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

131/3B

PHYSICS 3B
ACTUAL PRACTICAL B

(For Both School and Private Candidates)

Time: 3:20 Hours **Friday, 13th May 2016 a.m.**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer all questions.
3. Question **Number 1** carries 20 marks and the 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:

   Specific heat capacity, c, of Naphthalene = $1176.8 JKg^{-1}K^{-1}$.

1. In this experiment you are required to investigate the acceleration due to gravity.

Proceed as follows:

(a) Measure and record the length, l, of the metal rod provided.

(b) Bend the metal rod at its mid-point to form a V-shape with an angle θ of about 90^0 as it is in Figure 1.

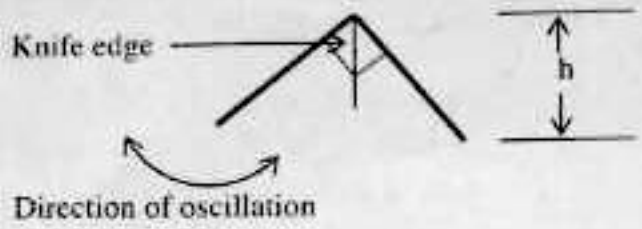


Figure 1

(c) With the V-shape metal rod resting on the bench, measure the height, h as shown in Figure 1. Then place the V-shape metal rod on a knife edge and set it for 20 oscillations in its own plane as indicated in Figure 1.

(d) Determine the frequency, f of the oscillation and show clearly how you do this.

(e) Repeat the procedures in 1 (b), (c) and (d) above for angle $\theta = 75^0, 60^0, 45^0$ and 30^0. Tabulate your results.

(f) (i) Plot a graph of f^2 against h.

(ii) State the relationship between f^2 and h over the range covered by your observation.

(iii) Find the gradient of the graph.

(iv) Using the relation $l^2 = \dfrac{g\,h}{6.573 f^2}$, calculate the acceleration due to gravity, g.

(v) State any two sources of error in this experiment.

(vi) Explain any difficulties experienced in this experiment.

2. The aim of this experiment is to determine the specific latent heat of the solid provided.

Proceeds as follows:

(a) Place the solid provided (Naphthalene) into a test tube. Put the test tube into the boiling water and leave it until the solid has melted. Then insert the thermometer into the molten solid and fix the test tube and the thermometer such that the thermometer does not touch the side of the tube as shown in Figure 2. Extinguish the flame, take off the boiling water and leave the test tube suspended in air. As the liquid in the test tube

cools down, record its temperature at 30 seconds intervals. Continue recording up to 5 minutes after the liquid has solidified.

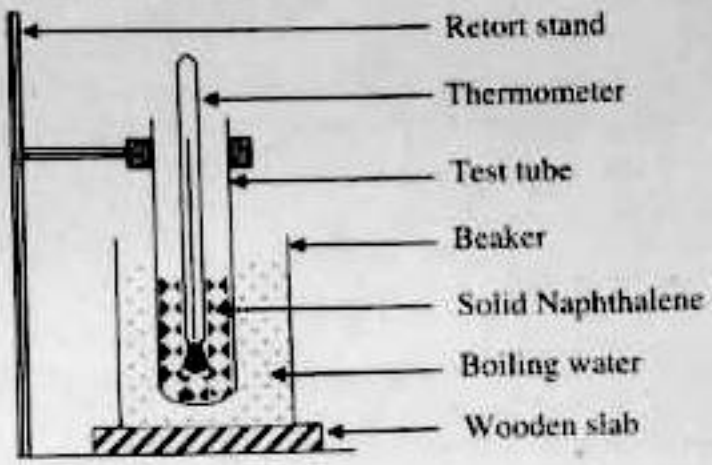


Figure 2

(b) Tabulate your results.

(c) Plot a graph of temperature against time.

(d) From your graph, determine the gradient, m, of the cooling curve of the solid for the portion near the melting point.

(e) Measure and record the time interval, t_0, from the start to the end of the flat portion of the cooling curve.

(f) Determine the specific latent heat of the solid given that, $L = mct_0$ where c is the specific heat capacity of the solid.

(g) State any two sources of error and one precaution taken in this experiment.

The aim of the experiment is to determine the resistivity, ρ, of the material of the wire labelled W in Figure 3.

Proceed as follows:

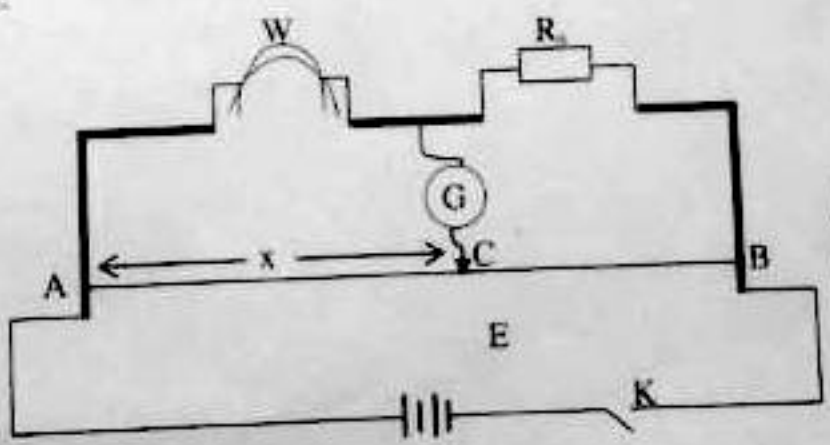


Figure 3

(a) Set up the circuit as shown in Figure 3 where AB is the metre-long wire of a Wheatstone bridge, E is a accumulator, R_s is 1Ω standard resistor, G is galvanometer and C is a jokey.

(b) Given five pieces of wire W of length of about 30cm, put a single piece of it in the left gap and use about 20cm (l_0) to obtain the balance length AC = x. Repeat the procedures with two, three, four and five pieces of equal lengths, l_0 in the gap and record the correct reading values of x.

(c) Tabulate your results.

(d) Given $n = \frac{\rho l_0}{AR_s}\left(\frac{l-x}{x}\right)$ where n is the number of pieces of wire, W in the gap, A is the cross-sectional area of the wire and l = AB;

(i) Calculate the cross sectional area, A.

(ii) Plot a graph of n against $\frac{1}{x}$ and use it to determine the resistivity, ρ of the wire W.

(iii) Determine the value of the $\frac{1}{x}$ intercept and find a value of l as l_1.

(iv) Calculate the percentage error in l.

11 = 20m
y = x

$x = \frac{20y}{11}$

$x = \frac{205}{24.6}$

1 = 20m
y = x

0.01 = 20m
5 = x

0.021
0.032
0.041
0.059
0.065