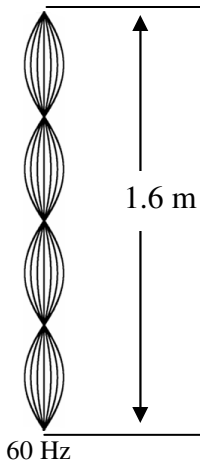# 2009 Harmonic Motion 5

1.6 m

60 Hz

From "Standing Waves" notes:
1. Use the graphic on the right to answer the following:
    A. How many antinodes does it have?    B. How many nodes does it have?
    C. Which harmonic is it?
    D. Draw the wave form on the diagram (as if "freeze framed").
    E. If it's frequency = 60 Hz, what is the frequency of the fundamental ($H_1$)?

    F. What is its wavelength?

    G. Find the speed of the wave on this string.

    H. Find the frequency of $H_2$.

    I. What is the wave speed of $H_6$?
    J. What is the wavelength of the natural frequency for this string?
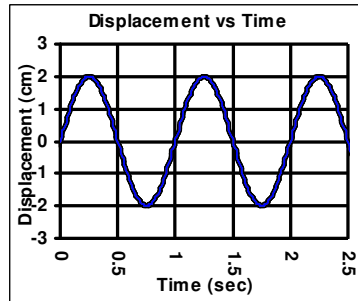
ruler

table

←—40 cm—→

F
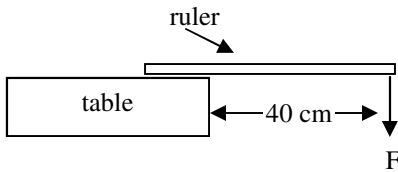
2. When a ruler is pulled down and released, it vibrates.
    A. Which harmonic is this?
    B. Mark the nodes and antinodes.
    C. How many wavelengths is it?
    D. If the end of the ruler is 40 cm from the desk, what is the wavelength of this harmonic?
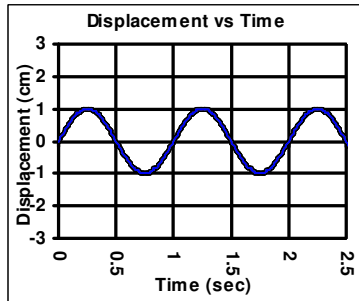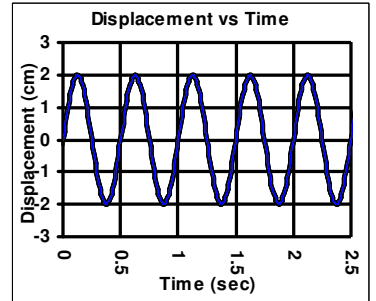
**Graph A:** Amplitude: _____    **Graph B:** Amplitude: _____    **Graph C:** Amplitude: _____

Period: _____         Period: _____         Period: _____

*There is a study help for this.*

*This section checks that you understand pendulums, graphs, and spring. It is very important.*


Displacement vs Time (Graph A)


Displacement vs Time (Graph B)


Displacement vs Time (Graph C)

Pendulum: _____         Pendulum: _____         Pendulum: _____

Spring: _____         Spring: _____         Spring: _____

3.  A. Fill in the information above each graph.
    B. Which pendulums have the same period?
    C. Which pendulums have the same amplitude?
    D. Now decide which graph is which pendulum.
    E. Which springs have the same period?
    F. Which springs have the same amplitude?
    G. Decide which graph is which spring.

