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

031/2A PHYSICS 2A

ALTERNATIVE A PRACTICAL

(For Both School and Private Candidates)

Time: 2 ½ Hours **8 November 2001 a.m.**

Instructions

1. This paper consists of **THREE** (3) questions.
2. Answer **TWO** (2) questions including question **Number 1.**
3. Calculations should be clearly presented.
4. Mathematical tables and desk calculators may be used.
5. Write your Examination Number on every page of your answer booklet(s).
6. You may use the following constant.

$\pi = \frac{22}{7}$

This paper consists of 4 printed pages.

1. The aim of this experiment is to determine the acceleration (g) due to gravity. Proceed as follows:

Set up the apparatus as shown in figure 1 below.

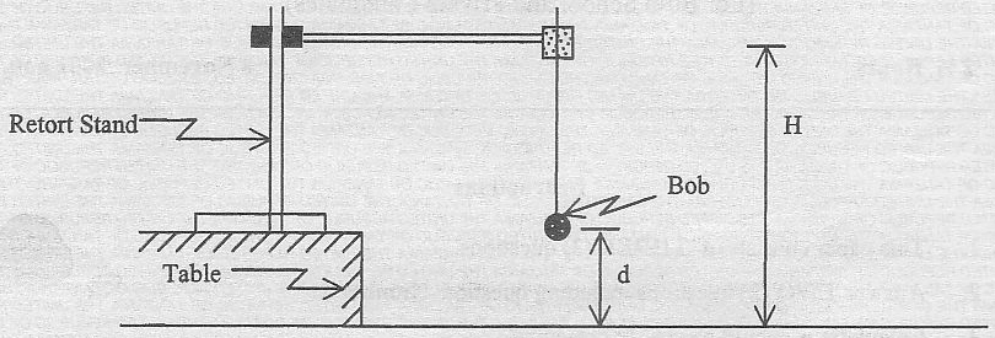


Figure 1

(a) Suspend the pendulum from a fixed point using the retort stand such that it is a distance d = 10 cm from the floor. H is the height of the point of suspension above the floor.

(b) Displace the pendulum through a small angle $\theta \approx 10^{\circ}$ to one side and record the time t for 10 complete oscillations hence find the periodic time T for one complete oscillation.

(c) Vary d in intervals of 10 cm to obtain five more values of d and repeat the procedure in (b) above.

(d) Tabulate your results for the values of d, t, T and T^2.

(e) Plot the graph of T^2 against d

(i) Determine the slope of the graph.

(ii) Determine the intercept along the d axis.

(iii) What does the intercept along d axis in (ii) above represent?

(iv) If $T^2 = -\frac{4\pi^2}{g} d + \frac{4\pi^2}{g} H$ is the equation for the motion of the pendulum, calculate the acceleration due to gravity of the pendulum.

(f) Mention any three sources of errors of the experiment.

2. The aim of this experiment is to determine the melting point of a powdered substance N contained in a beaker labelled N. One test tube, retort stand, thermometer (0 – 100° C), bunsen burner, stop watch, wire gauze, wooden block and a glass beaker with water are provided.

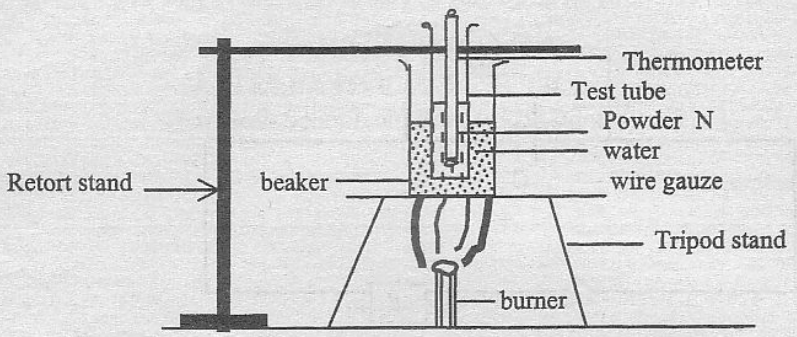


Fig. 1

Proceed as follows:
Fill the test tube with the powdered substance N to about ⅓ of its depth. Place the test tube in a beaker of water standing on a tripod stand with a gauze over a bunsen burner, support the test tube vertically using a retort stand. Heat the water to boiling point (100° C). Continue heating until all the powder has liquefied. Place a thermometer in the test tube and continue heating until the temperature of the liquid in the test tube is about 90° C.

Remove the test tube and place it on the wooden block given. As soon as possible record the temperature θ of the substance N at intervals of 2 minutes until it reaches a temperature of about 50° C as it cools.

Tabulate your results as follows:

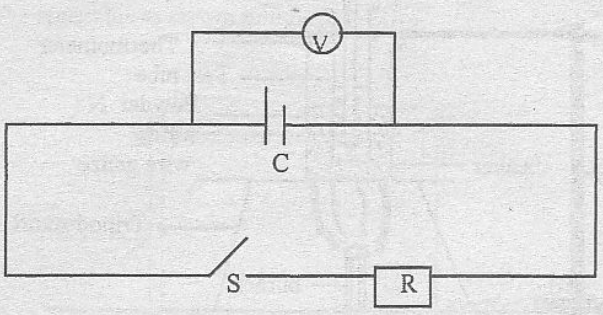
Time t in minutes											
Temperature θ in °C											

(a) Plot the graph of temperature θ against time t.

(b) Use the graph in (a) above to find the melting point of substance N.

(c) Give the name of substance N.

3. You are provided with dry cells(s) C, a resistance box R, a voltmeter V, a switch S and connecting wires. Arrange the apparatus as shown in the diagram below.



Proceed as follows:

(i) Using a resistance of R = 1 Ω in the resistance box, close the switch and record the reading V, as indicated by the voltmeter.
(ii) Repeat the procedure in (i) above for values of R = 2, 4, 5 and 10 Ω.
(iii) Tabulate your observations as shown below:

R (Ω)	V (volts)	$1/V$	$1/R$
1			
2			
3			
4			
5			
10			

(a) Plot a graph of $\frac{1}{V}$ against $\frac{1}{R}$
(b) From your graph in (a) above
  (i) read and record N which is the value of $\frac{1}{V}$ when $\frac{1}{R}$ is zero . Find $\frac{1}{N}$.
  (ii) read and record M which is the value of $\frac{1}{R}$ when $\frac{1}{V}$ is zero . Find $\frac{1}{M}$.
(c) Show how $\frac{N}{M}$ is related to G, where G is the slope of the graph.
(d) (i) What is the magnitude of the current supplied by the cell?
  (ii) What is the physical meaning of $\frac{1}{N}$ and $\frac{1}{M}$ from the graph in (a) above?