TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL

FORM SIX INTER ISLAMIC MOCK EXAMINATION

PHYSICS 3

(ACTUAL PRACTICAL)

(For Both School and Private Candidates)

131/3A

TIME: 3:20 HOURS **Tuesday, 11th March 2025 a.m.**

Instructions

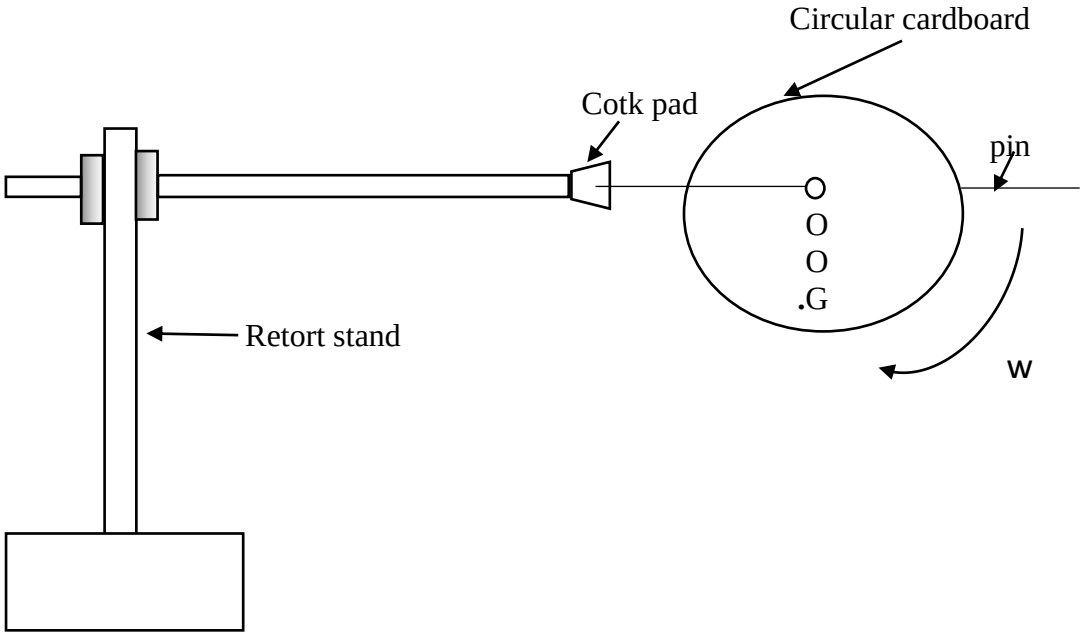
1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question number one (1) carries 20 marks and the other two (2) carry fifteen (15) marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones and any unauthorized materials are **not**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

   Pie, $\pi = 3.14$

1. You are provided with a circular cardboard, a string/plumb line, an optical pin and a stopwatch.

   Proceed as follows:

   (a) By the aid of a string/plumbline provided, locate the centre of gravity, G of a circular carboard.
   (b) Draw a line from the centre of gravity G to any point on the circumference of the cardboard. Measure a distance of 1cm from the centre of gravity G, along the line you have drawn. Make a hole at this point.
   (c) Make five (5) other holes along the line at a distance of 1cm from each other.
   (d) Suspend the cardboard using the furthest hole from G as shown on the figure 1. Measure a distance h from G to the point of suspension.



   (e) Allow the circular cardboard to swing in a vertical plane with a small angle of deflection θ. Using a stopwatch record the time t for 10 complete oscillations and hence determine the periodic time T.
   (f) Repeat the procedure in (e) above using all of the remaining holes in (c) above.

   Questions:

   (i) Record the results in a tabular form for the values of h, h^2, t, T, T^2 and T^2h.
   (ii) Plot a graph of h^2 against t^2h.
   (iii) Using the relation $T^2h=\left(\frac{2\pi}{a}\right)^2 (b^2+h^2)$ determine the values of a and b.
   (iv) What does the value of a^2 and b represent?
   (v) State any two possible sources of errors and precautions taken in this experiment
   (vi) Suggest two possible aims of this experiment

   [20 marks]

2. You are required to determine the specific heat capacity of mass M of a solid provided. Proceed as follows:
   (a) Measure and record the mass of a given solid M, an empty calorimeter, M_c and the room temperature Q_R.
   (b) Half-fill hot water in a calorimeter then observe and record the temperature θ^oC of the water.
   (c) Start with a temperature of 80^oC of hot water in the calorimeter while stirring and fanning after every one minute for about 10 minutes. Record the results.
   (d) Record the mass of calorimeter with hot water hence determine the mass Mw of water used.
   (e) Repeat the procedures in 2(c) and (d) but in this case transfer quickly the mass M provided to the calorimeter with water when the temperature is exactly 80^oC. Record the results.

   Questions:

   (i) On the same graph, plot the cooling curves for both experiments, then determine the highest difference in temperature ΔT between the two curves by indicating the vertical line showing the upper temperature T_1 and lower temperature T_2
   (ii) Use the equation;
   $M_C C_C \Delta T + Mw C'w\Delta T = MC(T_2-\theta_R)$to determine the specific heat capacity C of the mass M provided.

[15 marks]

3. You are required to determine the specific resistance of the wire provided.

   Proceed as follows:
   (a) Connect the wire provided with length L to the right hand gap of the metre bridge.
   (b) Connect a 4Ω standard resistor in parallel with resistance box R to the left hand gap of the metre bridge. If E is the emf of the battery, G is the galvanometer and J is the Jockey, complete the metre bridge circuit in the usual manner including the switch K.
   (c) Place Jockey J at 50cm mark throughout the experiment.
   (d) Starting with R = 40Ω, find the value of length L of the wire for which the galvanometer gives zero deflection.
   (e) Repeat the procedures in 3(d) above for the values of R=20Ω, 10Ω, 2Ω and 1Ω.

   Questions:
   (i) Record your results in tabular form including the values of 1/R and 1/L.
   (ii) Draw a well labelled circuit diagram of the set up outlined in 3(b) above.
   (iii) Using micrometer screw gauge, measure and record the diameter of the wire.
   (iv) Plot a graph of $\frac{1}{R}^{(\Omega^{-1})}$ against $\frac{1}{L}$ (cm^{-1}).
   (v) Using the relation $\frac{1}{R} = \frac{A}{\rho L} - \frac{1}{4}$. Where A is cross-sectional area of the wire, determine specific resistances ρ of the wire.

[15 marks]