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

131/3A

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

Time: 3:20 Hours **Wednesday, 10th May 2017 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 of water, $C_w = 4.2\ Jg^{-1}K^{-1}$

   Specific heat capacity of copper, $C_c = 0.39\ Jg^{-1}K^{-1}$

1. You are provided with a 120cm wooden grooved bar, ten (10) small wooden blocks of dimension 5cm × 3cm × 0.8cm.

Proceed as follows:

(a) Set up the apparatus as shown in Figure 1 such that the grooved bar is inclined.

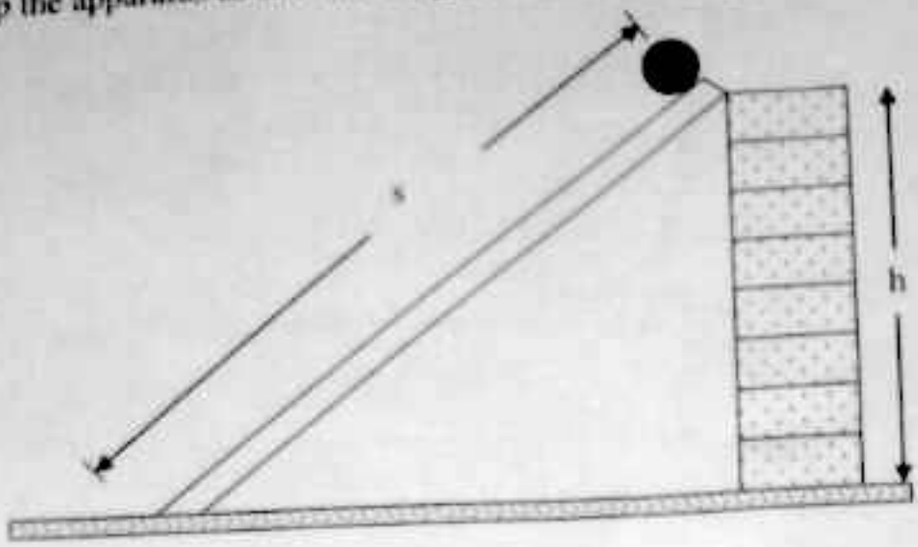

Figure 1

(b) Measure the diameter of a sphere using a micrometer screw gauge.

(c) Place four wooden blocks of each thickness of 0.8cm to make a bar inclined at height h = 3.2cm and release freely the steel sphere provided along a track (groove) rolling down to place.

(d) By using a stopwatch, measure the time t_1, taken by a sphere from rest to the bottom.

(e) Repeat the procedure in 1 (d) to obtain t_2 and t_3, then find the average of measured time t. Record the time t_1, t_2, t_3, t, t^2 and height, h in a tabular form.

(f) Repeat the procedures described in (a) to (e) by piling of different blocks one after another in a sequence of 4.8cm, 6.4cm and 8.0cm.

(g) Plot a graph of h against $\frac{1}{t^2}$ then

(i) Find the slope of your graph.

(ii) Determine the value of acceleration due to gravity using the relation,

$\frac{h}{s^2} = \frac{2.8}{gt^2}$ where s is the length of the bar.

The aim of the experiment is to determine the latent heat of vaporization of water.

Proceeds as follows:

(a) Half- fill the flask with water then fit on to it the cork and boil the water. Meanwhile weigh the calorimeter with stirrer. Fill the calorimeter with 200cm^3 of water and reweigh.

(b) Having noted the initial water temperature θ_1, allow the steam to bubble through the water in the calorimeter and observe the temperature rise at the interval of 1 minute while stirring the water. Tabulate your results.

