THE INTERNATIONAL SCHOOL OF MINNESOTA

Department of Physics

AP Physics C Mechanics

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Determine Gravitational Constant Through Free Fall

Group 1

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Contents

1 Purpose

The purpose of the overall experiment is to determine the gravitational constant $g \approx 9.81 m/s^2$

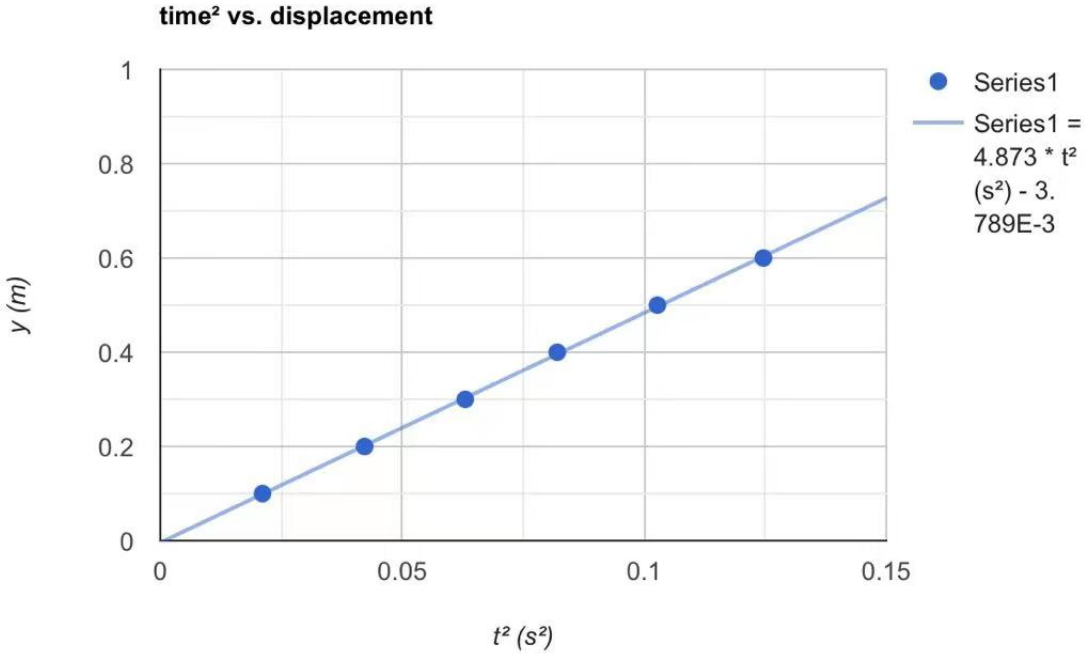
2 Introduction

Gravitational acceleration on Earth's surface is approximately $9.81 m/s^2$. Since all the fall objects close to earth's surface get accelerated in the rate, if we can find the distance and the time an object takes to complete the free fall, we can reversely determine the gravitational constant g. this experiment is designed to deduce the gravitational constant through dropping an object on various heights and measure the time it take to complete the free fall.

3 Results and Discussion

Raw data

displacement (m)	time (t)	time^2 (t^2)
0.1	0.1455	0.0211
0.2	0.2055	0.0422
0.3	0.2510	0.0630
0.4	0.2865	0.0820
0.5	0.3205	0.1027
0.6	0.3530	0.1246



Calculation

The graph above is consists of data points from the table and the line of best fit.

$\because$ Based on the data points above, the line of best fit is: $\boxed{f(x) = y = 4.873x - 0.004}$

$\because \frac{g}{2}$ can be represented with the slope of the line $f(x)$

$\therefore \boxed{g = 9.746}$

By comparing the $g = 9.746$ with gravitational constant $g \approx 9.81$, we can derive the numerical value we derived is close to the standard g

4 Error Analysis

1. the acceleration of the ball might not be uniform
2. air resistance
3. error in the measurement accuracy

5 Conclusions

By conducting the experiment above, we can effectively approximate the gravitational constant g by measuring the height and the time for an object to conduct a free fall. Errors are analyzed and conclusion are drawn.