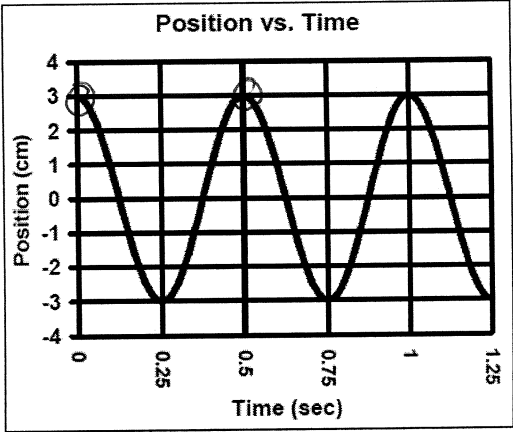
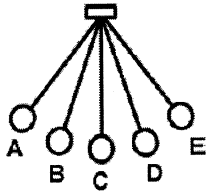


Harmonic Motion Basics

1. T Period, Frequency, or Amplitude?
- A. F This increases as it vibrates back and forth faster.
 - B. A A wider swing means more of this.
 - C. T Time for one complete cycle to occur.
 - D. F If a pendulum swings slower this increases.
 - E. A Measured from the center to the extreme.
 - F. A Will decrease over time.
 - G. T In seconds.
 - H. A Contains the energy.
 - I. F Decreases when it vibrates back and forth slower.
 - J. F In Hz.
 - K. A Could be measured in degrees, cm, or meters.



2. A. The pendulum's equilibrium position is: C
- B. If the cycle begins at C going to the left, where does one cycle end?
C to left
- B. Where will the pendulum come to rest? C



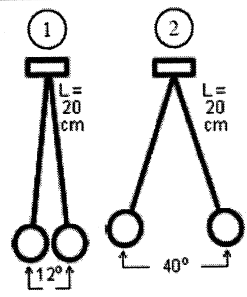
7. The graph above shows the position of a pendulum moving back and forth over time.
- A. Mark one cycle on the above graph.
 - B. How many total cycles are on the graph? 2.5
 - C. The graph shows 2.5 cycles in 1.25 seconds.
 - D. Calculate the frequency of the motion.
$$F = \frac{\# \text{ cycles}}{\# \text{ sec}} = \frac{2.5}{1.25} = 2 \text{ Hz}$$
 - E. What is the period of the graph? $\frac{1}{2} = 0.5 \text{ sec}$
 - F. What is the equilibrium position? 0 cm
 - G. What is the amplitude of the graph? 3 cm

3. A pendulum has a period of 0.25 seconds.
- A. How many cycles will it undergo per second?
4
- B. What is its frequency?
4 Hz

8. How many centimeters are in a meter? 100
9. 45 cm = 0.45 m
10. Calculate the period of a pendulum that has a length of 68 cm.
$$T = 2\pi \sqrt{\frac{l}{g_{\text{ms}^2}}} = 6.28 \sqrt{\frac{0.68 \text{ m}}{10}} = 1.64 \text{ sec}$$

4. A pendulum has a frequency of 0.65 Hz. Calculate the period of the pendulum.
$$T = \frac{1}{f} = \frac{1}{0.65} = 1.54 \text{ sec}$$

5. A. Amplitude of Pendulum 1: 6°
- B. Amplitude of Pendulum 2: 20°
- C. Which has the most energy? 2
- D. Over time will the amplitude increase or decrease?
- E. This is called damping.



11. A pendulum is 125 cm long. Calculate its period.
$$T = 6.28 \sqrt{\frac{1.25 \text{ m}}{10 \text{ m/s}^2}} = 2.22 \text{ sec}$$
12. A pendulum has a period of 1.4 seconds. How long is it?
$$T = 2\pi \sqrt{\frac{l}{g}}$$

$$1.4 \text{ sec} = 6.28 \sqrt{\frac{l}{10 \text{ m/s}^2}} \quad l = 0.5 \text{ m or } 50 \text{ cm}$$

6. Frequency is cycles per second, calculate the frequency of a pendulum that undergoes 35 cycles in 4.6 seconds.
$$F = \frac{\# \text{ cycles}}{\# \text{ sec}} = \frac{35}{4.6} = 7.6 \text{ Hz}$$

13. A spring moves back and forth, turning at points A and C.
- A. What is its amplitude?
6 cm
- B. What distance does the spring travel in one complete cycle?
24 cm

