

Student Name: _____
Teacher Name: Botelho
Class Name/Subject: AP Physics
Period: 5
Assignment Week #: Week 1

AP LAB 8 PART A: MASSES ON SPRINGS

In this lab you will study the motion of a mass oscillating on a spring.

1. Lab Setup: springs (3 of the same if possible, or 2 of different stiffness or spring constant), string, and masses (choose an object that you have multiple of like marbles) that can be hung on the spring (with the string or directly attached to the spring) and make it stretch a little.

****Remember:** you can use things like rubber bands if you don't have springs (they work similarly), dental floss would make a good string; and you don't need to weigh the objects if you have multiple of the same object (like paper clips or marbles in a plastic bag) you can estimate the weight (or google it) and use multiples of that weight.

- a. Hold or hang the spring. Use a paper as your background and mark a point on the paper where you are going to hold the top of the spring for each trial.
- b. Put a red line on the paper where you are going to compress the spring enough to get oscillation but not max out or damage the spring with the weights attached. If you have a small spring it may be easier to stretch the spring

Lab 1: Period and Mass: Find the relationship between the period of the oscillation and the amount of mass hanging on the spring, as follows.

- a. Do at least 3 trials (5 if you have enough materials), starting with one mass and increasing the mass by the same amount each trial. Don't change any other settings for these trials.
- b. Raise the mass to the red line and release it for each trial. Measure the average period for 5 or 10 oscillations. Remember, period is the time it takes the mass to make one complete cycle - if you lift the mass to the red line and release it, the period is the time it takes the mass to go down and come back up to the red line.

Lab 1 Results:

1. Record your results in a table in Excel or Google Sheets or graph paper.
2. Graph your results, and come up with an equation that relates Period (dependent variable) to Mass (independent variable). Give your equation and constants on your graph.

Save your spreadsheet - you will add to it and submit it at the end of this lab.

Lab 2: Period and Spring Constant: Find the relationship between the period of the oscillation and the spring constant of the spring, as follows.

- a. Do at least 5 trials, increasing the spring constant, connect your springs side by side not end to end! It doesn't matter the actual value of the spring constant, just use a scale from "small" to "large"). Keep the same mass for each trial, and don't change any other settings for these trials.
- b. Raise the mass to the red line and release it for each trial. Measure the average period for 5 or 10 oscillations.

Lab 2 Results:

1. Record your results in a table in Excel or Google Sheets or graph paper.
2. Describe any trend that you see:
3. As spring constant increases, period _____(increases or decrease or stays the same).

Save your spreadsheet - you will add to it and submit it at the end of this lab.

Lab 3: Period and Amplitude: Find the relationship between the period of the oscillation and the amplitude of the oscillations, as follows.

- a. Hang a mass on the spring, mark a black line where the mass hangs in equilibrium.
- b. Amplitude is the "size" of the oscillations - if you start the mass at the red line, the amplitude is the distance from the black line to the red line.
- c. Do at least 5 trials, increasing the distance between the red line (where you release the mass when the spring is stretched) and the black line each trial. Keep the same mass and spring constant for each trial, and don't change any other settings for these trials.
- d. Raise the mass to the red line and release it for each trial. Measure the average period for 5 or 10 oscillations.

Lab 3 Results:

1. Record your results in a table in Excel or Google Sheets or graph paper.
2. Describe any trend that you see:
3. As amplitude increases, period _____(increases or decrease or stays the same).

Save your spreadsheet - you will add to it and submit it at the end of this lab.

4. Upload Your Spreadsheet/Turn in your graph paper: You should have all parts of the lab on the same spreadsheet/paper (three data tables and graphs).