Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Walker Lab

**Purpose:** In this lab, you will record the distance and time for several 5-meter intervals as a walker travels at a constant velocity on a football field. You will then plot graphs of distance vs. time for three walkers and interpret the meaning of the slope of the graph.

**Materials:** meter stick and stopwatch

**Hypothesis:**

Draw what you think the motion for the following types of walkers would look like in the boxes below.

|  |  |  |  |
| --- | --- | --- | --- |
| Type of Graph | Slow Walker | Fast Walker | Running Walker |
| Position-Time |  |  |  |
| Velocity-Time |  |  |  |

**Procedure:**

1. In your groups assign the following roles:

* 6 timers
  + Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* 1 walker
  + Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* 1 data recorder
  + Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. We will go out to the football field.
2. You will have the six timers stand on the same line of the football field, but spread apart by approximately 5 meters. You will take a meter stick with you to mark the distance between the people and record the information in the column labeled position.
3. The walker will start at the zero line. When the walker yells “GO” all the timers will begin their stopwatch. The walker will walk at a slow pace and each timer will stop their stopwatch when the walker passes them.
4. After the walker has walked the course, the recorder will record the time from each timer in the data table.
5. The process will repeat with the walker walking at a medium and a fast speed.

**Data Table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Timer | Position (m) | Time for Slow Walker  (s) | Time for Medium Walker (s) | Time for Fast Walker  (s) | Time Increasing |
| 1 | 0 |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |
| 11 |  |  |  |  |

Record all measured values to the appropriate degree of precision.

**Data Analysis**

1. Using your knowledge of good graphing technique, produce a position versus time graph of the slow walker.

2. After completing your graph, compute the slope of the line. Remember that the slope should have units.

3. On the same axes plot position vs time for the two other Walkers. Use a different symbol to draw the best fit line for each set of data.

**Conclusion Questions – these should be answered in *paragraph* form in your conclusion.**

1. Which Walker traveled with the most consistent constant speed and how do you know?

2. Write a general statement summarizing the concepts and results in this lab. Be sure to give what the slope represents and how you know the motion was constant. Give also the difference of each of the lines on the graph.

3. List two reasonable sources of error in this lab and describe how each may have affected your results.

4. In general, explain the significance of the slope of a position vs. time graph. Include a discussion of positive and negative slope.

5. What type of motion is occurring when the slope of a position vs time graph is constant?

6. What type of motion is occurring when the slope of a position vs time graph is changing? Relate this to the distribution of points around your best fit line for one of your Walkers.

7. When you plotted your data, and drew the best fit line through the data, why were some of the data points not located directly on your best fit line?

**PreAP Physics – Moving Man PhET Lab**

Today, you will use the Moving Man PhET Simulation to explore how the motion of a person can be graphed in positon-time and velocity-time graphs.

**Beginning Observations –** Open the Moving Man PhET Simulation.

On the Introduction tab, what can you change and control?

**Part 1 – Investigating Constant Velocity**

You will now use the Charts tab to explore how the motion of the moving man can be graphed. Below are a series of scenarios. You will *first*  make a prediction then use the simulation to *verify* or *correct*  your prediction.

1 – Man moves towards house slowly at a constant velocity

|  |  |  |
| --- | --- | --- |
| Predicted positon-time graph | Actual position-time graph | Explain |
|  |  |  |

2 – Man moves quickly towards house at a constant velocity

|  |  |  |
| --- | --- | --- |
| Predicted positon-time graph | Actual position-time graph | Explain |
|  |  |  |

3 – Man moves towards tree slowly at a constant velocity

|  |  |  |
| --- | --- | --- |
| Predicted positon-time graph | Actual position-time graph | Explain |
|  |  |  |

4 – Man moves towards tree quickly at a constant velocity

|  |  |  |
| --- | --- | --- |
| Predicted positon-time graph | Actual position-time graph | Explain |
|  |  |  |

Reflection Q’s

1) Where your predictions correct? Explain any errors.

2) Explain the differences in the slope between questions 1 and 2.

3) How are scenarios 1 and 3 different? 2 and 4?

**Part 2 – Changing Velocity**

*Repeat one of the scenarios above but change the moving man’s velocity as he moves. This means have the man either a) slow down or b) speed up.*

1) What are you changing if you change the velocity of the moving man?

2) Explain the scenario you acted out using the computer and your results. Include the position-time graph and the velocity-time graph.

3) How are your graphs in Part 2 different from your graphs in Part 1?