THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATION EXAMINATION

731/2A

PHYSICS 2A
ACTUAL PRACTICAL A

Time: 3 Hours **Wednesday, 15th May 2019 a.m.**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **one (1)** carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

Use the following:

$\pi = 3.14$

1. In this experiment you are required to determine the radius of gyration k of a given wooden disc and acceleration due to gravity g.

Proceed as follows:

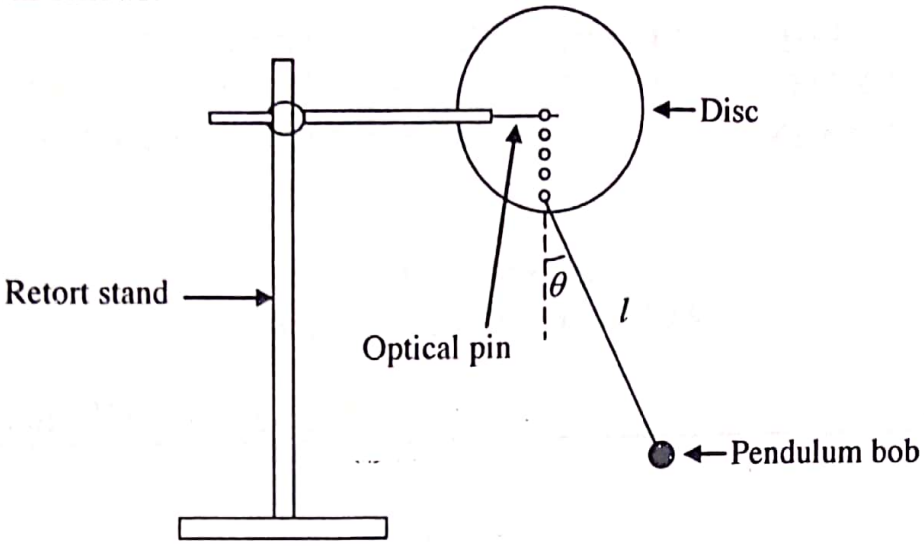

Figure 1

(i) Suspend the bob through a hole nearest to the circumference of the disc then measure the length of thread, l = 100 cm and displace the bob through a small angle θ. The disc should remain pivoted through a hole at its centre as shown in Figure 1.

(ii) Release the bob so that the disc and the bob together perform oscillations in vertical plane and parallel to the plane of the disc.

(iii) Determine the period T of oscillations of the system for twenty (20) oscillations.

(iv) Repeat the procedure in 1 (iii) for the values of l = 80 cm, 50 cm, 30 cm, 20 cm and 10 cm.

Questions:

(a) Tabulate your results.

(b) Plot the graph of T^2s^2 against l (cm) and draw the best line through the points.

(c) Determine the slope and the vertical intercept of the graph.

(d) Use the answer obtained in 1 (b) and the relation $T = 2\pi\sqrt{\frac{l+1.414k}{g}}$, to calculate the numerical values of g and k.

(e) Apart from errors in measuring length of thread and timing of oscillations, state other two sources of errors in this experiment.

2. The aim of this experiment is to investigate the relation between the loss of heat from a copper calorimeter and the excess temperature over its surroundings under the condition of forced convection.

Proceed as follows:

(i) Record the room temperature as θ_o.

(ii) Fill about three quarter of the calorimeter with hot water heated to about 85°C.

(iii) Place the copper calorimeter on a wooden base and cover it with its lid. When the temperature of water reaches 80°C start stopwatch and gently stir the hot water while recording the temperature θ°C for every 1 minute. Take your readings for 14 minutes.

Questions:

(a) Tabulate your results as shown in the following Table.

Time t (min)	Temperature θ (°C)	$(\theta - \theta_o)$°C	$\log(\theta - \theta_o)$

(b) Plot a graph of $\log(\theta-\theta_o)$ against time t (min.).

(c) State if your results obey the relation $\log_{10}(\theta - \theta_0) = kt + \text{Constant}$, hence, determine the value of k.

(d) What is the physical meaning of k?

(e) Mention two sources of errors in doing this experiment.

3. The aim of this experiment is to determine the e.m.f. E and internal resistance r of a given dry cell.

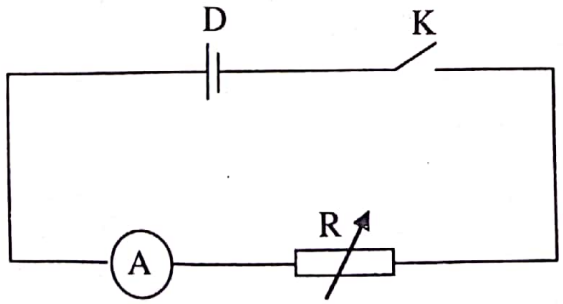

Figure 2

Proceed as follows:

(i) Carefully set up the circuit as shown in Figure 2, where R is a resistance box, D is a dry cell, K is a switch and A is an ammeter.

(ii) Start with R= 4 Ω, close the switch K and record the current, I from the ammeter, A.

(iii) Repeat the procedure in 3 (ii) for values of R equal to 6 Ω, 8 Ω, 10 Ω, and 15 Ω.

Questions:

(a) Tabulate the results obtained in 3 (ii) and (iii), including the column for the values of $\frac{1}{I}$ in the same table.

(b) Plot a graph of R (Ω) against $\frac{1}{I}$ (A^{-1}).

(c) Determine the slope from your graph.

(d) Use your graph do determine the e.m.f. E and internal resistance r of the given dry cell.