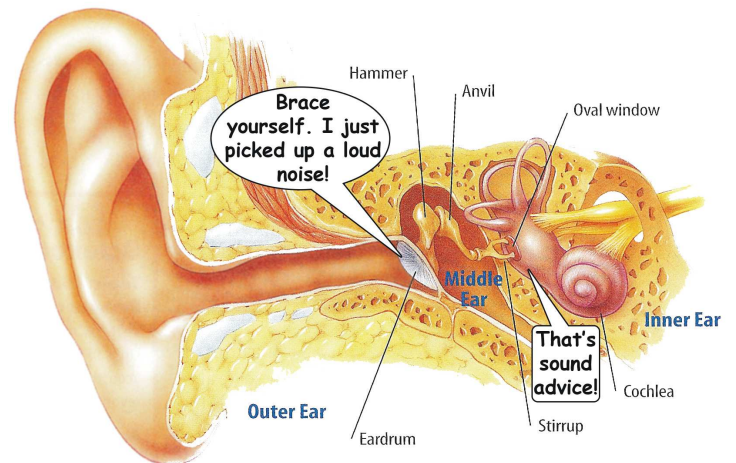


Hearing Sound

A pleasant melody drifts by. You know that it is a complex mixture of waves caused by vibrations, but how do you detect it? Your ears are amazing, complex devices perfectly suited to collecting, amplifying, and interpreting sound. The outer ear, with its funnel shape, is a sound collector. It funnels sound into the auditory canal which carries the waves to the ear drum. The middle ear, which consists of the eardrum and three small bones, is an amplifier. The eardrum vibrates in response to sound. Three small bones, the hammer, anvil, and stirrup amplify sound by leverage, and transfer vibrations from the eardrum to the oval window on the cochlea. The inner ear, which contains the cochlea, a snail shaped, fluid filled chamber, is a sound interpreter.



The stirrup presses on the oval window producing pressure waves in the fluid of the cochlea. The oval window, a small membrane on the cochlea, amplifies vibrations of the eardrum (NOTE: $P = F/A$ - the relatively smaller area of the oval window result in an increase in the pressure resulting from the applied force). The cochlea contains the receptors called hair cells. Different hair cells respond to different frequencies and send information to the brain. Constant exposure to loud noise can damage hair cells. Hair cells also degenerate with age and disease. Mammalian hair cells do not regenerate. Damage to hair cells results in hearing loss.

Answer the questions below based on the reading above, and on your knowledge of physics.

1. How does the ear capture sound waves? _____

2. What are the functions of the following parts of the ear:
 - a. Eardrum? _____
 - b. Hammer, anvil, and stirrup? _____

 - c. Cochlea? _____

3. How are loud noises harmful? _____
