Candidate Name_____

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Physics

5054/2

Paper 2

Monday   **25 JULY 2016**

Additional materials:

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

Time: 2 hours

Instructions to Candidates

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.

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 on the separate Answer Booklet provided.

At the end of the examination:

1   fasten separate Answer Booklets used securely to the question paper,

2   tick the numbers of the Section **B** questions you have answered in the grid below.

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.

Tick 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.

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

Cell phones are not allowed in the examination room.

SECTION A
[50 marks]

Answer **all** the questions.

1 **(a)** Complete the table below to show what property is measured by each of the instruments listed.

Instrument	Property Measured	Unit
Ammeter		
Spring balance		
Micrometer		

[3]

(b) State one precaution that should be observed when using a micrometer screw gauge.

....

....

....

.... [1]

Total [4]

2 **(a)** A balloon is filled with 0.008m³ of air. Without the air the balloon has a mass of 0.02kg, but when filed with air the mass increases to 0.03kg.

(i) Define mass

....

.... [1]

(ii) Define density

....

....

.... [1]

(iii) Find the mass of the air in the balloon.

....

....

.... [1]

(iv) Calculate the density of the air in the balloon.

....

....

.... [2]

(b) A block of metal has a density of 2700 kg/m³ and occupies a volume of 0.1m³. Find the weight of the metal block.

....

....

....

....

.... [4]

Total [9]

3   A car accelerates uniformly from rest for 20 seconds with an acceleration of $1.5m/s^2$. It then travels at a constant speed for 2 minutes before slowing down with a uniform deceleration to come to rest in a further 10 seconds.

(a)   Determine the car's maximum speed.

....

....

.... [1]

(b)   Sketch a velocity-time graph of the motion in the space below.

[3]

(c)   What is the total distance travelled by the car in the time described?

....

....

.... [2]

Total [6]

4   **Figure 4.1** below shows a child's toy car of mass 40g positioned at **A**, at the top of a roller coaster truck.
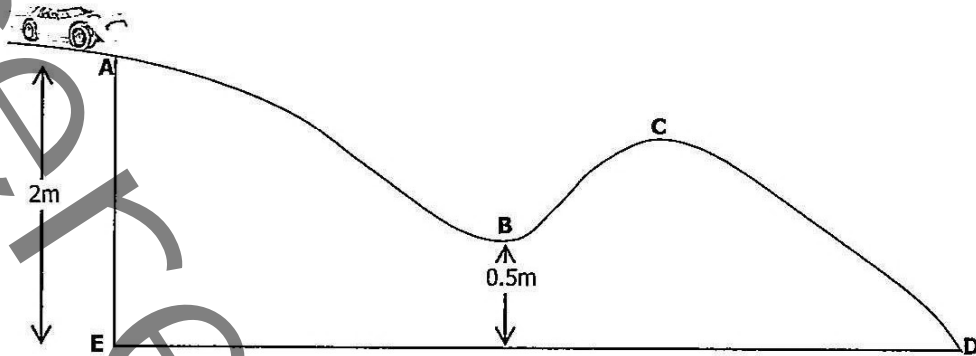

Figure 4.1

Assume that all forces due to friction and air resistance may be ignored and take **g** as 10N/kg.

(a)   Calculate the loss of potential energy of the toy car as it moves from **A** to **D**.

....

....

....   [2]

(b)   Calculate the speed of the toy car at **B**.

....

....

....   [2]

(c)   How does the total energy of the toy car at **B** compare with that at **C**?

....

....   [1]

(d)   How does the speed of the toy car at **D** compare with the speed it would have if it had fallen vertically to **E**?

....

....   [1]

Total [6]

5 An iron nail with a point of area 0.5mm² is pushed against a wall with a force of 100N.

(a) Define pressure and state its relationship with force.

....

....

....

.... [2]

(b) Calculate the pressure exerted on the wall at the sharp point of the nail.

....

....

....

