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: 3:10 Hours **Wednesday, 15th February 2012 a.m.**

Instructions

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

   $\pi = 3.14$.

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1. You are required to determine the acceleration due to gravity g.

Proceed as follows:

(a) Suspend a pendulum bob from the table such that its thread length is 100 cm (see Figure 1).

(b) Set the bob oscillating through a small angle and record the time, t, for 20 complete oscillations. Determine the period T.

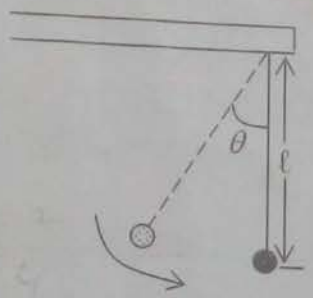


Figure 1

(c) Repeat procedures (a) - (b) above for values of ℓ = 80 cm, 60 cm, 40 cm, and 20 cm.

(d) Tabulate your results.

(e) (i) Plot a graph of ℓ against T^2.
(ii) Use the graph and the relation $gT^2 = 4\pi^2 \ell$ to determine the value of g.

(f) State two possible sources of error in this experiment.

2. The aim of this experiment is to investigate the rate of cooling of calorimeter containing hot water.

Proceed as follows:

(a) Measure the room temperature θ_R.

(b) Heat the beaker containing water on a burner until the water reaches a temperature of about 90°C. Pour the hot water into the calorimeter to about $\frac{3}{4}$ full.

(c) Starting with temperature = 80 °C, record the temperature of water at the interval of one (1) minute. Do this until the temperature is about 55 °C.

Note: Stir water thoroughly until the end of your experiment.

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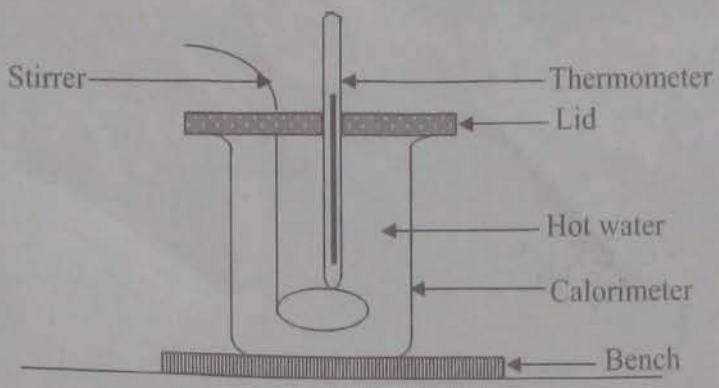


Figure 2

(d) Record the values as shown in Table 1.

Table 1

t(min)						
θ °C						

(e) Plot the graph of θ °C against time t.

(f) From your graph in 2 (e), choose five (5) points along the curve (θ, t) and record the rate of change of temperature and the excess temperature $\theta - \theta_R$ corresponding to each of the five points. Record your results as shown in Table 2.

Table 2

Temperature θ °C					
Rate of change of temperature $\frac{\Delta\theta}{\Delta t}$ / $\frac{^\circ C}{min}$					
Excess temperature $\theta - \theta_R$ °C					

(g) Plot the graph of $\frac{\Delta\theta}{\Delta t}$ against $\theta - \theta_R$.

(h) In your own words, comment on the graph in (g).

3. In this experiment you are required to estimate the resistance $\mathbf{r_a}$ of an ammeter and e.m.f. **E** of the cell.

Proceed as follows:

(a) Connect the circuit as shown in Figure 3.

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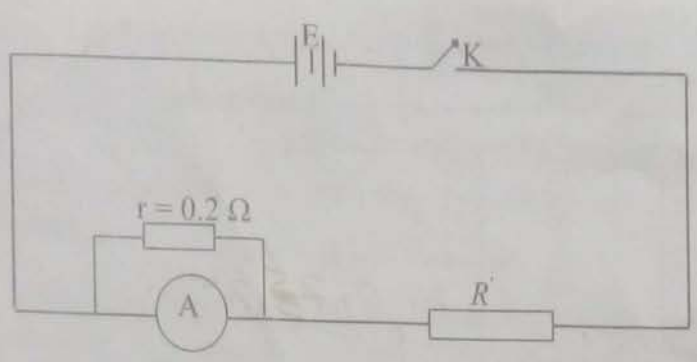


Figure 3

(b) Set R′ = 5Ω and record the ammeter reading I. If R = R′ + 1.5 where 1.5 is resistance in ohm of the two new dry cells connected together to form E, record the values of R and those of the ammeter reading.

(c) Repeat the procedure in (b) above. For values of R′ = 4Ω, 3Ω, 2Ω and 1Ω respectively.

(d) Tabulate your results and include $\frac{1}{I}$.

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

(f) Use your graph to determine the resistance of the ammeter $\mathbf{r_a}$ and the e.m.f. **E** of the cell.
The relation governing the experiment is

$$\frac{E}{I} = R\left(1+\frac{0.2r_a}{(0.2+r_a)R}\right).$$

(g) Mention a source of error in this experiment.

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