Experiment 2 : Compound Pendulum: *Kater's Reversible*

- To determine the value of acceleration due to gravity using **Kater's pendulum** revesible pendulum for both the cases (a) $T_1 \sim T_2$ and (b) $T_1 \neq T_2$
- Discuss the relative merits of both cases by estimation of error in the two cases.

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1. **SETUP & FORMULAE:** The Kater's pendulum is a compound of bar pendulum with two knife edge support and with two geometrically similar wooden and steel blocks placed at the opposite ends of the bar. These two objects are used to control the position of the CG so as to make the pendulum have almost same time period (T_1 and T_2) of oscillations in reverse modes. -The value of acceleration due to gravity (g) can be found from the equation

$$g = \frac{8\pi^2}{\left[\frac{T_1^2+T_2^2}{l_1+l_2} + \frac{T_1^2-T_2^2}{l_1-l_2}\right]} \xrightarrow{T_1 \sim T_2} \frac{8\pi^2}{\left[\frac{T_1^2+T_2^2}{l_1+l_2}\right]}$$

   where l_1 and l_2 are the distance of the point of suspension from the CG.

2. **Tables: Observations and Calculations**
   - (Preliminary Step) Adjust the positions of the weights and record of times of oscillations during for (a) $T_1 \sim T_2$ and (b) $T_1 \neq T_2$.
   - (Final Step) Tabulate time periods T_1 and T_2 for 50 oscillations. Repeat for 100 oscillations.
   - Also tabulate the corresponding distances l_1 and l_2
   - Discuss the relative merits of both cases ($T_1 \sim T_2$ and $T_1 \neq T_2$) by estimation of error in the two cases.

3. **APPLICATIONS**

   (a) Any of say (i) Analyzing Rotational Motion, (ii) Period and Frequency Determination (iii) Moment of Inertia Calculation (iv) Structural Engineering (v) Biomechanics (vi)Architectural Design