Candidate Name _____

Centre Number	Candidate Number

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Physics 5054/2

Paper 2

Monday **31 JULY 2017**

Additional Information:

Graph paper
Electronic calculator/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.

Candidate's Use	Examiner's Use
Section A	
Section B 9	
10	
11	
12	
Total	

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 more marks are awarded for correct working than for correct answers.

Cell phones and laptops/tablets are not allowed in the examination room.

This question paper consists of 12 printed pages

Section A [50 marks]

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

1 A learner carried out an experiment to determine the density of ethanol and obtained the following results. The learner used a bottle of known volume.

Mass of empty glass bottle = 242g

Mass of bottle filled with water = 992g

Mass of bottle filled with ethanol = 857g

(a) **(i)** What mass of water was used to fill the bottle?

.....

.....

..... [1]

(ii) What mass of ethanol was used to fill the bottle?

.....

.....

..... [1]

(b) Calculate the relative density of the ethanol.

.....

.....

.....

.....

..... [2]

(c) If the density of water, under the conditions of the experiment was $1g/cm^3$, calculate;

(i) the density of ethanol

.....

.....

.....

..... [1]

(ii) capacity of the bottle

.....

.....

.....

..... [2]

[Total: 7 marks]

2 **Figure 2.1** shows a van of mass 2500kg moving from level **A** to level **B**. Running at a velocity of 20m/s, the van reached point **B** in 5 seconds. The distance between **A** and **B** is 25m.

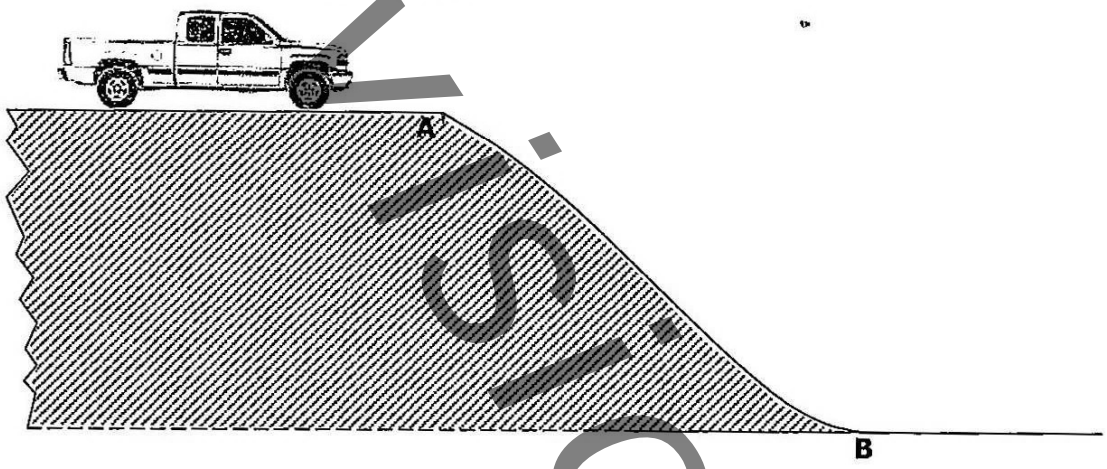

Figure 2.1

(a) Calculate the work done by gravitational force to bring the van to the lowest level **B**. (Take g = 10N/kg)

.....

.....

.....

..... [2]

(b) How high was the car on level **A** of the road?

.....

.....

.....

..... [2]

(c) Before reaching point **B**, the van briefly stopped halfway between points **A** and **B**. What is the value of the frictional force which made the van stop half way downhill?

.....

.....

.....

..... [2]

(d) Calculate the acceleration of the van downhill.

.....

..... [2]

[Total: 8 marks]

3 **Figure 3.0.** below shows a 30kg crate being dragged up a ramp of length 20m using a 150N force. The height of the ramp is 5m.

