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

731/2A

PHYSICS 2A
(ACTUAL PRACTICAL A)

Time: 3 Hours **Thursday, 12th May 2011 a.m.**

INSTRUCTIONS

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question number one carries 40 marks, question number two and three carries 30 marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

This paper consists of 4 printed pages.

1. The aim of this experiment is to determine the mass of a spring and the acceleration due to gravity by using an oscillating mass attached to a spiral spring.

Apparatus:

You are provided with a retort stand with clamp, spiral spring, stop watch, slotted weights, hanger for weights.

Procedures:

(a) Suspend a spiral spring from a retort stand provided. Attach a mass of 100 gm at the end of the spring; slightly pull down the mass such that it oscillates up and down. Measure and record the time for 30 oscillations.

(b) Repeat the procedures in (a) above by attaching mass of 200 gm, 300 gm, 400 gm, 500 gm and 600 gm, each time measuring the time taken to make 30 complete oscillations.

(c) Record your measurement in a suitable table.

Load m (gm)	**Time t for 30 Oscillations (sec)**	**Period time T (sec)**	**T^2 $(sec)^2$**
100			
200			
300			
400			
500			
600			

Questions:

(i) Draw a well labeled diagram of this experiment.

(ii) Plot a graph of m against T^2.

(iii) Find the slope and the intercept on the m axis.

(iv) T and m are related to the equation $T = 2\pi\sqrt{\frac{m+m_0}{kg}}$ where k is the spring constant of magnitude 40 gm cm^{-1}. Use the given equation and your graph to calculate the value of the acceleration due to gravity g, and the mass m_o, of the spring.

2. **The aim of this experiment is to investigate the rate of loss of heat from a calorimeter.**

Apparatus:

You are provided with a calorimeter, stirrer, thermometer, a piece of paper, beaker, hot water and a stopwatch.

Procedures:

(a) Set up the apparatus of an experiment.

(b) Read and record the room temperature θ_0.

(c) Pour in some water about $85^0 C$ into the calorimeter until is about three quarter full.

(d) Read and record the temperature θ of water after every two minutes beginning with the temperature of water of about $80^0 C$. As you proceed gently stir the water and fan the calorimeter. Take your readings for 20 minutes.

(e) Tabulate your results.

Questions:

(i) Draw a well labeled diagram of this experiment.

(ii) Plot a graph of $\log_{10}(\theta - \theta_0)$ against time t.

(iii) The experiment obeys the relation, $\log_{10}(\theta - \theta_0) = -kt + A$. Determine the value of k and the constant A.

(iv) What is the physical meaning of k?

(v) Mention two sources of error in the experiment.

3. The aim of this experiment is to determine the electromotive force (e.m.f) and the internal resistance of a given dry cell.

Diagram:

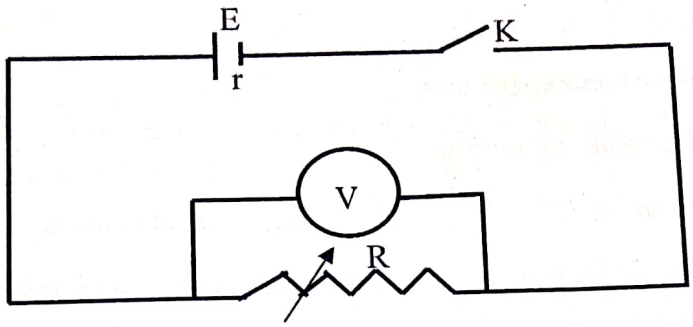

Figure 1

Procedures:

(a) Set up the electric circuit as shown in figure 1, where K= key; E= dry cell, V = voltmeter and R = rheostat.

(b) Starting with a resistor R=20Ω and the key closed, record R and reading V of the voltmeter.

(c) Repeat the procedure in (b) above for values of R equal to 10Ω, 5Ω, 4Ω, 3Ω, 2Ω and 1Ω.

(d) Tabulate your results for R and V.

Questions:

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

(ii) From the graph, determine the slope and intercepts.

(iii) Write down the relation that connects $\frac{1}{R}$ and $\frac{1}{V}$.

(iv) Use the result in (iii) above to find the e.m.f and the internal resistance of the dry cell.

(v) State the source of error and precaution taken in this experiment.