

Candidate Name \_\_\_\_\_

Centre Number	Candidate Number									

## EXAMINATIONS COUNCIL OF ZAMBIA

### Examination for School Certificate Ordinary Level

## Physics

### Paper 2

**5054/2**

**Wednesday**

**8 NOVEMBER 2017**

#### Additional Materials:

- Graph paper
- Electronic calculator (non-programmable)/Mathematical tables
- Answer Booklet

**Time 2 hours**

#### Instructions to Candidates

Write your name, centre number and candidate number in the spaces at the top of this page and on the Answer Booklet used.

#### Section A

Answer all questions.

Write your answers in the spaces provided on the question paper.

#### Section B

Answer any **three** questions.

Write your answers in the separate Answer Booklet provided.

At the end of the examination:

- 1 fasten the Answer Booklets used securely to the question paper,
- 2 circle the numbers of the Section **B** questions you have answered in the grid on the bottom right side corner.

#### Information for candidates

The number of marks is given in brackets [ ] at the end of each question or part question. Candidates are reminded that all quantitative answers should include appropriate units. Circle the questions answered in Section **B** in the grid. Candidates are advised to **show all their working** in a clear and orderly manner, as marks are awarded for correct working and for correct answers.

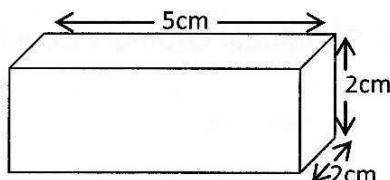
**Cell phones are not allowed in the examination room.**

Candidate's Use	Examiner's Use
<b>Section A</b>	
<b>Section B</b>	<b>9</b>
	<b>10</b>
	<b>11</b>
	<b>12</b>
<b>Total</b>	

**Section A [50 marks]**

**Answer all the questions in the spaces provided on the question paper.**

- 1 Figures 1.1** is a full scale drawing of an aluminium bar.



**Figure 1.1**

- (a)** Calculate the volume of the bar.

[2]

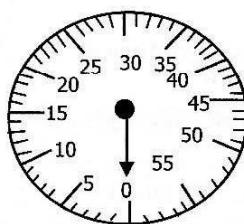
- (b)** What other measurement(s) are needed to determine the density of aluminium?

.....  
.....

[1]

- (c)** When placed on a measuring pan, a reading of 56 grams is obtained.

- (i)** On **figure 1.2** draw a pointer showing a reading of 56 grams.



**Figure 1.2**

[1]

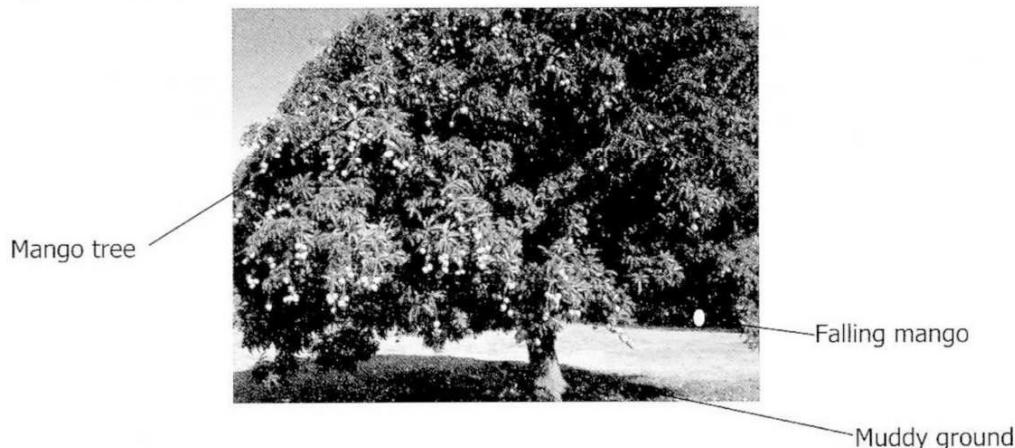
- (ii)** Find the density of the aluminium bar.

.....  
.....  
.....