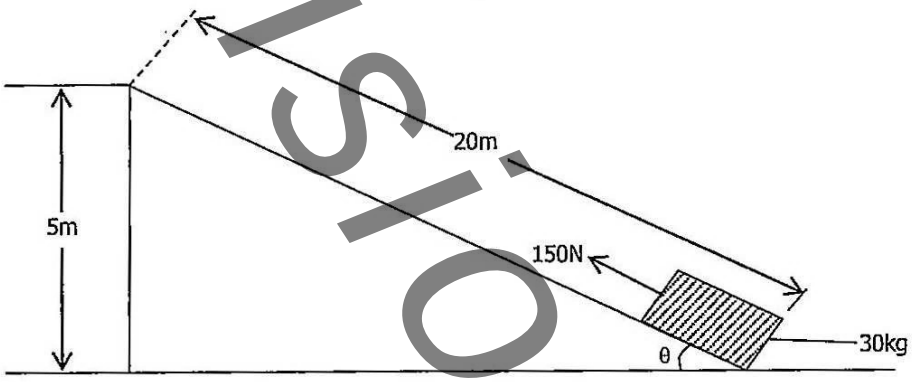

Figure 3.0

(a) Calculate;

(i) the velocity ratio of the system

.....

.....

.....

..... [1]

(ii) the mechanical advantage of the system

.....

.....

.....

..... [1]

(b) Find the work done against gravity

.....

.....

..... [1]

(c) What is the efficiency of the ramp?

.....

.....

.....

.....

..... [2]

(d) Calculate the angle of inclination θ

.....

.....

.....

.....

..... [2]

[Total: 7 marks]

4 A learner sees a flash of lightning in a distance and hears the thunder clap 4 seconds later.

(a) Which one is produced first, the lightning flash or the thunder clap?

..... [1]

(b) If the speed of sound is 320m/s, how far away was the storm from where the learner was?

.....

.....

.....

..... [2]

(c) After the storm was over, a rainbow was seen in the sky. Name the **two** outer most colours in the rainbow.

..... [1]

(d) Orange light has a wavelength of 0.6 micrometers (0.6μm). Calculate the frequency of orange light. (Taking $1\mu m = 1 \times 10^{-7}m$)

.....

.....

.....

..... [2]

[Total: 6 marks]

5 **Figure 5.1** shows the arrangement of a suspended light ball coated with conducting paint. The ball is suspended using an insulating thread.

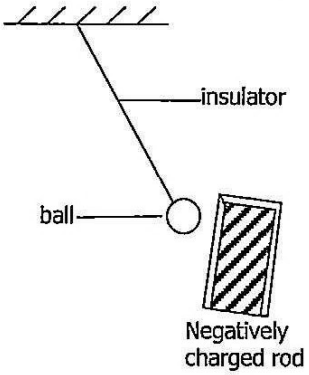

Figure 5.1

(a) **(i)** Explain why in **Figure 5.1**, the ball is displaced from the vertical position.

.....

.....

..... [2]

(ii) What happens if the ball is allowed to touch the rod? Explain.

.....

.....

..... [2]

(b) **Figure 5.2** below shows balloons with charges.

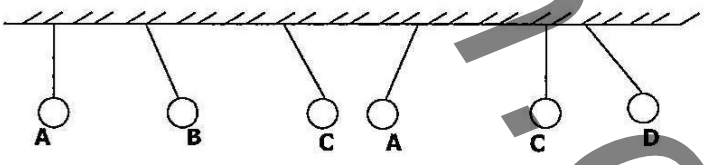

Figure 5.2

What are the charges on balloons **A** and **C** if balloon **D** is positively charged?

.....

.....

..... [1]

[Total: 5 marks]

6 **Figure 6.1** shows a 60V battery connected to five resistors as shown below.

