

SUMMARY OF TERMS (KNOWLEDGE)

Sine curve The waveform traced by simple harmonic motion, which can be made visible on a moving conveyor belt by a pendulum swinging at right angles above the moving belt.

Amplitude For a wave or vibration, the maximum displacement on either side of the equilibrium (midpoint) position.

Wavelength The distance between successive crests, troughs, or identical parts of a wave.

Frequency For a vibrating body or medium, the number of vibrations per unit time. For a wave, the number of crests that pass a particular point per unit time.

Hertz The SI unit of frequency. One hertz (symbol Hz) equals one vibration per second.

Period The time in which a vibration is completed. The period of a wave equals the period of the source and is equal to $1/\text{frequency}$.

Transverse wave A wave in which the medium vibrates perpendicularly (at right angles) to the direction in which the wave travels. Light waves and waves on stringed instruments are transverse.

Longitudinal wave A wave in which the medium vibrates parallel to (along) the direction in which the wave travels. Sound waves are longitudinal.

Wave speed The speed with which waves pass a particular point:

$$\text{Wave speed} = \text{frequency} \times \text{wavelength}$$

Wave interference The phenomenon that occurs when two waves meet while traveling along the same medium.

Interference pattern The pattern formed by the superposition of different sets of waves that produces reinforcement in some places and cancellation in others.

Standing wave A stationary interference pattern formed in a medium when two sets of identical waves pass through the medium in opposite directions.

Doppler effect The shift in received frequency due to the motion of a vibrating source toward or away from a receiver.

Bow wave The V-shaped disturbance created by an object moving across a liquid surface at a speed greater than the wave speed.

Shock wave The cone-shaped disturbance created by an object moving at supersonic speed through a fluid.

Sonic boom The loud sound that results from the incidence of a shock wave.

READING CHECK QUESTIONS (COMPREHENSION)**19.1 Good Vibrations**

1. What is a *wiggle in time* called? What do you call a *wiggle in space* and time?
2. What is the source of all waves?
3. What is meant by the *period* of a pendulum?
4. Which has the longer period: a short or a long pendulum?

19.2 Wave Description

5. How does a sine curve relate to the wave description?
6. Distinguish among these different aspects of a wave: period, amplitude, wavelength, and frequency.
7. How many vibrations per second are represented in a radio wave of 101.7 MHz?
8. How do frequency and period relate to each other?

19.3 Wave Motion

9. In one word, what is it that moves from source to receiver in wave motion?
10. Does the medium in which a wave travels move with the wave?
11. In what direction are the vibrations relative to the direction of wave travel in a transverse wave?
12. In what direction are the vibrations relative to the direction of wave travel in a longitudinal wave?

13. The wavelength of a transverse wave is the distance between successive crests (or troughs). What is the wavelength of a longitudinal wave?

19.4 Wave Speed

14. What is the relationship among frequency, wavelength, and wave speed?

19.5 Wave Interference

15. What is the superposition principle?
16. Distinguish between constructive interference and destructive interference.
17. What kinds of waves can show interference?
18. What is a node? What is an antinode?
19. Can standing waves be formed of transverse waves, longitudinal waves, or both?

19.6 Doppler Effect

20. In the Doppler effect, does frequency change? Does wave speed change?
21. Can the Doppler effect be observed with longitudinal waves, with transverse waves, or with both?
22. What is meant by a blue shift and a red shift for light?

19.7 Bow Waves

23. How fast must a bug swim to keep up with the waves it produces? How fast must it move to produce a bow wave?