Module Two Lab Activity

Velocity and Acceleration - A Virtual PhET Lab

Objectives

After completing this lab activity, the students should be able to:

- **Calculate velocity**
- **Calculate acceleration**
- **Determine position, velocity, and acceleration using the graphs**
- **Write a lab report**

Lab Report

The lab report must include the following:

- **Title**
- **Introduction**
- **Experimental Details or Theoretical Analysis**
- **Results**
- **Discussion**
- **Conclusions and Summary**
- **References**

Please visit the following website to learn more about lab reports:

ASC Format for Laboratory Reports (Links to an external site.)

An example of a lab report is given on the following website:

Professor K Samples (Links to an external site.)

Lab Activity

Please follow the steps given below to conduct the experiment:

- This lab requires you to produce a lab report to **determine** "**Velocity and Acceleration."** This is the **"Title"** of your lab report.
- Read the relevant chapter on velocity and acceleration and add an **"Introduction."**

You conduct this lab by connecting to the PhET website by clicking on the link given below (or where applicable through the embedded simulation on the lab page):

The Moving Man (Links to an external site.)

Attribution:

PhET Interactive Simulations
University of Colorado Boulder
https://phet.colorado.edu (Links to an external site.)

(If you cannot use the above simulation or cannot get to the website by clicking on the link, please copy and paste the link into your browser. If the simulation is not running, please check if you have the latest Java, Adobe Flash, or HTML5 software [depending on the simulated lab]. If you download the relevant software and attempt to run the simulation and it is still not working, please call the IT helpdesk. It also could be that your computer does not have sufficient space to run the simulation. Please check all the possibilities).

- For this experiment, you use the **"Charts"** section of the lab. After you click the Charts section of the lab, select the "velocity" and "acceleration" tools (left-hand side). You can change the position, velocity, and acceleration values as per the scenarios given below and relevant graphs will appear on the screen. (Also, note the "record" button at the bottom of the simulation. You can select this function and run the simulation. Then, use the "playback" button to view the experiment again to note the time values for that scenario.) This information constitutes the **"Experimental Details"** section of the lab report. You must keep a record of the details information of the graphs appearing on the screen as **experimental values** for each scenario. These values form part of the **"Results"** section of the lab report. Now, complete the theoretical calculations of velocity and acceleration for each scenario using relevant equations. These calculated values also form the **"Results"** section of the lab report.
- Now, you can complete the **"Discussion"** section of your lab report by comparing the values and discussing any differences in the theoretical and experimental values and any other information relevant to the experiment.
- Complete the lab report by adding a summary to the "**Conclusion**" section of your lab report.
- Submit the lab report to the relevant Canvas Dropbox

Lab Scenarios

Using the Moving Man simulation chart section, develop Position v. Time, Velocity v. Time, and Acceleration v. Time graphs for the following scenarios and use them as the experimental results of your lab report (screenshots or take pictures of the graphs or hand-drawn graphs with actual time values). Remember to explain the graphs, how to calculate velocity or acceleration, and what information can be gathered from the area under each graph in your discussion section.

1. Constant velocity (10 m/s) in the positive direction for 10m.

2. Constant velocity (-4 m/s) in the negative direction for 5m.

3. Constant acceleration (4 m/s^2) in the positive direction for 10m.

4. Constant acceleration (-5 m/s^2) in the negative direction for 5m.

Please discuss (without using the simulation), the following two scenarios:

1. An object is travelling in a positive direction and change to a negative velocity - discuss. What possibilities are there for acceleration values?

2. An object is travelling in a negative direction and change to a positive velocity - discuss. What possibilities are there for acceleration values?

N.B.: When operating the simulation, it is better to enter only the velocity or acceleration value for each scenario. Do not enter the position values, since this would change the initial position. You control the position value by stopping the simulation when the man has moved the desired distance.