Physics 123 Lab 1 Homework: Kinematics in One Dimension

Physics 123: Electricity and Magnetism

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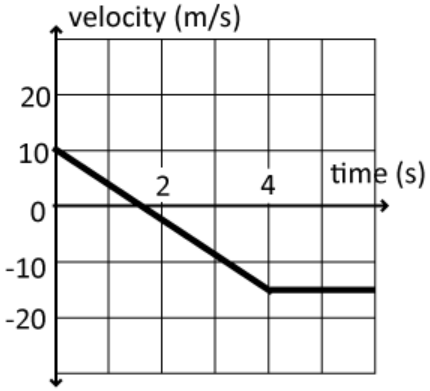
Each week, the lab homework begins with the **postlab,** a set of questions that involve the same concepts as the prelab, but require you to apply those concepts to a new physical situation. Applying knowledge to new situations is challenging. The postlab thus provides a yardstick for you to gauge how well you have mastered the lab's learning targets.

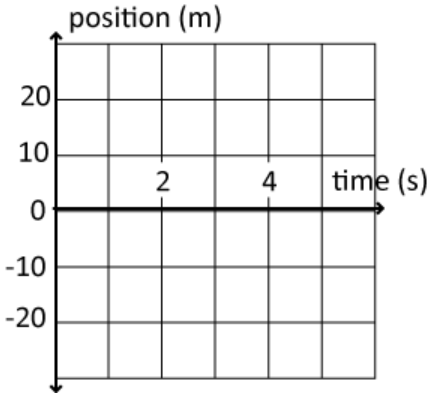
Postlab:

Viking 45 is back, and now must reproduce the velocity graph at right.



1. a. At time t = 1 s, is the acceleration of Viking 45 *positive*, *negative*, or *zero*? Explain.

   b. At time t = 3 s, is Viking 45 *speeding up*, *slowing down*, or *moving with constant speed?* Explain.



2. For the interval from time t = 0 s to time t = 4 s, the slope of the velocity graph has a value of –6.25. Write an *interpretation* of this number. Explain the specific information that the number –6.25 conveys about this motion. Note that *acceleration* is a name, not an interpretation.

3. On the axes provided, draw a position graph for Viking 45. Assume that the car starts at position x = 20 m at time t = 0 s. Estimate as necessary to make the graph quantitatively accurate (but don't worry about developing any equations).

4. Now use the velocity graph to write an equation for $x(t)$, the position of Viking 45 as a function of time. Your equation should be valid for the time interval from t = 0 to t = 4 s. Once you have your equation, check that your equation and your position graph are consistent. Below explain **how** you checked that your equation and graph are consistent.

5. Did *Viking* 45 turn around during this motion? Mark and label on both graphs the time(s) at which any turn-arounds occurred. Was the acceleration *positive, negative,* or *zero?*

Synthesis Challenge Mini-Report:

Describe your work on the Synthesis Challenge in a one-page "mini-report". The mini-report should be clear and detailed enough so that another lab group could follow what you did and reproduce your experiment. Your mini-report should have the three sections described below. You are encouraged to use the template posted on the course website.

Describe the problem. Draw a picture showing the physical set up. Label key objects, variables, coordinate system, etc. Define variables, list knowns and unknowns, state the goal. Draw diagrams or graphs that illustrate the key concepts and how they apply.

Make a plan and carry it out. Assemble important principles and equations. Outline a plan. Carry out the plan. Work symbolically first, and plug in numbers at the end.

Evaluate the result. Did you reach the goal? Were the units correct? Is the value reasonable? Can you check it for any limiting cases?