**A-Day: Due Thurs., Apr 1 (no, really!)**
**B-Day: Due Mon., Apr 5**

# 2009-10 PreAP Harmonic Motion 3

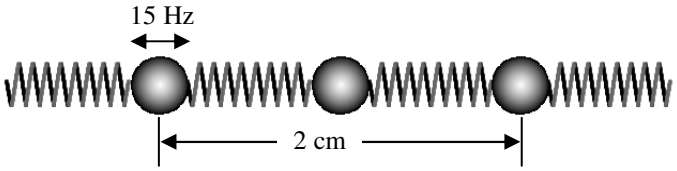
*At this point I have to assume that you can find the period of a pendulum and a spring AND that you know what affects their periods. If you need to redo the lab, come in and take care of it.*

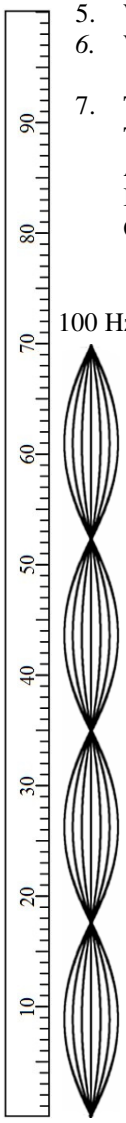
*From the "Waves" notes:*

1. What is the medium for water waves? For sound in a room?
2. What moves in wave motion: the actual particles in the medium or the energy?
3. A wave has a wavelength of 45 m and a frequency of 13 Hz, what is its speed?
4. What kind of wave: longitudinal or transverse?
   A. When the slinky is moved side to side. B. When the slinky is pushed.
   C. If the slinky vibrate perpendicular to the direction it travels.

5. Which has a faster wave: a loose slinky or a tight slinky?
6. Will a wave move faster if the molecules are close together or far apart?

7. Three ping pong balls are attached by springs. The first of the balls has a frequency of 15 Hz.
   A. What is the frequency of the third ball?
   B. What kind of wave is it?
   C. If it takes 0.6 seconds for the wave to move from ball 1 to ball 3, calculate the speed of the wave. (*Notice distance is in cm [hint, hint]*).



100 Hz



   D. Now that you have the speed, calculate its wavelength.

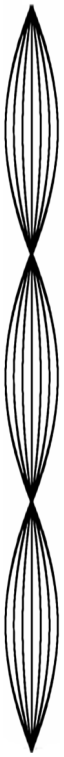
8. *From the "Standing Waves Lab". Also, use your "Standing Waves" notes.*
   A. What harmonic is shown at the left?
   B. How many antinodes does it have?
   C. How many nodes does it have?
   D. What is the wavelength of the harmonic (in m)?
   E. If its frequency is 100 Hz, what is its velocity?
   F. What would be the frequency of the 1st harmonic?

   *The frequency of vibration is changed until the shape at the right is shown.*
   G. What harmonic is shown at the right?
   H. Mark the nodes and antinodes.
   I. What do you notice about the number of nodes vs. antinodes?

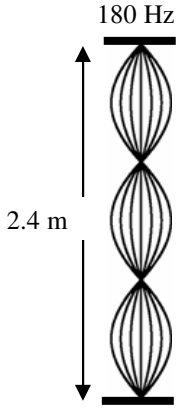
   J. What is its frequency?
   K. What would be the velocity of this harmonic?

   L. During the lab, when the frequency went up (bigger #), the wavelength went _____ and the velocity:

   M. Since the length of the string has not changed, what is the wavelength for this new harmonic?
   N. When you tightened the string, what two things changed?

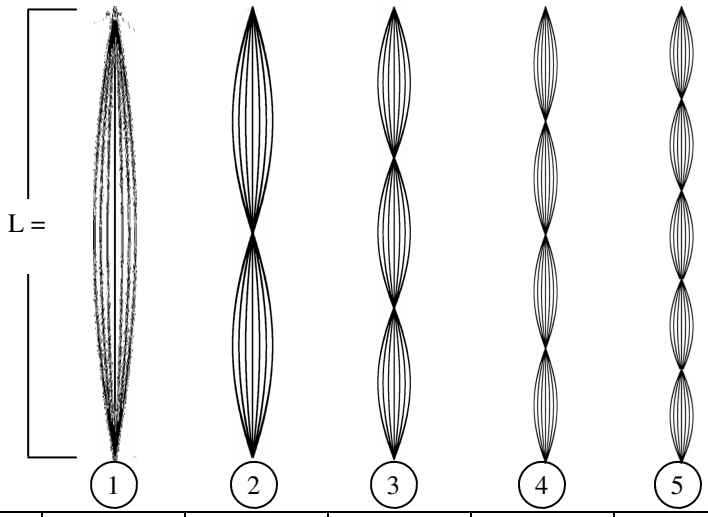


180 Hz




9. A different string vibrating at 180 Hz produces the harmonic shown.
   A. Which harmonic is it?
   B. How many nodes does it have?
   C. If a high speed camera were to take its picture, draw what the string would look when frozen.
   D. How many wavelengths is the harmonic?
   E. What is the wavelength of this harmonic?
   F. Calculate the speed of the wave on the string.

   G. What is the frequency of the first harmonic for this string?
   H. What is the wavelength of the fundamental for this string?
   I. What would be the speed of the fifth harmonic for this string?