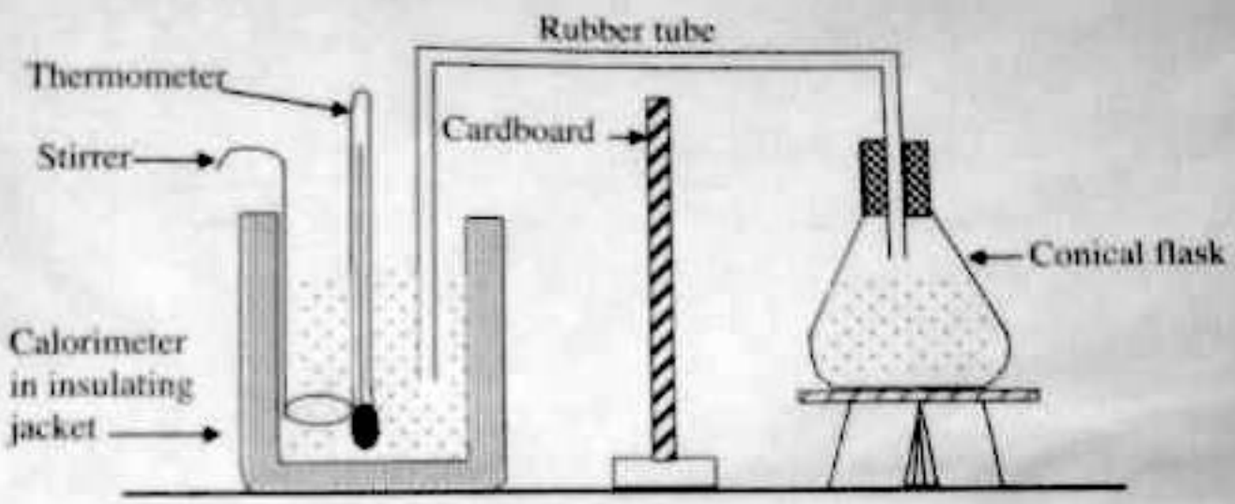

Figure 2

(c) Remove the calorimeter when the water temperature has risen by about 65^{0}C above θ_1, then note the temperature at 1 minute interval until it has dropped by about 10^{0}C.

(d) Reweigh the calorimeter with water and steam.

(e) Plot a graph of temperature against time and from it determine the cooling correction c.

(f) The specific latent heat of vaporization , L is given by the relation

$$mL = mc_w(100 - \theta_2) = (m_2c_w + m_1c_c)(\theta_2 - \theta_1)$$

Where

m = mass of the steam

m_1 = mass of calorimeter with stirrer

m_2 = mass of water

θ_2 = final water temperature with cooling correction

Determine the value of L for water.

3. You are required to determine the resistivity of a wire, L and the length of the unknow resistance, P provided.

Proceeds as follows:

(a) Set up the circuit as shown in Figure 3 in which the unknown resistance P and t resistance wire, L connected in parallel are placed in right hand gap of the metre brid while the standard resistance $R_s = 1.0\Omega$ is placed in the left hand gap.

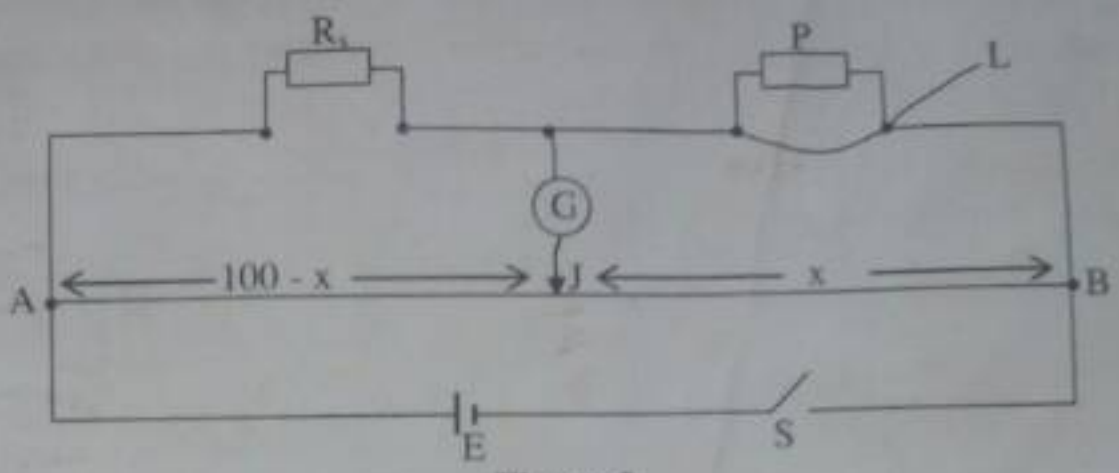

Figure 3

(b) With the length of the wire $l = 10$cm, find the balance point, x.

(c) Repeat the procedure in 3 (b) each time varying, L in steps of 10cm so as to obtain more readings of the balance point, x.

(d) Tabulate your results, include columns for $100 - x$, $\frac{100-x}{x}$ and $\frac{1}{l}$.

(e) Plot a graph of $\frac{100-x}{x}$ against $\frac{1}{l}$

(f) Using your graph, determine the resistance per centimeter of the wire, L and the of P.

(g) Measure the diametre, d of the wire L; hence calculate the resistivity, ρ of the w