**	
3.	a. b. c.			 1 1 1	
			Total	**3**	

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td>a.</td><td></td><td>
<table>
<tr><th rowspan="2">Radiation</th><th colspan="3">Penetrating power</th></tr>
<tr><th>Low</th><th>Medium</th><th>High</th></tr>
<tr><td>Gamma</td><td></td><td></td><td>✓</td></tr>
<tr><td>Alpha</td><td>✓</td><td></td><td></td></tr>
<tr><td>Beta</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>1
1
1</td><td></td></tr>
<tr><td></td><td>b.</td><td></td><td>Harm, safe, concrete, buried</td><td>1,1,1,1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.</td><td>a.</td><td>i.</td><td>Correct labelling of cell
Correct labelling of resistor</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>ii.</td><td>Correct marking of positive terminal
Correct indication of conventional current flow</td><td>2</td><td></td></tr>
<tr><td></td><td>b.</td><td></td><td>V=IR
= 0.4 x 5
= 2 V</td><td>1
1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>6.</td><td>a.</td><td>i.</td><td>Sound waves</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Micro waves</td><td>1</td><td>Any other acceptable answer</td></tr>
<tr><td></td><td>b.</td><td>i.</td><td>Correct labelling of amplitude and wavelength</td><td>1,1</td><td></td></tr>
<tr><td></td><td></td><td>ii.</td><td>T = 1/f
= 1/0.1
= 10s</td><td>1
1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7.</td><td>a.</td><td>i.</td><td>Energy cannot be created nor destroyed,
but can only be transformed from one form to another</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>ii.</td><td>PE = mgh
= 20 x 10 x (1.15 – 0.15)
= 20 x 10 x 1
= 200J</td><td>1
1
1</td><td></td></tr>
<tr><td></td><td></td><td>iii.</td><td>KE
Sound, heat</td><td>1
1,1</td><td></td></tr>
<tr><td></td><td>b.</td><td>i.</td><td>W=m x g
= 30 x 10 = 300 N</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>ii.</td><td>Work = F x d
= 300 x 2
= 600 J</td><td>1
1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td><td></td></tr>
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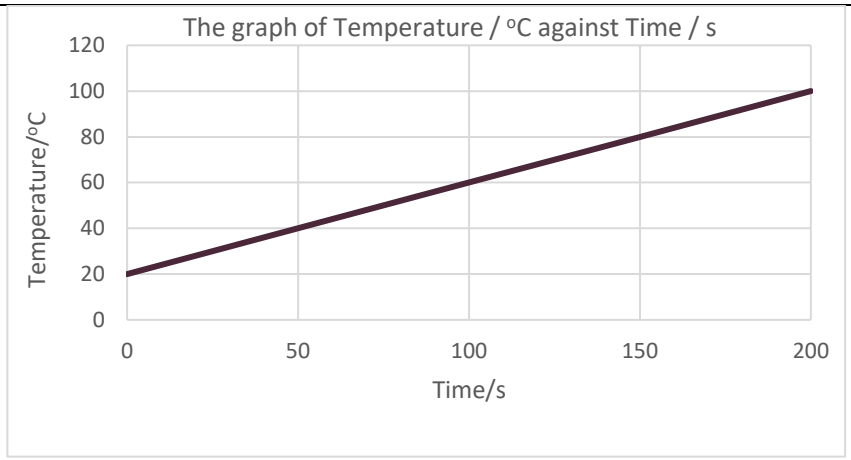
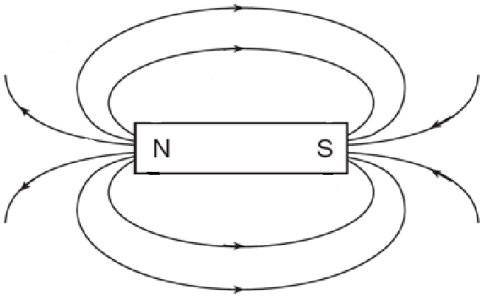
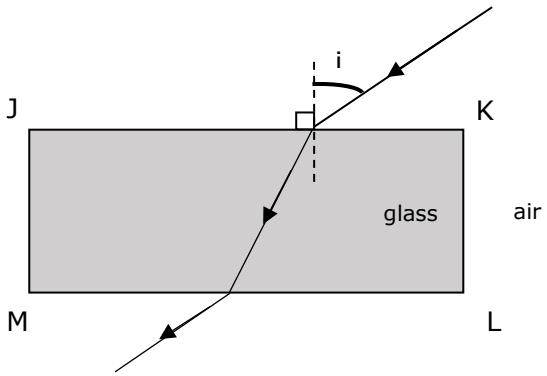
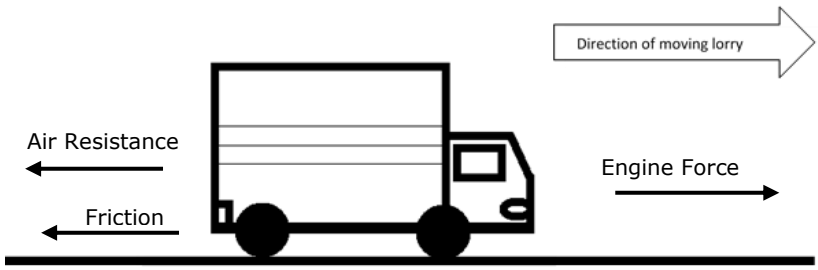
<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="10">8.</td><td rowspan="4">a.</td><td>i.</td><td>False</td><td>1</td><td></td></tr>
<tr><td>ii.</td><td>True</td><td>1</td><td></td></tr>
<tr><td>iii.</td><td>True</td><td>1</td><td></td></tr>
<tr><td>iv.</td><td>True</td><td>1</td><td></td></tr>
<tr><td rowspan="2">b.</td><td>i.</td><td>Hot</td><td>1</td><td></td></tr>
<tr><td>ii.</td><td>Cold</td><td>1</td><td></td></tr>
<tr><td rowspan="2">c.</td><td>i.</td><td> 
</td><td>1 correct scale

1 correct axes/graph labelling

1 correct plotting

1 straight line</td><td></td></tr>
<tr><td>ii.</td><td>20 °C
48 °C</td><td>1
1</td><td></td></tr>
<tr><td>d.</td><td></td><td><table>
<tr><td>plastic spoon</td><td></td></tr>
<tr><td>stainless steel ladle</td><td>X</td></tr>
<tr><td>wooden spoon</td><td></td></tr>
<tr><td>metal fork</td><td>X</td></tr>
<tr><td>copper spoon</td><td>X</td></tr>
</table></td><td>1,1,1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>15</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="9">9.</td><td>a.</td><td></td><td>Any one from iron, steel, cobalt, nickel</td><td>1</td><td></td></tr>
<tr><td>b.</td><td></td><td>N – North; S - South</td><td>2</td><td></td></tr>
<tr><td>c.</td><td></td><td> 
</td><td>1 mark for correct shape of field lines

1 mark for arrows</td><td></td></tr>
<tr><td rowspan="2">d.</td><td>i.</td><td>P – South; Q - North</td><td>1,1</td><td></td></tr>
<tr><td>ii.</td><td>Attract, repel</td><td>1,1</td><td></td></tr>
<tr><td rowspan="3">e.</td><td>i.</td><td>Correct labelling</td><td>4</td><td></td></tr>
<tr><td>ii.</td><td>To be able to identify the different wires</td><td>1</td><td>Any suitable answer.</td></tr>
<tr><td>iii.</td><td>Any one of: Fuse, earth wire, cord grip</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>15</td><td></td></tr>
</table>

10.	a.	i.	Convex	1	
		ii.	Converging	1	
	b.	i.	Correct marking of $\mathbf{h_i}$ and **u**	1,1	
		ii.	Mag = h_i / h_o = 0.6/1.2 = 0.5 (to be confirmed when printed)	 1 1	
	c.	i.		1 correct angle of incidence 2 correct rays and arrows	
		ii.	Decreases	1	
	d.	i.	Total internal reflection	1	
		ii.	Data transfer	1	Other acceptable answer
	e.	i.	Correct labelling of R and V	2	
		ii.	Dispersion	1	
			Total	**15**	
11.	a.			3	
	b.		A	2	
	c.	i.	The lorry is moving at constant speed The lorry is at rest	1 1	
		ii.	Speed = distance / time = 40 / 4 = 10 m/s	 1 1	
		iii.	40 m	1	
		iv	40 + 40 = 80 m	2	
	d.	i.	Time taken by the driver to apply the brakes after seeing the obstacle	1	
		ii.	Wet road	1	
		iii.	15 m + 18 m = 33 m	1	
			Total	**15**	

Specimen Controlled Assessments Level 2-3

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL SAMPLE PAPER

SUBJECT:	**Physics**
PAPER NUMBER:	**Level 2 – 3**
DATE:	
TIME:	2 Hours

Answer **ALL** questions.

You are requested to show your working and to write the units where necessary.

When necessary, take g, acceleration due to gravity, as $10 m/s^2$.

Density	$\rho = \frac{m}{V}$
Pressure	$p = \frac{F}{A}$ $\quad p = h \rho g$
Moments	Moment = F × perpendicular distance
Energy and Work	$PE = m g h$ $\quad KE = \frac{1}{2} m v^2$ $\quad W = F s$ $\quad P = \frac{E}{t}$
Force and Motion	resultant force = m a $\quad W = m g$ $\quad p = m v$ $\quad F = \frac{(mv-mu)}{t}$
	average speed = $\frac{\text{total distance}}{\text{total time}}$ $\quad v = u + a t$ $\quad s = (u + v)\frac{t}{2}$
	$v^2 = u^2 + 2 a s$ $\quad s = u t + \frac{1}{2} a t^2$
Waves	$\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$ $\quad \eta = \frac{\text{real depth}}{\text{apparent depth}}$
	Magnification = $\frac{\text{image height}}{\text{object height}}$ $\quad$ Magnification = $\frac{\text{image distance}}{\text{object distance}}$
	$v = f\lambda$ $\quad T = \frac{1}{f}$
Electricity	$I = \frac{Q}{t}$ $\quad V = I R$ $\quad P = I V$
	$E = Q V$ $\quad E = I V t$
	$R_{total} = R_1 + R_2 + R_3$ $\quad \frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$
Electromagnetism	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$ $\quad V_p I_p = V_s I_s$
Heat	$Q = m c \Delta\theta$
Radioactivity	$A = Z + N$
Other equations	Area of a triangle = $\frac{1}{2}$ b h $\quad$ Area of a trapezium = $\frac{1}{2}$ (a + b) h

Answer ALL questions in ALL sections

Section A

1. The solar water heater has a length of copper pipe through which water passes and is heated by the Sun.

   a. What is the thermal process by which water is heated in the copper pipes?

