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

131/3A

PHYSICS 3A
ACTUAL PRACTICAL A
(For Both School and Private Candidates)

Time: 3:20 Hours **Tuesday, 15th May 2018 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 and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. Use the following:

   Pie, $\pi = 3.14$

1. You are required to determine the acceleration due to gravity. Proceed as follows:

(a) Fix a perforated metre rule provided on a knife edge so that it balances horizontally and mark its centre of mass, G.

(b) Suspend the perforated metre rule using a last hole from the centre of gravity on an optical pin fixed on the retort stand so that it is free to swing in a vertical plane.

(c) Measure the distance h from the point of suspension to the centre of mass G of the metre rule.

(d) Allow the metre rule to swing in the vertical plane with a small angle of deflection θ and by means of stopwatch, record the time, t for 10 complete oscillations.

(e) Repeat the procedures in (c) and (d) using 4 other holes and in each case determine the time, t and hence the periodic time, T.

(f) Tabulate your results as shown in the following table.

Hole	**h (cm)**	**Time for 10 oscillations (sec)**	**Period T (s)**	**T^2 (s^2)**	**T^2h (s^2 cm)**	**h^2 (cm^2)**
1st hole						
2nd hole						

(g) Plot a graph of T^2h against h^2.

(h) From the graph in part (g), determine the value of acceleration due to gravity given that $T^2h = \frac{4\pi^2}{g}\left(k^2 + h^2\right)$.

(i) (i) Use the graph and equation in part (h) to determine the value of k.

(ii) What is the physical significance of k?

(j) List two sources of errors in performing this experiment.

2. You are provided with a Bunsen burner, Water, a piece of duplicating paper, a rubber band, thermometer, beaker, test tube and a stopwatch. Proceed as follows:

(a) Pour water in the beaker and heat to its boiling point.

(b) Wrap the given piece of duplicating paper around the bulb of the thermometer and use a rubber band to hold the paper in place.

(c) Put the thermometer inside a dry test tube then place it in the boiling water as shown in Figure 1. Make sure that water does not enter in the test tube. Leave the test tube in boiling water until the thermometer indicates a steady temperature.

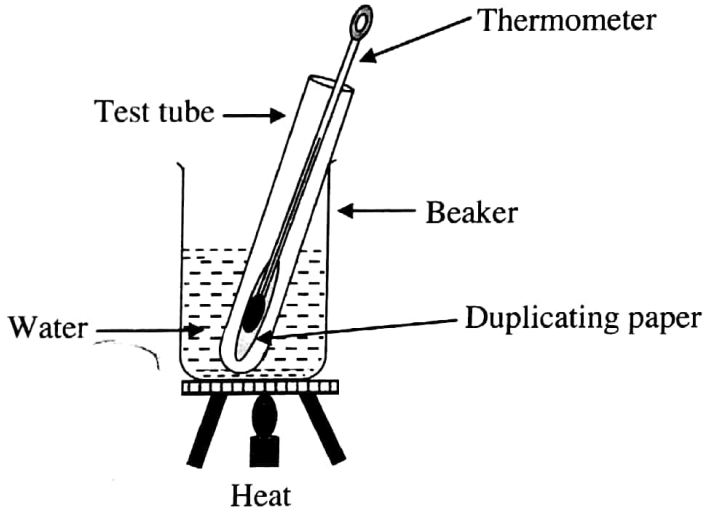

Figure 1

(d) Remove the thermometer from the test tube and immediately start the stopwatch. Read and record its temperature at 1 minute interval for 10 minutes. Tabulate your results.

(e) Place the wrapped thermometer directly into boiling water. Leave the thermometer in the boiling water until it indicates a steady temperature.

(f) Take out the wrapped thermometer from boiling water and record the reading of the thermometer at interval of half a minute for 5 minutes. Record your results in a suitable table.

(g) Using the same axes, plot the graphs of temperature against time for the results obtained in part (d) and (f).

(h) (i) For each graph, determine the time taken for the temperature to fall from 60°C to 40°C, recording t_T as the time interval when thermometer is put in test tube and t_W when it is direct into water.

(ii) Find the ratio t_T/t_W.

(i) (i) State the purpose of performing this experiment.

(ii) Comment on the ratio obtained in (h) (ii).

3. The aim of this experiment is to determine the resistance, R_v of a voltmeter. Proceed as follows:

(a) Connect the circuit as shown in Figure 2.

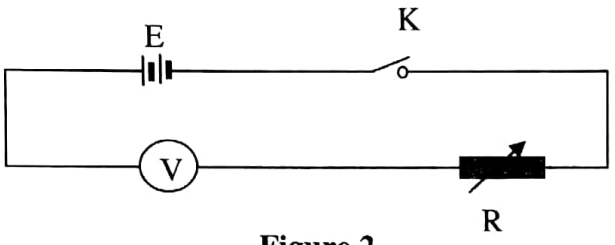

Figure 2

(b) Set the value of R = 250 Ω, close the switch and quickly read and record the voltmeter reading, V. Always open the switch after readings.

(c) Repeat procedure (b) for the values of R = 500 Ω, 750 Ω, 1000 Ω and 1250 Ω.

(d) Record your results in a tabular form showing the values of R, V and $\frac{1}{V}$.

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

(f) From your graph, determine the values of:

(i) Slope.

(ii) $\frac{1}{V}$ – intercept, G.

(g) If the internal resistance of the cell is ignored, state the physical meaning of G.

(h) Determine the resistance R_v of a given voltmeter given that, $\frac{1}{R_v} = \frac{slope}{G}$.