PHYSICS LAB EXP 1

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Ans 1 >>>

To plot a graph between the distance of the knife edge from the center of the gravity and time period of bar pendulum from graph, find:

acceleration due to gravity

the radius of gyration and the moment of inertia of the bar about on axis.

Ans 2 >>>

Translational Motion:

Translational motion is motion that involves the sliding of an object in one or more of the three dimensions: x, y or z. But an object can still be moving even when it's just sitting at a particular x-, y- and z-coordinate, it can still spin.

Rotational Motion:

Rotational motion is where an object spins around an internal axis in a continuous way.

Ans 3 >>>

Simple Pendulum:

An ideal simple pendulum consists of a heavy point mass body(bob) suspended by a weightless, in-extensible and perfectly flexible string from a rigid support about which it oscillate.

But an ideal pendulum is impossible to construct.

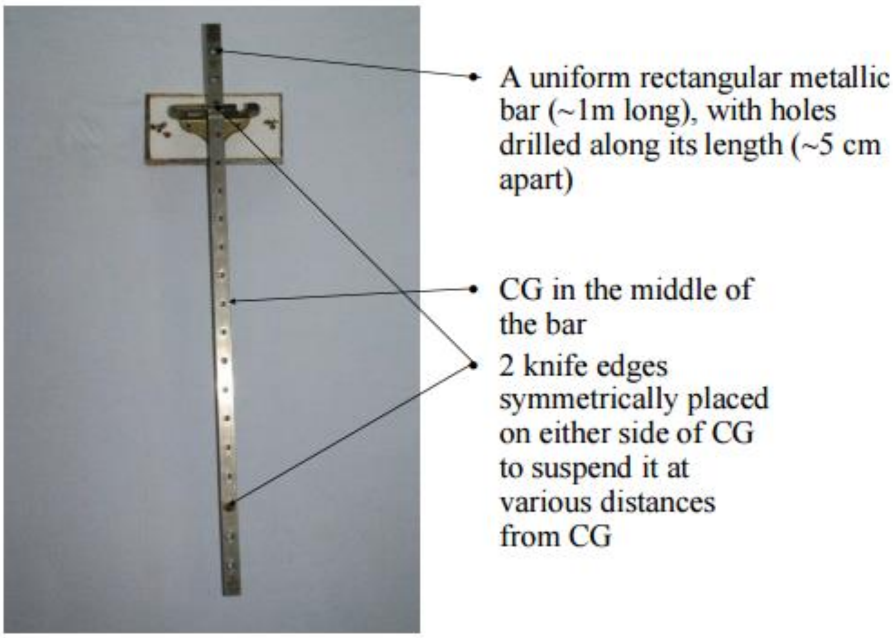
Compound Pendulum:

Any rigid body suspended from a fixed support constitutes a physical pendulum. The body can be irregular also.

It's a real-life scenario, and practical extension of simple pendulum. Since Here, the length is replaced by L effective i.e., Effective length of the pendulum= distance between the suspension point and center of mass.

Ans 4 >>>

Bar Pendulum



Radius of gyration (K) = sqrt(L' x L'')

Equivalent length = (L' x (distance from point of suspension) + L'' x (distance from point of oscillation))

Ans 6 >>>

Three best example for oscillatory motion are:

Weighted wood log floating in a liquid pressed down and released

Mass performing oscillations attached to a spring

Bar pendulum

Ans 7 >>>

If higher amplitude is given to the compound pendulum The pendulum still oscillates, but the motion is no longer simple harmonic motion because the angular acceleration is not proportional to the negative of the angular displacement.

Ans 8 >>>

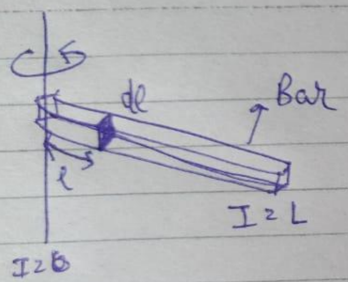
We have seen that the total energy of a harmonic oscillator remains constant. Once started, the oscillations continue forever with a constant amplitude and a constant frequency. Simple harmonic motions which persist indefinitely without loss of amplitude are called free or undamped.

However, observation of the free oscillations of a real physical system reveals that the energy of the oscillator gradually decreases with time and the oscillator eventually comes to rest.

This happens because, in actual physical systems, friction (or damping) is always present.

