Centre Number	Candidate Number

Candidate Name _____

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.

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.

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

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.
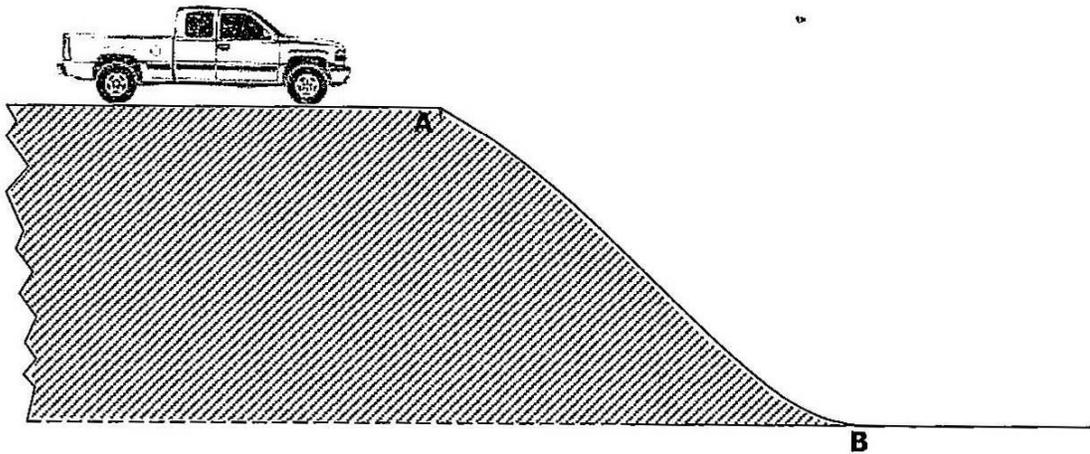

Figure 2.1

(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.
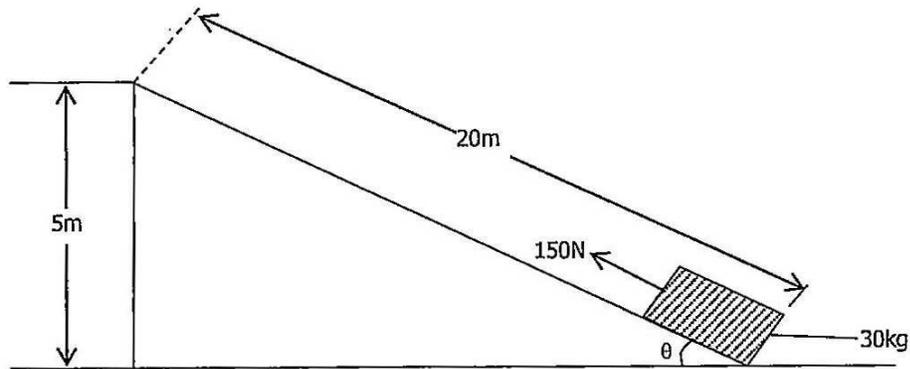

Figure 3.0

(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]

[Turn over

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 ($0.6\mu m$).
      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.
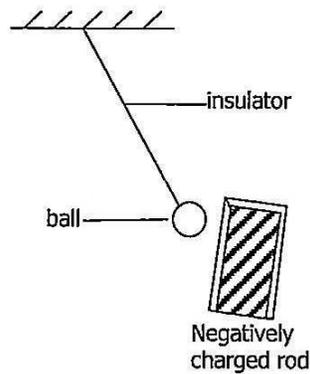

Figure 5.1

(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.
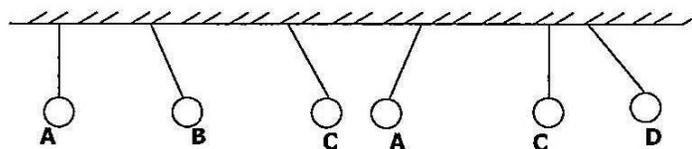
Figure 5.2

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

....

....