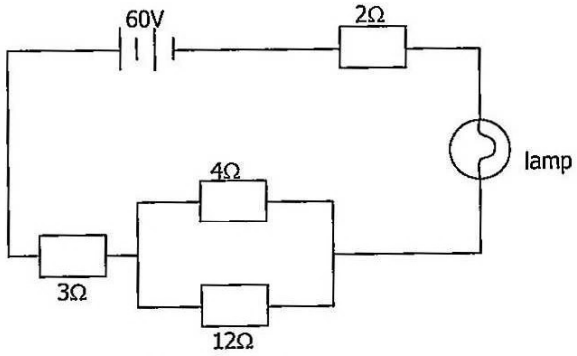

Figure 6.1

(a) What is the total resistance in the circuit?

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.....

..... [2]

(b) What is the charge passing through the lamp in 4 seconds?

.....

.....

.....

..... [2]

(c) Calculate the current passing through the 12Ω resistor?

.....

.....

.....

..... [1]

(d) Calculate the power of the battery.

.....

.....

.....

..... [1]

[Total: 6 marks]

7 **Figure 7.1** shows a stream of beta particles entering the space between a North and South Pole of a very strong magnet.

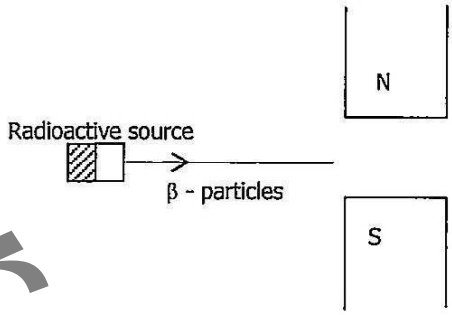

Figure 7.1

(a) State and explain the behaviour of the beta particles as they pass in the space between the two poles of the magnet.

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.....

.....

.....

.....

..... [3]

(b) State the difference in behaviour if the radiation had been alpha particles or gamma rays.

Alpha .....

.....

Gamma .....

..... [2]

[Total: 5 marks]

8 **Figure 8.1** below shows a garden pond containing a small fountain.

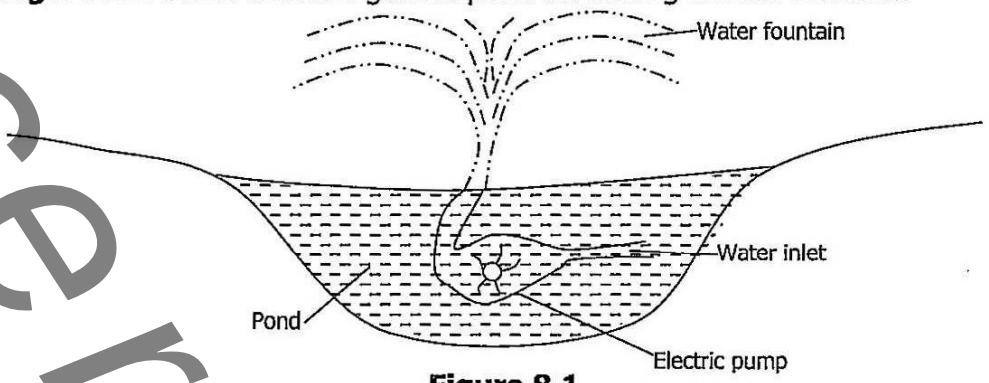

Figure 8.1

(a) The pressure of the water increases with depth.

(i) Explain the meaning of pressure.

.....

.....

..... [1]

(ii) Explain why the pressure below the water surface increases with depth.

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.....

..... [2]

(b) Describe energy changes that occur within the pump.

.....

.....

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.....

..... [3]

[Total: 6 marks]

Section B [30 marks]

Answer any three questions

Each question carries 10 marks

9 **Figure 9.1. shows** a thermocouple being used to measure the temperature at a point on a hot plate.

