

Motion of a body moving in a straight line under constant acceleration.

Purpose

To observe and analyze the motion of a body moving in a straight line under constant acceleration.

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 two dots is**

$$\frac{1}{50} \text{ sec} = 0.02 \text{ seconds}$$

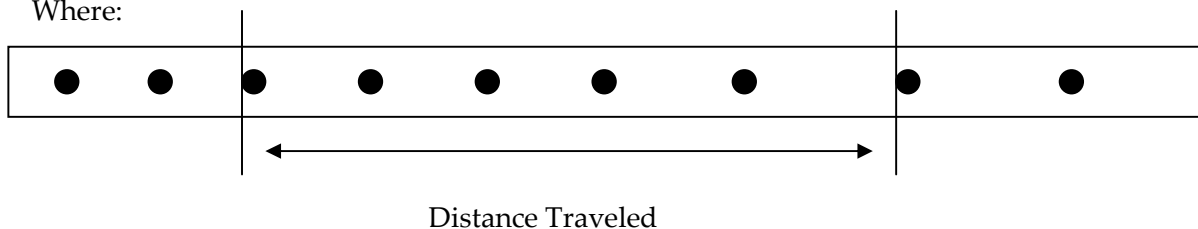
Normal practice is to record the **distance between six successive dots (i.e. five successive gaps)**, and so the average speed is calculated as follows:

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

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

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

Where:



Equipment

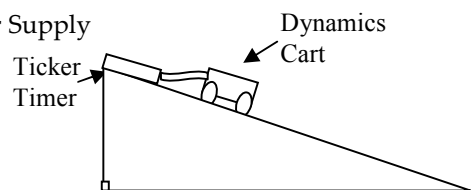
Dynamics Cart, inclined plane, String, Ticker Timer, Power Supply

Method

Set up the apparatus as per the diagram aside

Procedure

1. Turn on the timer and release the cart.
2. Turn off the timer when the cart reached to the bottom of the inclined plane and inspect the tape to ensure that the results are good and dots are clear.
3. Repeat Procedure until each member of the group has a tape.
4. Label the first distinguishable dot as 0, count six dots (5 successive space) and label segment as 1. Continue counting off five dots, labeling them "2", "3" etc. Each set of five spaces represents one time interval.



Results

Record your results in a table as below

Name _____

Class _____ Date _____

Partner _____

Time Interval	Distance travel in each time interval (m)	Total Time traveled (sec)	Total Distance traveled (m)	Time ² (t ²) (sec ²)	Average Speed in each time interval (m/s)
1.	x ₁	0.1	x ₁	0.01	$V_1 = \frac{X_1}{0.1}$
2.	x ₂	0.2	x ₁ + x ₂	0.04	
3.	x ₃	0.3	x ₁ + x ₂ + x ₃	0.09	$V_2 = \frac{X_2}{0.1}$
.	
.	$V_3 = \frac{X_3}{0.1}$
.	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Analysis

1. Plot a graph of Total Distance (y-axis) versus Time (x-axis) [x-t] (on the Graph paper)
2. Plot a graph of Total Distance (y-axis) versus Time² (x-axis) [x-t²] (on the Graph paper)
3. Plot a graph of Average Speed (y-axis) versus Time (x-axis) [V-t] (on the Graph paper)
4. For the Distance versus Time Graph. [x-t]:
 - a) What is the meaning of the graph?
 - b) What is the shape of the graph?
 - c) Try to explain the shape of the graph by suitable equations.

5. For the Distance versus Time² Graph [x-t²]:
 - a) What is the meaning of the graph?
 - b) What is the shape of the graph?

Name _____
Class _____ Date _____
Partner _____

c) Try to explain the shape of the graph by suitable equations.

6. For the Average Speed versus Time Graph [V-t]:

- a) What is the meaning of the graph?
- b) What is the shape of the graph?
- c) Try to explain the shape of the graph by suitable equations.

7. Calculate the gradient (slope) of the Speed versus Time Graph, what is the significance of the slope?

8. What factors would have caused errors in your experiment?

When preparing the graphs make sure you pay close attention to the following criteria's

Name _____

Class _____ Date _____

Partner _____

How To Construct a Line Graph On Paper		
Step	What To Do	How To Do It
1	Identify the variables	a. Independent Variable - (controlled by the experimenter) <ul style="list-style-type: none"> • Goes on the X axis (horizontal) • Should be on the left side of a data table. b. Dependent Variable - (changes with the independent variable) <ul style="list-style-type: none"> • Goes on the Y axis (vertical) • Should be on the right side of a data table.
2	Determine the variable range.	a. Subtract the lowest data value from the highest data value. b. Do each variable separately.
3	Determine the scale of the graph.	a. Determine a scale, (the numerical value for each square), that best fits the range of each variable and write it underneath the axes. b. Spread the graph to use MOST of the available space.
4	Number and label each axis.	<ul style="list-style-type: none"> • This tells what data the lines on your graph represent.
5	Plot the data points.	a. Plot each data value on the graph with a dot. b. You can put the data number by the dot, if it does not clutter your graph.
6	Draw the graph.	a. Draw a curve or a line that best fits the data points. b. Most graphs of experimental <u>data are not drawn as "connect-the-dots"</u> .
7	Title the graph.	a. Your title should clearly tell what the graph is about. b. If your graph has more than one set of data, provide a "key" to identify the different lines.

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