THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

131/3B **PHYSICS 3B**

ALTERNATIVE B PRATICAL

(For Both School and Private Candidates)

Time: 3:10 Hours **Tuesday, 22nd February 2011 a.m.**

INSTRUCTIONS

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **Number 1** carries 20 marks and other **two (2)** 15 marks each.
4. Calculations should be clearly shown.
5. Mathematical tables and non-programmable calculators may be used.
6. Cellular phones are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet (s).
8. Use the following:

   $\pi = 3.14$.

This paper consists of 4 printed pages.

1. In this experiment you are required to determine the acceleration due to gravity at your centre.

Proceed as follows:

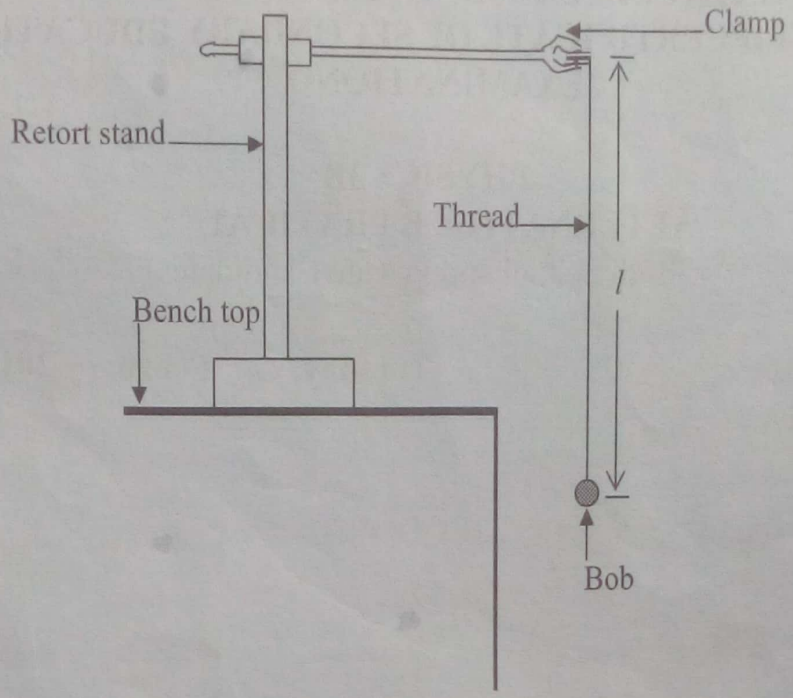

Figure 1

(i) Set up the apparatus as illustrated in Figure 1. By means of the thread given, suspend the pendulum bob from a rigid support and measure length of the thread $\ell = 100$ cm from the point of suspension to the centre of the bob.

(ii) Displace the bob through a small angle. Note and record the time t for twenty complete oscillations.

(iii) Repeat Procedures (i) – (ii) above for the values of $\ell = 90$ cm, 80 cm, 70 cm, 60 cm and 50 cm. In each case determine the periodic time T(s).

(a) Tabulate your results for ℓ (m), t (s), T (s), $\log_{10} \ell$ and $\log_{10} T$.

(b) (i) Plot a graph of $\log_{10} T$ against $\log_{10} \ell$ starting your scales at t from the origin.

(ii) From your graph, find the slope S.

(c) If the relation governing the experiment is $\log_{10} T = n \log_{10} \ell + \log_{10} K$, determine:

(i) The values of n and K.

(ii) Given that $g = \frac{4\pi^2}{K^2}$ determine g, the value of the acceleration due to gravity.

