Interpreting the Slope Lab

Teacher's Guide

Topic:

One Dimensional Kinematics

The following information is provided to the student:

Question:
How does the slope of the line on a position-time graph compare to the speed of an object?

Purpose:
To compare the speed of an object to the slope of the line on a position-time graph.

A complete lab write-up includes a Title, a Purpose, a Data section, a Conclusion and a Discussion of Results. The Data Section should include the appropriate measurements, graphical display and calculations which are required to accomplish the purpose of the lab; all data should be properly labeled and organized. Work for calculations should be shown. The Conclusion should respond to the purpose of the lab. The Discussion of Results section should describe the evidence which leads to the conclusion statement; specific information which serves as evidence should be identified and elaborated upon. A percent difference calculation is shown.

Materials Required:

Computer-interfaced motion detector and accompanying software; constant speed car.

Description of Procedure:

A motion detector can be used to detect the motion of a constant speed car. Most software programs allow the user to determine the slope of the line by selecting a portion of the graph and clicking a button to perform a linear regression analysis.

Alternative Materials and Procedure:

If a constant speed car is not available, then a wind-up toy car could be used. The toy car may or may not have a very long-lived constant speed phase. If this is the case, the Purpose should be changed: "to determine the maximum speed of a toy car using a position-time graph."

Safety Concern:

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

Suggestions, Precautions, Notes:

1. This lab was originally written as a complement to the Speedometer lab. The speed obtained from that lab can be compared to the slope of the line. Depending on the carefulness given by students on measurements on the Speedometer Lab, the agreement between that speed value and the slope may be minimal.

2. Two other labs proposed for this unit - the Speedometer Lab and The Dune Buggy Challenge - make use of the constant-motion car. It is advisable to number or somehow label the cars to insure that students use the same car in these other labs.

Auxiliary Materials:

None

Scoring Rubric:

K5.	**Interpreting the Slope Lab**	**Score**
____	Included, labeled and organized all parts of the lab report.	
____	Data section includes a graph and other data relevant to the purpose under study. All data is properly labeled. Work is shown for any calculations.	____/____
____	Conclusion accurately compares the slope to the speed of the object.	
____	Discussion of Results describes the evidence which supports the conclusion. Includes a percent difference calculation; work is shown and labeled.	

Connections to The Physics Classroom Tutorial:

The following reading is a suitable accompaniment to this lab:

http://www.physicsclassroom.com/Class/1DKin/u1l3c.cfm

Connections to Minds on Physics Internet Modules:

Sublevel 4 of the Kinematic Graphing module is a suitable accompaniment to this lab:

http://www.physicsclassroom.com/mop/module.cfm