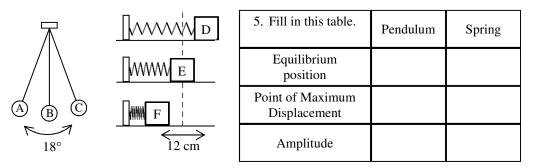
2011 PreAP Harmonic Motion 5

For the next two questions, be sure to start with the formula. Put in the change, then follow the math.

- 1. On planet Xorgon the acceleration due to gravity is 1/2 that of the earth's. A. * By what factor would the <u>period</u> of a pendulum change on Xorgon?
 - B. * By what factor would the period of a spring-mass system change on Xorgon?
- 2. A pendulum is moved to planet Pidronium where the acceleration due to gravity is 1/8 the strength of the earth's. (Careful!) What is the change in <u>frequency</u> of the pendulum?
- 3. An open pipe has a third harmonic of 520 Hz. What is the length of the pipe if the speed of sound on this day is 352 m/s (*Boy, is it hot!*).
- 4. A closed pipe is 18 cm long. If the second possible harmonic is 1400 Hz, what is the speed of sound that day? (*And is it a hot day?*)



6. If the speed of sound in air is 340 m/s, what is the wavelength of a 12 kHz sound?

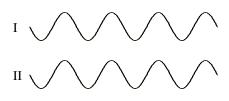
- 7. What is the frequency of a sound wave in air that has a wavelength of 12mm?
- 8. A string has a length of 0.8m.
 - A. What is the wavelength of the natural frequency of the string?
 - B. What are the wavelengths of the first 3 harmonics of the string?

C. If the speed of sound in air is 342 m/s, what is the frequency of the fundamental for this string?

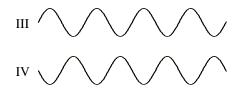
- D. What are the frequencies for the first 3 harmonics of the string?
- 9. A. How are frequency and pitch related?
 - B. How are they different (*book question*)?
- 10. In which materials is the speed of sound greater:
 - A. Solids or gases?
 - B. Dense or non-dense materials?
 - C. Fast vibrating or slowly vibrating molecules?

From the "Wave Action":

- 11. Use the four waves shown at the right for the following.
 - A. Which pair of waves are in-phase: I and II OR III or IV?
 - B. Which pair of waves will produce destructive interference?
 - C. Below each pair of waves, sketch the result of the interference that will result.

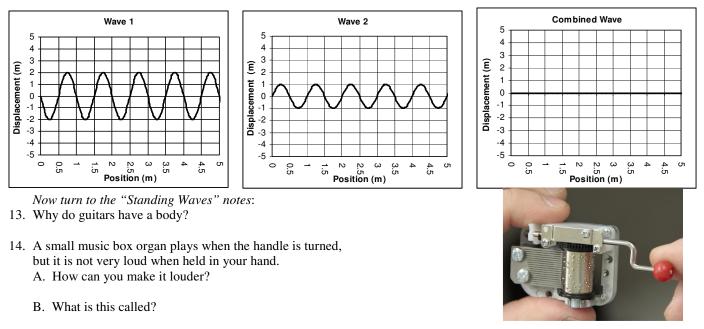






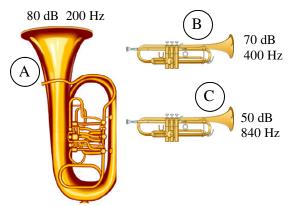
III + IV:

- 12. Use the graph at the bottom left to answer parts A thru C below.
 - A. Wavelength = B. Amplitude =
 - C. If the wave is vibrating at 380 Hz, what is its speed?
 - D. Adding the two waves together at each point, draw the combined wave
 - on the third graph below. This is known as "superposition".



This is true ANY time that one object (one force) causes another object to vibrate a lot (like a loud sound). A forced vibration can cause an object to vibrate at any frequency, but it will not be a large vibration: it doesn't "fit".

15. Give the other two names for the first harmonic.



- 16. Use the three instrument pictures at the left to answer the following.
 - A. Which one has the greatest amplitude?B. Which one has the highest frequency?
 - C. Which two have the same timbre?
 - D. Which one is playing the longest wavelength?
 - E. Which one is producing the fastest speed of sound?
 - F. Which one has the smallest period?
 - G. Which two will sound "in tune"?
 - H. Why?
- 17. A sound source has an intensity of 2.1×10^{-7} W/m² from 10 m away. A. How powerful is the sound source?
 - B. What would be the intensity twice as far away?



- 18. Slim Jim is driving his truck and honks its horn when he sees Slim Kim on the side of the road.
 - A. What does Kim hear as the truck passes?
 - B. What does Bim the dog hear in the back of the truck?
 - C. What is this called?

 T_{Earth} or $I = 1.414T_{Earth}$.

Q1A) put g/2 in denominator. Mult by reciprocal and the 2 goes next to the ℓ , which means T_{Xorgon} = square root of 2 times