

Centre Number	Candidate Number

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

## **EXAMINATIONS COUNCIL OF ZAMBIA**

### **Examination for General Certificate of Education Ordinary Level**

## **Science**

**5124/1**

### **Paper 1**

**Monday**

**31 JULY 2017**

**Additional Information:**

Electronic calculator (non programmable) and / or Mathematical tables  
 Graph paper  
 Soft clean eraser  
 Soft pencil (type B or HB is recommended)

**Time 2 hours**

**Instructions to Candidates**

**Do not open this booklet until you are told to do so.**

Write your name, centre number and candidate number in the spaces provided at the top of this page and on any separate answer booklet/paper used.

There are **three (3)** sections in this paper.

**Section A**

There are **twenty (20)** questions in this section. Answer all questions. For each question, there are four possible answers, **A, B, C** and **D**. Choose the one you consider correct and indicate your choice by marking it with a cross (X) on the answer grid provided on the question paper.

**Section B**

Answer all questions. Write your answers in the spaces provided on the question paper.  
 Read very carefully the instructions on the answer sheet.

**Section C**

Answer any two questions. Write your answers on a separate answer booklet provided.

**Information for candidates**

Any rough working should be done in this question paper.

**At the end of the examination:**

- 1 Fasten the separate answer booklet/papers used securely to the question paper.
- 2 Circle the numbers of the section **C** questions you have answered in the grid shown on this page.

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

Candidate's Use	Examiner's Us
Section A	
Section B	
<b>Section C</b>	<b>1</b>
	2
	3
	<b>Total</b>

**ANSWER GRID FOR SECTION A**

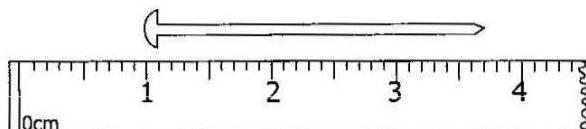
**Put a cross (X) on the letter indicating your choice of answer.**

<b>1</b>	A	B	C	D
<b>2</b>	A	B	C	D
<b>3</b>	A	B	C	D
<b>4</b>	A	B	C	D
<b>5</b>	A	B	C	D
<b>6</b>	A	B	C	D
<b>7</b>	A	B	C	D
<b>8</b>	A	B	C	D
<b>9</b>	A	B	C	D
<b>10</b>	A	B	C	D

<b>11</b>	A	B	C	D
<b>12</b>	A	B	C	D
<b>13</b>	A	B	C	D
<b>14</b>	A	B	C	D
<b>15</b>	A	B	C	D
<b>16</b>	A	B	C	D
<b>17</b>	A	B	C	D
<b>18</b>	A	B	C	D
<b>19</b>	A	B	C	D
<b>20</b>	A	B	C	D

**SECTION A [20 MARKS]****Answer all the questions on the answer grid provided.**

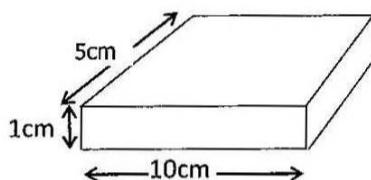
- A1** The diagram below shows part of a ruler used to find the length of a nail



What is the length of the nail?

- A** 2.2cm
- B** 2.7cm
- C** 3.2cm
- D** 3.7cm

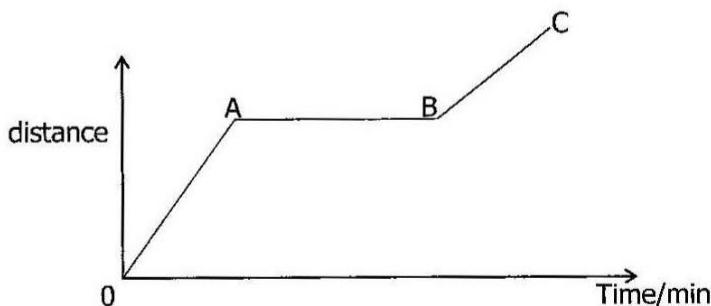
- A2** The diagram below shows a block of wood of density  $0.6 \text{ g/cm}^3$ .