Ans 9 >>>

Answer 9 >>>



Now since the rod is uniform (assume) therefore we have constant linear density

$\delta = M/L = dm/dl$

$dm = \frac{M}{L}(dl)$

$I = \int_0^M l^2 (M/L)\, dl$

If we apply the integration:

$I_{end} = \frac{M}{L}\int_0^L l^2\, dl$

$= \frac{M}{L}\left|\frac{l^3}{3}\right|_0^L$

$$\boxed{I_{end} = \frac{1}{3} ML^2}$$

Ans 10 >>>

Refer to diagram of question no. 4

Ans 11 >>>

Observations :

Least count of the stop watch = **0.1 sec**

Least count of the meter scale = **0.01 m**

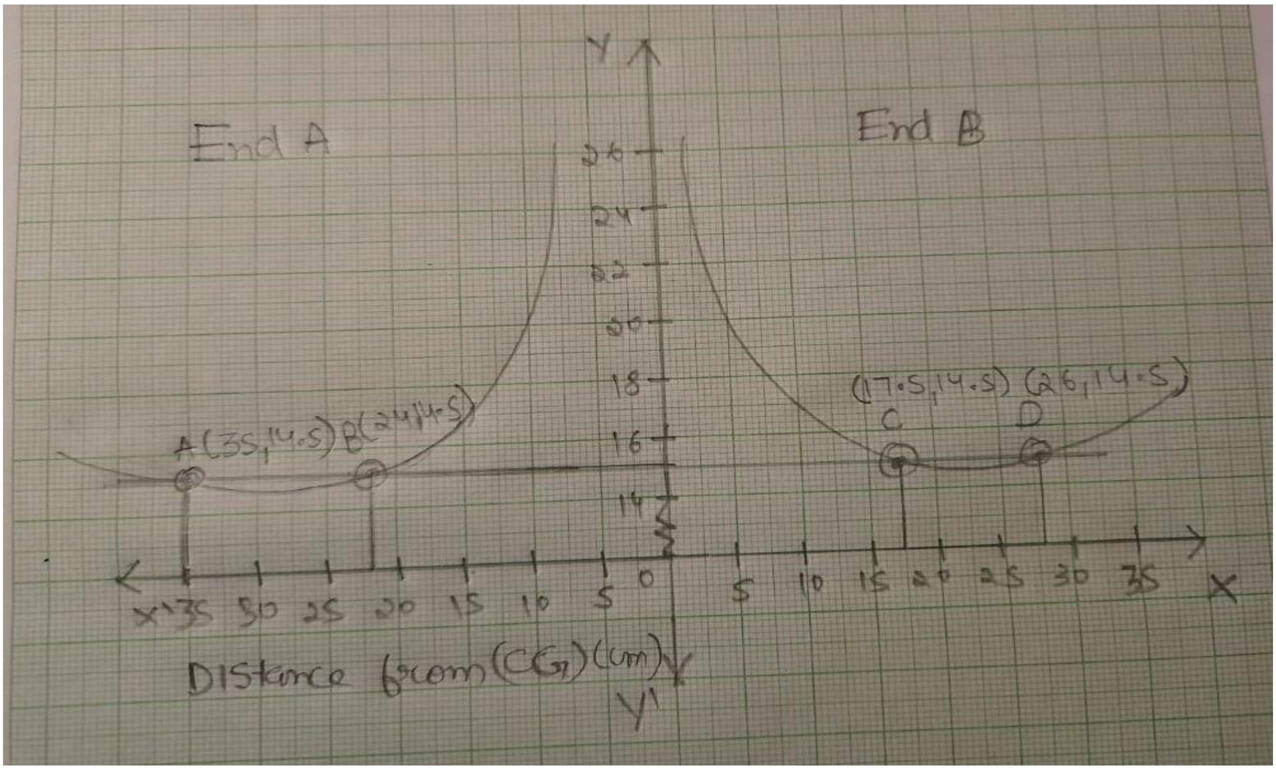
Mass of the bar pendulum = **1.45 Kg**

No. of hole	Distance of hole from CG(m)	No of oscillations	Time taken (s)	Periodic Time (s)
1	0.45	20	32.10	1.605
2	0.40	20	31.08	1.554
3	0.35	20	30.65	1.5325
...	...	...	...	...
8	0.30	20	38.60	1.93
9	0.35	20	51.54	2.577

Position of center of gravity [Turn the pendulum]

10	0.05	20	50.82	2.541
11	0.10	20	38.08	1.904
12	0.15	20	32.93	1.6465
...	...	...	...	...
17	0.40	20	31.25	1.5625
18	0.45	20	31.94	1.597

Ans 12 >>>



Ans 13 >>>

Answer 13 >>>

$AC = 34 + 23 = 57\ cm \rightarrow l' = \frac{57}{2} = 28.5$

$BD = 22 + 33 = 55\ cm \rightarrow l'' = \frac{55}{2} = 27.5$

$l' = \frac{AC + BD}{2} = \frac{57 + 55}{2} = 56\ cm$

$g = \frac{4\pi^2 L}{T^2} = \frac{4 \times (3.14)^2 \times 56}{(1.5)^2} = 981.5779\ cm/s^2$

$= 9.815779\ m/s^2$

Ans 14 >>>

Answer 14 >>> $\% \text{ error} = \left[\dfrac{9.81577 - 9.81}{9.81} \right] \times 100 = 0.057\%$

$K = \sqrt{l' \times l''} = \sqrt{0.28 \times 0.27} = 0.274 \text{ m}$

$I = mK^2 = 1.45 \times (0.27)^2 = 0.1057 \text{ kg/m}^2$