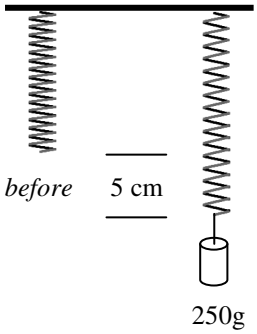



| Harm | | | | | |
|---|---|---|---|---|---|
| Freq | | | 36 Hz | | |
| # of λ | | | | | |
| λ | | | | | |

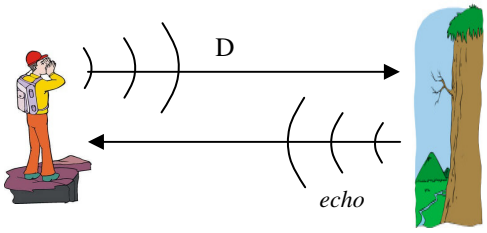
10. A 0.75m string is vibrated at different frequencies. The given shapes were found.
    A. These shapes are known as what?
    B. Give the three names for shape 1.
    C. Fill in the chart.
    D. Calculate the period of harmonic 3.
    E. What is the velocity of harmonic 2's wave?
    F. What is the velocity of harmonic 5's wave?
    G. What changes if the string is tightened?

*From "Spring-Mass Systems" notes:*

11. A 250 g mass is hung on a spring. The spring stretches 5 cm.
    A. What is the mass of the object in kilograms?
    B. How much force is pulling down on the spring (*think weight*)?
    C. Calculate the spring constant of the spring.
    D. Calculate the period of the spring.




12. A wave has a frequency of 120Hz and a wavelength of 9 m.
    A. What is it speed?
    B. Using the units for speed, how far does the wave move in 40 seconds?




13. Imagine a boy standing in a canyon. He yells at the opposite wall of the canyon. The speed of sound is approximately 340 m/s.
    A. If the distance to the other side of the canyon is D, how far does the sound actually travel from the boy and back?
    B. If it takes 1.6 seconds from the moment the boy yells for the echo to get back to the boy, how far wide is the canyon?

14. A person hits a metal rail with a hammer. The sound travels down the 650 m rail and reflects off of a post at the end. A sensor detects the reflected sound 0.25 seconds after it is struck. What is the speed of sound in the rail?

*When using T = #sec/#cycles (or f = #cycles/#sec), these words can be substituted for cycles: periods, vibrations, waves, wavelengths, crests (top of waves), back-and-forths.*

15. A spring bounces up and down 82 times in one minute. Calculate its period.

16. 15 wavelengths pass a point in 22 seconds. If the wave is moving 105m/s, calculate its frequency and wavelength.

# Day 21—Body Systems

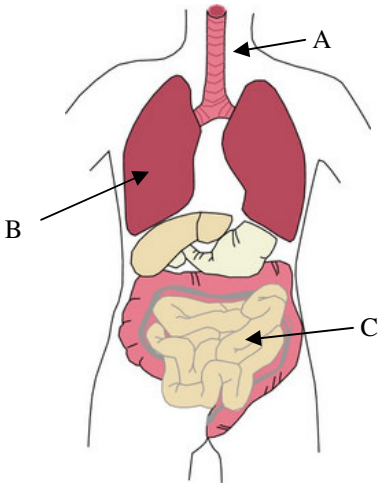
| System | Function | Organs |
|---|---|---|
| Circulatory system | moves water, oxygen, and nutrients around the organism | heart, veins, arteries, capillaries |
| Digestive System | breaks down food to be absorbed by body. | mouth, teeth, throat, esophagus, stomach, small and large intestines |
| Nervous system | interprets and sends information throughout the organism, motor function. | brain, spinal cord, nerves (neurons) |
| Endocrine System | secretes hormones to regulate body functions. | testis and ovaries (and others) |
| Reproductive System | produces egg and sperm to propagate (continue) species. | genitals, testicles, ovaries |
| Integumentary System | protects from external environment; | skin (also attachments like hair and nails) |
| Skeletal system | supports body, place for muscle attachment, protects organs | bones, ligaments (attachments), cartilage (nose) |
| Respiratory System | used to exchange $CO_2$ and $O_2$ between blood and air. | nose, mouth, wind pipe (trachea), lungs |
| Muscular system | used for locomotion, support, and protection | muscles, tendons (for attachment) |
| Excretory/ Urinary system | used to remove waste products from organism | bladder (storage tank), kidneys (filter), colon |
| Immune System | protects from and fights infections | white blood cells, skin (as a barrier) |

1. Which body system?

A. The only system that has completely different parts for males and females.
B. Surrounds the entire body.
C. Attacked by the AIDS virus.
D. Protects your brain.
E. Moves the bones.
F. Stomach and intestines.
G. Causes you to feel anxious.
H. A bird's feathers.
I. Protects your bones.
J. Helps you get well from the flu.
K. Removes unabsorbed food.
L. Is like the cell membrane for a cell.
M. Makes decisions for the body.

*In addition to their primary functions, most body systems interrelate and aid other systems.*

2. Which four systems does the heart transport for?




3. Which two systems have been opened when you bleed?
4. Large muscles in the extremities of the body (arms and legs) surround veins and arteries. When these muscles contract, they squeeze veins and arteries, helping which system?
5. How does the skin help the immune system?
6. How is the skin part of the nervous system?
7. Circulatory systems can be open or closed. Which do we have?
8. Amphibians allow oxygen thru their skin. Which system is this helping?
9. Some muscles are autonomous (*you don't control them*). Give two examples.
10. In the diagram at the left, identify the three organs.
    A. B. C.