_____ (1)

   b. The storage tank of a solar water heater contains 80 kg of water. The specific heat capacity of water is 4200 J/kg°C. Calculate the quantity of energy absorbed from the sun to raise the temperature of water in the tank from 25 °C to 60 °C.

_____

_____

_____ (2)

   c. The solar water heater also has an electric heater to be used on cloudy days. The electric heater has a power of 2000 W. How long would it take for the electric heater to heat up all the water in the tank from 25 °C to 60 °C?

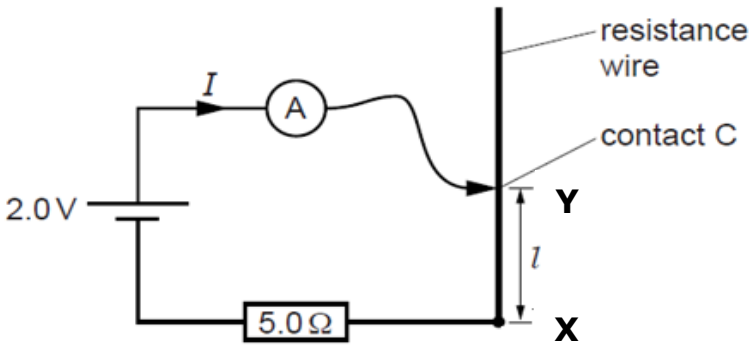
_____

_____

_____ (2)

(Total: 5 marks)

2. A length of bare uniform resistance wire is included in the circuit as shown below. Contact C can be moved to any position along the resistance wire.



   a. Explain how the resistance in the circuit changes as contact C moves from point X to point Y.

_____

_____ (2)

b. Calculate the reading on the ammeter when contact C is at point X.

_____

_____ (2)

c. Contact C is moved so that the resistance of the length *l* of the resistance wire is 15 Ω.
Calculate:

i. the total resistance of the circuit;

_____

_____ (1)

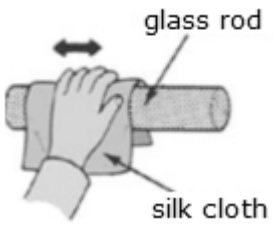
ii. the new ammeter reading.

_____

_____ (1)

(Total: 6 marks)

3. A glass rod is rubbed with a silk cloth as shown in the diagram. The glass rod becomes positively charged.



a. What is the charge left on the silk cloth after rubbing?

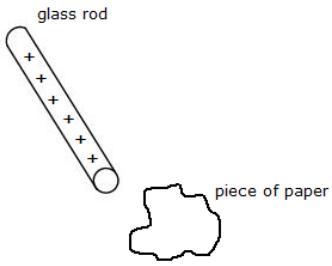
_____ (1)

b. The positive glass rod is now brought close to a neutral piece of paper.

i. What can you say about the number of positive and negative charges in a neutral piece of paper?

_____ (1)

ii. On the diagram below, draw what happens to the charges on the paper when the rod is brought close. (1)

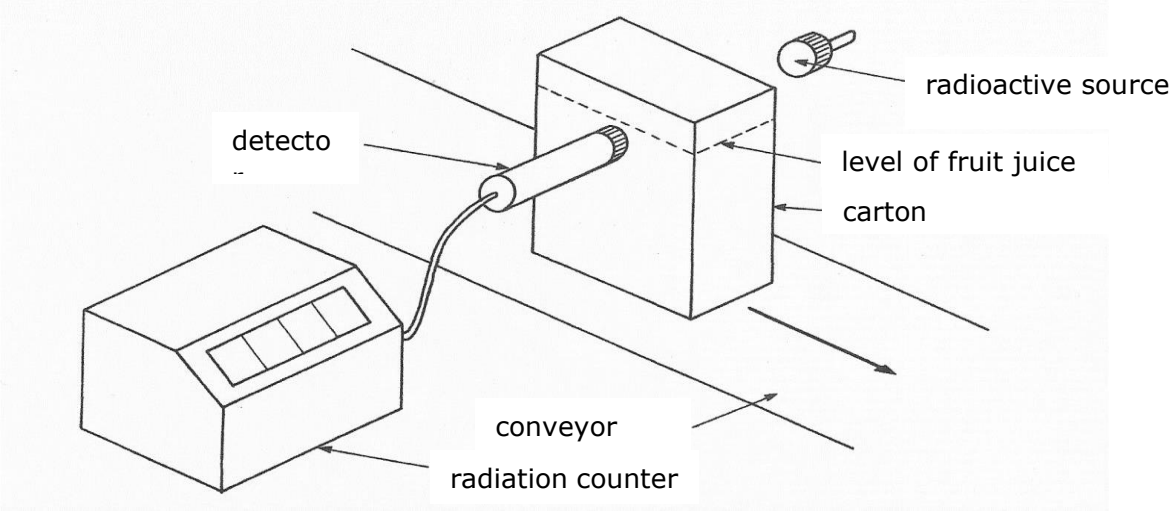


iii. State what you would observe.

_____ (1)

(Total: 4 marks)

4. A radioactive source and a detector are used to check the level of fruit juice in a carton. Cartons of fruit juice on a conveyor belt pass between the radioactive source and the detector.



The count rates for five cartons labelled A, B, C, D and E as they pass the detector are noted and recorded in this table below.

Packet	A	B	C	D	E
Count rate	40	39	38	410	42

a. The five statements shown below are related to the above diagram and table. Read these statements and indicate which of these are True [T] or False [F] in the right hand column. (5)

	Statement	**True [T] or False [F]**
i.	The radiation counter shows a high count-rate as carton D passes by it because radiation from the radioactive source is reaching the detector. This means that the carton is not filled to the required level.	
ii.	In this set up, the source of radiation being used is gamma radiation.	
iii.	The count rate readings for cartons A, B, C, and E all show that a small amount of radiation is reaching the detector. This radiation is called background radiation.	
iv.	One source of background radiation is cosmic rays from the sun.	
v.	When used in such set ups, radioactive sources need to have a long half-life so that they can be used for a long time.	

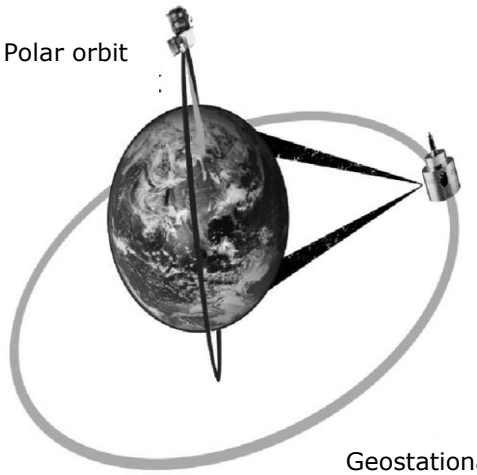
(Total: 5 marks)

5. Different types of man-made and natural satellites orbit the earth.

a. Give **ONE** example of a natural satellite.

_____ (1)

b. The diagram shows two man-made satellites that orbit the Earth. Read the passage below and answer the questions related to these two types of satellites.



Source: https://tinyurl.com/y9hgxmk7

Satellites in polar orbits are positioned around 200 km above the Earth. They rotate around the Earth over its poles several times per day. These satellites are often used for earth-mapping and observation. They can also be used to relay pictures of cloud movement and other factors that help to forecast weather over all places on Earth.

Geostationary satellites are around 35800 km above the equator and rotate around the Earth once a day. Therefore, they remain in the same position above the Earth. By acting as relay stations, they make continuous, worldwide communications, such as Global Positioning Systems (GPS), mobile phones and television programmes possible.

i. State **ONE** difference between these two types of satellites.

_____ (1)

ii. Explain how this difference is related to the function of **each** type of satellite.

_____

_____ (2)

iii. By considering the height of the satellites above the Earth, which of these satellites will be mostly affected by air resistance?

_____ (1)

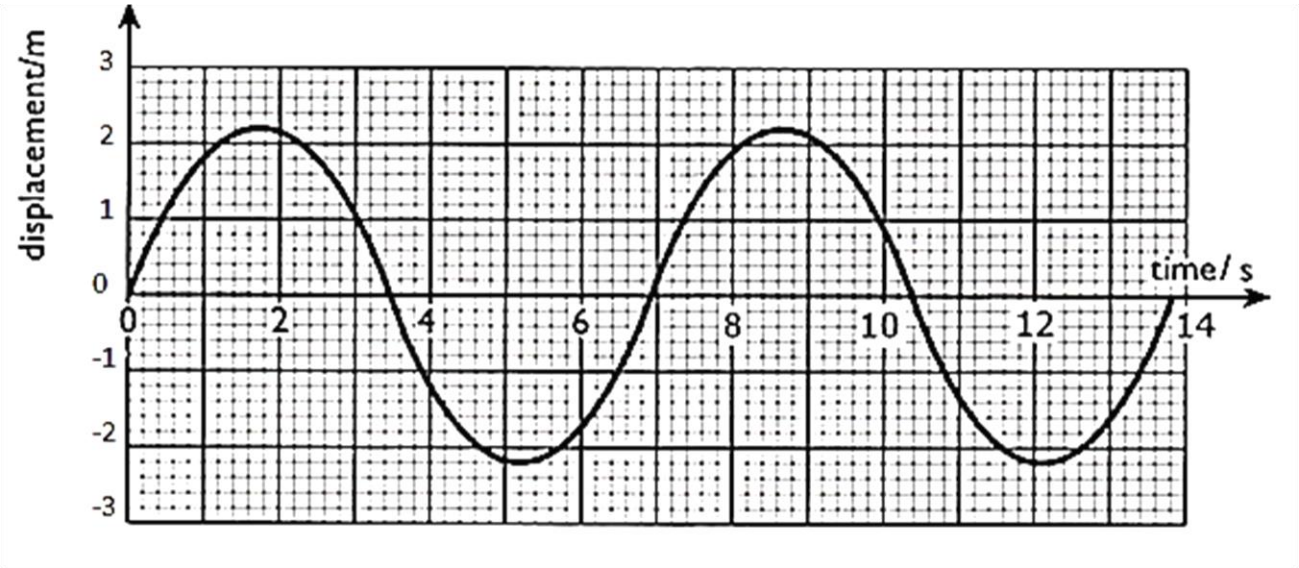
(Total: 5 marks)

6. a. Explain how sound travels through the particles of air.