[2]

**Total 6 marks**

- 2 A mango of mass 200g drops from a mango tree as shown in **figure 2.1**. It takes 1 second to strike the muddy ground below and penetrates 4cm into the ground. [take  $g = 10\text{m/s}^2$ ]



**Figure 2.1**

- (a) From what height did the mango drop?

.....  
.....  
.....

[2]

- (b) What is the kinetic energy of the mango just before it strikes the ground?

.....  
.....  
.....

[2]

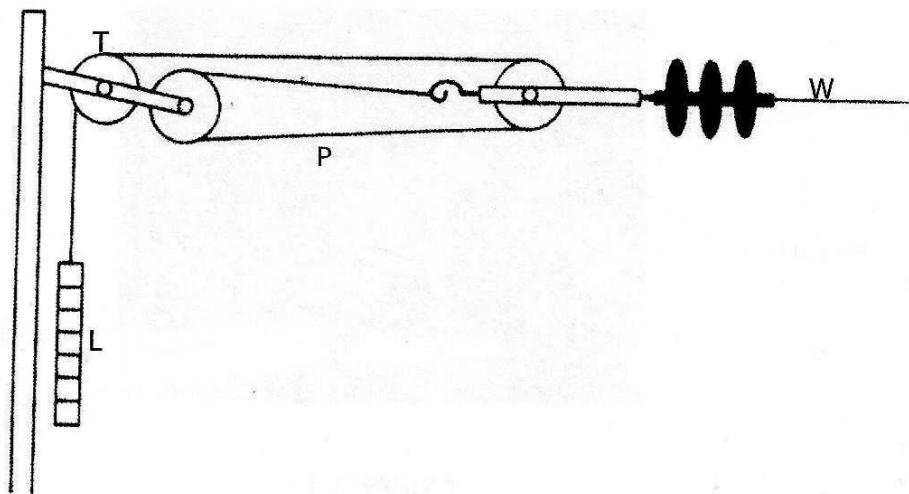
- (c) (i) Calculate the retardation on the mango as it penetrates the ground.

.....  
.....  
.....

[2]

**Total 6 marks**

- 3** **Figure 2.1.** shows a wire for an electrification system being held taut by a load **L** and a pulley system **P**.



**Figure 3.1**

- (a)** State one factor that multiplies force in the system shown in **figure 3.1**.

..... [1]

- (b)** What is the purpose of pulley **T**?

..... [1]

- (c)** If the load **L** is 2000N, what is the tension in the wire **W**?

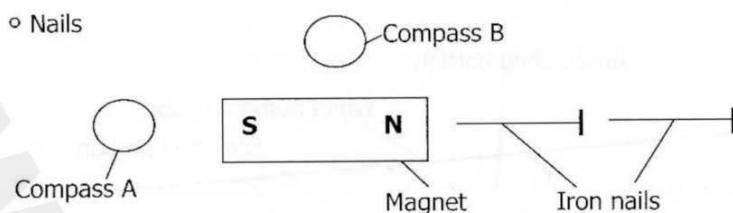
.....  
.....  
..... [2]

- (d)** Find the efficiency of the system.

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

**Total 6 marks**

- 4 **Figure 4.1.** shows a magnet, two compasses and two nails.



**Figure 4.1**

- (a) On **figure 4.1**, draw an arrow in each compass to show the direction of the magnetic field of the magnet at the two positions. [2]
- (b) The magnet causes the nails to become magnetized by induction. Both ends of each nail become magnetic poles.  
On **figure 4.1**, mark **N** and **S** at both ends of each nail to show the magnetic poles. [2]
- (c) When the magnet is removed, the nails are still magnetized.  
(i) Describe how to test whether the nails are still magnetized when they are away from the magnet.

.....  
.....  
.....