(d) State two (2) sources of errors. **(20 marks)**

2. The aim of this experiment is to determine the thermal conductivity, K, of the rubber tubing provided.

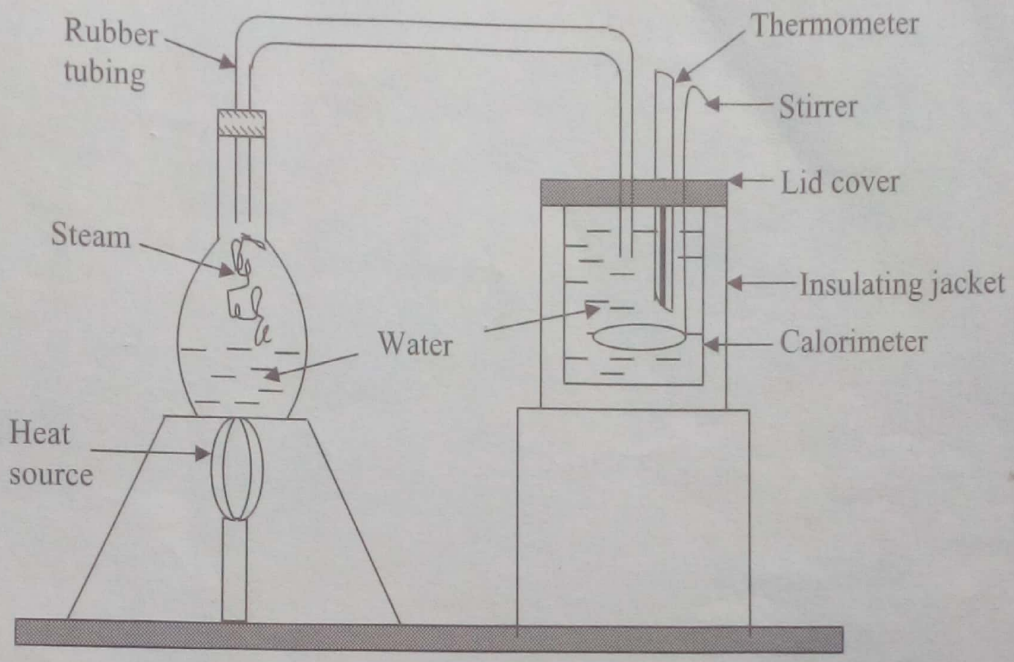

Figure 2

Proceed as follows:

(i) Record the room temperature θ_R.

(ii) Set up your apparatus as shown in Figure 2, whereby the calorimeter is $\frac{3}{4}$ filled with water which is at room temperature and the flask is half-filled with water which is about 5 °C above room temperature.

(iii) Heat the water which is in the flask until it produces steam.

(iv) While the steam passes through the rubber tubing to the water contained in the calorimeter, start stirring up and record the reading of the temperature in the calorimeter at an interval of 1 minute until the temperature is about 70 °C.

(a) Tabulate your observations.

(b) Plot a graph of temperature (°C) against time (minutes).

(c) (i) From the graph, determine the slope of the curve at room temperature.

(ii) From the value of the slope obtained in 2(c) (i) above, deduce the thermal conductivity of the rubber tubing.

(d) State the possible sources of error in this experiment.

(15 marks)

3. Set up the circuit using the dry cell, **D**, resistance box, **R**, switch or key, **K**, voltmeter, **V** and connecting wires provided.

(a) Draw the circuit diagram.

(b) (i) With a resistance R = 1 Ω in the resistance box, close the switch K, read and record the reading V as indicated by the voltmeter.

(ii) Repeat the process in b (i) above for values of R = 2, 4, 5 and 10 Ω

(c) Tabulate your results: R, V, $\frac{1}{V}$ and $\frac{1}{R}$.

(d) (i) Plot a graph of $\frac{1}{R}$ against $\frac{1}{V}$.

(ii) Find the gradient S of your graph.

(iii) Read and record, A the value of $\frac{1}{V}$ when $\frac{1}{R} = 0$.

(iv) Calculate $\frac{1}{A}$.

(e) (i) Read and record. B the value of $\frac{1}{R}$ when $\frac{1}{V} = 0$.

(ii) Calculate $\frac{1}{B}$.

(f) How is $\frac{A}{B}$ related to S?

(g) Mention two (2) sources of error.

(15 marks)

$(M_1C_2 + M_wC_w)\Delta\theta = KA\frac{d\theta}{dt}$