_____

_____ (2)

b. The graph below shows the displacement (m) of an oscillating body with time (s).



i. Use the above graph to determine:

- the amplitude;

_____ (1)

- the period.

_____ (1)

ii. Calculate the frequency of the wave.

_____ (1)

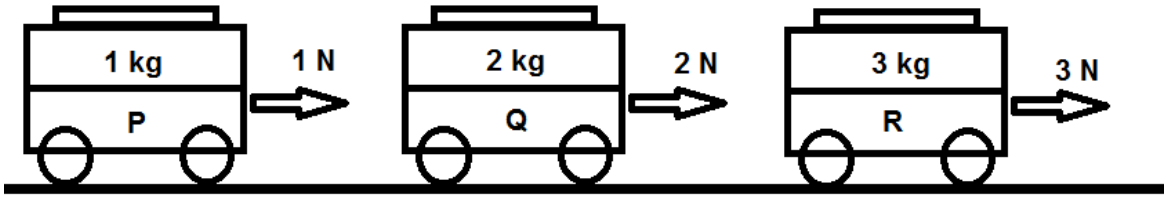
(Total: 5 marks)

7. The diagram shows a parachutist who is falling at constant velocity.

a. Mark with a ☑ the option that shows the possible values for both the weight of the parachutist and the air resistance acting on the parachute. (1)

		Weight of parachutist	Air resistance
A	☐	70 N	60 N
B	☐	700 N	600 N
C	☐	700 N	700 N
D	☐	7000 N	6000 N

b. Three trolleys are pulled by the forces shown in the diagram below on a frictionless surface.



Mark with a ☑ **ONE** option from A, B, C and D. (1)

A	☐	P has the biggest acceleration.
B	☐	Q has the biggest acceleration.
C	☐	R has the biggest acceleration.
D	☐	P, Q and R all accelerate at the same rate.

c. An astronaut is on the Moon. He drops a hammer from a height of 3.2 m and it takes 2.0 s to hit the lunar landscape.

i. What is the acceleration due to gravity on the Moon?

_____

_____

_____ (2)

ii. Explain why the result for part c. i. is different from the value of acceleration due to gravity on Earth.

_____ (1)

(Total: 5 marks)

8. Martina, of mass 50 kg, runs up a flight of stairs in 9 s. The stairs are 3 m high.

a. Calculate her power output.

_____

_____

_____ (2)

b. Her sister throws Martina's purse of mass 0.4 kg vertically upwards with a kinetic energy of 10 J. Will it reach Martina?

_____

_____

_____ (3)

(Total: 5 marks)

Section B

9. Sarah boils water in a beaker. She wishes to test which material round the beaker is the best insulator. All necessary apparatus is available in the school laboratory.

   a. Underline the right answer:

   The best insulator is one which keeps the water in the beaker warm for the (longest, shortest) period of time. (1)

   b. Design a simple experiment to determine whether a plastic bag or a cotton wool are the best materials for insulation.

      i. In the space below, draw a well-labelled diagram of the required setup. (3)

      ii. Briefly explain the method that Sarah needs to follow.

_____

_____

_____

_____ (3)

      iii. The following data is recorded during the experiment for the plastic bag insulation.

Temperature / °C	100	91	87	84	81	78	76
Time / minutes	0	5	10	15	20	25	30

Plot a graph of Temperature (°C) on the y-axis against Time (minutes) on the x-axis. (4)

      iv. Predict whether the graph for the cotton wool insulation would be above or below the plotted graph? Give **ONE** reason for your answer.

_____

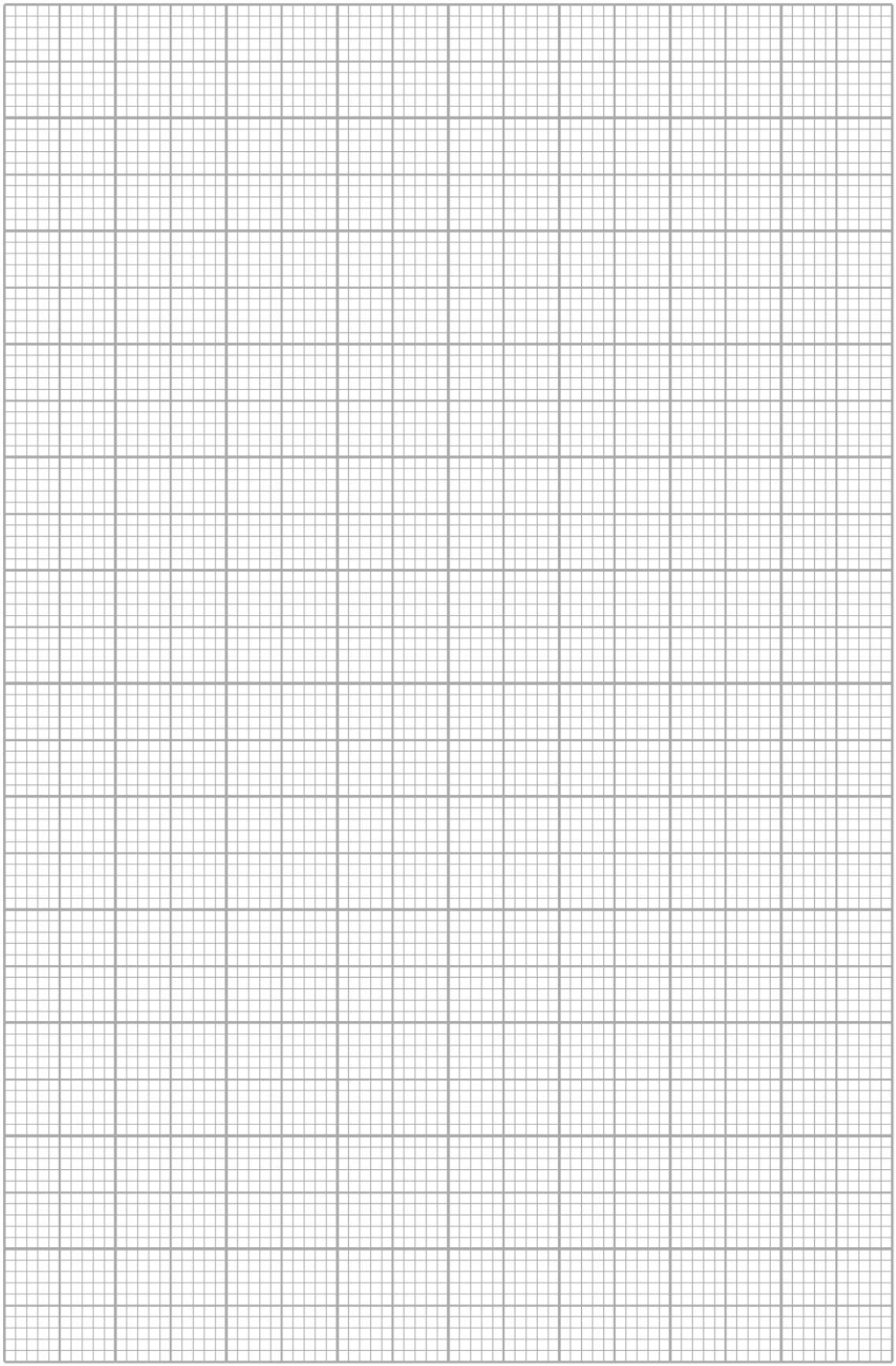
_____ (2)

      v. What do insulating materials, like cotton, contain to ensure conduction of heat is reduced?

_____ (1)

      vi. State **ONE** method of reducing heat losses in the home.

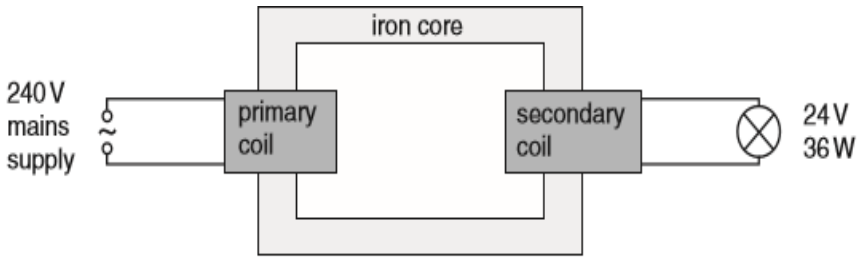
_____ (1)



(Total: 15 marks)

Section C

10. a. The diagram below shows a simple transformer that is used to light a lamp as shown.



i. Name the type of transformer used and explain its function.

_____

_____ (2)

ii. Explain why the primary coil needs to be connected to an alternating current source so that the transformer can serve its purpose.

_____

_____ (2)

iii. The primary coil of the transformer contains 500 turns. Calculate the number of turns on the secondary coil of the transformer.

_____

_____ (2)

iv. Calculate the current flowing in the secondary circuit of this transformer.

_____

_____ (2)

v. Underline a suitable fuse that is to be included in the secondary coil and give a reason for your choice.

1A **2A** **5A** **13A**

_____

_____ (2)

vi. The secondary coil and the lamp are connected in series. Calculate the total resistance in the secondary arm.

_____

_____ (2)

vii. Find the resistance of the lamp, if the coil has a total resistance of 10 Ω.

_____

_____ (1)

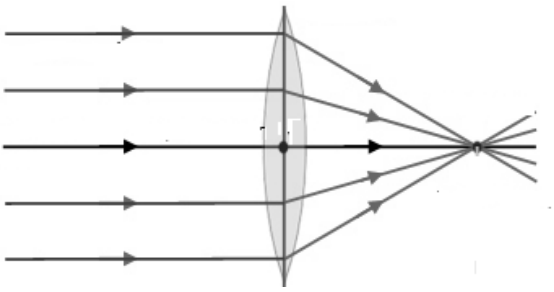
b. Lamps, heaters and other electrical appliances in a household are connected in parallel. Give **TWO** reasons for this arrangement.

