

ANSWERS TO EVEN-NUMBERED CONCEPTUAL QUESTIONS

2. The resonant frequency depends on the length of the pipe. Thus, changing the length of the pipe will cause different frequencies to be emphasized in the resulting sound.
4. The speed of light is so high that the arrival of the flash is practically simultaneous with the lightning discharge. Thus, the delay between the flash and the arrival of the sound of thunder is the time sound takes to travel the distance separating the lightning from you. By counting the seconds between the flash and thunder and knowing the approximate speed of sound in air, you have a rough measure of the distance to the lightning bolt.
6. Refer to Table 14.2 to see that a rock concert has an intensity level of about 120 dB, the turning of a page in a textbook about 30 dB, a normal conversation is about 50 dB, background noise at a church about 30 dB. This leaves a cheering crowd at a football game to be about 60 dB.
8. A beam of radio waves of known frequency is sent toward a speeding car, which reflects the beam back to a detector in the police car. The amount the returning frequency has been shifted depends on the velocity of the oncoming car.
10. Consider the level of fluid in the bottle to be adjusted so that the air column above it resonates at the first harmonic. This is given by $f = v/4L$. This equation indicates that as the length L of the column increases (fluid level decreases), the resonant frequency decreases.
12. A vibrating string is not able to set very much air into motion when vibrated alone. Thus it will not be very loud. If it is placed on the instrument, however, the string's vibration sets the sounding board of the guitar into vibration. A vibrating piece of wood is able to move a lot of air, and the note is louder.