Honors Physics
Waves and Sound

This unit will allow each student to:

a. gain a better understanding of the behavior and characteristics of wave phenomena in general and sound and waves specifically
b. continue making proper scientific measurements and calculations
c. define and properly use all vocabulary
d. properly apply all terms and concepts in describing/explaining real world examples
e. continue making and interpreting scientific graphs
f. teach someone else the concepts discussed
g. practice proper laboratory safety

This will be accomplished by each student that is able to:

1. recognize and relate SI and USCS units of period, frequency, wavelength, wave speed, and loudness
2. recognize period, frequency, wavelength, wave speed, and loudness by the units only
3. describe the periodic motion of a pendulum
4. measure the period and frequency of a pendulum
5. compare a simple oscillation to wave motion
6. draw and label the parts of transverse and longitudinal waves
7. identify wavelength, rest position, crest, trough, and amplitude of a transverse wave
8. identify the wavelength, rest position, compression, rarefaction, and amplitude of a longitudinal wave
9. compare and contrast longitudinal and transverse waves
10. use the relationships of wave speed, frequency, wavelength, and period in calculations
11. describe the behavior of a standing wave and identify the node(s) and anti-node(s)
12. illustrate and identify examples of the Doppler effect
13. explain wave interactions with matter including reflection, refraction, diffraction, interference, and resonance
14. describe the creation of sound waves
15. relate the speed of sound to medium properties and conditions
16. describe the intensity of a sound wave in terms of loudness and the units of decibels
17. compare the natural frequencies of various objects
18. describe the interference of sound waves in terms of beats and beat frequency
19. trace the reception and interpretation of sound waves by the human ear and brain

Textbook Reference – Physics

Chapter 11 - Vibrations and Waves; Chapter 12 - Sound

Key Terms

oscillation, vibration, pendulum, period, frequency, natural frequency, wave, medium, reflection, refraction, interference, transverse wave, rest position, crest, trough, wavelength, amplitude, longitudinal/compressional wave, compression, rarefaction, sound, intensity/loudness/volume, decibel, pitch, resonance, forced vibration, Doppler effect, beats, standing wave, node, anti-node

Waves and sound review sheet

1. **Draw and label a transverse wave.**

2. **Draw and label a longitudinal wave.**

3. **Compare and contrast transverse and longitudinal waves.**

4. **Distinguish between the *period* and the *frequency* of a vibration or a wave. How do they relate to one another?**

5. **Does the medium in which a wave travels move along with the wave itself? Defend your answer with an example.**

6. **How does the speed of a wave relate to its frequency and wavelength?**

7. **As the frequency of sound is increased, does the wavelength increase or decrease? Give a mathematical example.**

8. **How far, in terms of wavelength, does a wave travel in one period?**

9. **What is the period of a pendulum?**

10. **If you triple the frequency of a vibrating object, what will happen to its period?**

11. **While watching ocean waves at the dock of the bay, Otis notices that 10 waves pass beneath him in 30 seconds. He also notices that the crests of successive waves exactly coincide with the posts of the dock that are 5 meters apart. What are the period, frequency, wavelength, and speed of the ocean waves?**

12. **What types of materials can transmit sound waves? Where does sound travel faster?**

13. **What happens to the speed of sound in air as the air temperature increases?**

14. When a wave source moves toward a receiver, does the receiver encounter an increase in wave frequency, wave speed, or both?

15. Would it be correct to say that the Doppler effect is the apparent change in the speed of a wave due to motion of the source?

16. Distinguish between *constructive* interference and *destructive* interference.

17. Is interference a property of only some types of waves or of all types of waves?

18. How can you observe interference in sound waves?

19. What is the beat frequency of two tuning forks, one has a frequency of 440 Hz and the other a frequency of 443 Hz?

20. How many times louder is a 70 dB sound than a 60 dB sound?

21. What causes the refraction of a wave?

22. What happens when a wave is reflected?

23. What causes the diffraction of a wave?

24. Where on a standing wave would you measure the amplitude of the wave?

25. Where on a standing wave is the node?

26. Describe what happens when an object is forced to vibrate at its natural frequency?

27. Use resonance to explain the collapse of the Tacoma Narrows bridge in 1940.