THE PRESIDENT'S OFFICE

REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

FORM SIX COMPETENCE EXAMINATIONS (FOSCE) -2025

CODE: 131/3 **PHYSICS 3B**

TIME: 3 HOURS **5TH FEBRUARY 2025, AM**

INSTRUCTIONS:

1. This paper consists of **Three (3)** questions.
2. Answer **ALL (3)** questions.
3. All working must be shown clearly on how you arrived at the answer.
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 booklets.
7. The following information may be useful:
   (a) Acceleration due to gravity, (g) = 9.8 m/s^2
   (b) Pie, $\pi = 3.14$
   (c) Specific heat capacity of copper calorimeter $C_C = 400 Jkg^{-1}°C^{-1}$
   (d) Specific heat capacity of water $C_w = 4200 Jkg^{-1}°C^{-1}$

1. You are provided with an inextensible string of about 120cm long, a retort stand with its clamp, two wooden blocks , meter rule, stop watch and pendulum bob.
   Proceeds as follows:
   (a) Set up the apparatus as shown in figure 1 below

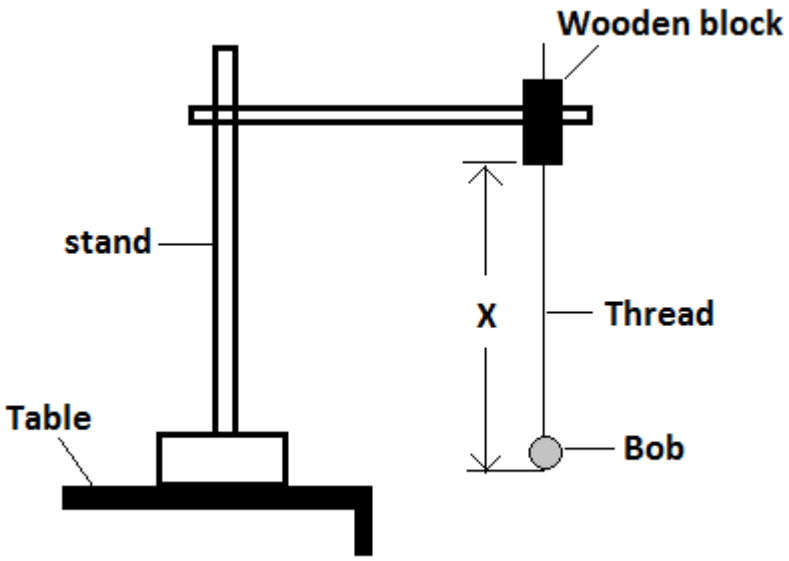


Figure 1

   (b) Set $X = 110cm$, displace the pendulum bob through a small angle and release it such that it begins to swing to and fro motion. Determine the time t(s) for 20 complete oscillations and hence the corresponding periodic time T(s)
   (c) Repeat the procedure in (b) above for$X = 90cm, 70cm, 50cm, 30cm$. Tabulate the results include the value of$T^2(s^2)$.

QUESTIONS

i. Plot a graph of $T^2(s^2)$ against$X(cm)$.
ii. From the graph determine the slope M and$T^2 - Intercept(B)$.
iii. Derive an equation of the graph and use it to define the physical meaning of $T^2 - Intercept(B)$ and the slope M
iv. Calculate the value of constant C from $C \times M = -B$
v. If $C = 0.5 \times Q$, find the value of Q and hence state the physical meaning of Q
vi. State the aim of this experiment.

2. The aim of this experiment is to determine the specific heat capacity of solid brass by the method of mixture.
   Proceed as follows
   (a) Set up the apparatus as shown below.