_____

_____ (2)

(Total: 15 marks)

11. The following diagram shows a number of light rays passing through a convex lens.



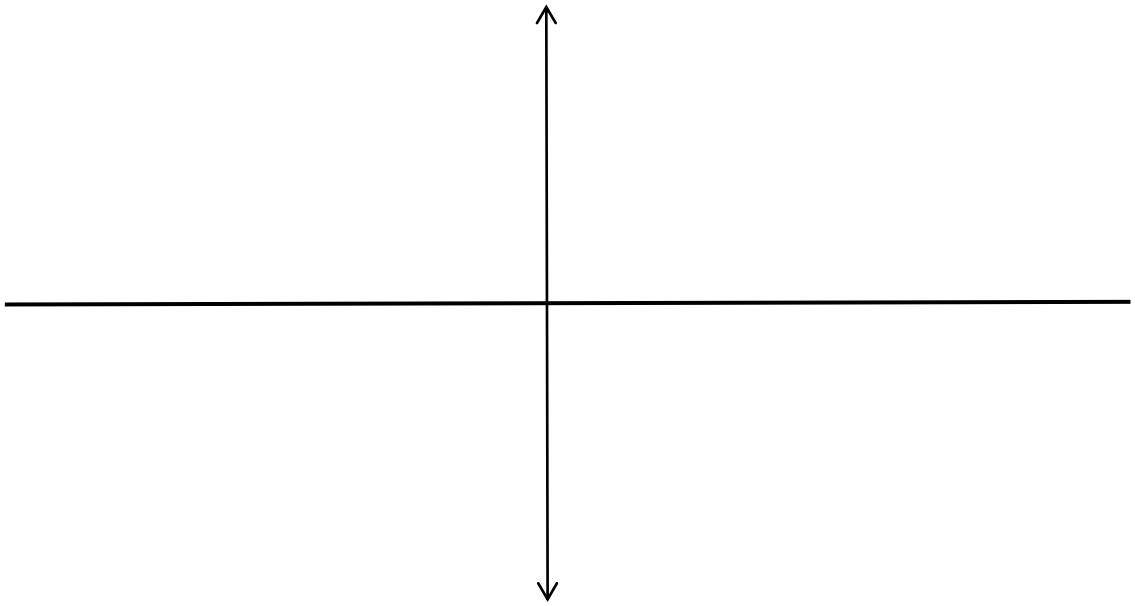
a. On the given ray diagram, mark:

i. the Focal Point with a letter 'F'; (1)

ii. the Principal Axis with a letter 'X'. (1)

b. An illuminated object, 2.2 cm high, is placed 5 cm from a convex lens of focal length 3 cm.

i. Draw a ray diagram (to scale) to show the formation of a real image. (3)

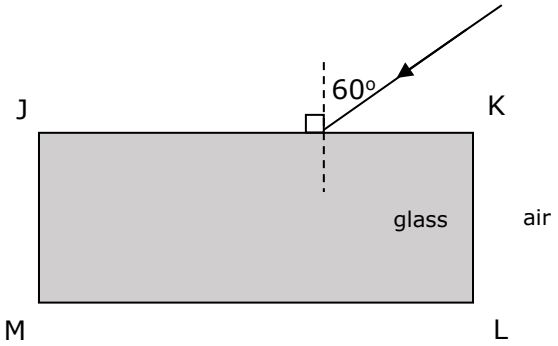


ii. Calculate the magnification of the lens.

_____

_____ (2)

c. The diagram below shows a ray of light incident on side JK of a square glass block JKLM. The angle of incidence of the ray of light is 60°.



i. Complete the ray of light as it passes through the glass block and out again. (2)

ii. Label the Normal on the side LM of the above diagram. (1)

iii. Name another change which occurs when the ray of light passes from air to glass.

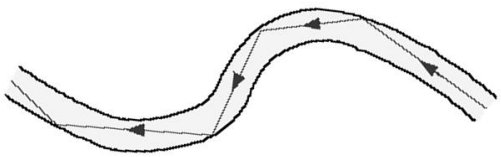
_____ (1)

iv. Explain the term 'critical angle'.

_____

_____ (2)

d. The diagram below shows a light signal travelling through an optical fibre made of solid glass.



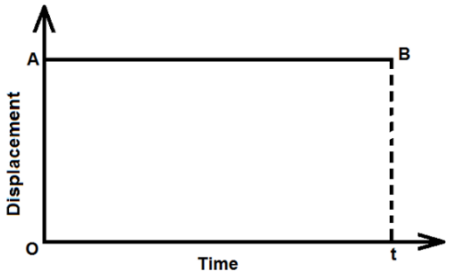
Explain how the light follows the path shown after hitting the walls of the fibre.

_____

_____ (2)

(Total: 15 marks)

12. The figure below represents the displacement of a car with time.



Tom made the following statements with regards to the graph.

A. The graph represents the motion of the car moving with uniform velocity.
B. The area under the graph represents the displacement travelled by the car.
C. The car is at rest.

a. Identify the correct statement. _____ (1)

b. Explain briefly why Tom was wrong in the other two statements.

Statement: _____

Reason:

_____

_____ (1)

Statement: _____

Reason:

_____

_____ (1)

c. Tom draws a second graph of velocity against time and considers the following statements again.

A. The graph represents the motion of the car moving with uniform velocity.
B. The area under the graph represents the displacement travelled by the car.
C. The car is at rest.

Identify **ONE** correct statement and a give a brief explanation.

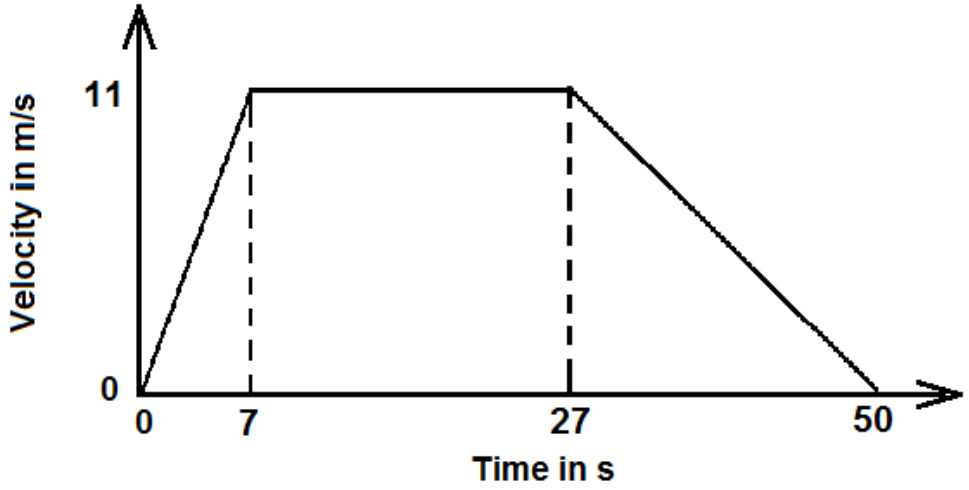
Statement: _____ (1)

Reason:

_____

_____ (1)

d. The following diagram represents the motion of a van.



i. Using the diagram above, explain the motion of the van between 0 – 7 s.

_____

_____ (1)

ii. Calculate the displacement of the van while moving at uniform velocity.

_____

_____ (2)

iii. Calculate the deceleration of the van.

_____

_____ (3)

iv. Use the graph to find:

- the total distance travelled by the van;

_____

_____ (2)

- the average speed of the van.

_____

_____ (2)

(Total: 15 marks)

END OF PAPER

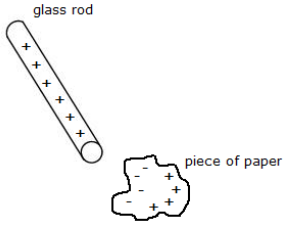
Specimen Controlled Assessments Level 2-3 Marking Scheme

L-Università ta' Malta

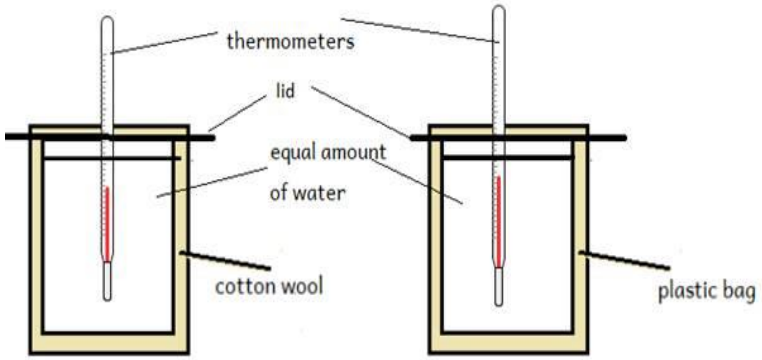
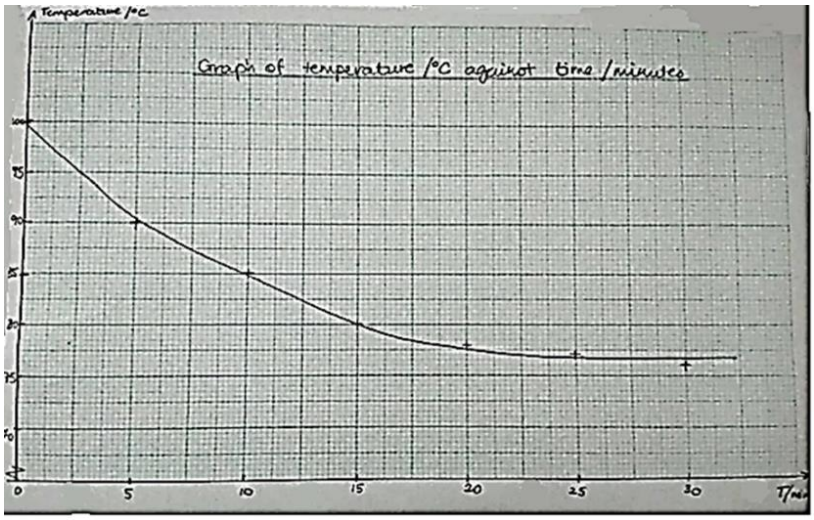
MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

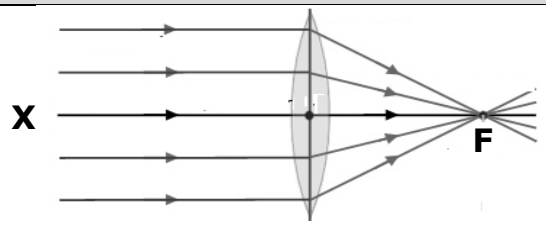
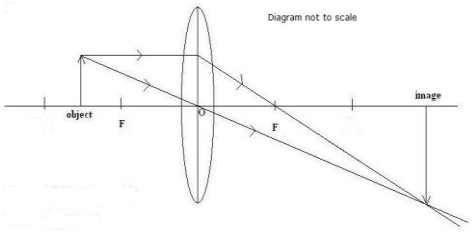
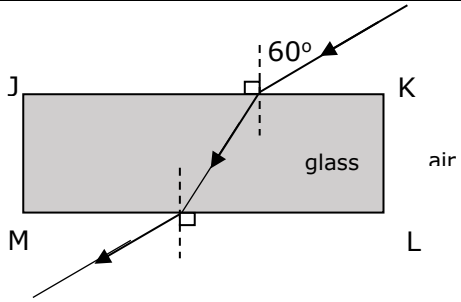
SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER MARKING SCHEME

