Uniform Accelerated Motion

Graphing Review
Measuring Techniques

Quick review:

- What is the difference between ***average velocity*** and ***instantaneous velocity***?
  - Average Velocity: The rate of change in position—the total displacement in a total amount of time.
  - Instantaneous Velocity: How fast an object is traveling "right here, right now" (at any given instant in time).
    - Inst. Velocity is found by determining an average velocity for a very small displacement and time (essentially, taking a limit calculation as time approaches 0)

Graphing Linear Motion—quick summary

- What does a displacement-time (or position-time) graph look like for…
  - Constant velocity?
  - Constant Acceleration?
- What does a velocity-time graph look like for…
  - Constant velocity in the positive direction?
  - A car moving in the positive direction, but is slowing down?
  - A ball that rolls up a hill, then rolls back down the hill.

Summary, Continued…

- How do you determine the acceleration of a moving object from a velocity-time graph?
- How do you determine the Displacement of a moving object from a velocity-time graph?

Measuring Acceleration Experimentally

- **Photogates:** Like you did in your first lab, photogates can be used to determine the time it takes an object to travel a short distance, therefore you can determine instantaneous velocities
  - **2 photogates** allow you to determine an initial velocity, a final velocity, and a total time between the two.

Measuring Acceleration Experimentally

- **Ticker-Timer:**
  - A bar with a small metal point on it vibrates at a set frequency (60 Hz (= 60 times per second))
  - Carbon paper is placed under the metal point so that each impact will leave a dot
  - A Thin strip of paper is attached to the object that is accelerating, and the paper is threaded between the metal point and the carbon paper
  - As the object moves, dots are placed at equal time intervals (0.02 s per dot).

Measuring Acceleration Experimentally

- **Ticker-Timer:**
  - The distance between dots, divided by the time interval, will give the **average velocity** for that interval. This is the instantaneous velocity the object has at the mid-point between dots (in other words, at the position corresponding to half the time interval between the two dots)
  - Repeat these measurements for each dot that occurs during the acceleration
  - These velocities, plotted against the total time it took to reach each velocity, will allow you to determine the acceleration of the object

Mini-lab: Ticker-Tape Timer

- This is an official **DCP** exercise.
- Using the ticker-tape given to you, determine the acceleration of an object that has its motion depicted by the marks on the ticker tape.
- Due Monday, beginning of the period (BOP)