Centre Number	Candidate Number

Candidate Name _____

EXAMINATIONS COUNCIL OF ZAMBIA

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

SCIENCE 5124/2

PAPER 2 (PHYSICS)

Wednesday **2 NOVEMBER 2011** **1 hour 15 minutes**

Additional materials:
Mathematical tables
Graph paper
Writing paper

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 paper 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 below.

Candidate's use	Examiner's use
Section A	
Section B	
Total	

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 9 printed pages.

Section A

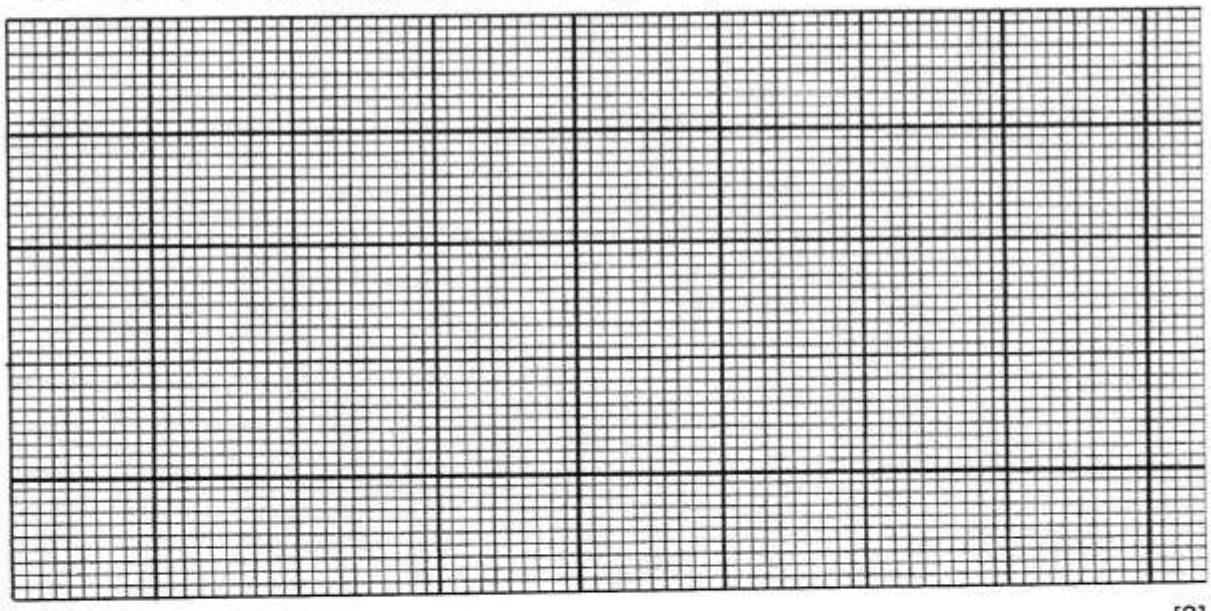
[45 marks]

Answer all questions.

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

1 A cyclist accelerates uniformly from rest to a velocity of 10m/s in 3s. He then moves with a constant velocity of 10m/s for 6s, before decelerating uniformly to rest in a further 5s.

(a) Draw a velocity-time graph representing the cyclists motion.



[3]

(b) Calculate the distance travelled by the cyclist during the journey.

Distance = [2]

Total: [5]

2 **(a)** What is meant by the centre of mass of an object?

_____

_____

_____ [1]

(b) Explain why a minibus is more likely to topple over when the roof rack is heavily loaded than when the roof rack is empty.

_____

_____

_____ [2]

(c) A metre rule is supported on a knife-edge placed at the 40cm mark. It is found that the metre rule balances when a mass of 45g is suspended from the 15cm mark as shown in **Figure 2.1**.

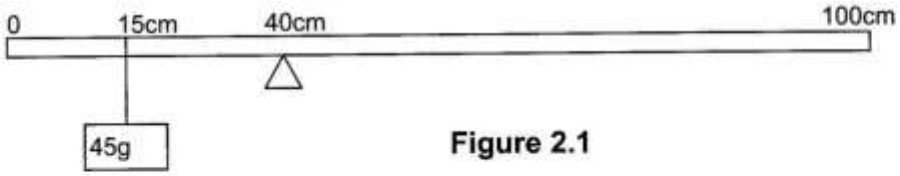


Figure 2.1

If the centre of mass of the metre rule is at the 52.5cm mark, calculate the mass of the metre rule.