SUBJECT:	**Physics**
PAPER NUMBER:	**Level 2 –3**
DATE:	
TIME:	2 Hours

Question			Suggested Answer/s	Marks	Remarks
1.	a.		conduction	1	
	b.		ΔQ = mc Δθ = (80) (4200) (60-25) = 11 760 000 J	 1 1	
	c.		E = Pt 11 760 000 = (2000) t t = 5880 s	 1 1	
			Total	**5**	
2.	a.		Resistance increases Length of wire is proportional to resistance	1 1	
	b.		I = V / R = 2 / 5 = 0.4 A	½ 1 ½	
	c.	i.	$R_T = R_1 + R_2$ $R_T = 15 + 5$ = 20 Ω	 ½ ½	
		ii.	I = V / R = 2 / 20 = 0.1 A	 ½ ½	
			Total	**6**	
3.	a.		Negative charge	1	
	b.		Number of positive and negative charges is equal	1	
	c.			1	
	d.		Attraction	1	
			Total	**4**	

4.	i.		True	1	
	ii.		False	1	
	iii.		True	1	
	iv.		True	1	
	v.		False	1	
			Total	**5**	
5.	a.		Moon	1	
	b.	i.	Polar satellites rotate about the poles while geostationary satellites rotate above the equator.	1	
		ii.	Polar satellites are suitable for weather forecast and geostationary satellites are suitable for worldwide communication.	1 1	
		iii.	Polar satellites	1	
			Total	**5**	
6.	a.		Sound causes air particles to vibrate creating compressions and rarefactions in the air	1 1	
	b.	i.	2.2 m 6.9 s	1 1	
		ii.	F = 1/T = 1/6.9 = 0.15 Hz	1	
			Total	**5**	
7.	a.		C	1	
	b.		D	1	
	c.	i.	S = u t + ½ g t^2 3.2 = 0 + ½(g)2^2 3.2 /2 = g = 1.6 N/kg	 1 1	
		ii.	Difference in mass	1	
			Total	**5**	
8.	a.		Power = Energy / time = (50 x 10 x 3) / 9 = 167 W	 1 1	
	b.		KE lost = PE gained 10J = 0.4 (10) h 2.5m = h NO, the purse will not reach Martina.	1 1 1	
			Total	**5**	

9.	a.		longest	1	
	b.	i.		3	1 mark for thermo-meter inside can 1 mark for insulation all around 1 mark for lid
		ii.	The above apparatus was arranged with equal amount of (boiling) water in both cans. Take readings of temperature simultaneously every minute. Repeat this for about 15 minutes.	1 1 1	
		iii.		4	1 axes labels 1 title of graph 1 for plot 1 suitable curve
		iv.	Above Cotton wool would have more entrapped air	1 1	
		v.	Entrapped air	1	
		vi.	Any one from: (Solar) water heater; tea cosy; oven gloves; double glazing; carpets	1	Any other acceptable answer
			Total	**15**	
10.	a.	i.	Step down transformer Decreases the voltage	1 1	
		ii.	Since a.c. creates a fluctuating magnetic field Required for induction of emf.	1 1	
		iii.	$N_1/N_2=V_1/V_2$ $500/N_2= 240/24$ $N_2 =50$ turns	 1 1	
		iv.	$P = IV \rightarrow I= P/V$ $I = 36/24$ $= 1.5$ A	 1 1	

		v.	2 A Slightly higher than the current in the circuit.	1 1	
		vi.	V = IR R = 24/0.5 = 48 Ω	 1 1	
		vii.	$R_T = R_1 + R_2$ $48 = 10 + R_2$ $R_2 = 38$ Ω	 ½ ½	
	b.		Any **two** of: When one goes off the other is still on / they light brighter / more current in each appliance / can be switched on separately.	2	
			Total	**15**	
11.	a.	i.		2	
		ii.		1	
	b.	i.	 correct positioning of F correct arrows drawing correct measurements	3	
		ii.	Magnification = image height / object height Magnification = 3 (correct measurement from diagram +/- 0.2cm)/ 2.2 Magnification = 1.36 (Accept values for magnification between 1.27 and 1.45)	 1 1	Accept workings with m= image distance /object distance
	c.	i.		2	
		ii.		1	Correct labelling of Normal
		iii.	Any one of: Velocity decreases / Wavelength decreases	 1	
		iv.	That angle, beyond which, light rays are totally reflected when going from a medium to a less dense medium	1	
	d.		The angle at which the emergent ray skims the surface between two media. The incident ray should be passing from the more dense to the less dense medium.	1 1	
			Total	**15**	

12.	a.		Statement C	1	
	b.		Statement A: The car is not moving with uniform velocity but is at rest. Statement B: The area under a displacement time graph does not represent distance travelled	1 1	
	c.		Statement A, a horizontal line in a velocity-time indicates that the body is travelling with uniform velocity. OR Statement B, the area below a velocity-time graph gives the displacement of the body.	1 1	
	d	i.	The car starts from rest and accelerates uniformly for 7 s and reaches a velocity of 11 m/s.	1	
		ii.	Displacement = velocity x time = 11 m/s x 20 s = 220 m/s	 1 1	
		iii.	a = (v – u)/t a = (0 – 11)/23 a = -0.48 m/s^2 OR decel. = 0.48 m/s^2	1 1 1	Deduct 1 mark if answer does not include "-" sign or "decel. = "
		iv.	Total distance travelled = area under graph = ½ x (20 + 50) x 11 = 385 m	 1 1	Accept also addition of areas of composite shapes
			average speed of motion = Total Distance / Total Time = 385/50 = 7.7 m/s	 1 1	
			Total	**15**	

Specimen Controlled Assessments Level 1-2-3 Private Candidates

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
PRIVATE CANDIDATES SAMPLE PAPER

SUBJECT:	**Physics**
PAPER NUMBER:	**Level 1 – 2 – 3**
DATE:	
TIME:	2 Hours

Answer **ALL** questions.

You are requested to show your working and to write the units where necessary.

When necessary, take g, acceleration due to gravity, as $10 m/s^2$.

Density	$\rho = \frac{m}{V}$			
Pressure	$p = \frac{F}{A}$	$p = h \rho g$		
Moments	Moment = F × perpendicular distance			
Energy and Work	$PE = m g h$	$KE = \frac{1}{2} m v^2$	$W = F s$	$P = \frac{E}{t}$
Force and Motion	resultant force = m a	$W = m g$	$p = m v$	$F = \frac{(mv-mu)}{t}$
	$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$	$v = u + a t$	$s = (u + v)\frac{t}{2}$	
	$v^2 = u^2 + 2 a s$	$s = u t + \frac{1}{2} a t^2$		
Waves	$\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$	$\eta = \frac{\text{real depth}}{\text{apparent depth}}$		
	$\text{Magnification} = \frac{\text{image height}}{\text{object height}}$	$\text{Magnification} = \frac{\text{image distance}}{\text{object distance}}$		
	$v = f\lambda$	$T = \frac{1}{f}$		
Electricity	$I = \frac{Q}{t}$	$V = I R$	$P = I V$	
	$E = Q V$	$E = I V t$		
	$R_{total} = R_1 + R_2 + R_3$	$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$		
Electromagnetism	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$	$V_p I_p = V_s I_s$		
Heat	$Q = m c \Delta\theta$			
Radioactivity	$A = Z + N$			
Other equations	Area of a triangle = $\frac{1}{2}$ b h	Area of a trapezium = $\frac{1}{2}$ (a + b) h		

Section A

Answer ALL questions

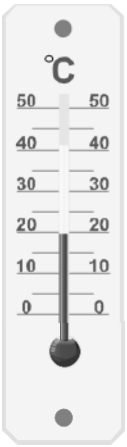


Figure 1

1) Alan has 200 ml of water in a beaker.

a) By referring to figure 1, what is the temperature recorded for the water?

_____ (1)

b) The water is boiled. Calculate the temperature change of the water.

_____ (2)

Alan pours equal amounts of warm water into two identical beakers, A and B. Beaker A is surrounded by cotton wool and beaker B has no insulation. He investigates the temperature change in both beakers. All necessary apparatus is available in the school laboratory.

c) In the space below, draw a well-labelled diagram of the set-up used for the two beakers. (2)

d) Give a brief explanation of how the above set up is used to carry out the investigation.

_____

_____

_____

_____

_____ (2)

e) Identify a safety precaution he needs to take.

_____

_____ (1)

The following data is recorded during the experiment for the cotton wool insulation.

Temperature / °C	60	50	45	40	38	37	36
Time / minutes	0	5	10	15	20	25	30

f) Plot a graph of Temperature on the y-axis against Time on the x-axis. (4)

g) On the same axes, sketch a graph to predict how the temperature in beaker B varies with time.(2)

h) Explain your answer to part (g) above.

_____

_____ (1)

(Total: 15 marks)

2) Water waves are being created in a ripple tank in the school laboratory as shown in figure 2.

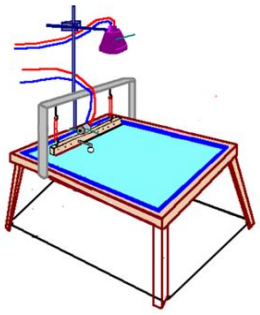


Figure 2

a) Describe how straight wavefronts are created in a ripple tank.

_____

_____ (1)

b) Describe how circular wavefronts are created in a ripple tank.

_____

_____ (1)

c) The distance between one wavefront and the next is called a _____.(1)

d) Describe what happens when straight wavefronts pass through a gap in the ripple tank if the width of the gap is:

i. approximately equal to the wavelength of the waves;

_____

_____

_____ (2)

ii. much larger than the wavelength of the waves.

_____

_____

_____ (2)

e) Name the phenomenon described in part (d) (i).