[1]

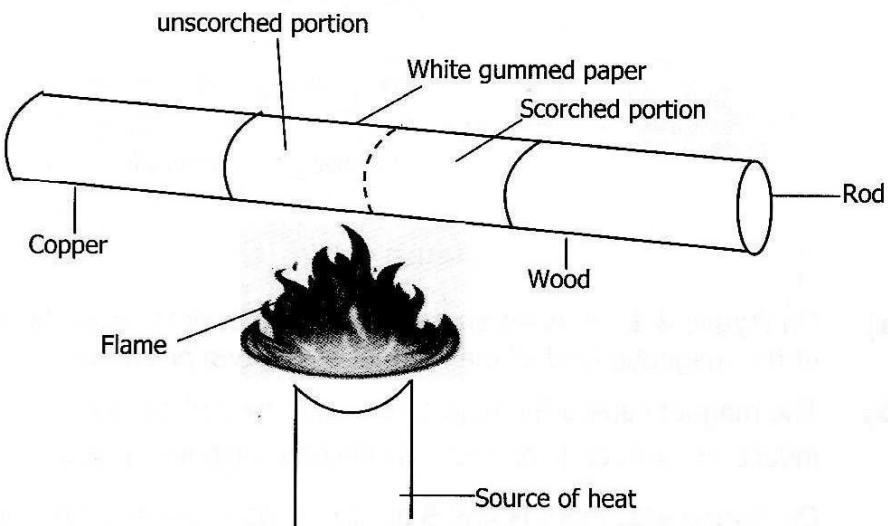
- (ii) Describe with the aid of a diagram how the nails can be demagnetized.

.....  
.....  
.....

[2]

**Total 7 marks**

- 5 **Figure 6.1** shows how copper is a good conductor of heat and wood a bad conductor.



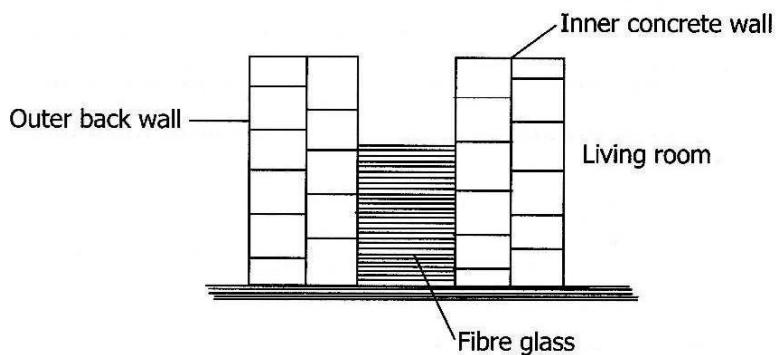
**Figure 6.1**

- (a) After passing the rod through a flame several times, the paper over the wood scorches but not that over the copper. Explain this observation.

.....  
.....  
.....

[2]

- (b) **Figure 5.2** shows double walls of a house with fibre glass in between.



**Figure 5.2**

- Explain the purpose of the fibre glass.

.....  
.....

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[1]

- (c) Explain why an unpainted concrete wall feels colder than a painted one.

.....  
.....  
.....

[1]

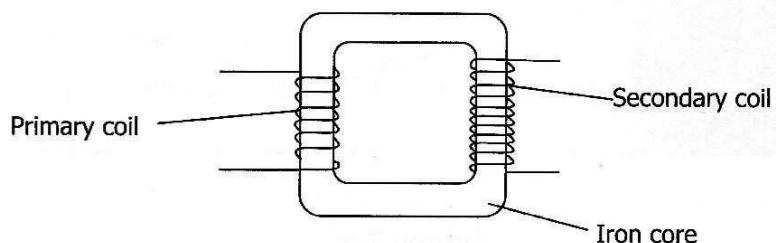
- (d) State **one** industrial use of a good conductor of heat.

.....  
.....

[1]

**Total 5 marks**

- 6 **Figure 7.1** shows a transformer with two coils wound on an iron core. The transformer is connected to an electricity transmission cable.



**Figure 6.1**

- (a) Explain the purpose of the iron core in the transformer.

.....  
.....  
.....

[2]

- (b) The transformer supplies electrical power to a factory at 33 000V. the current supplied is 85A.

Calculate;

- (i) the electrical power that the factory receives?

.....  
.....  
.....

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[2]

- (ii) the electrical energy the factory receives in 1 hour.

