

THE EAR

1. Which of these words do you know? Check new words in a dictionary. Write the translation of the words in the table.

ampulla	['æm'pulə]	
auditory area	['ɔ:dit(ə)rɪ]	
auditory tube	['ɔ:dit(ə)rɪ]	
auricle	['ɔ:rɪkl]	
bony labyrinth	['læb(ə)rɪnθ]	
cerebellum	[,serə'beləm]	
cochlea	['kɔkliə]	
cochlear duct	['kɔkliə dʌkt]	
ear canal	[ɪə kə'næl]	
eardrum	['ɪədrʌm]	
endolymph	['endə,lɪmf]	
equilibrium	[,i:kwi'librɪəm]	
Eustachian tube	[ju:s'teɪʃ(ə)n tju:b]	
gelatinous	[dʒɪ'lætɪnəs]	
hair cell	[heə]	
incus	['ɪŋkəs]	
malleus	['mæliəs]	
membranous labyrinth	['membrənəs 'læb(ə)rɪnθ]	
midbrain	['mɪd,breɪn]	
nasopharynx	[,neɪzəu'færiŋks]	
organ of Corti	['kɔ:ti]	
otolith	['əʊtəʊ,lɪθ]	
oval window	['əʊv(ə)l 'wɪndəʊ]	
perilymph	['peri,lɪmf]	

saccule	['sækju:l]	
semicircular canals	[,semi'sɜ:kjələ]	
stapes	['steɪpi:z]	
temporal bone	['temp(ə)r(ə)l]	
utricle	['ju:trɪkl]	
vestibule	['vestɪbjʊ:l]	

2. Read the text.

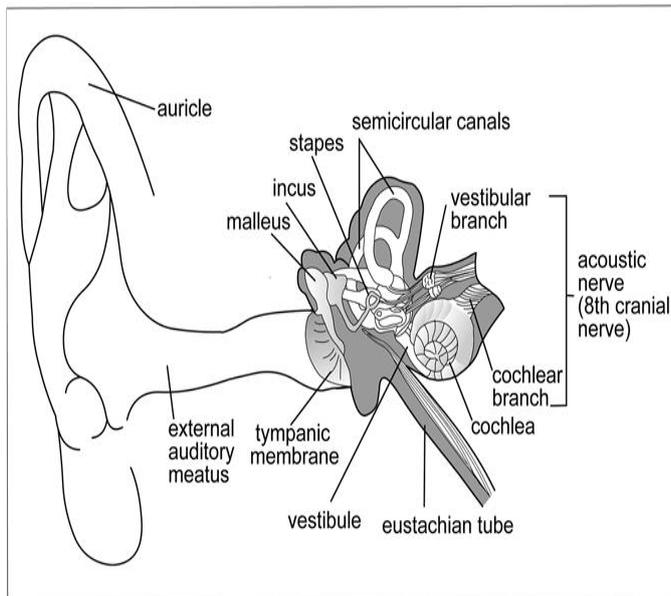
There are three main areas in the ear: the outer ear, the middle ear, and the inner ear. Receptors for hearing and equilibrium are both found in the inner ear.

The auricle and ear canal make up the outer ear. The auricle is composed of skin-covered cartilage. The second part of the outer ear, the ear canal, acts as a tunnel into the temporal bone and middle ear. The eardrum stretches across the end of the ear canal and produces vibrations when hit with sound waves. These vibrations are transmitted to the three auditory bones called the malleus, incus, and stapes. This last bone, the stapes, transports vibration to the oval window through the inner ear.

Air enters and leaves the middle ear through the Eustachian tube, also called the auditory tube, which extends from the middle ear to the nasopharynx. In order for the eardrum to function and vibrate, the air pressure in the middle ear must be equal to the pressure outside the ear.

The inner ear is located within the temporal bone and contains a bone cavity known as the bony labyrinth. Lined with a membrane called the membranous labyrinth, this cavity contains fluid called perilymph, which is found between the temporal bone and the membrane. Endolymph is the fluid found within the inner ear structures - the cochlea (important in hearing) and the utricle, saccule, and semicircular canals (all important in equilibrium).

The cochlea looks like a snail shell. It is divided into three canals filled with fluid. The medial canal is known as the cochlear duct and contains the hearing receptors in the spiral organ, or organ of Corti. These receptors are known as hair cells and contain nerve endings.



Hearing involves the reception of vibrations, the transmission of vibrations, and then the generation of nerve impulses. After sound waves enter the ear canal, they are transmitted to the ear structures according to the following sequence: eardrum, malleus, incus, stapes, the inner ear's oval window, the cochlea's perilymph and endolymph,

and finally the organ of Corti's hair cells. Vibrations reach these hair cells, which bend and then generate impulses that travel to the brain through the eighth cranial nerve. Sounds are heard and processed in the auditory areas of the brain, which are located in the temporal lobes of the cerebral cortex.