What is the mass of the block?

- A** 30g
- B** 50g
- C** 300g
- D** 500g

- A3** The diagram below shows a graph of how a distance covered by a woman varies with time as she takes a walk from her home to the market.



What was happening in the region AB during the woman's walk? She ...

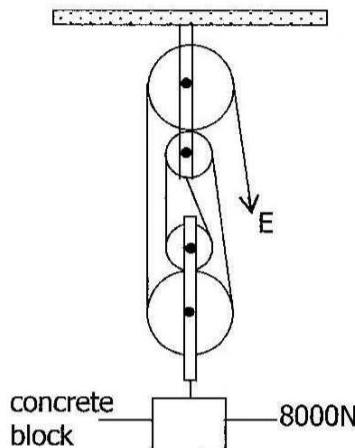
- A** walked with a constant speed.
- B** walked faster than before.
- C** walked slower than before.
- D** stopped walking.

- A4** A parachutist of mass 60kg falls with constant velocity of 5m/s together with a parachute of mass 20kg.

Taking g to be 10N/kg what is the resultant force on the system?

- A** 0N
- B** 400N
- C** 600N
- D** 800N

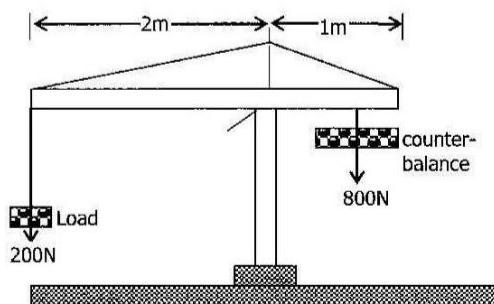
- A5** The diagram below shows a frictionless pulley used to lift an 8000N block of concrete.



What is the minimum effort required to raise the block?

- A** 1600N
- B** 2000N
- C** 3600N
- D** 8000N

- A6** The diagram below shows a model of a crane with a counter balance weighing 200N. This counter balance can be moved further or closer to O to accommodate different loads.



What is the maximum load the crane can safely lift?

- A** 200N
- B** 400N
- C** 600N
- D** 1000N

**A7** A dog running at constant speed of 3m/s increases its speed to 7m/s upon seeing a lion. If the mass of the dog is 20kg, the work it does in achieving the new speed is ...

- A** 40J
- B** 160J
- C** 400J
- D** 580J

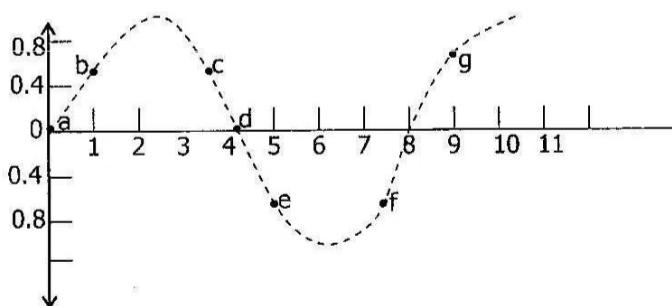
**A8** A thermos flask contains a vacuum. What is the purpose of this vacuum? Prevents ...

- A** conduction and radiation.
- B** conduction and convection.
- C** radiation and convection.
- D** conduction, convection and radiation.

**A9** Molecules of a liquid evaporate from a container and the temperature of the liquid left in the container changes. From which part of the body of the liquid do the molecules escape and what is the effect on the temperature of the liquid left in the container?