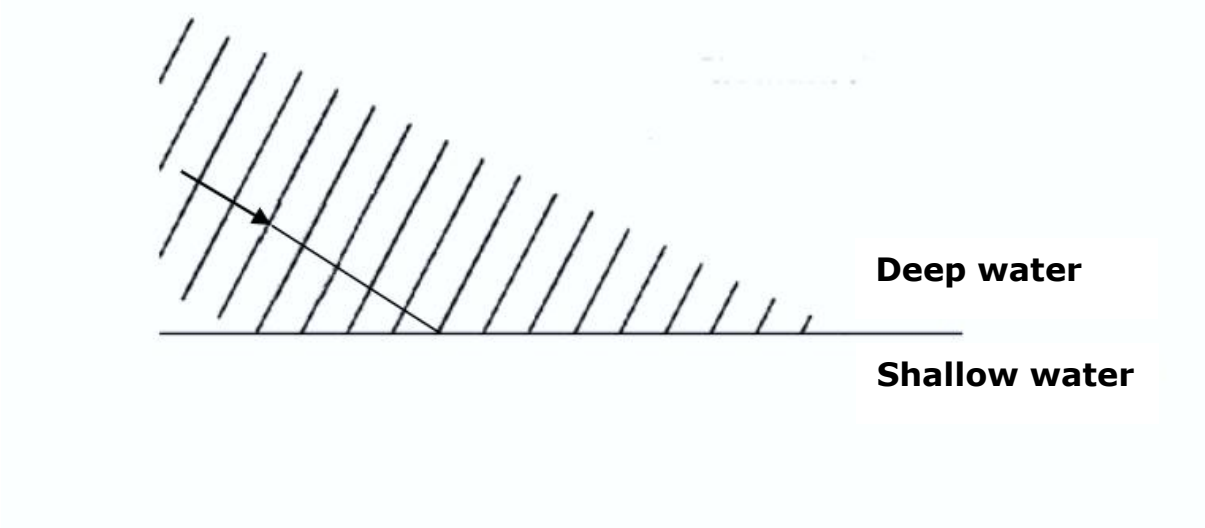
_____ (1)

A piece of glass was placed at the bottom the ripple tank to create a shallower region.

f) Underline the correct term(s).

The wavelength of the wavefront (changes, remains the same) when a plane water wave passes from deep to shallow water. (1)

g) Complete the following diagram. (3)



h) Outline what happens to the frequency as the wave enters the shallow region.

_____

_____ (1)

i) Explain why the stroboscope is helpful to view the wave pattern in the ripple tank.

_____

_____

_____

_____ (2)

(Total: 15 marks)

3) Emma and Claude want to perform an experiment to prove the principle of moments.

a) Define moment of a force.

_____

_____ (1)

Consider figure 3 below.

b) Label figure 3 below. (3)

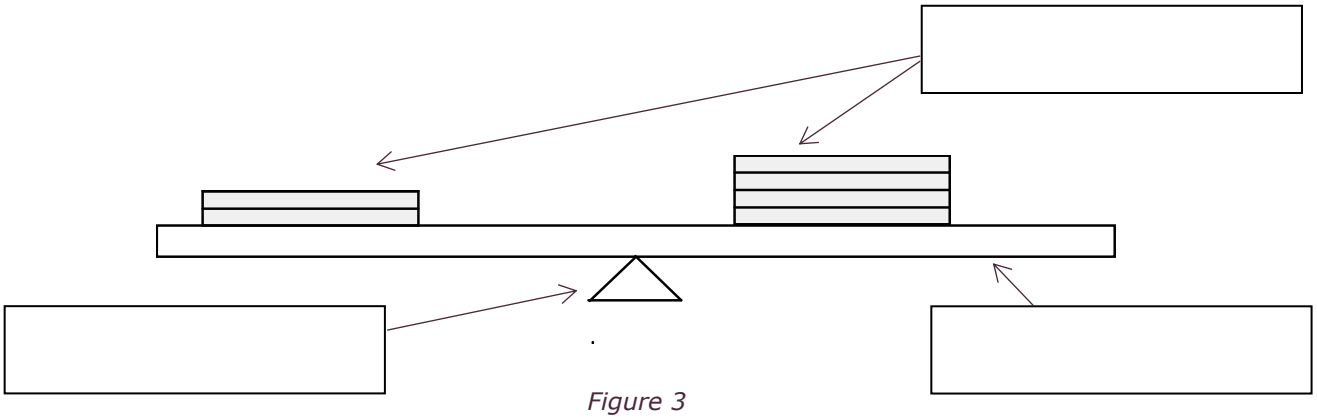


Figure 3

c) On figure 3, mark the clockwise moment (CM) and the anti-clockwise moment (ACM). (2)

d) State the principle of moments.

_____

_____

_____ (2)

e) Complete the next **TWO** steps in the experiment. (2)

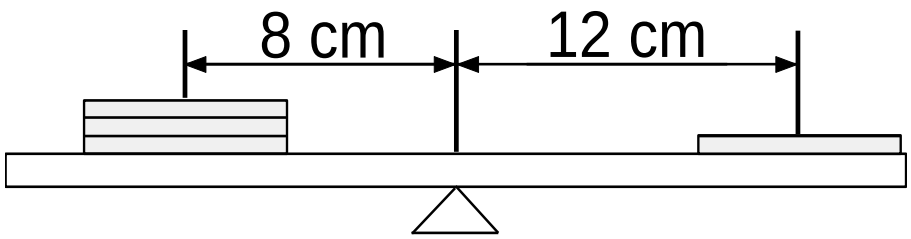
1	The above setup was arranged with the system in equilibrium.
2	_____ _____
3	_____ _____

f) Briefly explain **ONE** precaution taken during this experiment.

_____

_____ (1)

During the second part of the experiment, Emma and Claude wanted to prove the principle of moments using a uniform 30 cm ruler and some coins.



They put one large coin of weight 10 N on the right, 12 cm from the pivot, and three identical small coins on the left, 8 cm from the pivot. The ruler was balanced again.

g) Calculate the weight of **ONE** small coin on the left.

_____

_____

_____

_____

_____

_____ (3)

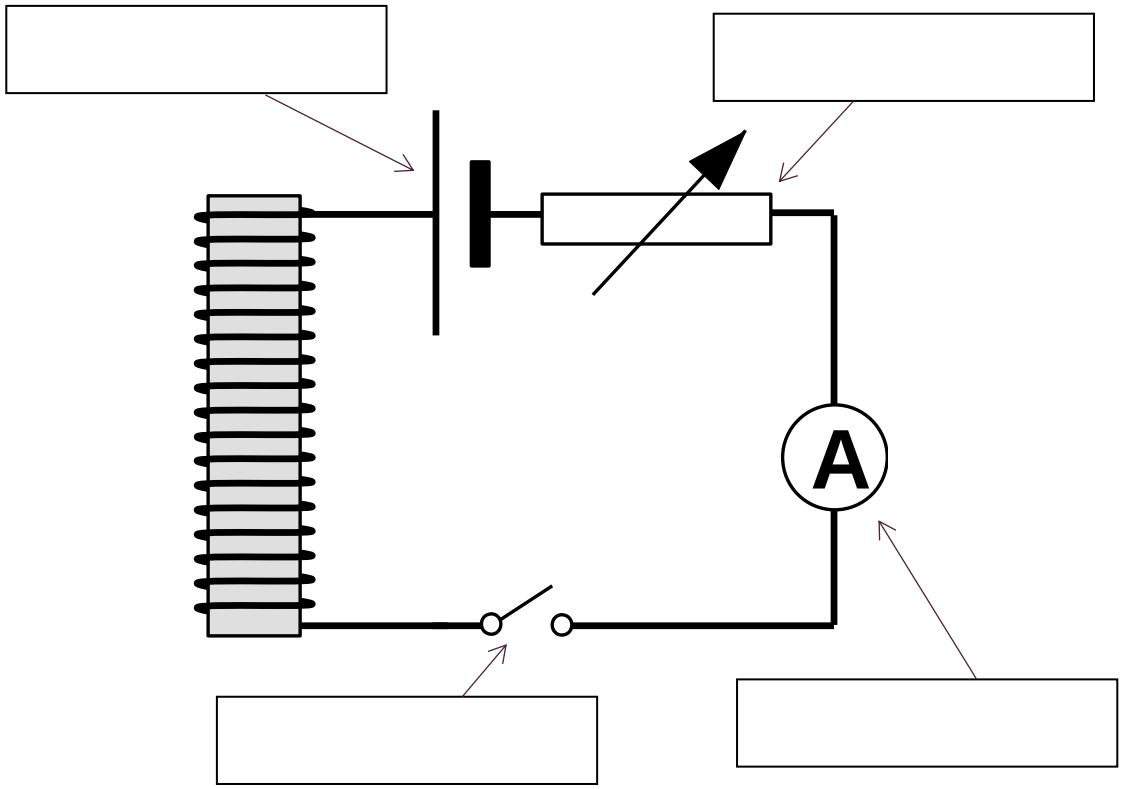
h) The 10 N coin on the right is moved further away from the pivot. State **ONE** change to the experimental setup that results in the ruler to balance again.

_____

_____ (1)

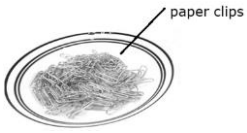
(Total: 15 marks)

4) Paul and Sarah want to investigate how the strength of an electromagnet changes as the number of turns in the coil change. They have set up the following apparatus.



a) Label **all** the components in the circuit. (4)

b) A plastic plate full of paper clips is placed under the electromagnet. State what happens to the paper clips as soon as the electromagnet is switched on.



_____ (1)

c) List **ONE** difference between a permanent magnet and an electromagnet.

_____

_____ (1)

Paul and Sarah make use of other electromagnets each having a different number of turns. They wish to investigate the way the number of turns in the coil effect the strength of the electromagnet.

The following data was recorded by the students at the end of the experiment.

No. of turns in electromagnet coil	No. of paper clips
50	14
100	26
150	43
200	57

d) Use the data obtained to reach a conclusion about the way the number of turns in the coil effect the strength of the electromagnet.

_____

_____

_____ (2)

e) During this experiment, Sarah kept monitoring the ammeter reading to ensure that it remains constant. Explain why this was an important precaution in this experiment.

_____

_____

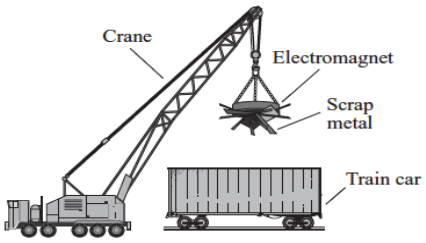
_____ (2)

f) List **TWO** precautions needed in this experiment to obtain accurate results.

_____

_____ (2)

Electromagnets are used in scrap yards to lift heavy loads. The crane operator notices that not all scrap metal is picked up by the electromagnet when it is switched on.



g) Briefly explain why aluminium objects are **not** picked up by the electromagnet when it is switched on.

_____ (1)

h) Describe **ONE** application of where electromagnets are used.

_____

_____

_____ (2)

(Total: 15 marks)

5) Two students perform an experiment using a helical spring to verify Hooke's Law.