Mass = [2]

Total: [5]

3 A girl whose mass is 45kg carries a box of mass 25kg up a flight of steps. There are 40 steps each 40cm high. She takes 16s to climb up the steps. (Take g = 10m/s^2)

(a) What is her weight?

Weight = [1]

(b) What is the weight of the box?

Weight = [1]

(c) *Calculate the total gravitational potential energy of the girl and the box when she reaches the top.*

Gravitational potential energy = [2]

(d) Calculate the total power.

Power = [2]

Total: [6]

4 **(a)** The diagram below represents a bar of soft iron which is to be magnetised with a north pole at end **A**.

Complete the diagram to show how you would arrange a coil connected to a cell to achieve this. Make clear on your diagram the windings of the coil and the polarity of each cell terminal. [3]

(b) What would be the effect of disconnecting the cell on the magnetisation of the bar?

_____

_____ [1]

Total: [4]

5 **(a)** The pressure of air in a tyre of an empty lorry is 3.0×10^5Pa and the volume of the air in the tyre is $0.080m^3$. Calculate the volume of the air in the tyre when the lorry is loaded until the pressure of the air in the tyre rises to 3.6×10^5Pa. (Assume that the air temperature is constant).

Volume = [3]

(b) The tyre pressure of a lorry that has been moving for sometime is usually greater than the pressure when the lorry has been standing at rest. Why is this so?

_____

_____ [2]

Total: [5]

6 Two successive crests of an approaching water wave are separated by a distance of 1.5m. It takes 0.2s for one crest to cover the distance of 1.5m.

(a) At what speed is the wave travelling?

Speed = [2]

(b) What is the frequency of the wave?

Frequency = [2]

(c) Distinguish between the nature of water wave and a sound wave.

(i) Water wave is _____

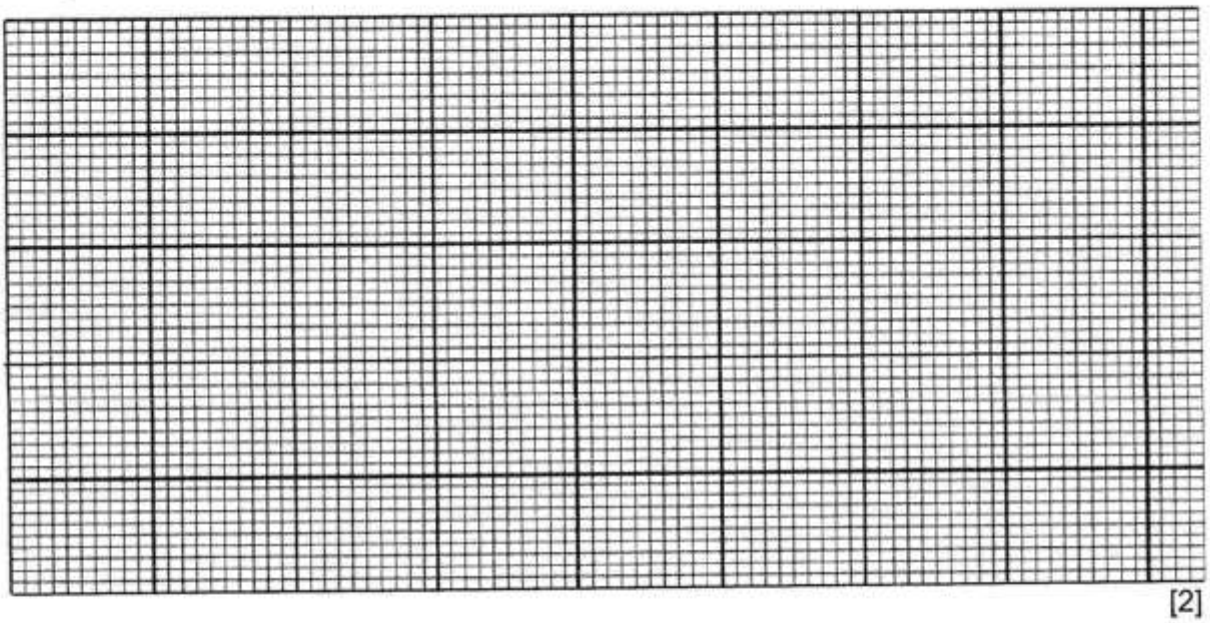
_____ [1]

(ii) Sound wave is _____

_____ [1]

Total: [6]

7 A 4cm high object is placed 8cm from a convex lens of focal length 3cm. Draw a scale diagram to find the position and size of the image.



