

## Chapter 6: Wave Motions and Sounds

1. Briefly describe a wave ?
2. What are the two common types of waves ? Give an example of each.
3. Illustrate with drawings how water waves travel and how sound wave travels in air.
4. An observer notices a lightning event before he hears the accompanying thunder. If he is 5 km from the lightning discharge and the speed of sound in air is 0.34 km/s, calculate the time elapse before he hears the thunder.
5. Determine the wavelength of a 300 Hz wave given that it is propagating at 1.8 km/s.
6. Describe standing wave.
7. Figure 6.1 shows (a) 2 waves in phase and (b) 2 waves  $180^\circ$  out of phase. Draw the final waveform for (a) and (b) on the right. Name the type of wave interference in both cases.

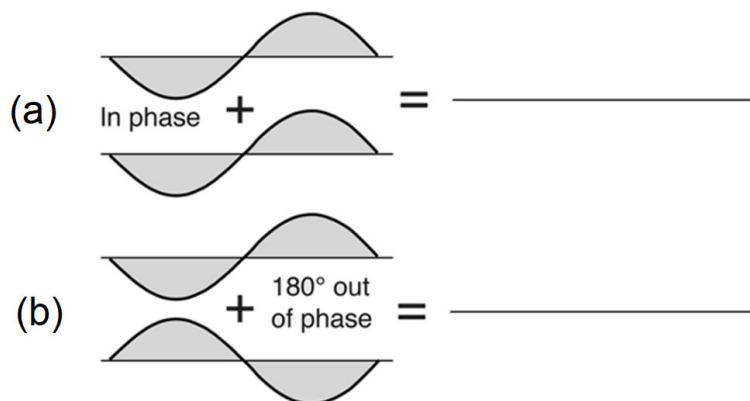


Figure 6.1

8. List the properties of sound.
9. Calculate the sound level in decibels (dB) if the intensity of sound is  $10^{-5} \text{ W / m}^2$ .
10. Give the relationship between Young's modulus, Bulk modulus and the density of a medium travelled by sound in solid, liquid and gas.

11. Compute the speed of sound in a metal rod whose Young's modulus and density are  $Y = 7.25 \times 10^6 \text{ N/m}^2$ ,  $\rho = 2.9 \text{ kg / m}^3$ .
12. What is the frequency of ultrasound? List the applications of ultrasound.
13. What does RADAR stand for ?
14. An autonomous car is fitted with an ultrasound obstacle detector. Find the distance,  $d$ , of the object from an autonomous car if it takes 40 ms for the signal to return after it is being emitted by the detector. Velocity of sound is 343 m/s.
15. With the aid of a diagram, explain Doppler's Effect.
16. An airport control station radar picked up a signal from an aircraft 20  $\mu\text{s}$  after emitting the signal. How far is the aircraft from the control station?  $c = 3 \times 10^8 \text{ m/s}$ .