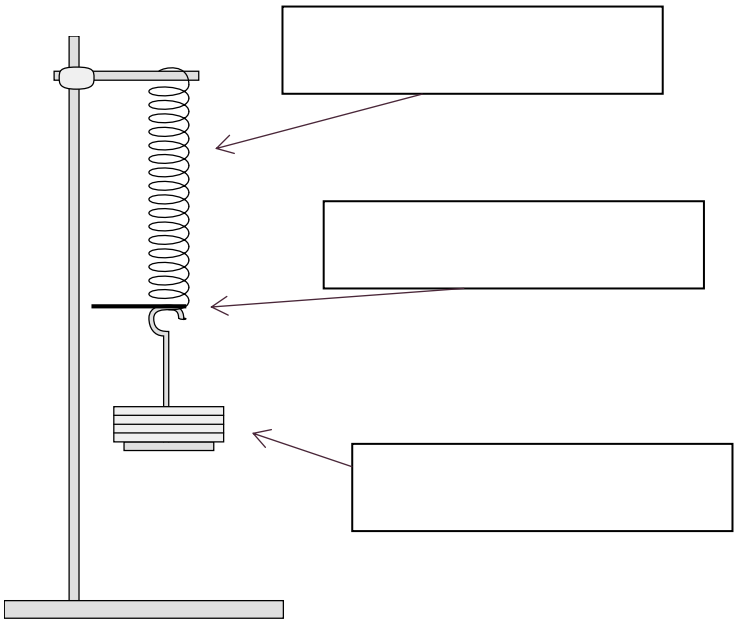


Figure 4

a) Label the apparatus shown in figure 5. (3)

b) Draw the **ONE** missing piece of apparatus on figure 5. (1)

The two students perform an experiment using the helical spring to verify Hooke's Law.

c) Complete the following:

Hooke's Law states that for an _____ material, the stretching force is _____ proportional to the _____ provided that the elastic limit is not exceeded. (3)

d) Define the term elastic limit.

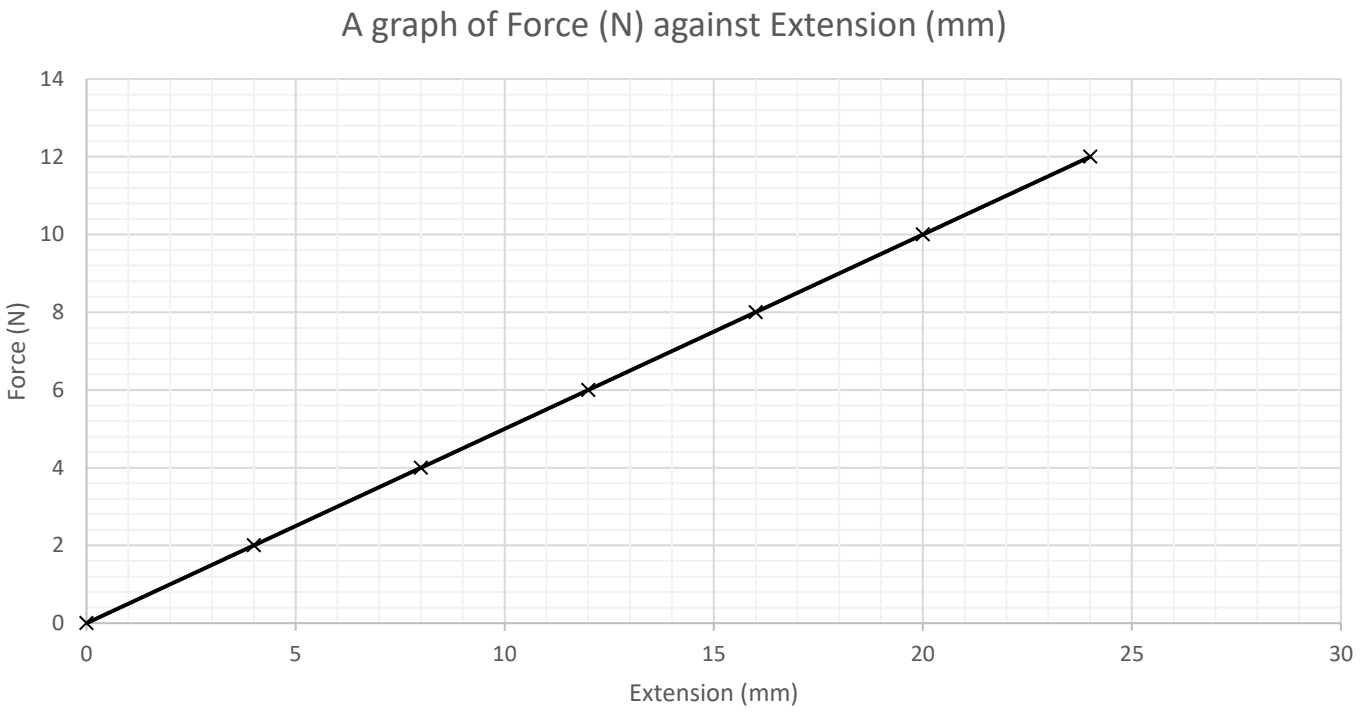
_____

_____

_____ (1)

The students record their measurements in a table, and a graph was plotted as shown below.

Force (N)	0	2	4	6	8	10	12
Extension (mm)	0	4	8	12	16	20	24



e) On the same axes, sketch a graph obtained for a stiffer spring. (1)

f) Explain your answer in part (e).

_____

_____

_____ (2)

g) Describe what happens to the spring when loaded beyond its elastic limit.

_____

_____

_____ (2)

The original length of the spring is 8 cm. A weight of 7 N is attached to the spring.

h) Use the graph to find the extension of the spring.

_____ (1)

i) What is the new length of the spring?

_____ (1)

(Total: 15 marks)

Section B

Answer ALL questions.

6) Figure 4 shows three wires, each 1 m in length but having different thickness. Wire A has a diameter of 0.5 mm, wire B a diameter of 0.25 mm and wire C a diameter of 0.125 mm.

Ian is asked to investigate how the thickness of each wire affects its resistance.

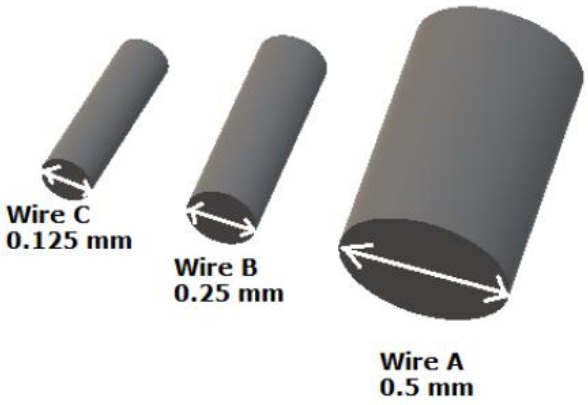


Figure 5

a) Fill in the blanks:

The resistance of the wire renders electrical energy to become _____ energy. (1)

The resistance is the _____ to the flow of current. (1)

b) List **ONE** other apparatus needed (besides the wires), in the experiment to calculate the resistance of wire A, B and C.

_____ (1)

c) Identify what measurements need to be recorded to find the resistance of wires A, B and C.

_____

_____

_____ (2)

d) Briefly describe how resistance can be found.

_____

_____ (2)

e) Draw **ONE** conclusion from this experiment.

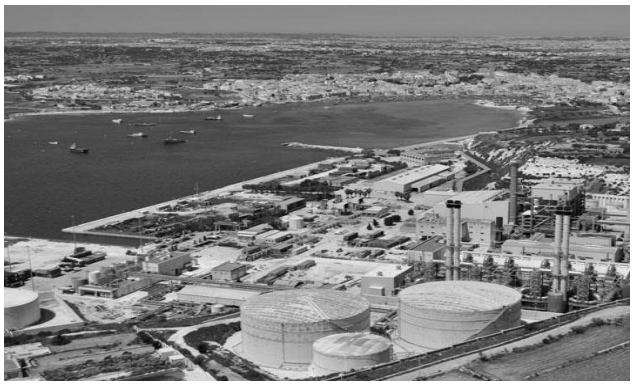
_____ (1)

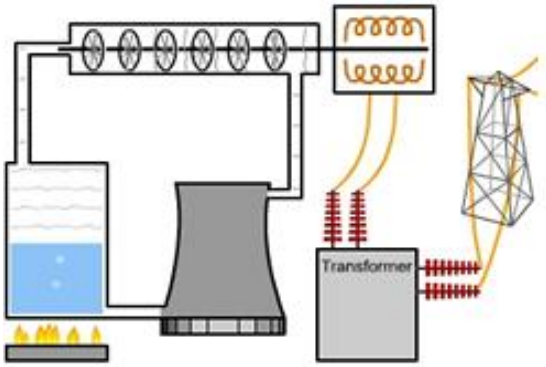
f) In the space below, sketch a graph of thickness of wires against resistance.

(2)

(Total: 10 marks)

7) Ms Galea took her class for a site visit at the Delimara Power Station. Fossil fuels are used to provide electrical energy from the power station to our homes.





a) Three energy sources present in the power station are shown below. In the right hand column, choose the type of energy that each energy source provides from the above list. (3)

Chemical energy, Electrical energy, Kinetic energy

No	Energy source	Type of energy
i.	Energy of fossil fuel	
ii.	Energy of rotating turbines	
iii.	Energy in the homes	

The rotating blades mentioned above, turn a coil of wire inside a magnetic field, and generate electricity. This creates Electromagnetic Induction.

b) Mention two factors that will effect the size of the current induced.

_____

_____ (2)

c) What happens to the induced emf as the rotating blade changes the direction of movement from upwards to downwards.

_____

_____ (1)

d) An engineer needs to transmit 1 MW of power from Delimara to Maltese villages and town at voltages of 33 kV. Determine the current flowing in the transmission cables at this voltage.

_____

_____

_____ (2)

In a village, a transformer located at the sub-station changes the voltage from 33,000 V to 240 V.

e) What type of transformer would be needed to do this?

_____ (1)

f) Calculate the number of turns of coil on the secondary arm of the transformer if there are 5500 turns of coil of the primary arm.