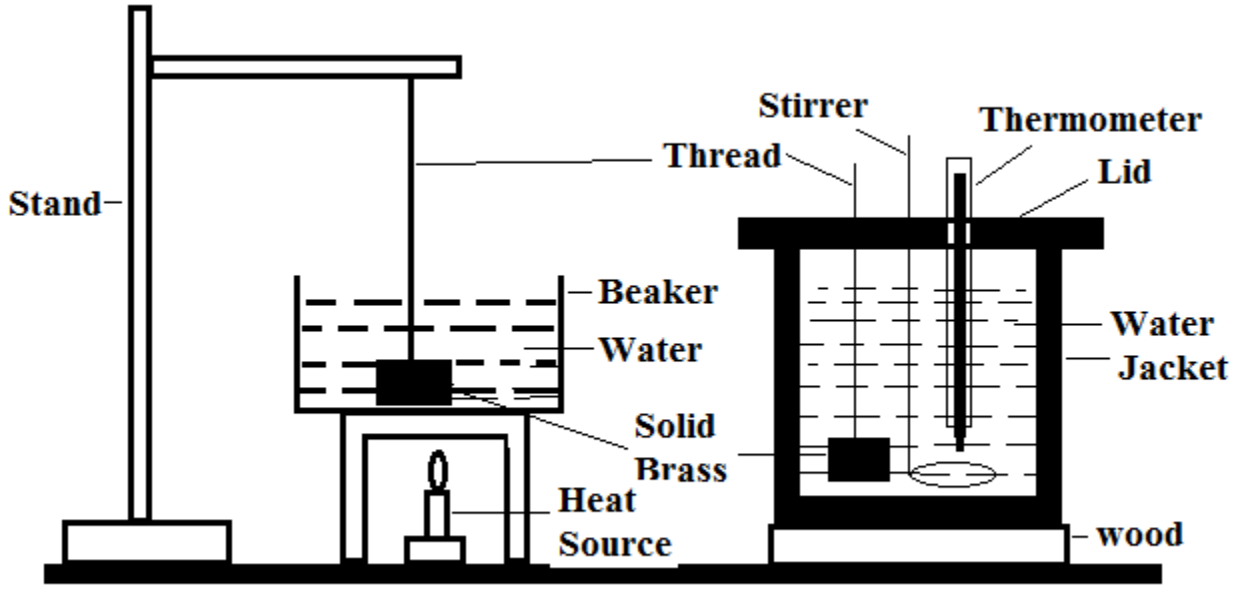


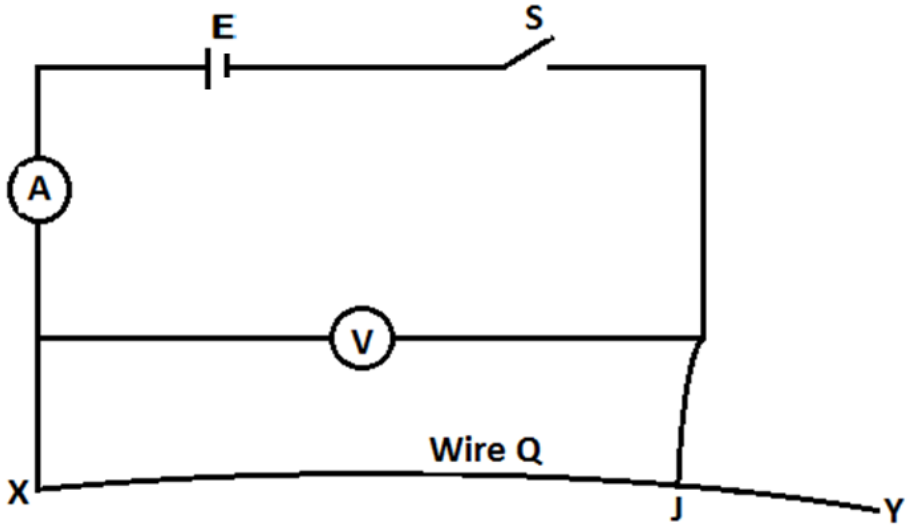
Figure 2

   (b) Heat up the solid brass in beaker containing some water to about100℃. Use a piece of thread to suspend the solid from retort stand in figure 2 above then record temperature of boiling point of water as initial temperature of solid brass $\theta_2 = 100℃$.
   (c) Meanwhile,
      (i) Determine the mass M_C of the calorimeter when empty and two-third filled with cold water then calculate mass of cold water M_W
      (ii) Place the calorimeter two-third filled with cold water in the jacket. Measure the initial temperature of the cold waterθ_O.
      (iii) Quickly transfer the solid brass into the calorimeter and cover it with lid to minimize heat losses as indicated in figure 2 above, stir well and record the equilibrium temperatureθ_1.
      (iv) Remove the solid from the calorimeter and measure its massM_S.
   (d) Apply the method of mixtures show how you can find the specific heat capacity of solid brass C_S then calculate its value
   (e) State one possible sources of error in this experiment and how to minimize it

3.You are provided with dry cell of emf E, a switch S, an ammeter A, a voltmeter V, connecting wires a constantan wire Q, and a jockey J.

Proceed as follows

(a) Setup a circuit as shown in figure below



(b) Connect one end of the wire Q to the ammeter A at point X.

(c) Start at $L = 15cm$ length of wire Q from end Y, move the jockey J toward X until the ammeter register 0.3A. Record the voltmeter reading V in volts.

(d) Move again the jockey J toward X until the ammeter reads 0.4A, record the corresponding new voltmeter reading V in volts.

(e) Repeat the procedure in (d) when the ammeter reads 0.5A, 0.6A and 0.7A.

QUESTIONS

i. Tabulates the results

ii. Plot a graph of current I(A) against voltage V(V)

iii. Find the slope S of the graph

iv. Determine the internal resistance (r) of a cell given that

$$s = -\frac{1}{r}$$

v. Use the graph drawn above find the value of emf E of a dry cell