A          B    C

30°        15°   30°

Spring A; k = 40 N/m

M  WWW  M

Spring B; k = 20 N/m

M  NN  M
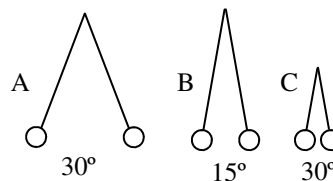
Spring C; k = 20 N/m

M  WWW  M

From "*Sound Notes*":

4. Increase in volume is an increase in what?
5. A higher pitched sound = an increase in what?
6. A lower pitched sound = an increase in what?
7. Can we hear 10 Hz?      Can we hear 12,000 Hz?      Can we hear 25,000 Hz?
8. High or low frequency: low notes?                    high notes?
9. Long or short wavelength: low notes?                  high notes?
10. Twice as loud as 70 dB would be:
11. A.  What is the speed of sound in air?
    B.  What is the wavelength of a sound with a frequency of 550 Hz?


    C.  What is the wavelength of a 30 Hz sound?


    D.  As wavelength goes up, the frequency goes _____, but the speed _____?

12. You see lightening and 3 seconds later you hear the thunder.  How far away is the storm?
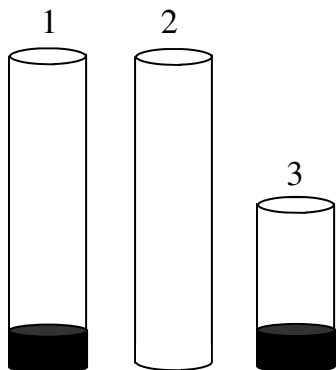
13. Pipes 1 and 2 are exactly twice the length of pipe 3.  Pipe 2 is open at both ends.
    (*If you don't remember these questions, come early to class and use the gear*.)
    A. _____ Which pipe has a higher notes 1 or 2?
    B. _____ Which pipe has a lower note 1 or 3?
    C. _____ Which pipe has a lower note 2 or 3?
    D. _____ Is the open end of a pipe a node or antinode?
    E. _____ How many antinodes does pipe 1 have?
    F. _____ How many antinodes does pipe 2 have?
    G. _____ How many nodes does pipe 2 have?
    H. _____ Label the location of the nodes (N) and antinodes (A) for pipe3.
    I. _____ How many wavelengths long is pipe 3?

From "Ancillary Sound Topics"
14. Higher, lower, or same frequency of the fire engine's siren?
    A. _____ For the man on the sidewalk as the vehicles are coming towards him?
    B. _____ For the man after they have passes him?
    C. _____ For the ambulance driver?
    D. What does the man notice as the engine passes?
    E. What is this called?

15. Use the graph at the right to answer the following.
    A. On the graph mark where it is loud and soft.
    B. How many beats PER SECOND are there?
    C. If frequency 1 is 830 Hz and frequency 2 is lower,
       what is frequency 2?
    D. If the two notes become more out-of-tune, will there
       be more or less beats per second?
    E. When the loud sections occur, is this constructive or destructive
       interference?

**Combined Wave**

Displacement (m) — 5, 3, 1, -1, -3, -5

Time (sec) — 0, 0.5, 1, 1.5, 2
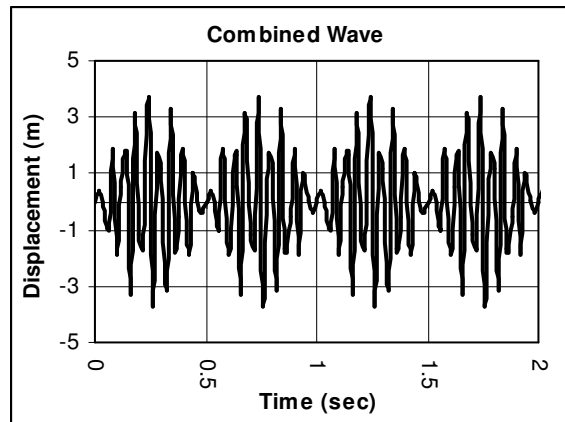
16. A person yells at a cliff.  After 2.4 seconds, he hears the echo.
    A. How far does the sound travel?  D or 2D?
    B. What is the speed of the sound?
    C. Find the distance TO THE CLIFF!