	<b>Molecules escape from</b>	<b>Temperature of liquid left in container</b>
<b>A</b>	All parts of the liquid	Decreases
<b>B</b>	All parts of the liquid	Increases
<b>C</b>	Only the liquid surface	Decreases
<b>D</b>	Only the liquid surface	Increases

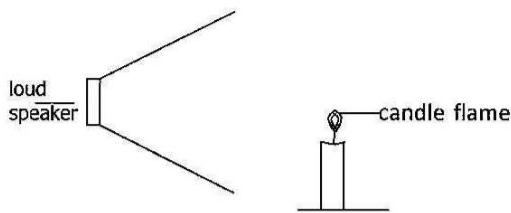
**A10** The diagram below represents a transverse wave.



Between which two marked points is the distance equal to the wavelength of the wave?

- A** a and d
- B** c and g
- C** b and g
- D** e and f

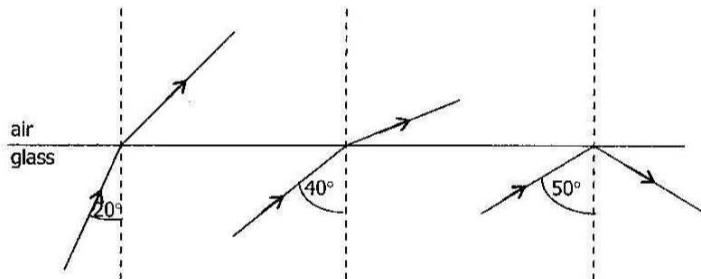
- A11** A lighted candle is placed in front of a loudspeaker that produces a loud, steady sound at regular intervals.



What type of wave is produced by the speaker and in which direction does it cause the flame to tilt?

Type of wave	Direction
<b>A</b> Longitudinal	↑↓
<b>B</b> Transverse	↓↑
<b>C</b> Transverse	↔
<b>D</b> Longitudinal	↔↔

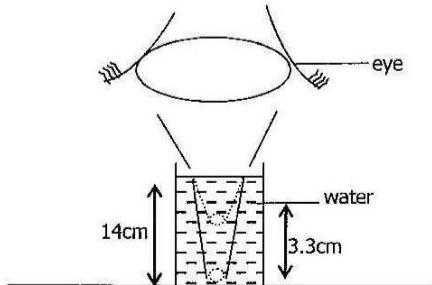
- A12** The diagrams below show three rays of light incident on the boundary between a glass block and air. The angles of incidence are different.



What is the possible critical angle?

- A**  $60^\circ$
- B**  $45^\circ$
- C**  $30^\circ$
- D**  $15^\circ$

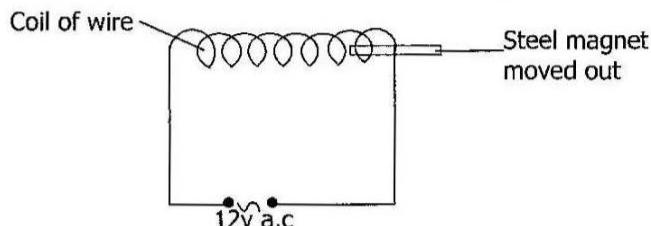
- A13** The diagram below shows an object placed under water and being viewed from the top.



What is the refractive index of water?

- A** 1.31
- B** 1.50
- C** 1.60
- D** 1.60

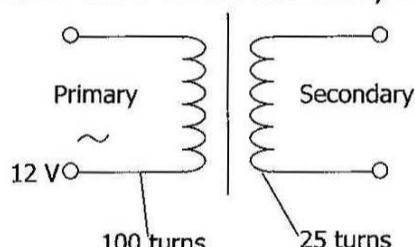
**A14** The diagram below shows a steel magnet being withdrawn from a coil of wire in the direction shown to a point as far away as possible.



What is the effect on the steel magnet, due to this action?

- A** No change
- B** Becomes magnetised
- C** Becomes demagnetised
- D** Becomes a stronger magnet

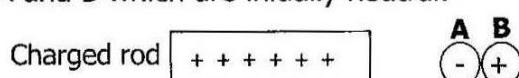
**A15** The diagram below shows an illustration of a transformer with 100 turns on the primary coil and 25 turns on the secondary coil.



