Waves and Interference Study Guide - 40

1. Define and/or illustrate
   1. Transverse wave
   2. Longitudinal wave
   3. Periodic wave
   4. Simple harmonic motion
   5. Frequency
   6. Wavelength
   7. Amplitude
   8. Sound wave
   9. Condensation
   10. Rarefaction
   11. Tone
   12. Node
   13. Anti-node
   14. Standing wave
   15. Constructive interference
   16. Destructive interference
   17. Beats
   18. Beat frequency
   19. Principle of Linear Superposition
   20. Diffraction
2. Short answer:
   1. How is a sound wave produced?
   2. How are beats formed?
   3. Summarize Young’s Double Slit Equation. What is seen on the screen and why? Explain the variables and how they affect the display on the screen.
   4. Summarize Thin Film Interference – How and why it occurs.
   5. Why does sound travel faster in solids and slower in air?
3. Solve the following problems:
   1. A wave has a frequency of 150Hz. What is its period?
   2. A wave cycle repeats every 0.003 seconds. What is its frequency?
   3. A wave travels at 650m/s and has a frequency of 600Hz. What is its wavelength?
   4. You shout at the top of a mountain 1500m away from me. If the speed of sound is 343m/2, how long until I hear you?
   5. A sound wave travels at 343m/s with an initial frequency *f*. If the frequency is doubled, what happens to the wavelength?
   6. A ray of blue light (λ=610nm) is being shone on a thin film of gasoline (n=1.21) atop a puddle of water (n=1.33). Find the minimum three depths of the gasoline (m=1,2,3)
   7. A green light of wavelength 524nm is reflected from a soapy film (n=1.12). What are the three minimum thicknesses of the oil where the green light will be brightest?
   8. Blue light (502nm) is shined on a thin film of gasoline (n=1.23). What are the three minimum thicknesses of the gasoline where the blue light will be strongly reflected?
   9. In an experiment where light with a wavelength of 522nm is shone through slits a difference of 5mm apart, alternating light and dark stripes were formed on a screen 67cm away. What happens if the distance between the slits is increased to 8mm?
   10. With two slits 0.12 mm apart, and a screen at a distance of 80 cm, the third bright line to one side of center in an interference pattern is found to be displaced 9.0 mm from the central line. What happens if the screen is moved further away?
   11. In an interference experiment, red light passes through a double slit. On a screen 1.5 m away, the distance between the 0th and the 10th dark bands is 2.0 cm. What happens if the wavelength is decreased?
4. Label the wave with the following labels: Amplitude, crest, trough, wavelength, equilibrium
5. Complete the following chart:

|  |  |  |  |
| --- | --- | --- | --- |
| Harmonic | Wave | Wave cycles | Overtone |
|  |  |  |  |
|  |  |  |  |
|  |  | 1.5 |  |
|  |  |  | 3 |
|  |  |  |  |
|  |  | 3.5 |  |