EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate
and General Certificate of Education Ordinary Level

SCIENCE

PAPER 2

(Physics)

Wednesday 16 October 2013

Additional materials:
Mathematical tables/electronic calculator
Graph paper
Answer Booklet

Time: 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

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

There are twelve (12) questions in this paper.

Section A

Answer all the questions.

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

Section B

Answer any two questions.

Write your answers on the Answer Booklet provided.

At the end of the examination
1. Fasten Answer Booklet used securely to the question paper.
2. Enter the numbers of the Section B questions you have answered in the grid shown.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

Cell phones are not allowed in the Examination room.

This question paper consists of 10 printed pages.
1 A car of mass 1400kg starts from rest and moves along a straight road with a constant acceleration to reach a speed of 10m/s in 6 seconds.

(a) On the axes below, draw a graph of speed against time for the first 6 seconds of the motion.

(b) For the motion of the car in the first 6 seconds, calculate the

(i) distance travelled by the car

Distance = ________________ [1]

(ii) acceleration of the car

Acceleration = ________________ [1]

(iii) resultant force acting on the car.

Resultant force = ________________ [1]

[Total: 4]
2. (a) State one difference between mass and weight.


[1]

(b) What two factors will make an object stable?

(i) 

(ii) 

[2]

(c) A mass of an object is 50kg on earth, what will be its mass on the moon?

Mass on the moon = 

[1]

[Total: 4]
3  (a) Briefly describe how the mass of a liquid can be determined. Show how the final result can be calculated.

(b) An empty relative density bottle has a mass of 35g. When filled with water, its mass becomes 85g.

Calculate the
(i) mass of water

Mass of water = ______________________ [1]

(ii) volume of the bottle (take the density of water to be 1g/cm³)

Volume of bottle = ______________________ [2]

[Total: 6]
4 Figure 4.1 below shows a door well secured on the door frame.

![Diagram of a door with dimensions labeled: 0.5m, 0.25m, and 0.75m]

Figure 4.1

(a) What is meant by moment of force? Include its SI unit?

(b) Calculate the moment of force if a force of 10N is applied at point 1 to open or close the door.

Moment of force = 

(c) Explain why it is easier to open or close the door if the handle is fixed at point 1 than at point 2 or 3.

[Total: 6]
5 Figure 5.1 below shows a simple bottle opener made by fixing two screws into a piece of wood.

![Figure 5.1]

(a) What is meant by a simple machine?

(b) Which of the points X, Y or Z is:
   (i) the pivot
   (ii) the effort

(c) Is the force applied at X less or greater than the force applied at Z?

(d) State one modification that should be made on the design of the bottle opener so that less effort is used to open the bottle.

[Total: 5]
Figure 6.1 below shows how the temperature of some liquid in a beaker changed as it was heated until it boiled.

![Graph showing temperature change over time](image)

Figure 6.1

(a) What was the boiling point of the liquid?

Boiling point = 

(b) State and explain what difference, if any, there would be in the final temperature if the liquid was heated more strongly.

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(c) State two differences between boiling and evaporation.

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[Total: 5]
7 Figure 7.1 below shows an incomplete ray diagram.

![Ray Diagram](image)

**Figure 7.1**

(a) Complete the ray diagram above to show the position of the image. [3]

(b) Give two characteristics of the image formed.

(i) ________________________________

(ii) ________________________________ [2]

[Total: 5]

8 Study the circuit diagram in Figure 8.1 below.

![Circuit Diagram](image)

**Figure 8.1**

(a) Calculate the current through the battery.

\[
\text{Current} = \text{____________________________} \quad [2]
\]
(b) (i) How long would it take a charge of 2.0C to flow through the battery?

\[ \text{Time} = \text{________________________} \quad [2] \]

(ii) How much energy would be used in moving this charge round the circuit?

\[ \text{Energy} = \text{________________________} \quad [2] \]

[Total: 6]

9 (a) For one neutral atom of lead \[ ^{214}_{82} \text{Pb} \], state the number of;

(i) Neutrons \[ \text{________________________} \quad [1] \]

(ii) Electrons \[ \text{________________________} \quad [1] \]

(b) Lead nucleus can undergo decay by the emission of beta particle to produce a bismuth (Bi) nucleus. Complete the equation below to represent the decay of the lead nucleus.

\[ ^{214}_{82} \text{Pb} \rightarrow \text{Bi} + \text{________________________} \quad [2] \]

[Total: 4]
Section B
[20 marks]

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

10  (a) Describe an experiment to show that a blackened metal surface is a better absorber of infrared radiation than a polished metal surface at the same temperature. [5]

(b) An electric light bulb quickly reaches a constant high temperature when switched on. Explain how heat is lost from the bulb and also why the temperature of the bulb becomes constant. [5]

[Total: 10]

11  (a) Describe an experiment to determine the upper fixed point of a liquid – in glass thermometer. [4]

(b) (i) The volume of a gas at a temperature of -73°C and a pressure of 380 mm Hg is 1 000 cm³. Find the volume of the same gas at a pressure 760 mm Hg and temperature of 127°C. [2]

(ii) State two advantages of mercury over alcohol as thermometric liquids. [2]

(c) Give two advantages of a thermocouple thermometer over liquid in glass thermometers. [2]

[Total: 10]

12  A detector of nuclear radiation was set up to measure the decay of a radioactive substance. Figure 12.1 below shows the results of the experiment.

![Graph showing count rate per second over time (hours)]

**Figure 12.1**

(a) (i) What is the half-life of the substance? [1]

(ii) Clearly explain how you obtained your answer to (a) (i) above. [2]

(b) List any three properties of a beta-particle. [3]

(c) Describe how you would show that the radioactive source is emitting only beta-particles. [4]

[Total: 10]
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