What is the voltage induced across the secondary coil?

- A** 3.0V
- B** 4.0V
- C** 48V
- D** 300V

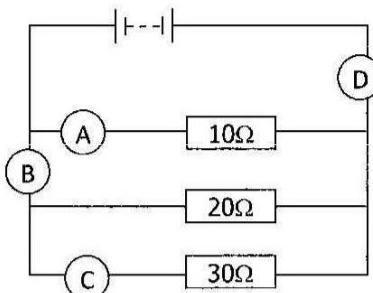
**A16** The diagram below shows a positively charged rod placed close to two metallic spheres A and B which are initially neutral.



Which statement is correct? **A** has ...

- A** lost positive charges to sphere **B**.
- B** gained electrons from sphere **B**.
- C** has gained electrons from the charged rod.
- D** has lost positive charges to the charged rod.

- A17** The diagram below shows a circuit with four ammeters connected at different positions and three resistors of different values. Which of the four ammeters labelled **A**, **B**, **C** or **D** would show the largest reading.



- A18** A Secretary in a Manager's office uses the following appliances with respective power ratings.

- 1 Electric kettle – 1200W
- 2 Printer – 600W
- 3 Computer – 100W

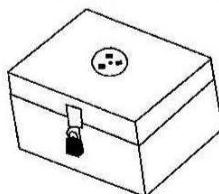
Given that the cost of electricity is K0.80/kwh, calculate the cost of operating all the three appliances at once for 12 hours.

- A** K 5.60
- B** K 8.00
- C** K 16.30
- D** K 18.24

- A19** Which of the following is correct about the purpose of X-plates and Y-plates in a Cathode Ray Oscilloscope?

- A** Deflecting the electron beam vertically
- B** Deflecting the electron beam horizontally
- C** Deflecting the electron beam vertically and horizontally
- D** Increasing the speed of the electron beam towards the screen.

- A20** The diagram below shows a box used for storing radioactive sources.



Which material is best for lining the box to prevent the escape of most radioactive emissions?

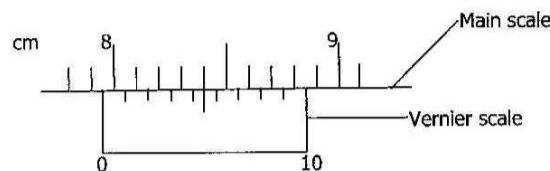
- A** Lead
- B** Steel
- C** Copper
- D** Aluminium

**Section B [45 marks]**

Answer **all** questions in this section.

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

- B1** **Figure B1.1** shows part of a Vernier Calipers.



**Figure B1.1**

- (a)** What is the reading of the Vernier Calipers?

Reading: ..... [2]

- (b)** Write in words the SI units of the following physical quantities and state their symbols.

**SI Unit in words**

**SI unit symbol**

**(i)** Velocity: ..... [1]

**(ii)** Temperature: ..... [1]

**(iii)** Acceleration: ..... [1]

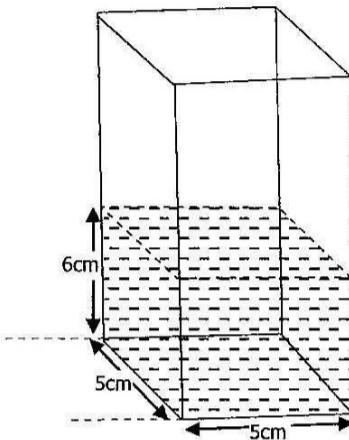
**[Total: 5 marks]**

- B2 (a)** What is the difference between density and relative density?

.....

..... [1]

- (b)** **Figure B2.1** shows a cuboid container that has a 5cm square base and contains water to a height of 6cm.



**Figure B2.1**

- (i)** What is the volume of the water?

Volume: .....

- (ii)** A stone is immersed into the water in the cuboid causing the water to rise to a height of 8cm. Determine the volume of the stone.

