

Teacher: Sayan Chakraborti

Student:

Acceleration in One Dimension

Introduction:

Acceleration is a fundamental concept in physics that describes how an object's velocity changes concerning time. Let's explore this concept and derive expressions for distance traveled under different conditions.

Acceleration:

Acceleration (a) is defined as the rate of change of velocity (v) concerning time (t). It can be expressed as:

$$a = \Delta v / \Delta t$$

Where Δv represents the change in velocity, and Δt represents the change in time.

Uniform Acceleration:

In cases of uniform acceleration (constant change in velocity), we use the following equations:

$$v = u + at$$

Where v is the final velocity, u is the initial velocity, a is the acceleration, and t is the time.

$$d = ut + \frac{1}{2} a t^2$$

Where d is the distance traveled, u is the initial velocity, a is the acceleration, and t is the time.

Problem: Pumpkin Drop at Caltech

Physics students at Caltech are conducting a Halloween experiment. They decide to drop a pumpkin from the top of the tallest building, which is approximately 45 meters tall. The pumpkin is released from rest, and its freefall is subject to gravity's acceleration, which the students are trying to figure out. They time the fall to be about 3 seconds. How much acceleration due to gravity did the pumpkin experience?