[2]

(a) Position of the image

Position = [1]

(b) Size of the image

Size = [1]

Total: [4]

8 **Figure 8.1** shows a diagram of a clinical thermometer with some features labelled.

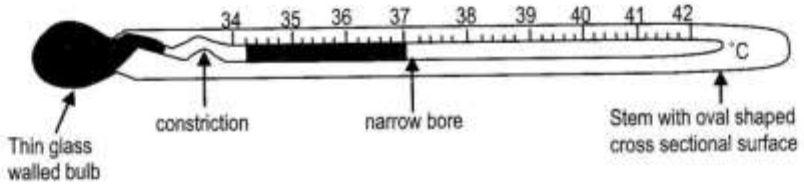


Figure 8.1

Explain why it has each of the following features:-

(a) A thin glass walled bulb,

_____

_____

_____ [1]

(b) A constriction,

_____

_____ [1]

(c) A short range of temperature calibration,

_____

_____ [1]

(d) A narrow bore,

_____

_____ [1]

(e) An oval shaped glass stem.

_____

_____ [1]

Total: [5]

9 **Figure 9.1** shows two metal spheres **A** and **B** being charged by induction using a negatively charged rod brought near **A**. In **figure 9.2**, the two spheres are separated. In **figure 9.3**, the charged rod is removed.

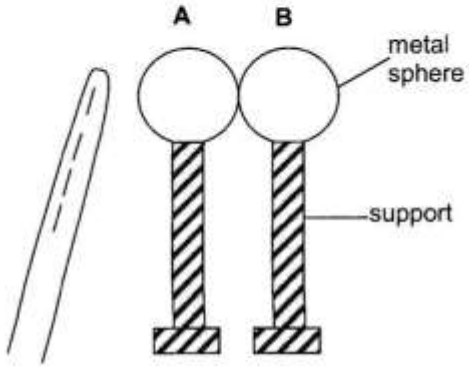


Figure 9.1

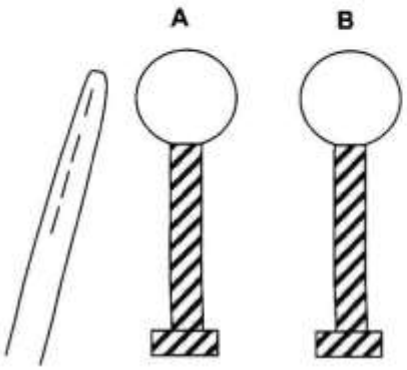


Figure 9.2

Figure 9.3

(a) What should be the nature of material used as the support of each sphere?

_____ [1]

(b) On each sphere in **9.1, 9.2** and **9.3**, indicate the charge distribution. [4]

Total: [5]

Section B

[20 marks]

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

10 **(a)** Define density of a substance. [1]

(b) Describe an experiment you would perform to determine the density of an irregularly shaped object such as a stone. [5]

(c) An empty tin of mass 20g and capacity $25cm^3$ was used to measure the density of mercury. When full of mercury, the mass of the tin and mercury was 360g. What is the density of mercury? [4]

Total: [10]

11 Radioactive isotopes can be used to locate internal bleeding in the body. A commonly used radioactive isotope is iodine – 131 (^{131}I). This emits gamma radiation and has a half-life of 8 days.

(a) Describe what is meant by a radioactive isotope. [2]

(b) Describe what is meant by half-life. [2]

(c) The activity of a sample of iodine – 131 (^{131}I) was measured over a period of 20 minutes on three separate occasions. The readings obtained were:- 338βq, 326βq, 356βq.

(i) Explain why the readings were not all the same. [1]

(ii) Calculate the average count rate for the radioactive isotope. [1]

(d) A patient has internal bleeding from a blood vessel in her leg. A small quantity of the isotope ^{131}I is injected into her blood stream. A detector is used to find the internal bleeding. **Figure 11.1** shows the arrangement and the results of the test.

