1. Timbre B
2. Beats C
3. Echo E
4. Echo-location A
5. Doppler Effect D

A. Using reflected waves to "see".
B. How two sounds can have the same frequency, but different sounds.
C. Created by two frequencies that are very close to each other.
D. Changing of pitch because of a moving object.
E. A reflected sound.

6. In front (F), behind (B), or on the ambulance (O)?
   A. B Pitch is lower?
   B. F Pitch is higher?
   C. B λ is longer?
   D. F λ shorter?
   E. Same Speed of sound is greater?
   F. O Pitch is the same (unchanged)?

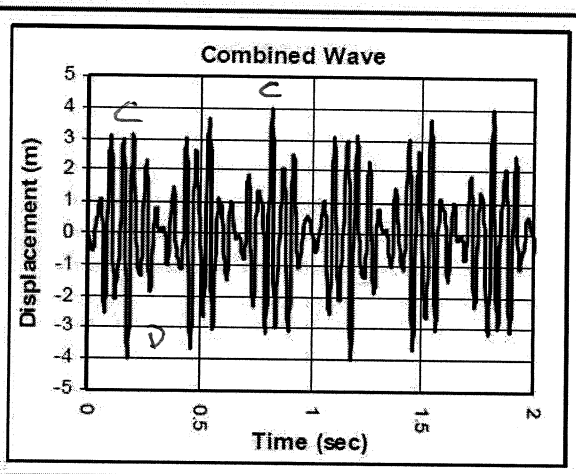
7. What happens as it passes you? Hi to Low (pitch drops)

8. Note 1 has a frequency of 185 Hz. Note 2 has a frequency of 189 Hz. How many beats do you hear? 4 Beats

9. f_1 = 366 Hz. There are 3 beats per second.
   f_2 = 363Hz or 369Hz.

10. If you heard 4 beats before and now you hear 2 beats, are the notes more in-tune or out-of-tune?

11. Use the graph at the right to answer the following.
   A. Mark constructive interference (C) and destructive interference (D).
   B. How many beats are shown per second? 3 beats / sec
   C. If f_1 = 592 Hz and f_2 is higher, what is f_2? 595 Hz



12. What helps us distinguish between two different instruments?
Timbre

13. A clarinet and an oboe play the same note.
   A. How do the fundamental frequencies of the two notes compare? they are the same
   B. What is different between the two notes?
Timbre: they have different Harmonics above their fundamental

14. Which has higher harmonics: a bright note or a dark note?

15. A boat using sound to map the bottom of a deep lake. The instrument reads 115 m deep.
   A. What kind of echolocation is being used? Sonar
   B. How far do the sound waves travel to get back to the boat?
115m x 2 = 230m

16. A person yelling into a canyon hears the echo in 1.4 seconds.
   A. What is the speed of the yell? V_s = 340m/s
   B. How deep is the canyon?
$V = \frac{2D}{t}$ $340m/s = \frac{2D}{1.4s} = 238m$

17. A person claps their hands, the echo is heard 1.5 seconds later after it reflects off of a wall 254 m away. How fast is the speed of sound for that temperature, and pressure?
$V = \frac{2D}{t} = \frac{2(254m)}{1.5} = 338.7m/s$

REVIEW:

18. Find the period of a pendulum with a length of 35 cm.
$T = 2\pi\sqrt{\frac{l}{g}} = 6.28\sqrt{\frac{.35}{10}} = 1.2sec$

19. A mass of 600 g is placed on a spring. It stretches 18 cm. Find the spring constant of the spring.
x = .18m
m = .6kg
Fw = 6N
$F = -kx$
$-6N = -k(.18m)$
$k = 33.3 N/m$

20. A sound has a frequency of 550 Hz in air. Find wavelength.
$V = f\lambda$ $340m/s = 550Hz \cdot \lambda = .62m$

21. Use the picture at the right to answer the following:
   A. If the string length is 2.8 meters, find the wavelength of this harmonic.
$2.5\lambda = 2.8m$
$\lambda = 1.12m$
   B. What is the wavelength of the fundamental?
$2(2.8) = 5.6m$
   C. Can we hear this frequency? Yes
   D. Find the wave speed of this string.
$V = f\lambda = 360Hz \cdot 1.12m$
$= 403.2$