ACTIVITY #2 SIMPLE OSCILLATION (Teacher Notes)

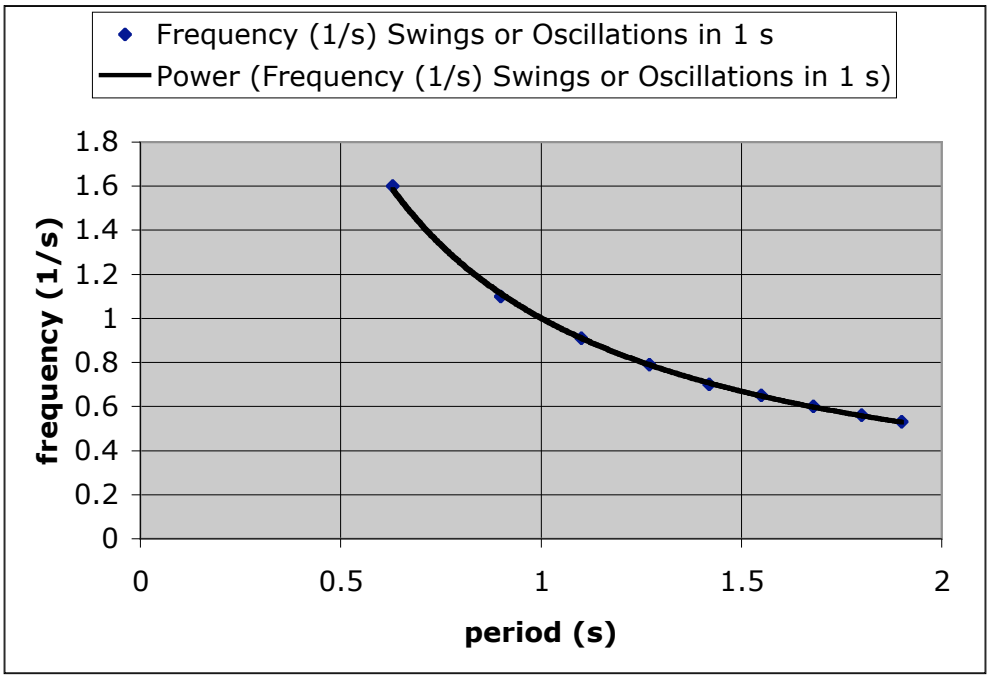
This activity addresses the following content standards and benchmarks:

- Content Standard 5 – 8 Physical Science B Transfer of Energy
- Content Standard 9 – 12 Physical Science B Interaction of Energy and Matter
- Benchmark 6 – 8 and 9 –12 The Physical Setting 4F Motion

This laboratory Activity is adapted from the Savi/Selph Center for Multisensory Learning 1981 Lawrence Hall of Science, UC Berkley, CA 94720

1. Prepare enough pendula of lengths from 10 to 90 cm (in 10 cm increments) for each student or group to have one. (They can trade with another group to do the second trial.) If, during data collection, a group or student can not get the pendulum to swing ten times, then they might try 5 swings and double the time to report on the data chart.
2. You may want to discuss with the group (or demonstrate) the counting of the "swings" prior to having students actually count. It is best to let the students discuss before you demonstrate. In many cases, students will inquire, "How many washers or what angle am I supposed to use?" Ask them, "Will it matter?" Encourage them to experiment with different masses and angles that are small, less than 15^{o} from vertical. (Larger angles do have a different period from smaller angles for the same pendulum.)
3. Draw a data table on a chalkboard, white board or a long piece of paper that can be posted and record the length of the pendula from 10 cm to 90 cm in increments of 10 cm. Provide data columns for the time for ten swings or oscillations to occur, the frequency, swings or oscillations per second, and period, the time for 1 swing or oscillation. See sample data below.

Length in cm	Time (s) for 10 Swings/oscillations	Frequency (1/s) Swings or Oscillations in 1 s	Period (s) Time for 1 Swings or Oscillations
10	6.3.	1.6	0.63
20	9.0	1.1	0.90
30	11.0	0.91	1.10
40	12.7	0.79	1.27
50	14.2	0.70	1.42
60	15.5	0.65	1.55
70	16.8	0.60	1.68
80	18.0	0.56	1.80
90	19.0	0.53	1.90



Answers to questions within the laboratory activity:

1. What graphical relationship fits your data?

   The graph is an inverse relationship. Frequency of the pendulum varies as the inverse of the period.

   Linearize your data and determine the mathematical relationship between the frequency and the period of the pendula. To linearize data take the inverse of the period. *The slope of the frequency versus inverse of period graph is approximately 1. Therefore $f = 1/T$*