

Chapter 14 Answers – Waves

1. Two: by particle transfer and by waves.
2. Mechanical needs medium, electromagnetic does not.
3. Particles of transverse wave move perpendicular to direction of wave. Particles of longitudinal wave move parallel to direction of wave.
4. Same position.
5. Wave pulse is single disturbance, continuous wave is many pulses together.
6. Frequency is the number of cycles per second, wave velocity is the speed of the wave through the medium.
7. Same.
8. a) No, speed is constant if the medium is not changed.
b) By changing the frequency of the source.
9. Speed is constant down the spring, motion of a point is perpendicular to the motion.
10. See notes.
11. Maximum displacement from equilibrium; represents the energy in the wave.
12. Somewhat proportional.
13. The difference between the two media in contact.
14. Goes from more dense to less dense so reflected wave is erect.
15. Goes from less dense to more dense so reflected wave is inverted.
16. Frequency depends on the source, not the medium itself.
17. Total energy remains constant, just transferred to different parts of the medium.
18. Minimal movement.
19. Sugar moves away from antinodes and collects at nodes.
20. It's a 4th harmonic standing wave; can touch it at its 5 nodes.
21. Inverted.
22. When two or more waves superimpose. Can be constructive or destructive.
23. First hit produces longitudinal waves. Second hit produces transverse waves.
24. Speed is constant so wavelength decreases.
25. Period decreases.
26. Decreases.
27. Approximately four times.
28. Bottom, because the difference in media is greater.
29. Motion has to match the natural (resonance) frequency.
30. Longer wavelengths diffract more than shorter wavelengths.

31. Boundary A is more dense, B is less, C is less, D is more.

32. 1.0×10^1 s

33. 5.0 m/s

34. a) 0.29 m/s
b) 0.21 m/s

35. a) 2.4 m/s
b) 2.9 m

36. 6.0×10^{-7} m

37. a) 190 m to 550 m
b) 2.8 m to 3.4 m

38. a) 1.50×10^3 m/s
b) 1.00×10^{-6} s
c) 1.00×10^{-6} s ; the period and frequency remain unchanged.

39. a) 470 Hz
b) 240 complete waves

c) 170 m

40. 1350 m

41. a) 1/4 wavelength
b) 0.72 s
c) 1.4 Hz

42. 4.2 m/s

43. 870 000 m

44. 63.7 N

45. Refer to Problems and Solutions Manual for sketches

46. 0.90 m/s

47. a) 2.4×10^{-3} s
b) Reflected pulses are inverted so returning pulse is down (below)
c) 15 cm from the other end, where the distances traveled are the same.