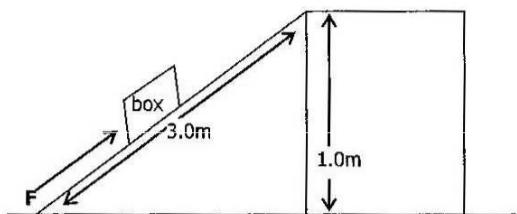
Volume: ..... [2]

- (c)** If the mass of the stone is 80g, calculate the density of the stone.

Density: ..... [2]

**[Total: 5 marks]**

- B3** *Figure B3.1* shows a ramp being used to lift a box weighing 480N through a distance of 3 metres and a height of 1 metre by applying a force  $F$  of 200N.



**Figure B3.1**

- (a)** State the meaning of the term 'Simple Machine.'

.....

..... [1]

- (b)** Calculate the mechanical advantage of the ramp shown in *figure B3.1*.

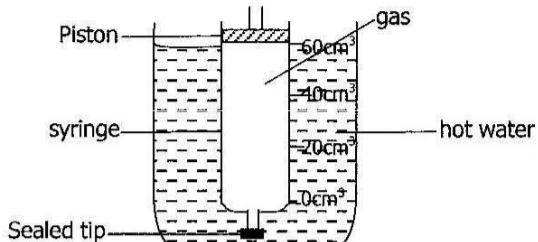
M.A: ..... [2]

- (c)** Calculate the efficiency of the ramp.

Efficiency: ..... [2]

**[Total: 5 marks]**

- B4** **Figure B4.1** shows a glass syringe with a sealed tip containing a gas at an initial pressure of 360Pa placed in hot water. After a few minutes the piston in the syringe moved up.



**Figure B4.1**

- (a)** Using the kinetic theory explain why the piston in the syringe moved upwards when the syringe was placed in hot water.

..... [1]

- (b)** The piston was pushed downwards to 20cm<sup>3</sup> while the temperature was kept constant.

- (i)** In terms of the kinetic theory explain why the pressure of the gas in the syringe increases.

..... [2]

- (ii)** Calculate the pressure of gas in the syringe.

Pressure: ..... [2]

**[Total: 5 marks]**

- B5** *Figure B5.1* shows various **Regions** of the Electromagnetic Spectrum.

K	L	M	Visible light	Ultra violet	N	O
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**Figure B5.1**

- (a) What is the name of component **N**?

.....

..... [1]

- (b) Give **one** practical use of Region **M**.

.....

..... [1]

- (c) State **one** property which is the same for all Electromagnetic Waves.

.....

..... [1]

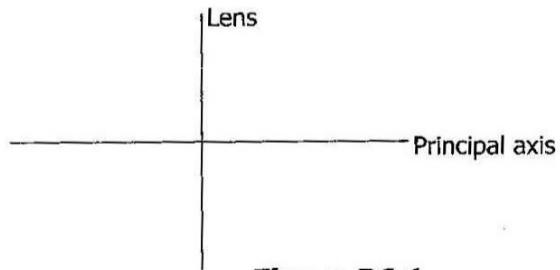
- (d) State **one** possible source of the radiation from Region **O**.

.....

..... [1]

**[Total: 4 marks]**

- B6** *Figure B6.1* shows a converging lens of focal length 2.0cm used to produce an image of an object 2.0cm tall placed 5cm from the lens .

**Figure B6.1**

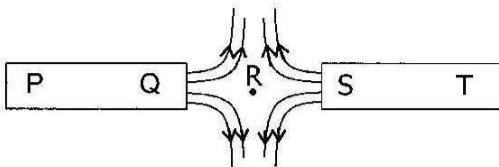
Using the information given above,

- (i) Draw to scale on *figure B6.1*, a ray diagram to locate the image formed. [3]
- (ii) Calculate the magnification of the image formed.

Magnification = ..... [2]

**[Total: 5 marks]**

**B7** **Figure B7.1** shows magnetic field lines between the poles of two magnets.



**Figure B7.1**

- (a)** Name point **R**.

