

Name:
Partner:
Class:
Date returned:

FREE FALL EXPERIMENT

Purpose

To observe and analyze the motion of a free falling body and draw its (x-t) and (v-t) graphs.

Operation of Ticker Timer

The Ticker Timer consists of a small motor driving a hammer to make a mark in a piece of Ticker Timer Tape. The motor achieves this by oscillating back and forth according to the AC (Alternating Current) supply that it is attached to. The AC current is alternating at 50 Hz (i.e. 50 cycles per second), consequently the hammer strikes the tape 50 times per second, and so the time between the dots is

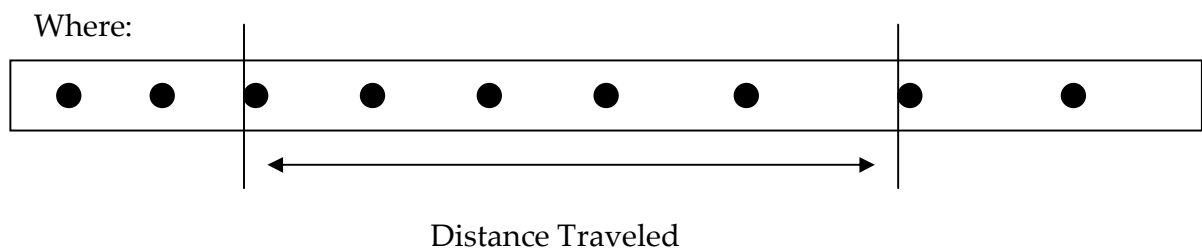
$$\frac{1 \text{ second}}{50 \text{ strikes per second}} = 0.02 \text{ seconds}$$

Normal practice is to record the **distance between five successive dots**, and so the average speed is calculated as follows:

$$\text{Average Speed} = \frac{\text{Change in Distance}}{\text{Change in Time}}$$

$$\text{Average Speed} = \frac{(\text{Distance between five dots})}{(5 \times 0.02)}$$

$$\text{Average Speed} = \frac{\Delta d}{0.1}$$

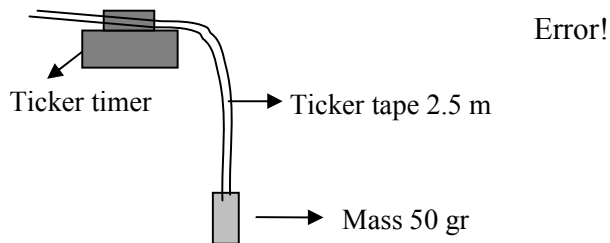


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Equipment

Masses, String, Ticker Timer, Power Supply

Set up the apparatus as per the diagram below



Procedure

1. Turn on the timer and release the mass from at least 2.5 m above the ground. (DO NOT FORGET TO PLACE A BOOK ON THE FLOOR TO PREVENT DAMAGING)
2. Turn off the timer and inspect the tape to ensure that the results are good
3. **Repeat Procedure until each member of the group has a tape.**
4. Label the first distinguishable dot as 0, count five dots (spaces) and label this dot 1. Continue counting off five dots, labeling them "2", "3" etc. Each set of five spaces represents one time interval.

Analysis

1. Plot a graph of Total Distance (y-axis) versus Time (x-axis)
2. Plot a graph of Average Speed (y-axis) versus Time (x-axis)
3. Describe the Distance versus Time Graph. What is the meaning of the graph?
4. Describe the Average Speed versus Time Graph. What is the meaning of the graph?
5. Calculate the gradient (slope) of the Speed versus Time Graph, what is the significance of the slope?
6. What factors would have caused errors in your experiment?

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Results

Record your results in a table as below

Time Interval	Distance (m)	Total Distance (m)	Average Speed (m/s)
1	y_1	y_1	$V_1 = \frac{y_1}{0.1}$
2	y_2	$y_1 + y_2$	$V_2 = \frac{y_2}{0.1}$
3	y_3	$y_1 + y_2 + y_3$	$V_3 = \frac{y_3}{0.1}$
0.1			
0.2			
0.3			
0.4			
0.5			
0.6			
0.7			
0.8			
0.9			
1.0			
1.1			
1.2			
1.3			
1.4			
1.5			
1.6			