



Uniform Motion – Dynamics Cart Analysis

Name: _____ Date: _____

Questions:

What is uniform motion and how is uniform motion shown on a position-time graph?

MATERIALS:

- Dynamics cart, 60 Hz Spark timer, ruler & calculator

PROCEDURE:

1. You will need 2 pieces (each approx. 0.5 metres) of ticker tape and a dynamics cart. Fasten one end of the ticker tape to the back of the cart using masking tape.
2. The timer vibrates at 60Hz. Calculate the period of the vibration. This is the time interval between successive dots on the ticker tape.
3. Set up the apparatus and straighten the ticker tape so it will run smoothly through the timer.
4. Start the timer and push the cart with a constant force and then release.
5. Repeat step 4 using a new piece of ticker tape, using more force to make the cart travel faster.
6. Observe the lines of dots on the ticker tape and label them trial 1 and trial 2.
7. Perform this analysis:
 - a) Choose a section of dots that is straight, about 30 cm long and uniformly spaced.
 - b) Mark the first and last dot in the section.
 - c) Measure the displacement from the first to the second dot and record in a table. Remember that the time interval between the dots was given to you by the teacher.
 - d) Measure the displacement from the first to the third dot and record in the data table. Repeat for the remaining dots in the section of the line.
8. Repeat all of step 7 for Trial 2

ANALYSIS:

Watch the video tutorial on how to format Word documents and use the built in equation editor: <http://bit.ly/YTgPQk>

Using Excel, plot the data on a distance-time graph. Be sure to put the dependent and independent variables on the correct axis. You will be graphing both trials on the same graph. You only need to include the time intervals once and then have two columns for the distance measurements. Your graph must have a title and axis labels (with units). The lines will be more or less straight; you will add a trend-line (line of best fit) and display the equations on the graph. You must change the variables x and y to the variables they really represent: d and t . Recall that the equation of a line is $y = mx + b$; where m represents the slope (rise over

run). When displaying the equation for the line of best fit using Excel set the y-intercept (b value) to zero for this investigation.

DISCUSSION:

1. Which variable is the dependent and which is the dependent variable in this investigation? Explain how you know this.
2. If the space between the dots is uniform, what does this tell about the motion/speed of the cart?
3. Why are the dots spaced differently between the two trials? Explain Thoroughly.
4. Describe the shape of the graph. How does this relate to your answers to questions 1 and 2?
5. Calculate the slope of the lines on your graph. Show your work and include all units.
6. Answer the question: How is uniform motion shown on a position-time graph?
7. In which trial was the cart moving faster. Use your graphs to explain.
8. In the first trial, at what time has the cart traveled 10 cm?
9. In the first trial, how long will it take the cart to travel 1.5 m?

LAB REPORT:

Watch the video tutorial on how to format Word documents and use the built in equation editor: <http://bit.ly/1runywQ>

Write a lab report detailing the experiment. It must be type written and must include the following sections:

- **Title page:** descriptive title, graphics/images, name, date, teacher and course code. There are lots of great title page templates in Word.
- **Introduction:** Description of the investigation. What are you trying to prove or show? List the materials that you are using, etc.
- **Procedure:** in paragraph form write out a summary of the procedure that you followed to collect the data. It is a summary, but it should be thorough.
- **Observations/Results:** in this section you will copy and paste the graph(s) from excel. The graph(s) should be correctly labelled. Add a figure caption which clearly describes the graph. You must have a introductory sentence or paragraph before the graph and a summary description after the graph. Two trials were completed and two lines of best fit (with equations) were found. List the two equations in this section and describe what they represent.
- **Discussion:** In this section answer in full complete sentences your answers to the questions from the discussion section.
- **Conclusion:** write a multi-line paragraph conclusion for the lab. Conclusions must restate the problem or goal of the investigation, give a brief review of the results (from the results section), include numerical results or general equations found, and give an answer to the posed problem or goal.

Marking Rubric: <http://bit.ly/q2ZbBT>