

**Objective 11:** Describe the pressure waves we experience as sound.

1. The stimulus for hearing, or \_\_\_\_\_, is sound waves, created by the compression and expansion of \_\_\_\_\_.
2. The amplitude of a sound wave determines the sound's \_\_\_\_\_.
3. The pitch of a sound is derived from the \_\_\_\_\_ of its wave.
4. Sound energy is measured in units called \_\_\_\_\_. The absolute threshold for hearing is arbitrarily defined as \_\_\_\_\_ such units.

**Objective 12:** Describe the three regions of the ear, and outline the series of events that triggers the electrical impulses sent to the brain.

5. The ear is divided into three main parts: the \_\_\_\_\_ ear, the \_\_\_\_\_ ear, and the \_\_\_\_\_ ear.
6. The outer ear channels sound waves toward the \_\_\_\_\_, a tight membrane that then vibrates.
7. The middle ear transmits the vibrations through a piston made of three small bones: the \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
8. In the inner ear, a coiled tube called the \_\_\_\_\_ contains the receptor cells for hearing. The incoming vibrations cause the \_\_\_\_\_ to vibrate the fluid that fills the tube, which causes ripples in the \_\_\_\_\_. \_\_\_\_\_, which is lined with \_\_\_\_\_. This movement triggers impulses in adjacent nerve fibers that converge to form the auditory nerve, which carries the neural messages (via the \_\_\_\_\_) to the \_\_\_\_\_ lobe's auditory cortex. The brain interprets loudness from the \_\_\_\_\_ of hair cells a sound activates.

9. (Close-Up) On tasks requiring alert performance, people in noisy environments work \_\_\_\_\_ (more/less) efficiently. People who live in noisy environments suffer elevated rates of \_\_\_\_\_-related disorders such as \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. Noise is especially stressful when it is \_\_\_\_\_ or \_\_\_\_\_.

**Objective 13:** Contrast place and frequency theories, and explain how they help us to understand pitch perception.

10. One theory of pitch perception proposes that different pitches activate different places on the cochlea's basilar membrane; this is the \_\_\_\_\_ theory. This theory has difficulty accounting for how we hear \_\_\_\_\_-pitched sounds, which do not have such localized effects.
11. A second theory proposes that neural impulses, sent to the brain at the same frequency as the sound wave, allow the perception of different pitches. This is the \_\_\_\_\_ theory. This theory fails to account for the perception of \_\_\_\_\_-pitched sounds, because individual neurons cannot fire faster than \_\_\_\_\_ times per second.
12. For the higher pitches, cells may alternate their firing to match the sound's frequency, according to the \_\_\_\_\_ principle.

**Objective 14:** Describe how we pinpoint sounds.

13. We locate a sound by sensing differences in the \_\_\_\_\_ and \_\_\_\_\_ with which it reaches our ears.
14. A sound that comes from directly ahead will be \_\_\_\_\_ (easier/harder) to locate than a sound that comes from off to one side.
15. As with visual information, the brain uses \_\_\_\_\_ as specialized neural teams work on different auditory tasks simultaneously.