....   [1]

[Total: 5 marks]

Physics/5054/2/2017   **[Turn over**

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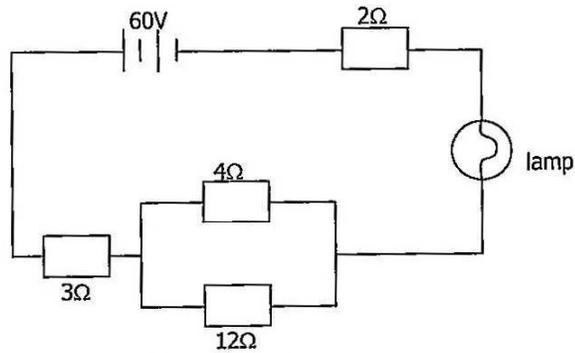
Figure 6.1

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

....

....

.... [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.
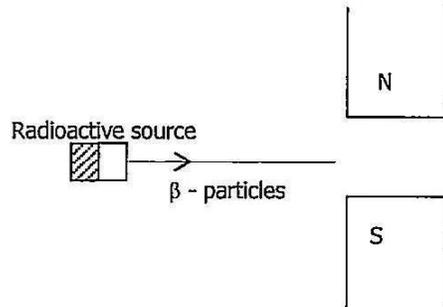

Figure 7.1

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

....

....

....

....

....

.... [3]

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

Alpha ....

....

Gamma ....

.... [2]

[Total: 5 marks]

[Turn over

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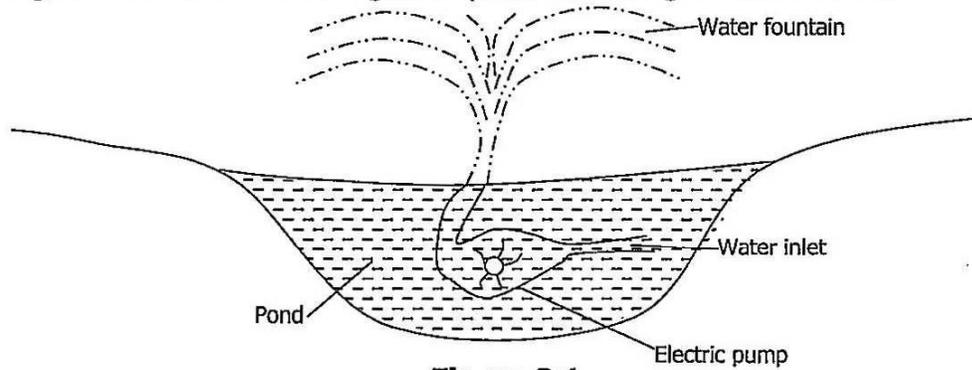
Figure 8.1

(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.

....

....

.... [2]

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

....

....

....

....

.... [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.
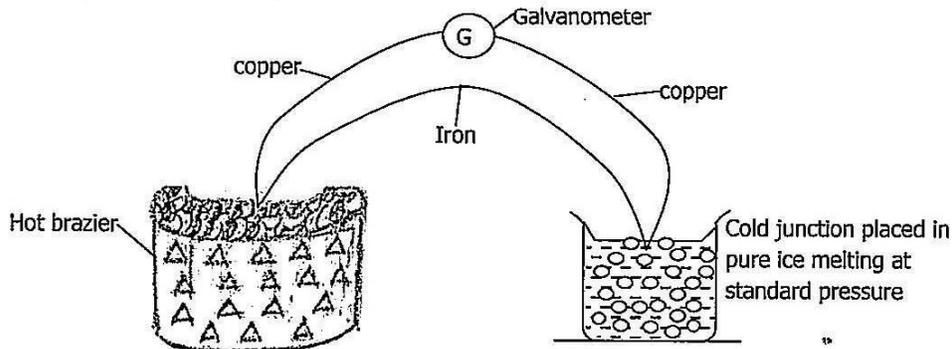
Figure 9.1

(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]

[Turn over

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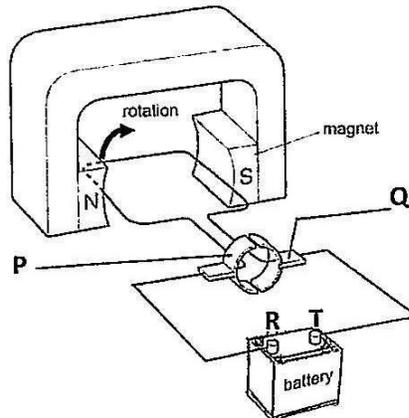

Figure 11.1

(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]

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