**A C K PHYSICS PAPER 3**

**INSTRUCTIONS TO CANDIDATES**

1. Write your **name, index number, class, date** and **signature** in the spaces provided above.

2. This paper consists of two questions **1** and **2.**

3. Answer all questions in the spaces provided.

4. Non-programmable calculators and mathematical tables may be used.

5. Show all your workings.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **QUESTION 1** | **c** | **g** | **h** | **i** | **j** | **k** | **l** |
| **Maximum score** | **1** | **8** | **5** | **2** | **1** | **2** | **1** |
| **Candidates score** |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **QUESTION 2** | **b** | **c** | **d** | **e** |  | **GRAND TOTAL** |
| **Maximum score** | **3** | **2** | **6** | **9** |  |  |
| **Candidates score** |  |  |  |  |  |

**QUESTION ONE**

You are provided with the following

**2** new dry cell size **D**

A cell holder

A switch

A milliameter of range **0** – **1mA**

A capacitor labelled **C**

**8** connecting wires at least four with crocodile clips on one end

A stop watch

A carbon resistor labelled **R**

Proceed as follows

a) Connecting the circuit as shown in the **figure 1** below, where **P** and **Q** are crocodile clips

**R**

**C**

**S**

**Figure 1**

b) Close the switch **S**

c) Record the highest reading of the milliammeter **Io** and then open the switch.

**Io** =………………………………………… (1 mark)

d) Use **Io** above to calculate **4/5Io, 3/4Io**, **2/3Io**, **1/2Io**, **2/5Io**, **1/3Io** and **1/4Io.** Record in the **table 1** below.

e) Close switch **S** for a second time and observe the deflection in the milliammeter (*the pointer should rise back to the same initial value Io*.)

f) Open switch **S** and at the same time start the stop watch to measure the time taken for the current to decrease to four fifth the value of **Io**. i.e. **4/5Io**. Record your value in the **table 1** below.

g) Repeat steps **e** and **f** for other values of current as shown on the **table 1** below

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Current **I** (**mA**) | **Io** | **4/5Io** | **3/4Io** | **2/3Io** | **1/2Io** | **2/5Io** | **1/3Io** | **1/4Io** |
| Your calculated fraction of **Io** (**mA**) |  |  |  |  |  |  |  |  |
| Time **t** (**s**) |  |  |  |  |  |  |  |  |

(8marks) **Table 1**

h) Plot a graph of current **I** (y-axis) (**mA**) against time **t** (**s**) (5marks)

i) From your graph, find **W** the value of **I** when **t** = **7.00s** in **SI** units.(2marks)

j) Given that **A** = **10W**,determine the value of **A**. (1mark)

k) Determine the voltage across **R** at **t** = **7.00s** given that **R** = **4.7 KΩ** (2marks)

l) State the quantity represented by the area under the graph (1mark)

1. **QUESTION TWO**

This question has two parts A and B. Answer both parts.

**PART A**

You are provided with the following:-

* A retort stand, clamp and boss.
* A spiral spring.
* A stop watch.
* Three 100g masses.

**Proceed as follows:**

* + 1. Suspend a 100g mass at the end of the spring as shown in figure 1.



 **Fig. 1**

Now give the mass a small vertical displacement and release so that it performs vertical oscillations. Time ten oscillations and determine the period T. Enter your results in table 1.

* + 1. Repeat the experiment for the other values of mass and complete the table.

**Table 1**

|  |  |  |  |
| --- | --- | --- | --- |
| Mass m (g) | 100 | 200 | 300 |
| Time for 10 oscillations (s) |  |  |  |
| Periodic time T(s) |  |  |  |

 (3mks)

* + 1. Given that T = π m , where k is the spring constant, find the average value k for the spring. K (2mks)

**PART B**

You are provided with the following:-

* A 250ml glass beaker
* A Bunsen burner
* A Thermometer
* A Stop watch
* A Tripod stand and a Wire gauze
* A measuring cylinder 100ml
* Water

Set the apparatus as shown in figure 2 below.



**Fig. 2**

* + 1. Measure 100cm3 of water and pour it into the beaker. Take the initial temperature of the water.

T0 = …………………………………………….0C (1mk)

Now heat the water to a temperature of 800C. switch off the gas tap and place a thermometer into the beaker and start the stop watch when the temperature is 650C. Take the temperature T0C of water ever two minutes. Record your results in the table 2 below.

**Table 2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time, t(min) | 2 | 4 | 6 | 8 | 10 | 12 | 14 |
| Temperature (T)  0C |  |  |  |  |  |  |  |
| (T - T0) |  |  |  |  |  |  |  |
| Log (T - T0) |  |  |  |  |  |  |  |

(5mks

* + 1. Plot a graph of Log (T - T0) against Time (t). (5mks)
1. Find the value of P of log (T - T0) when t = 0. (1mk)
2. Determine N, where N is the antilog of P. (1mk)
3. Calculate the temperature of the surrounding TR using the expression N = 65–TR

 (2mks)