The Physics of Sound

Go to the following website and answer the questions that follow:

http://www.gmi.edu/~drussell/Demos/waves/wavemotion.html

1. View the animation of the longitudinal wave. Pick out a single particle and watch its movement. Describe the movement of that single particle:

2. Click on the link entitled “Sound Radiation from Simple Sources”. View the monopole animation. What is a monopole?

3. Pick out one single point on the monopole animation. Describe the movement of that single particle:

4. Scroll down to the animation entitled “Radiation from a Dipole Source”. What is a dipole?

5. Pick out one single point on the dipole animation. Describe the movement of that single particle:

6. Scroll down to the last two animations. What is the difference between a lateral quadruple source and a linear quadruple source?

7. Which of the two sources mentioned in question #6 is a tuning fork an example of?

8. Use the BACK button on the browser to go back to the page with the longitudinal waves. Scroll down to the transverse wave. View the animation. How does the transverse wave differ from the longitudinal wave in its motion?

9. Scroll down to the water wave. View the animation. What kind of motion do the yellow particles make?

10. Water waves are actually a combination of what?

11. Scroll down and view the animation on Rayleigh surface waves. How does depth affect the motion of individual particles?

Go to the following web page and answer the questions that follow:
http://www.gmi.edu/~drussell/Demos/doppler/doppler.html

12. What is the Doppler effect?

13. Scroll down to the graphic entitled “Stationary Sound Source”. Describe the frequency heard by a stationary observer when a car horn is sounded by a stationary source.

14. Scroll down to the graphic entitled “Source moving with $v_{source} < v_{sound}$(Mach 0.7)”

Describe the frequency of the sound heard by an observer in front of the moving source versus the frequency of the sound heard by an observer behind the moving source.

15. What is the term for a source moving below the speed of sound?

16. Scroll down to the graphic entitled “Source moving with $V_{source} = v_{sound}$(Mach 1)”
Describe the frequency of the sound heard by an observer in front of the moving source.

17. What happens when the velocity of the source exceeds the velocity of sound? What is the term for this?

18. Scroll down to the graphic entitled "Source moving with $v_{source} > v_{sound}$" What is the term for this?

19. Describe the frequency of the sound heard by an observer in front of the moving source.

20. Why does a "sonic boom" occur?

21. Why does a "double thump" occur?

Go to the following web site and answer the questions that follow:
http://www.gmi.edu/~drussell/Demos/reflect/reflect.html

22. What two properties of a string does wave speed depend on and how does any change in these properties affect the speed?

23. Scroll down to"Reflection from a HARD Boundary". Describe the change, if any, between the incident pulse and reflected pulse.

24. Scroll down to“Reflection from a SOFT Boundary”. Describe the change, if any, between the incident pulse and reflected pulse.

25. Which law of mechanics determines these differences observed in questions 23 and 24?

26. Scroll down to the animation from high speed to low speed. How does the density change?

27. How do the amplitudes of the reflected and transmitted waves compare to the amplitude of the incident wave?

28. How do the polarities of the reflected and transmitted waves compare to the polarity of the incident wave?

29. How do the widths of the reflected and transmitted waves compare to the width (wavelength) of the incident wave?

30. Scroll down to the animation from low speed to high speed. How does the density change?

31. How do the amplitudes of the reflected and transmitted waves compare to the amplitude of the incident wave?

32. How do the polarities of the reflected and transmitted waves compare to the polarity of the incident wave?

33. How do the widths (wavelengths) of the reflected and transmitted waves compare to the width of the incident wave?

Go to the following web site and view the animations on constructive and destructive interference
http://www.gmi.edu/~drussell/Demos/superposition/superposition.html

34. Constructive interference results from waves that are traveling _____ and produces an amplitude that is _____ than either of the two incident waves.

Destructive interference results from waves that are traveling _____ and produces an amplitude that is _____ than either of the two incident waves.

35. How is a standing wave produced?

36. How are beats produced?

37. How is the beat frequency determined?