**TAKS PREP**

17. The diagram shows how 4 liquids arrange themselves when placed into a container. Based on the diagram, which of the following conclusions is accurate?
    A. Water is the densest of the four liquids
    B. Glycerin is the least dense of the four liquids
    C. Vegetable oil is denser than alcohol, but less dense than water.
    D. Vegetable oil is denser than water, but less dense than alcohol.



Alcohol

Vegetable oil

Water

Glycerin
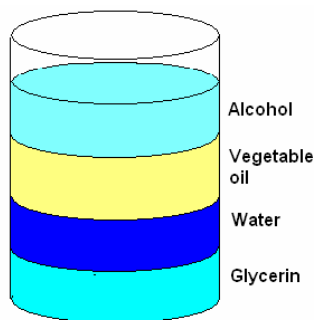
18. How many protons are in the nucleus of a sulfur atom?
    A. 3    _B. 16    C. 32    D. 32.06

19. A compound dissociates fully when placed in water. All of the following statements about the solution are true except— (*see notes at bottom*)
    A. the solution will conduct electricity
    B. the solution is a strong electrolyte
    C. the solution contains ions
    D. the solution is a base

20. What process changes water vapor into liquid water?
    A. Freezing
    B. Condensation
    C. Melting
    D. Precipitation

21. Theresa runs in one direction at 1.5 meters per second (m/s). She then turns around and runs in the opposite direction at 2.0 m/s. The entire trips takes 5.0 seconds (s). What is Teresa's average acceleration, in meters per second squared ($m/s^2$)?
    A. $-0.7$ m/s$^2$
    B. $-0.1$ m/s$^2$
    C. $+0.1$ m/s$^2$
    D. $+0.7$ m/s$^2$

22. The hands of a swimmer pushing backward against water represent an action force. What is the reaction force?
    A. The swimmer's body moving forward.
    B. The water pushing against the swimmer's hands.
    C. The swimmer's body pushing against the water.
    D. The water moving backward from the swimmer.

23. What property causes the pencil in the picture to appear to be in two pieces? (*Look on your "Wave Action" notes.*)
    A. Refraction
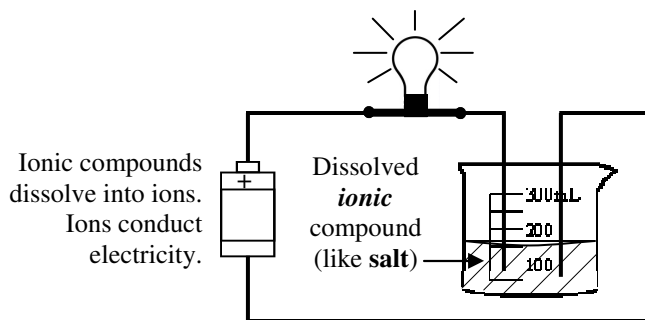    B. Reflection
    C. Interference
    D. Polarization
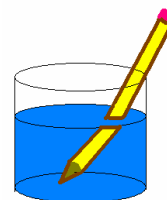


24. In the rock cycle, there are two main types of changes in rock – physical and chemical. Which of the following types of changes in rocks is best classified as a physical change?
    A. Formation of carbonate minerals from the reaction of $CO_2$ and silicate.
    B. Breaking of quartz crystals into smaller pieces.
    C. Dissolving of limestone into $CO_2$ and minerals from acid rain.
    D. Oxidation of iron into ferric oxide.

| Electrolytes | Electrolytes are compounds that allow electricity to flow when they are dissolved in water. Ionic compounds are good electrolytes. Covalent compounds are not. |

**Ionic Compounds are Electrolytes**



Ionic compounds dissolve into ions. Ions conduct electricity.

Dissolved *ionic* compound (like **salt**)

**Covalent Compounds are NOT Electrolytes**



Covalent compounds do not dissolve into ions and do not conduct electricity.

Dissolved *covalent* compound (like **sugar**)