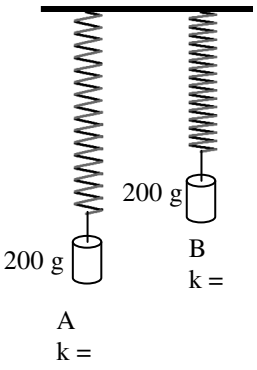
B-Day: Due Tues., Mar 23
A-Day: Due Wed., Mar 24

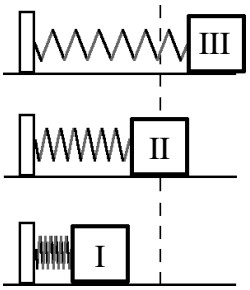
2009-10 Harmonic Motion 3



From the "Spring-Mass Systems" Notes:

1. Two springs are attached as seen in the diagram. One spring has a k = 50 N/m the other has a k = 30 N/m.
   A. _____ Which spring on the diagram is the stronger spring (harder to stretch)?
   B. Label the diagram with the correct spring constant for the correct spring.
   C. _____ Which one will move the mass easier?
   D. _____ Which one will have the faster period?
   E. What are two ways you could make spring B move faster?

2. Use the positions on the graphic at the right to answer the following. The dashed line shows where the mass will eventually stop moving.
   A. _____ Where the spring is relaxed.
   B. _____ Where the spring is compressed.
   C. _____ Where the spring is stretched.
   D. _____ Where x = 0.
   E. _____ Where Ep is a maximum.
   F. _____ Where Ek is a maximum.
   G. _____ Where the force is a minimum
   H. _____ Where the acceleration is a maximum.



The formula for period of a spring is on the "Spring-Mass System" notes and on the "Harmonic Motion Basics" table.

3. 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?

Example: A spring-mass has a spring constant of 12 N/m. If it has a period of 1.6 seconds, how much mass is attached to the spring?

$$T = 2\pi\sqrt{\frac{m}{k}}$$

$$1.6 = 6.28\sqrt{\frac{m}{12}}$$

$$\frac{1.6}{6.28} = \frac{6.28}{6.28}\sqrt{\frac{m}{12}}$$

$$0.255 = \sqrt{\frac{m}{12}}$$

$$(0.255)^2 = \frac{m}{12}$$

$$0.0650 = \frac{m}{12}$$

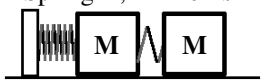
$$12(0.0650) = m$$

$$m = 0.78kg = 780g$$

4. 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? *How to do the math is shown here:* →

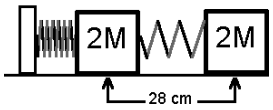
Spring A; k = 40 N/m

Spring B; k = 20 N/m



Spring C; k = 20 N/m

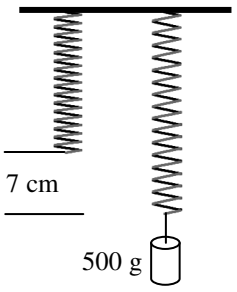
Spring D; k = 20 N/m



5. The spring-mass systems shown at the left show their left and right-most positions.
   A. ___ Which spring has a faster period: A or B?
   B. What is different about springs B and C?
   C. ___ Which spring has a faster period: B or C?
   D. What is different about springs C and D?
   E. ___ Which spring has a faster period: C or D?
   F. ___ Which spring has a faster period: A or D? (*Hint: use the formula.*)
   G. What is the amplitude of spring D?
   H. If spring C has a period of 0.33 seconds, calculate its frequency.

6. A force of 18 N causes a spring to stretch 76 cm. (*Remember to be in meters*!) Use Hooke's Law to calculate the spring constant for this spring.

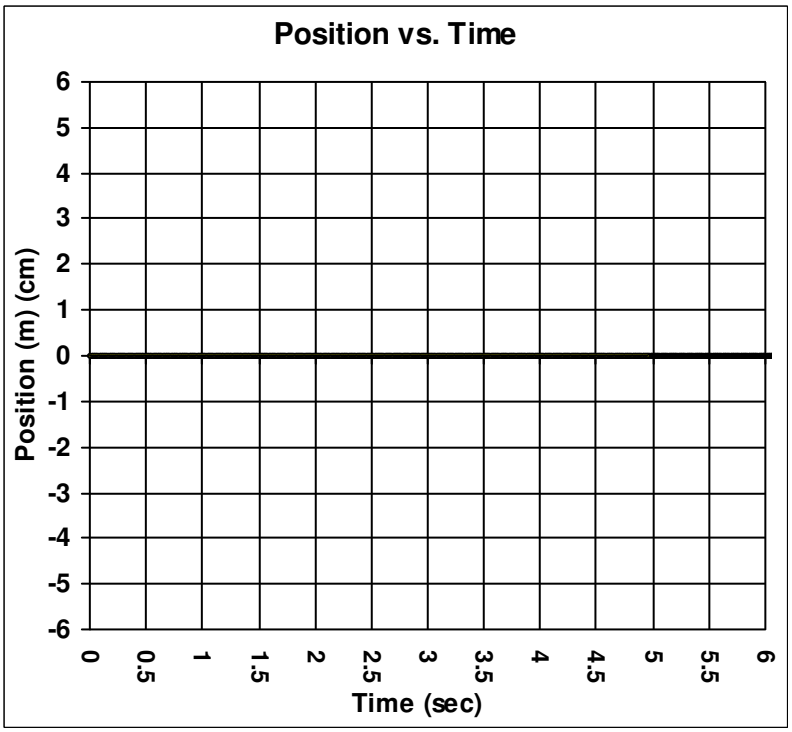
7. Use the diagram at the right to answer the following.
   A. What is the mass in kg?
   B. What is the weight of the object?
   C. How far did the spring stretch in meters?
   D. Calculate the spring constant for this spring.



Remember again that the period is how long for 1 cycle OR T = #seconds/#cycles. The frequency is how many cycles occur each second OR f = #cycles/#seconds.

8. A pendulum swings back and forth 14 times in 8 seconds. What is the pendulum's period?

9. On the blank graph given sketch harmonic motion that has a 2 second period and a 4 cm amplitude.



And now for a little "Harmonic Motion Basics" table scavenger hunt… (Get out the notes.)

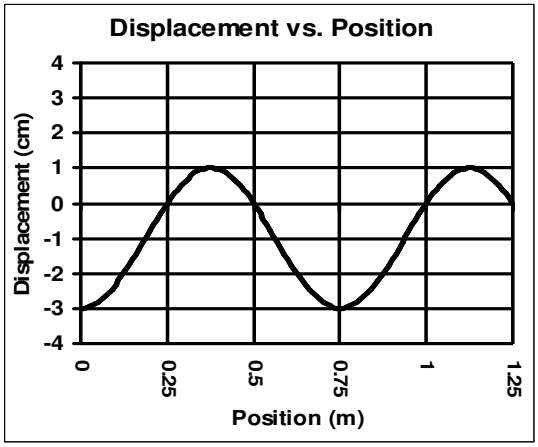
10. What is "dampening"?

11. What do we call this symbol: λ?

12. A wave is moving 25 m/s and has a frequency of 80 Hz. What is it's wavelength?

13. What is the ***medium*** that sound travels thru to your ears?

14. On the graph at the right…
    A. What is the wavelength of the wave?
    B. Mark a trough and a crest.



15. For sound, how many decibels is twice as loud?

16. If a sound is 40 dB, how many decibels is twice as loud?

And do the TAKS homework.