Two other inner ear structures, the utricle and saccule, are located in the vestibule between the cochlea and semicircular canals. These structures are actually hair cells surrounded in a gelatinous membrane with otoliths, which are tiny crystals of calcium carbonate. When the head changes position, gravity pulls down on these otoliths and bends the hair cells, thus generating impulses. Nerves transmit these impulses to the cerebellum, midbrain, and temporal lobes of the cerebrum. At the subconscious level, the cerebellum and midbrain interpret and process these impulses to maintain equilibrium. The cerebrum informs us of the head's position.

The last inner ear structure consists of three semicircular canals, which are also involved in stabilizing equilibrium. Each of these membranes is oriented in a separate plane and filled with fluid. At the bottom of each structure is the ampulla, an enlarged portion that contains hair cells sensitive to movement. When the body moves forward, the hair cells are bent backward and then straighten. Impulses are generated when these cells bend, and are also transmitted to the brain. In general, the semicircular canals provide information while the body is in motion, and the utricle

and saccule provide information while the body is at rest. The brain synthesizes all this information to create a unified sense of body position.

3. Note the plural forms of the following nouns:

singular	plural
malleus	mallei ['mæli:]
incus	incudes ['ɪŋkjudi:z]
stapes	stapes or stapedes [stæ'pi:di:z]
cochlea	cochleae ['kɒkli:]
utricle	utricle or utriculi [ju:'trɪkjʊ , laɪ]
saccule	saccules or sacculi [li:]
ampulla	ampullae ['æm'puli:]

4. Answer the questions.

1. What receptors are found in the inner ear?
2. What makes up the outer ear?
3. Where is the eardrum located?
4. What is necessary for the functioning of the eardrum?
5. What does hearing involve?
6. What does the cochlea consist of?
7. What are otoliths?
8. Where are the auditory areas of the brain located?
9. What is the function of semicircular canals?
10. What is endolymph?

5. Define if the statements are true or false. Correct them if it is necessary.

1. There are three main areas in the ear: the outer ear, the inner ear, the middle ear.
2. The middle ear is composed of the auricle and ear canal.
3. The vibrations of the eardrum are transmitted to the auditory tube.
4. The auditory bones are called the malleus, incus and stapes.

5. The membranous labyrinth contains endolymph.
6. The semicircular canals provide information while the body is at rest.
7. The cochlea is divided into five canals filled with fluid.
8. The utricle and saccule are necessary for hearing.
9. The organ of Corti contains receptors known as hair cells.
10. Hair cells generate impulses that travel to the brain.

6. Make up word combinations.

1. to stabilize	a. to movement
2. to be filled	b. of three canals
3. to be involved	c. as a tunnel
4. to transmit	d. with membrane
5. to hear	e. in hearing
6. to be lined	f. of body position
7. to consist	g. sounds
8. to be sensitive	h. with fluid
9. to create a sense	i. equilibrium
10. to act	j. sound wave

7. Find in the text synonyms to the following words:

tympanic membrane, auditory tube, to transport, external auditory meatus, pinna, stirrup, auditory ossicles, hammer, balance, anvil.

8. Fill in the gaps.

1. The eardrum produces _____ when hit with sound waves.
2. The stapes transports vibrations to the oval _____.
3. The Eustachian tube extends from the middle ear to the _____.
4. The inner ear is located within the _____ bone.
5. The _____ looks like a snail shell.
6. Sounds are processed in the _____ _____ of the brain.

7. Vibrations reach _____ which bend and generate impulses.
8. _____ canals are involved in stabilizing equilibrium.
9. The auricle is composed of skin-covered _____.
10. Hearing involves the _____ and _____ of vibrations and the generation of nerve impulses.

9. Match the following words with their definitions:

Bony labyrinth, nasopharynx, semicircular canals, eardrum, cochlea, inner ear, sound, malleus, Eustachian tube, middle ear.

1. The membrane of the middle ear, which vibrates in response to sound waves.
2. The spiral cavity of the inner ear containing the organ of Corti, which produces nerve impulses in response to sound vibrations.
3. A narrow passage leading from the pharynx to the cavity of the middle ear, permitting the equalization of pressure on each side of the eardrum.
4. Three fluid-filled bony channels in the inner ear. They are situated at right angles to each other and provide information about orientation to the brain to help maintain balance.
5. The upper part of the pharynx, connecting with the nasal cavity above the soft palate.
6. The air-filled central cavity of the ear behind the eardrum, containing the malleus, incus, and stapes.
7. The semicircular canals and cochlea, which form the organs of balance and hearing and are embedded in the temporal bone
8. Vibrations that travel through the air or another medium and can be heard when they reach a person's ear
9. A small bone in the middle ear which transmits vibrations of the eardrum to the incus.

10. A complex structure in the inner ear which contains the organs of hearing and balance. It consists of bony cavities filled with fluid and lined with sensitive membranes.

10. Complete the table using the words from the frame:

organ of Corti, malleus, semicircular canals, ear canal, eardrum, incus, auricle, saccule, Eustachian tube, stapes, cochlea, utricle
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outer ear	middle ear	inner ear