.... [3]

Total [5]

6 The electromagnetic spectrum accommodates all the electromagnetic waves. *Figure 6.1* below represents the electromagnetic spectrum.

1	x-rays	2	3	Infra-red	4	T.V and Radio waves

Figure 6.1

(a) Name the radiations

(i) 1:...

(ii) 2:...

(iii) 3:...

(iv) 4:... [4]

(b) State the two properties common only to electromagnetic waves and not any other transverse waves.

....

....

.... [2]

(c) What is the source of the television waves?

....

.... [1]

Total [7]

7   *Figure 7.1* shows a cross section of a cathode-ray oscilloscope.
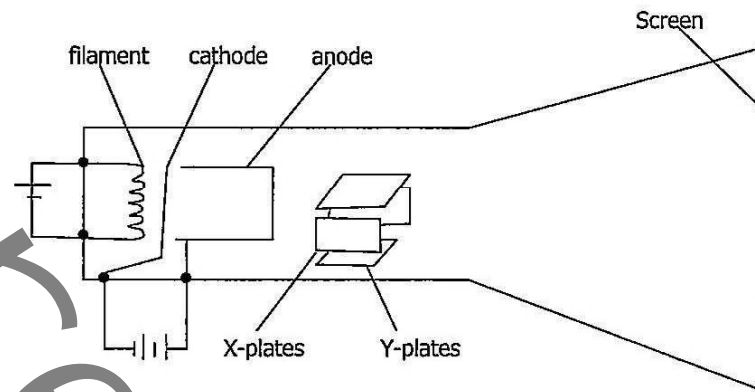
Figure 7.1

(a)   Explain how the electrons are emitted from the cathode.

....

....

.... [2]

(b)   What term is used to describe the process in (a) above?

.... [1]

(c)   Explain why the electrons move towards the anode.

....

.... [2]

(d)   When a voltage of 120V is applied across the Y-plates the electron beam is deflected by 9mm on the screen. Estimate the deflection of the electron beam when the voltage across the Y-plates is 230V. Express your answer to 2 significant figures.

....

....

.... [2]

Total [7]

[Turnover

8 **(a)** If a polythene rod is rubbed with fur, the rod becomes negatively charged. Explain how the net negative charge is acquired by the polythene rod.

....

....

.... [2]

(b) One method of painting a car uses electrostatics. A paint spray produces paint particles which are given a positive charge. The car body is given a negative charge, as shown in **figure 8.1**.
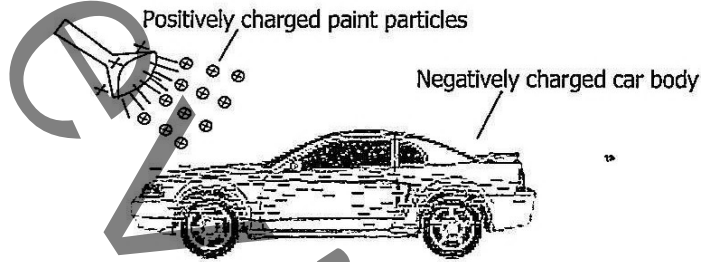
Figure 8.1

Explain why it is important to give

(i) all of the paint particles a positive charge.

....

.... [2]

(ii) the car body a negative charge

....

....

.... [2]

Total [6]

SECTION B

(45 marks)

There are **four (4)** questions in this section.

Answer any **three (3)** questions.

Each question carries 15 marks.

