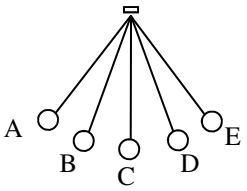
A-Day: Due Tues., Mar 30
B-Day: Due Wed., Mar 31

2009-10 PreAP 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?

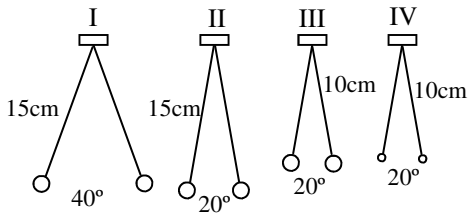
2. If the period of a pendulum is 0.5 seconds, calculate the frequency of the pendulum.

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

4. A spring vibrates back and forth 24 times in 9 seconds. What is its frequency?

5. Another pendulum swings back and forth 34 times in one minute. What is its period?

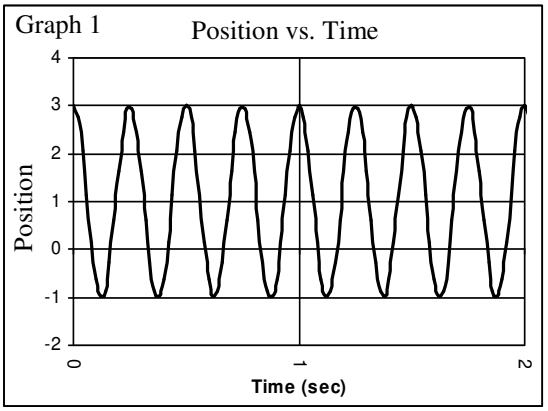
6. Use the pendulums at the right to answer the following. Notice IV. has smaller masses.
   A. Which has the most energy?
   B. What is the amplitude of I?
   C. Which has the smallest period: I or II?
   D. From the lab: which pendulum has the longest period: III or IV?
   E. Why?
   F. Which pendulum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



7. 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

Graph 1



8. 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.

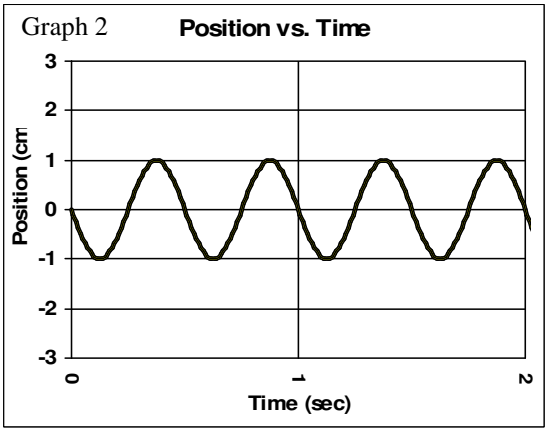
   E. Over time, the pendulum will d_____.
   F. Where will it come to rest?

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

   C. T =

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

Graph 2



10. 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.

11. 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?

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

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

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

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

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

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

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

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

$$10(0.2597) = \ell$$

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

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

14. Give two ways to change the period of a pendulum.

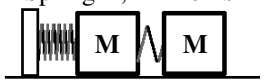
15. Give two ways to change the period of a spring-mass system.

16. Remembering that 1000 g = 1 kg, what is the period of a spring that has a 400 g mass and a spring constant of 120 N/m?

17. A spring-mass system has a period of 2.5 seconds and a spring constant that is 65 N/m. How much mass is attached?

Spring A; k = 40 N/m

Spring B; k = 20 N/m



Spring C; k = 20 N/m

Spring D; k = 20 N/m

18. The spring-mass systems at the left are shown at their left and right-most positions.

A. ____ Which spring has a faster period: A or B?
B. ____ Which spring has a faster period: B or C?
C. ____ Which spring has a faster period: C or D?
D. ____ Which spring has a faster period: A or D?
E. What is the amplitude of spring D?

F. If spring C has a period of 0.33 seconds, calculate its frequency.

And do the TAKS Homework.