

## Answers to selected questions

### Chapter 15

**Q6.** The wavelength must increase to produce a higher wave speed for the same frequency according to the relationship  $v = f \lambda$ .

**Q12.** Transverse waves are much easier to observe on a heavy rope than a light string because the higher mass per unit length of the rope produces a lower wave speed. The waves on the light string move so rapidly to be easily seen.

**Q18.** The frequency will be greater for the standing wave with the node in the middle. This wavelength of the traveling waves that interfere to produce this standing wave is half that of the fundamental. For a fixed wave speed, a shorter wavelength produces a higher frequency (double that of the fundamental). ( $f = v / \lambda$ )

**Q24. a.** The speed of a sound wave increases for higher temperatures because the

higher molecular velocities causes the air molecules to collide more frequently.

**b.** For a given frequency, the larger wave speed will be associated with a longer wavelength ( $v = f \lambda$ ).

**Q30.** A guitar string is usually plucked at a distance roughly a quarter of the length of the string from the end. This is near the antinode of the second harmonic and therefore it is highly excited. The antinode for the fundamental is at the middle of the string.