ScienceCube

Motion of a Thrown Ball

We can measure the distance of a ball thrown vertically, analyze its speed, average acceleration, potential energy, and kinetic energy.

Fundamental Concept

When a ball is thrown straight up, its speed decreases until it reaches its peak height. At this point, the kinetic energy becomes zero while the potential energy increases to its maximum. After reaching the highest point, the ball falls back down under the influence of gravity, increasing in speed.

Height	Speed	Potential energy	Kinetic energy	Acceleration
Increase	Decrease	Increase	Decrease	g

Height	Speed	Potential energy	Kinetic energy	Acceleration
Decrease	Increase	Decrease	Increase	g

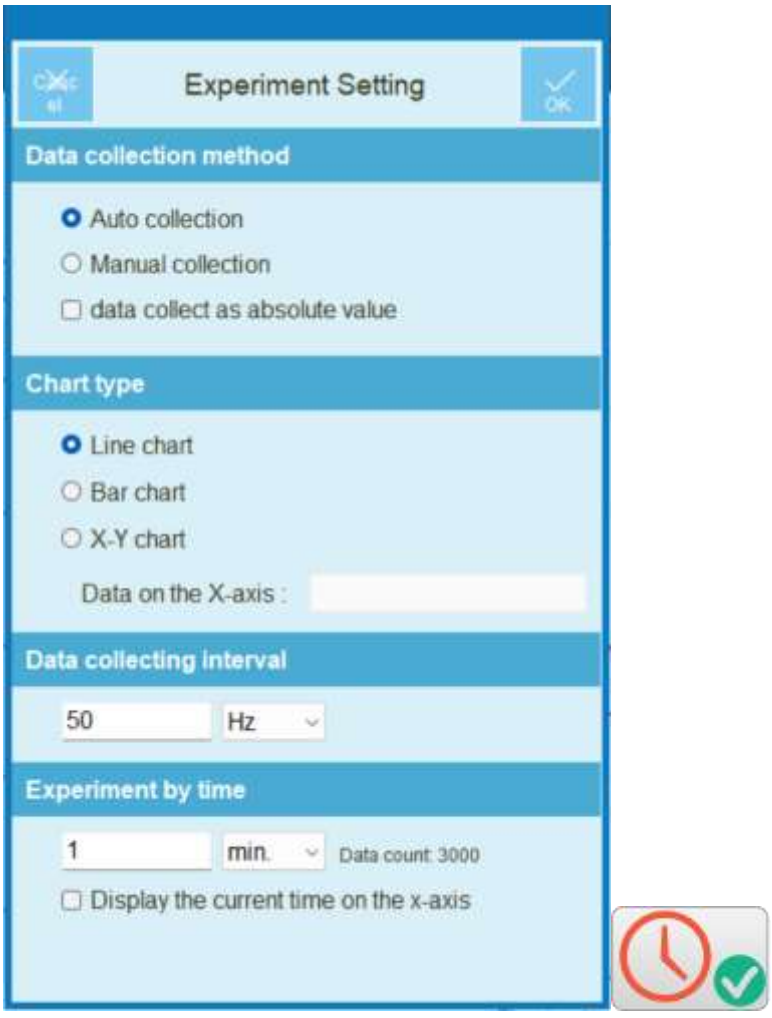
Experiment

Materials Needed

Interface, Science# program, Smart device, Motion sensor, Basketball

Interface Setup

1.  Run the Science# program.
2. Connect the motion sensor to the interface.
3. Press  to set up the experimental environment as shown below or press  for automatic setup.



Data Collection

1. Place the motion sensor on the ground facing the ceiling.
2. Stand holding the basketball above the sensor.
3. Press  to start data collection.
4. Throw the basketball straight up. Ensure the ball stays within the range of 0.15–2m from the motion sensor.

5. When the motion of the basketball stops, press  to end data collection.

Data Analysis

Recording Data

1. Draw a time-distance graph of the ball thrown vertically and explain the distance changes according to the ball's movement direction.

Motion of the Ball	Going Up	Coming Down
Distance Change		

Data Application

1. Use [Analyze] - [Differentiate] to draw a time-speed graph of the ball thrown vertically and explain the speed changes according to the ball's movement direction.

Motion of the Ball	Going Up	Coming Down
Speed Change		

2. Analyze the time-speed graph of the ball thrown vertically using [Analyze] - [Linear f(x)=Ax+B] to draw the graph and find the average acceleration (A).

Average Acceleration of the Vertically Thrown Ball (m/s^2)

3. Analyze the time-distance graph of the ball thrown vertically using [Analyze] - [Conservation of Mechanical Energy] - [Potential Energy Ep=mgh] to draw the potential energy graph, and use [Analyze] - [Conservation of Mechanical Energy] - [Kinetic Energy Ek=(1/2)mv^2] to draw the kinetic energy graph.

Motion of the Ball	Going Up	Coming Down
Potential Energy Change		
Kinetic Energy Change		


Report
(For Teachers)
Report
(For Students)