.....

..... [1]

- (b)** If **P** is a south pole what are the poles **Q** and **T**?

**Q:** ..... [1]

**T:** ..... [1]

- (c)** Explain how soft iron keepers help magnets retain their magnetism for a longer period of time.

.....

..... [1]

- (d)** State **two** differences between iron and steel as magnetic materials.

**1** .....

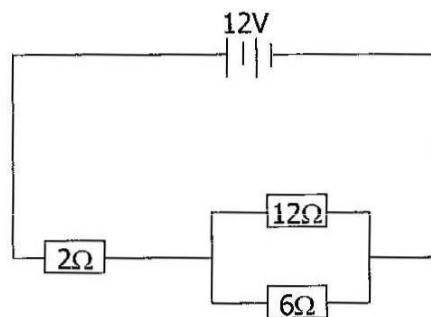
..... [1]

**2** .....

..... [1]

**[Total: 6 marks]**

**B8** *Figure B8.1* shows three resistors connected to a 12V battery.



**Figure B8.1**

Calculate:

- (a) the effective resistance between X and Y.

Resistance = ..... [2]

- (b) the current flowing in the battery.

Current = ..... [2]

- (c) the current flowing through the 6Ω resistor.

Current = ..... [2]

**[Total: 6 marks]**

**B9** Polonium -210( $^{210}_{84}\text{Po}$ ) can undergo radioactive decay by emitting an alpha particle to form lead (Pb).

- (a) What is an alpha particle?

.....

[1]

- (b) Write the equation for the radioactive decay of polonium – 210.

.....

[2]

- (c) State **one** use of alpha radiation.

.....

[1]

**[Total: 4 marks]**

### **Section C [20 marks]**

Answer any **two (2)** questions from this section in the Answer Booklet provided.

**C1** An automobile of mass 2000kg started from rest position and increased its speed uniformly to 9m/s in 30s. It maintained this speed for another 500s.

- (a) Sketch the speed time graph of the automobile for the journey described.

[3]

- (b) Calculate the uniform acceleration of the automobile.

[2]

- (c) How much force was required to produce this acceleration?

[1]

- (d) Calculate the distance covered by the automobile when it was moving at constant speed.

[2]

- (e) What was the average speed of the automobile for the journey described?

[2]

**[Total: 10 marks]**

- C2** **Table C2.1** shows a table with corresponding values of potential difference across a torch bulb and the current flowing through the same torch bulb.

Pd/Volts	0.20	1.00	5.00	10.00	16.00	23.00	31.00	40.00
Current/Ampères	0.40	0.80	1.20	1.60	2.00	2.40	2.80	3.20

**Table C2.1**

- (a) Using correct circuit symbols, draw a clearly labelled diagram of a circuit which could have been used to obtain this data. [2]
- (b) On the graph paper provided, and using the data in the figure above, plot a graph of the current on the X-axis and the p.d. on the Y-axis. [3]
- (c) From the graph state whether or not the filament of the torch bulb is an ohmic conductor. Explain your answer. [2]
- (d)
  - (i) Use the graph you have drawn to determine the value of the p.d across the torch bulb when the current flowing through it is 2.6A. [1]
  - (ii) Calculate the resistance of the torch bulb when the current through it is 2.6A [2]

**[Total: 10 marks]**

- C3** A radioactive element  $^{223}_{98}X$  emits one Beta particle followed by 2 Beta particles.

- (a) What is a Beta particle? [1]
- (b) Write the nucleon number and proton number of the remaining nuclide after the two emissions. [2]
- (c) A 400g radioactive sample has a half life of 4 years.
  - (i) On a graph paper plot a graph to show this decay curve after the period of 32 years. [5]
  - (ii) What period of time would it take for the sample to reduce to 40g? [1]
  - (iii) Name a source of gamma radiation. [1]

**[Total: 10 marks]**