_____

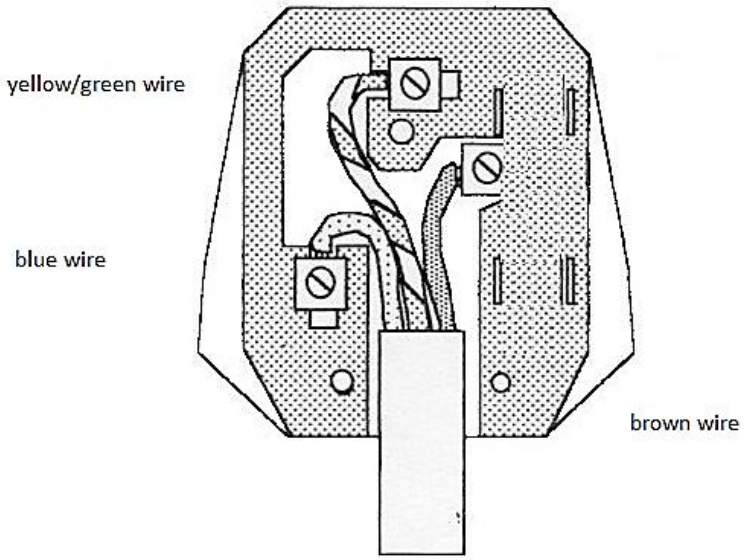
_____ (2)

g) In transmitting energy from Delimara to Maltese homes, one needs to make use of a high voltage and low current. Why is this necessary?

_____

_____ (2)

Look at the following diagram of an unsafe three-pin plug.



h) State **TWO** ways how the plug can be made safe to use.

_____

_____ (2)

(Total: 15 marks)

END OF PAPER

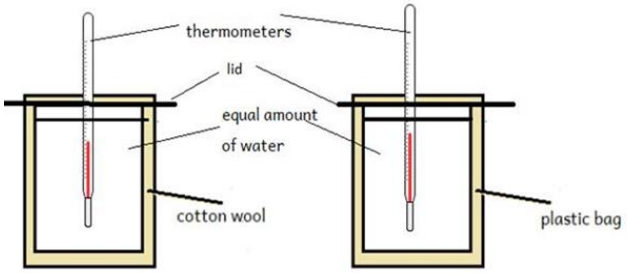
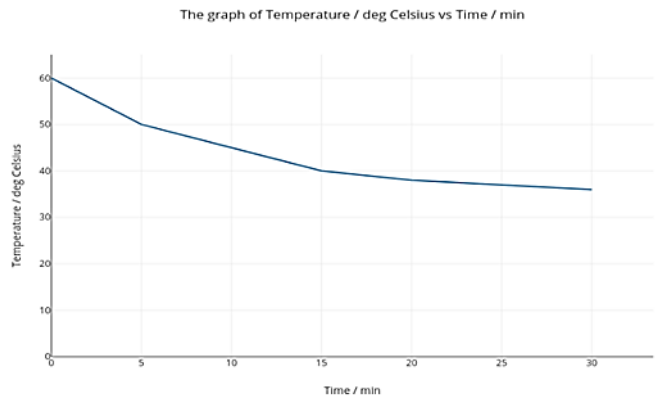
Specimen Controlled Assessments Level 1-2-3 Private Candidates Marking Scheme

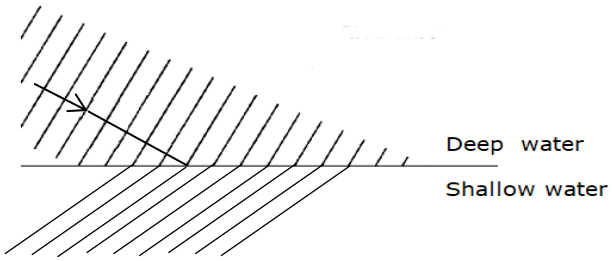
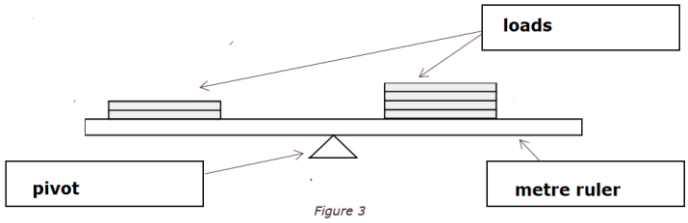
L-Università ta' Malta

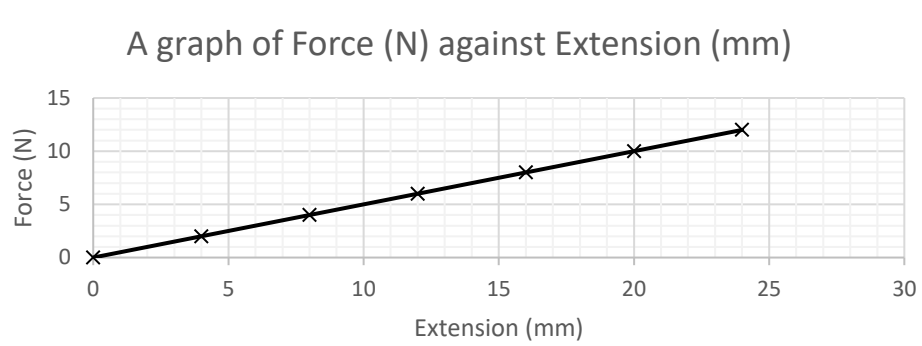
MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

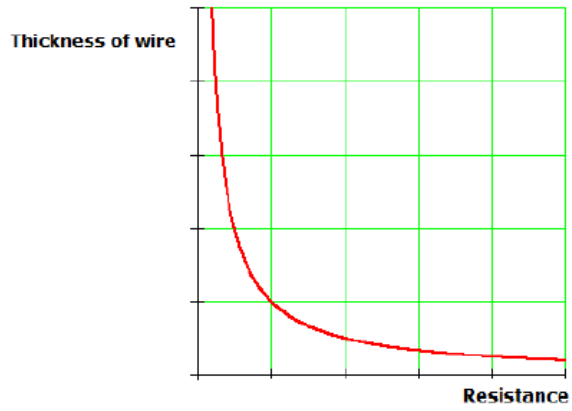
SECONDARY EDUCATION CERTIFICATE LEVEL
PRIVATE CANDIDATES SAMPLE PAPER MARKING SCHEME

SUBJECT:	**Physics**
PAPER NUMBER:	**Level 1 – 2 – 3**
DATE:	
TIME:	2 Hours

Qn no.			Suggested answers	Marks	Additional remarks
1	a	i	20°C	1	
	b		100 – 20 = 80 °C	1 1	
	c			2	1 mark for thermo-meter inside can 1 mark for insulation and lid all around
	d		The above apparatus was arranged with **equal amount of (boiling) water** in both cans. Take readings of **temperature** simultaneously **every minute**. Repeat this for **about 15 minutes**.	2	
	e		Care when pouring boiling water.	1	
	f			4	
	g		Curve below the graph.	2	
	h		No insulation more heat loss by conduction.	1	
			Total	**15**	
2	a		A straight rod is vibrated up and down using a motor / elastic bands	1	
	b		A spherical bob is vibrated up and down using a motor / elastic bands	1	
	c		Wavelength	1	
	d	i	Waves passing through a narrow gap will spread out	2	

			In a circular manner		
		ii	Waves passing through a wide gap will not spread out And exhibit slight bending at the edges	2	
	e		Diffraction	1	
	f		changes	1	
	g			3	
	h		Frequency remains the same.	1	
	i		The stroboscope makes the waves appear to be stationary, thus easier to view the pattern.	2	
			Total	**15**	
3	a		The **turning effect** of a force about a pivot at a perpendicular distance d from it.	1	
	b		 *Figure 3*	3	
	c		*It is checked that the loads on the right gives a clockwise moment and that on the left an anti-clockwise moment.*	2	
	d		For a system which is in equilibrium Clockwise moments are equal to anticlockwise moments	1 1	
	e		The distance between the pivot and the two weights is measured. The clockwise moments and the anticlockwise moments are calculated.	1 1	
	f		The system is checked to balance horizontally before noting distances. OR The readings of distance are taken at eye level to the scale of the ruler.	1	
	g		Clockwise moments – Anticlockwise moments 10N x 0.12 = Weight of 3 coins x 0.08m Weight of 3 coins = 1.2/0.24 = 5N Weight of 1 coin = 5/3 = 1.67N	 1 1 1	
	h		Add more coins on the other side OR Move the three coins further away	1	
			Total	**15**	
4	a		Supply Variable Resistor Switch Ammeter	1 1 1 1	
	b		The paper clips are attracted to the electromagnet.	1	
	c		An electromagnet is a magnet only when a current flows through the coil that surrounds it while a permanent magnet is always a magnet.	1	

	d		The greater the number of turns around the electromagnet the more paper clips it picks up hence the greater the strength of the electromagnet.	2	
	e		If the current varies, the strength of the electromagnet will also vary. This will hinder the experiment as only two variables are being investigated in this experiment.	2	
	f		Switch off the circuit when not taking readings and take repeated readings of the number of paper clips picked up for each set of windings.	2	
	g		Aluminium is not a magnetic material and therefore it is not attracted by magnets.	1	
	h		Electromagnets are included in all devices that use electric motors such as fans.	2	
			Total	**15**	
5	a		Spring Pointer Masses	1 1 1	
	b		Ruler	1	
	c		Hooke's Law states that for an elastic material, the stretching force is directly proportional to the load provided that the elastic limit is not exceeded.	3	
	d		The elastic limit as the point up to which a spring can be loaded and when unloaded goes back to its original length.	1	
	e			1	
	f		When the same load is added to a stiffer spring, the spring extension will be less.	2	
	g		When loaded beyond the elastic limit, the spring will not return to its original length and it will be permanently deformed.	2	
	h		3.5 cm	1	
	i		11.5 cm	1	
			Total	**15**	
6	a		Heat, opposition	1 1	
	b		DC supply/battery, ammeter, voltmeter	1	
	c		Current and voltage for each wire	2	
	d		R = V$oltage/Current$	2	
	e		The thicker the wire, the lower the resistance.	1	

	f			2	
			Total	**10**	
7	a		i. Chemical energy ii. Kinetic energy iii. Electrical energy	1 1 1	
	b		The rate of the cutting of flux. The number of turns in the coil.	1 1	
	c		The direction of the induced current changes.	1	
	d		P = I V 1,000,000 = I x 33,000 I = 30.3 A	 1 1	
	e		Step down.	1	
	f		$\frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{5500}{N_2} = \frac{33000}{240}$ $N_2 = \frac{240\ x\ 5500}{33000}$ N_2 = 40 turns	 1 1	
	g		Low current results in less resistance in the cables And therefore, less energy is lost as heat energy	1 1	
	h		Put a fuse Hold the wire with a cord grip	1 1	
			Total	**15**	