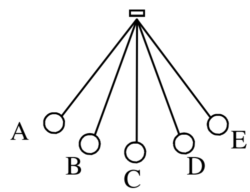
B-Day: Due Fri., Mar 12
A-Day: Due Mon., Mar 22

2009-10 Harmonic Motion 2

Diagram 1



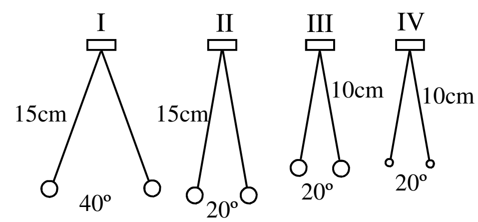
1. Use diagram 1 at the right answer the following:
   A. Starting at A, 1 cycle ends at ____.   B. Starting at E, 1 cycle ends at _____
   C. Starting at B going right, 1 cycle ends at ?
   D. Equilibrium position =   E. If A to E is 60°, the amplitude =
   F. In one cycle, the pendulum passes thru the equilibrium position ______ many times.
   G. How many amplitudes does it go thru in one full cycle?
   H If it takes 0.3 seconds to go from A to E, how long is one period?

2. Period, Amplitude, or Frequency?
   A. ____20º
   B._____1.25 seconds.
   C._____14 cm
   D. ____280 Hz
   E._____Maximum displacement from its equilibrium position.
   F._____How many cycles per second.
   G. ____Time for one cycle.
   H. ____ Decreases over time.
   I. ____ "A"
   J. ____ "T"
   K. ____ "f"

3. If the period of a pendulum is 0.5 seconds, calculate the frequency of the pendulum.

4. If the frequency of a wave is 1.35 Hz, find its period.

5. Use the pendulums at the right to answer the following. Notice IV. has smaller masses.
   A. Which has the most energy?
   B. What is the amplitude of I?
   C. Which has the smallest period: I or II?
   D. From the lab: which pendulum has the longest period: III or IV?
   E. Why?
   F. Which pendulum has the longest period: I or III?



6. If you double the mass on the end of a pendulum, does T increase or decrease?

Imagine a pendulum moving from the top of the graph to the bottom with a pen touching the graph. The graph moves to the right. The graph shows the position of the pendulum. Also, write these formulas on your table: f = #cycles/#seconds; T = #seconds/#cycles

7. Use Graph 1 to answer the following:
   A. Amplitude =   B. # of cycle in 1 second?
   C. Calculate the frequency shown on Graph 1.

   D. Calculate the period shown on Graph 1.

   E. Over time, the pendulum will d__________.
   F. Where will it come to rest?

8. Use Graph 2 to answer the following:
   A. Amplitude =   B. f =

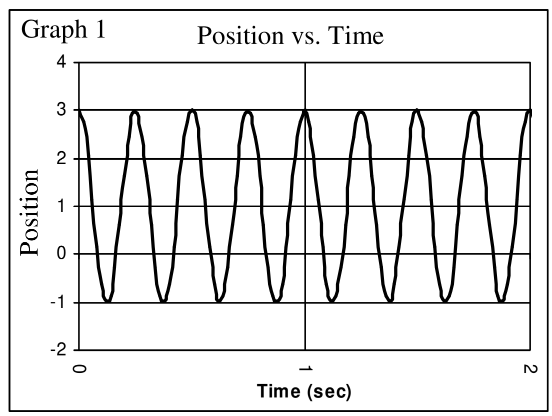
   C. T =

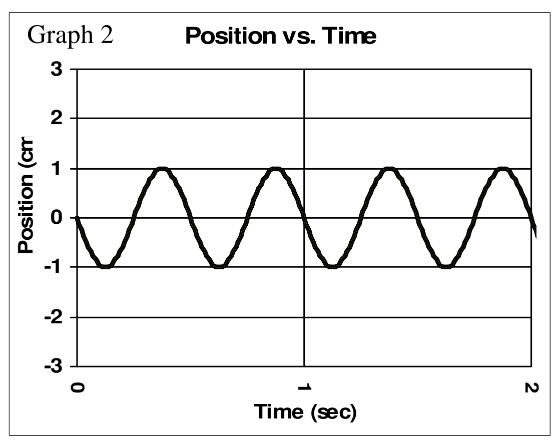
   D. How many cycles are shown?
   E. Equilibrium position =

9. Graph 1 or Graph 2
   A. ____Has the greatest amplitude.
   B. ____Has the longest period (most time).
   C. ____Has the greater frequency.
   D. ____Has the higher equilibrium position.

10. Now compare the shapes of Graph 1 and 2
    A. If the amplitude increases, how does the shape change?

    B. If the period gets smaller, how does the graph change?





11. If a pendulum is 34 cm long, find its period.
    (*Hint: notice that "g" is in m/s*^{2}.)

12. A pendulum has a period of 0.85 seconds. How long is the pendulum <u>in centimeters</u>.

Example: How long is a pendulum that has a period of 3.2 seconds?

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$$3.2 = 6.28\sqrt{\frac{\ell}{10}}$$

$$\frac{3.2}{6.28} = \frac{\cancel{6.28}}{\cancel{6.28}}\sqrt{\frac{\ell}{10}}$$

$$0.5096 = \sqrt{\frac{\ell}{10}}$$

$$(0.5096)^2 = \frac{\ell}{10}$$

$$0.2597 = \frac{\ell}{10}$$

$$10(0.2597) = \ell$$

$$\ell = 2.597m = 259.7cm$$

From the Lab:

13. Was it better to measure the period of the pendulum with only cycle or 5 cycles?

    Why?

14. What is the experimental variable in Table 1?
15. What are the control variables in Table 1?
16. What were students trying to understand in Table 1?

17. What were students trying to understand in Table 2?

Table 1

Mass	Length	Amplitude	Period
14g	10 cm	10°	.64 sec
14g	15 cm	10°	.79 sec
14g	25 cm	10°	1.1 sec

Table 2

Mass	Length	Amplitude	Period
14g	10 cm	10°	.64 sec
20g	15 cm	15°	.79 sec
5g	25 cm	25°	1.1 sec

18. How do the following affect the period of a pendulum?
    A. Amplitude.

    B. Mass

    C Length.

And do the TAKS Homework.