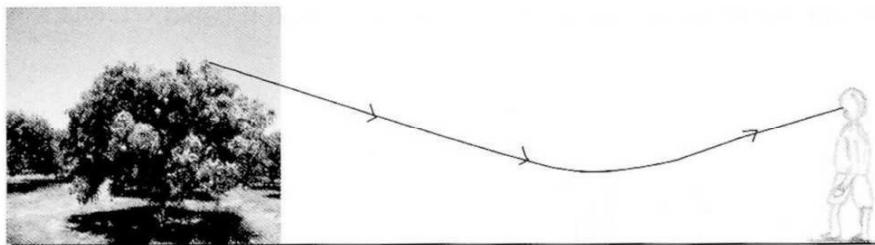
.....  
.....  
.....  
.....

[2]

**Total 6 marks**

- 7 A boy was moving along a tarred road on a very hot day. As he was approaching a tree beside the road, he saw an image of the tree on the tarred road.

**Figure 7.1** shows the boy approaching the tree. The wave has a frequency of 2000Hz and a speed of 320m/s.



**Figure 7.1**

- (a) Draw a ray on **figure 7.1** which enables the boy to see the image of the tree. [1]
- (b) Along the ray you have drawn in (a), mark with letter X the position where the mirage will be seen by the boy.

.....  
.....  
.....

[1]

- (c) Explain why the boy would not see the mirage on a cold day.

.....  
.....  
.....

[2]

**Total 4 marks**

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**8** What is an isotope?

[1]

(a)  $^{16}_8\text{O}$  and  $^{18}_8\text{O}$  are both atoms of oxygen.

(i) In the space below draw a diagram of an atom of one of these isotopes.

[3]

(ii) Give **one** use of radioactive isotopes.

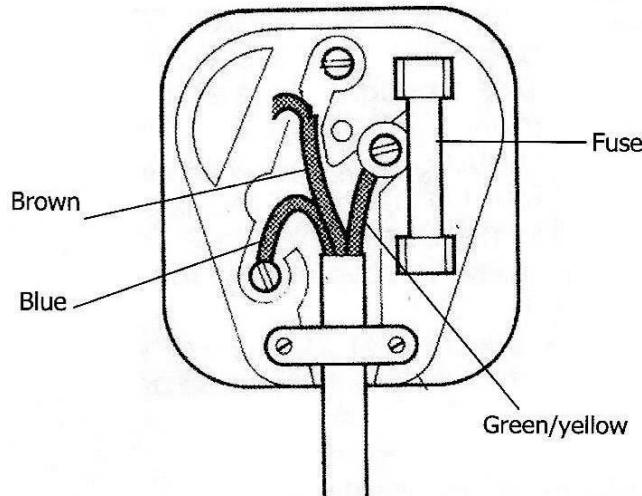
[1]

**Total 5 marks**

**Section B [30 marks]**

**Answer any three questions**

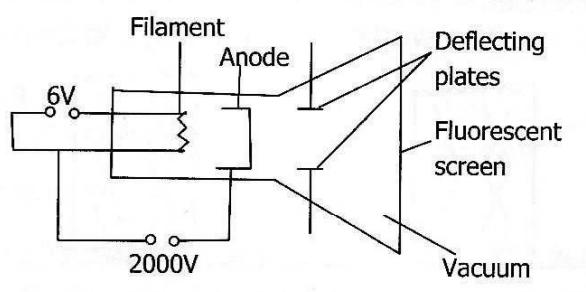
- 9 (a)** A fuse in a three pin plug for a one plate electric cooker was blown off. A grade 8 girl changed the plug and connected the new one as shown in **figure 9.1**.



**Figure 9.1**

- (i)** What was wrong with the connections made by the girl? [1]
- (ii)** Will the cooker connected to this plug work? Explain your answer. [2]
- (iii)** Draw a three pin plug showing correct connections of the wires. [2]
- (b)** An electric stove has two plates, each with a rating of 240V, 3000W. One plate is switched on for 5 hours. For the same period of time a heater rated 230V, 2 300W and a geyser with an element rated 240V, 2 500W are switched on.
- (i)** Calculate the electrical energy in kWh used by the stove, heater and the geyser in the 5 hours. [2]
- (ii)** If a kWh of electricity cost 50 ngwee, what is the cost of using the stove, heater and the geyser for 5 hours? [2]
- (iii)** What advice would you give regarding the switching on of many electrical appliances at the same time? [1]

- 10** **Figure 10.1** shows a simple version of an electron-beam tube.