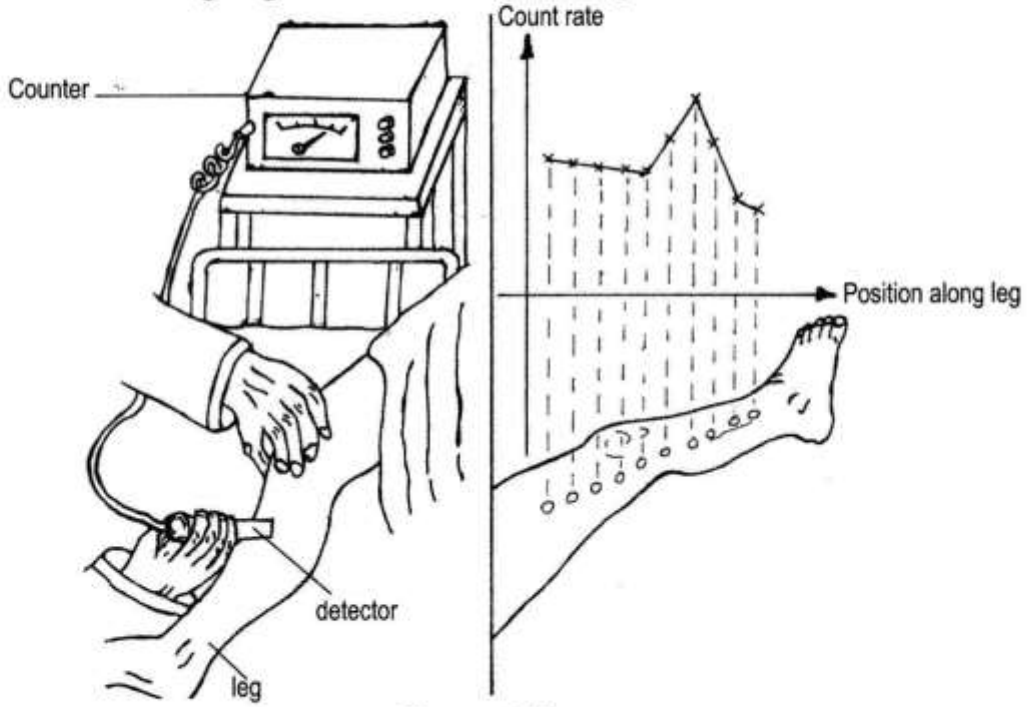


Figure 11.1

(i) State the name of a suitable detector. [1]

(ii) The radioactive isotope used for this purpose is a gamma emitter and not an alpha emitter. Why is a gamma emitter used? [2]

(iii) How will the doctor tell from the results where the internal bleeding is taking place? [1]

Total: [10]

12 **Figure 12.1** shows a bucket with a heating element at the bottom. The bucket has a plastic body with the outside casing of the element which is a metal.

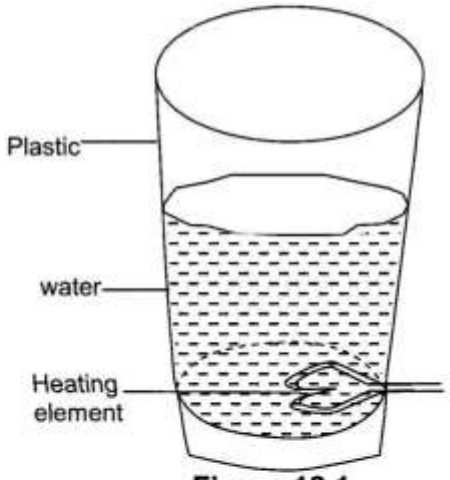


Figure 12.1

(a) Explain why;

(i) a fuse is included in the circuit and what happens when the fuse blows. [2]

(ii) the metal casing of the heating element is connected to the earth. [2]

(b) The electrical power input to the bucket is 2000W and the bucket is switched on for 6 minutes. Calculate the electrical energy, in Joules supplied to the bucket. [3]

(c) Explain, in molecular terms, how evaporation causes loss of energy from the water when the element is switched off. [3]

Total: [10]