

Modified from PASCO Essential Physics

Objectives:

- Understand the relationship between velocity, position, and their graphs.

Materials:

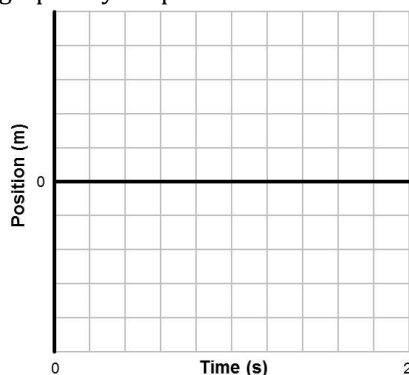
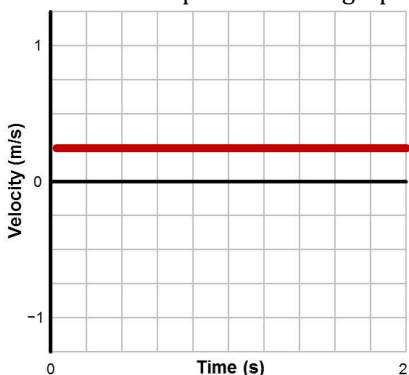
- PASCO Smart Cart with track
- Tablet or computer with SparkVue App

Procedure:

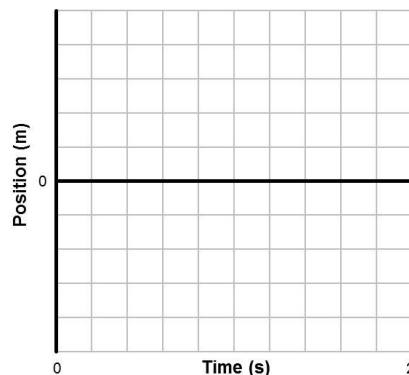
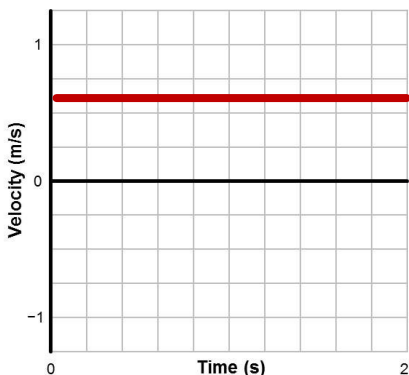
Graphs are important for describing the motion of an object. Position versus time and velocity versus time graphs can describe the location of an object, how fast it is moving, and which direction it is headed.

1. Set the Smart Cart on a level track.
2. In the SparkVue App, open the experiment file 03B_MotionGraphs from Essential Physics.
3. Turn on the Smart Cart and connect it to the SparkVue App.
4. For each of the following velocity-time graphs,
 - a. Sketch a *prediction* for the corresponding position-time graph.
 - b. Find the page in the experiment file with the same velocity-time graph.
 - c. Record data as you use your hand to move the cart so that its velocity-time graph matches the given graph.
 - d. Sketch the *actual* position-time graph in the same graph as your prediction. Label which graph is which.

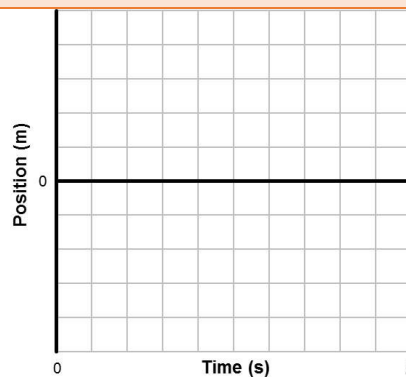
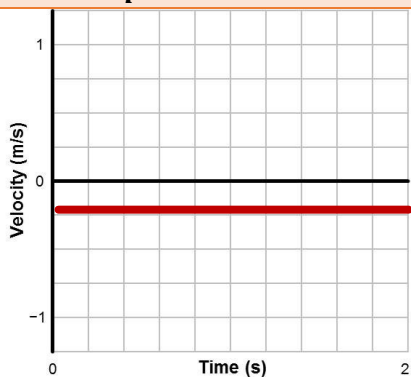
Moving forward at a slow speed
(Ex. pg1)



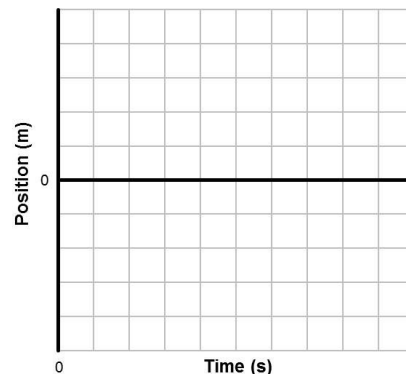
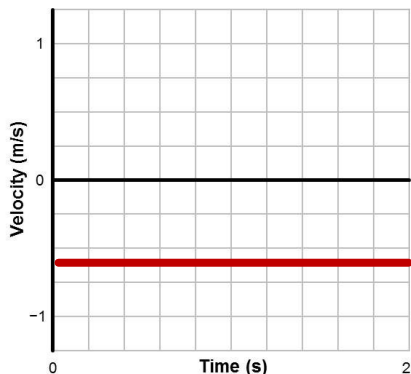
Moving forward at a fast speed
(Ex. pg2)



Moving backward at a slow speed (Ex. pg3)



Moving backward at a fast speed (Ex. pg4)



5. What is the difference between the *position* graph for a high positive velocity and a lower positive velocity?
6. What is the difference between the *velocity* graph for a high positive velocity and a lower positive velocity?
7. What is the difference between the *position* graph for a negative velocity and a positive velocity?
8. What is the difference between the *velocity* graph for a negative velocity and a positive velocity?
9. Describe a situation where the position versus time and the velocity versus time graph are both flat horizontal lines?
10. Go to page 5 in the experiment file. Record data while moving the cart to match the position-time graph. Then describe the motion of the cart during each section of the graph. Use terms like forward, backward, at rest, fast, slow.
 - a.
 - b.
 - c.
 - d.
11. Draw the velocity-time graph from the motion from step 10. Label each section using the letters from the graph in step 10.