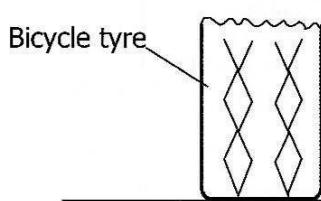


**Figure 10.1**

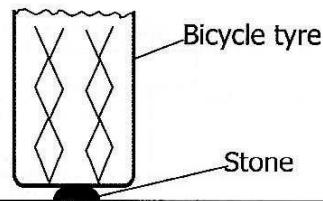
- (a)** State **one** property of cathode rays. [1]
- (b)** Explain why,
  - (i)** electrons are emitted from the filament. [1]
  - (ii)** electrons accelerate after they leave the filament. [1]
  - (iii)** a vacuum is needed in the tube. [1]
- (c)** A charge of  $1.8 \times 10^{-3}$  C passes through the cathode ray tube per second when the voltage between the anode and the cathode is 2000V.  
Calculate the energy carried by the cathode ray beam in 8 seconds. [2]
- (d)** When alternating potential differences of very low frequency is applied across the deflecting plates in **figure 10.1**, the spot of light on the screen is seen to move.  
Describe and explain the movement of the spot. [3]
- (e)** State **one** use of cathode rays. [1]

**Total 10 marks**

- 11** Figures 11.1 and 11.2 show sections through very old bicycle tyres which are made of solid rubber.

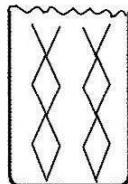


**Figure 11.1**

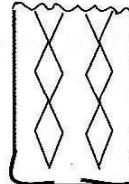


**Figure 11.2**

- (a) The solid rubber in **figure 11.1** exerts a pressure on the ground.
- (i) Define a Pascal. [1]
- (ii) The mass of the bicycle and the rider is 60kg and the total surface area in contact with the ground is  $2.4 \times 10^{-3} \text{ m}^2$ . The gravitational field strength is 10N/kg.  
Calculate the pressure exerted on the ground. [2]
- (iii) One of the solid rubber tyres went over a small stone as shown in **figure 11.2**.  
Describe and explain how the pressure exerted on the ground changes. [2]
- (b) **Figure 11.3** shows a modern bicycle tyre that contains air. A heavy person sits on the bicycle and the shape of the tyre changes as shown in **figure 11.4**.



**Figure 11.3**



**Figure 11.4**

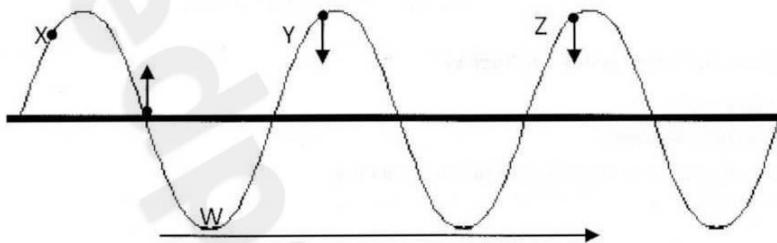
The table contains information about the tyre in **figure 11.3** and **figure 11.4**.

	Tyre in <b>figure 11.3</b>	Tyre in <b>figure 11.3</b>
Air pressure in tyre (Pa)	$1.9 \times 10^5$	$2.1 \times 10^5$
Volume of air ( $\text{cm}^3$ )	0.016	

- (i) What is the volume of air in the tyre in **figure 11.4**. [2]  
(ii) State **one** assumption that you made in arriving at your answer [1]

**Total 10 marks**

- 12 (a) What is a wave? [1]
- (b) Water waves are produced with a frequency of 4Hz, by hitting the water surface with a tip of a pen. If the wave travels 20m in 10 seconds, calculate the;.
- (i) Speed of the wave.  
(ii) wave length [4]
- (c) **Figure 12.1** shows a wave at a certain instant. The vertical arrows indicate the direction of vibration of some individual particles on the wave.



Draw the wave and use arrows to show the,

- (i) direction of flow of energy.  
(ii) direction in which the particle at point **X** will move.  
(iii) wavelength. [3]
- (d) In **figure 12.1**, which particle is in phase with **X**. [1]
- (e) Explain how the wave in **figure 12.1** carry energy. [1]

**Total 10 marks**



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