9   You are given a small electric heater in a cup containing 350g of water as shown in **Figure 9.1**. The heater is connected to a 12V supply and the current through the heating element is 4.2A.
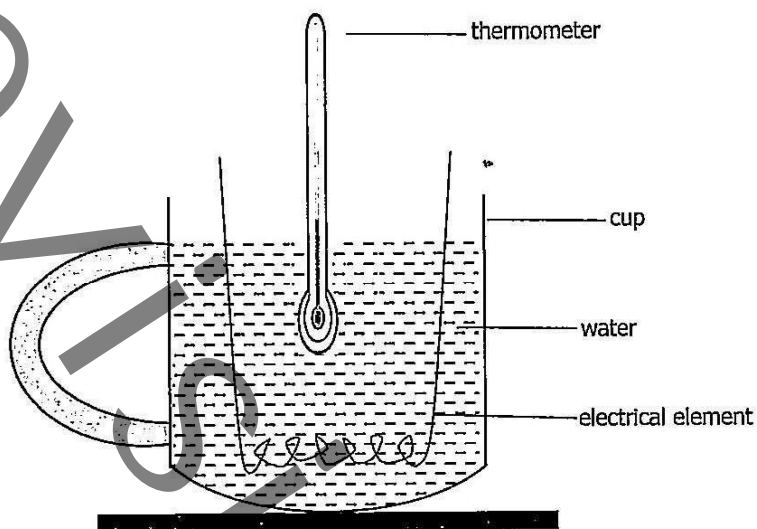
Figure 9.1

(a)   Copy Figure 9.1 onto your answer sheet and draw the electrical circuit that you will use. Include ammeter, voltmeter and power supply.   [4]

(b)   Given that the water was heated for 8 minutes in which time the temperature rose from 20°C to 35°C, (Heat capacity for water is 4200J/kg°C)

   (i)   Calculate the electrical power input to the heater.   [2]

   (ii)   Calculate the energy input to the heater giving your answer in kwh.[2]

   (iii)   Calculate the heat gained by the water.   [3]

   (iv)   Explain why the heat gained by the water is different from that supplied by the heater.   [2]

(c)   It is noticed that when heating, some of the water evaporates from the cup. Therefore, describe, using your knowledge about molecules of water, what happens during evaporation.   [2]

Total [15]

[Turnover

10 **(a)** Describe an experiment which you can carry out to determine the speed of sound in air around your school.

In your description, you should mention all the apparatus you will use, clearly state the measurements you would take and how these measured values can be used to calculate an accurate value of the speed of sound in air. [8]

(b) A boy stands 80m in front of a tall cliff and produces sound by clapping two planks together. A girl standing next to him times the return of the echo at 0.5s.

How fast do the sound waves travel in this place? If the wavelength of the sound waves is 2m, what is the frequency with which the boy claps the planks together? [4]

(c) Sound waves are longitudinal. What is meant by longitudinal waves?
How can you show that sound waves are only produced by vibrating bodies? [3]

Total [15]

11 In an experiment to verify Ohm's law for a conductor made from constantan wire, the following results were obtained at 25°C.

Voltage in volts	0	1.5	3.0	4.5	6.0	7.5	9.0
Current in amperes	0	0.2	0.4	0.6	0.8	1.0	1.2

(a) Draw a circuit diagram for the experimental set up used to obtain the results shown in the table above. [4]

(b) **(i)** Plot a graph of voltage against current. [4]

(ii) Calculate the gradient of the graph. In what units is the gradient of the graph? [3]

(iii) Does constantan conductor obey Ohm's law? Explain your answer. [2]

(c) What is the effect on the resistance of a conductor when the

(i) length is increased?

(ii) temperature is raised? [2]

Total [15]

12 **(a)** Name three main types of nuclear radiation and state the nature of each. [3]

(b) For one of the three main types of nuclear radiation, state any two properties. [2]

(c) **(i)** What are radioactive isotopes?

(ii) State any one important application of a named radioactive isotopes. [2]

(d) Sodium-24 $\left(^{24}_{11}Na\right)$ undergoes beta decay with a half-life of 30 hours.
What is meant by the term half-life?
Write down the nuclear equation to show the decay of sodium-24. (The daughter nuclide formed in the decay is an isotope of magnesium, Mg) [3]

(e) State the number of protons, neutrons and electrons in one atom of sodium-24. [3]

(f) If 8g of sodium-24 sample is available at a certain instant, calculate how long it would take for the sample to decay to one-eighth of the original mass. [2]

Total [15]