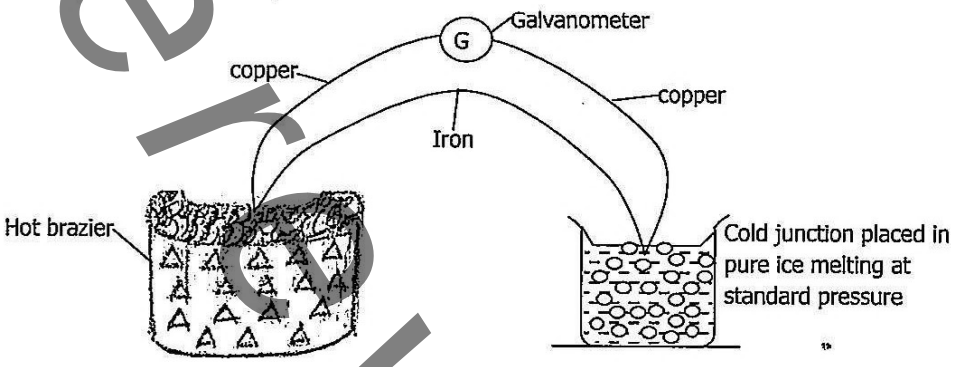

Figure 9.1

(a) Explain how a thermocouple is used to measure temperature and why it is capable of measuring very high temperatures. [3]

(b) A thermocouple is used to measure the temperature of a Bunsen burner flame. Its readings are found at six different temperatures of the hot junction. The results are recorded in the table below.

Current in mA	0	2.9	4.8	8.2	10.8	14.4
Temperature in °C	0	120	200	340	450	602

(i) Plot a graph of current in mA against temperature in °C. [3]

(ii) From the graph, find;

1 the current value for a temperature of 300°C. [1]

2 the temperature which corresponds to a current of 12mA. [1]

(iii) A thermocouple is more sensitive than a liquid-in-glass thermometer. Explain what this statement means. [2]

[Total: 10 marks]

10 **(a)** Define a semi conductor. [2]

(b) Explain the difference between an 'npn' transistor and a 'pnp' transistor. [2]

(c) With the aid of a labelled diagram, briefly describe how a transistor can be used as a switch. [6]

[Total: 10 marks]

11 **Figure 11.1** below shows a d.c motor. The arrow shows the direction of rotation of the coil.

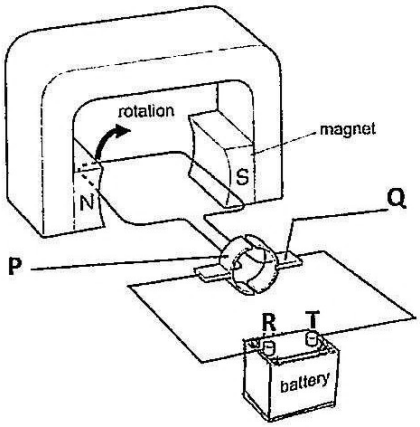

Figure 11.1

(a) Name the parts labelled **P** and **Q**. [2]

(b) Which one, **R** or **T**, is the positive terminal of the battery? [1]

(c) Describe how an electric motor works. [3]

(d) State **two** ways in which the coil in the electric motor can be made to rotate slower. [2]

(e) State **two** changes which can be made to the construction of the d.c motor in order to make it run as an a.c generator. [2]

[Total: 10 marks]

12 **Figure 12.1** represents air molecules in the sound wave at one instant.

Figure 12.1

(a) State one difference between the motion of a molecule **A** and the motion of molecule **B**. [1]

(b) Describe an experiment that shows that a medium is needed to transmit sound waves. Draw a labelled diagram of the apparatus. [4]

(c) A short pulse of sound waves produces an echo from a wall 20m away. The echo arrives back at the source of the sound 0.12s after the pulse was produced.

(i) Calculate the speed of sound. [2]

(ii) Calculate the frequency of the sound. [3]

[Total: 10 marks]