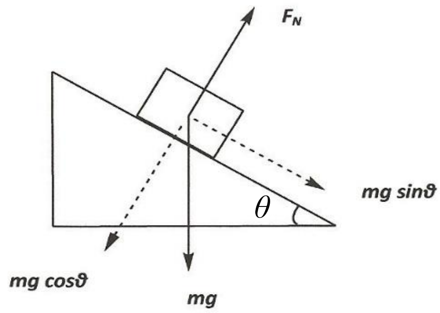
AIR TRACK

Objective:-

To find the acceleration due to gravity **g.**

Theory:-

When a body slides down a frictionless inclined plane, the components of the force acting on the body are shown in figure. The vertical component that will cancel and the horizontal component equals:



$$Ma = mg \sin \theta$$

$$\boxed{a = g \sin \theta}$$

Where:
a is the acceleration of the body **(m/s^2).**
g is the acceleration due to gravity **(m/s^2).**

$$\boxed{g = \text{slope}}$$

The velocity of the body at any point on the plane (constant acceleration) is given by:

$$v^2 = v_o^2 + 2aD$$

$$\boxed{a = \frac{v^2}{2D}}$$

Where:
v is velocity of the body at distance D, **(m/s)**.
v_0 is initial velocity of the body ($v_o = 0$).
D is the distance between the initial and final velocity (Δx), **(m).**

The velocity of the glider can be measured by passing it through a photoelectric gate which is connected to an electronic clock. On the top of the glider is mounted a flag of length L. As this flag first breaks the light beam in the gate, the clock will begin to measure time, when the flag passes the photocell the clock will stop counting. The velocity of the glider is given by:

$$\boxed{v = \frac{L}{t}}$$

Where:
L is the length of the flag **(m)**.
t is time measured by the smart timer **(s)**.

The inclination of the air track can be adjusted by inserting blocks of different height under single leg.

$$\boxed{\sin\theta = \frac{H}{L_0}}$$

Where:
L_0 is the distance between the legs of the air track **(m)**.
H is the height of the block **(m)**.

Apparatus:-

Air track	Photo gate
Glider	Flag
Smart timer	Air pump
Blocks	

Procedure:-

1. Measure the following **L_0**, **L** and **D**.

2. Timer Setup:
a. Press the **Select Measurement** button repeatedly until **Time** is displayed.
b. Press the **Select Mode** button repeatedly until the **stopwatch** mode is displayed.
c. Press the **Start/Stop** button once you will note the star sign * appears on the timer screen to indicate that the timer is ready takes the reading.

3. Choose a short riser block, carefully slide the block under the end of the air track with only one leg.
4. Turning on the air pump with just enough air flow to move the glider above the track.
5. Release the glider (**without pushing**) from rest (v_0 = 0) and read the time t on the digital display of the timer.
6. To prepare to take another measurement, reposition the glider from rest at same initial position, and press the Start/Stop button to reset the timer.
7. Repeat the steps 5 and 6 and record the time for different values of height H and tabulate the results.
8. Graph the relation between **sinθ** on the **x-axis** and the acceleration **a** on the **y-axis** and **calculate the slope.**
9. Use the graph to calculate the **acceleration of gravity g.**