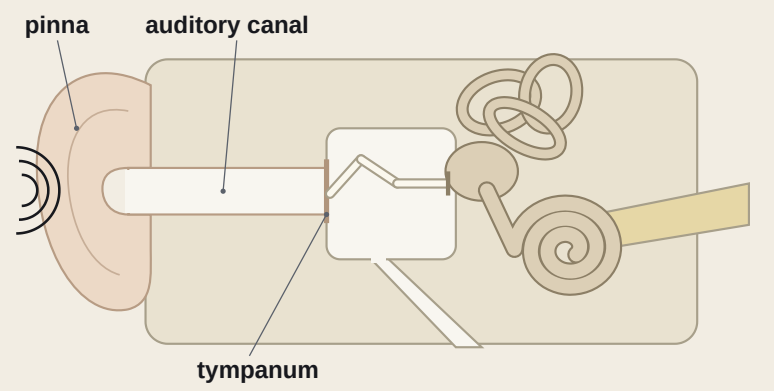
A9 · The ear: hearing and balance · Completed notes

Goals: Name the parts of the outer, middle and inner ear, and give the job of each. Describe how the organ of Corti starts action potentials. Trace sound from the pinna to the brain. Explain how the semicircular canals help you keep your balance.

These are the completed notes. The blanks are filled in and each question is worked.

Slide 1 of 5 · The outer ear

In lesson A8, the eye changed light into action potentials. Today the ear does the same with sound. It also keeps your balance.



Key ideas

The **pinna** collects sound waves.

The **auditory canal** carries them inward.

The **tympanum** is a thin sheet. It **vibrates** when sound hits it.

Example

Name the three parts of the outer ear, in the order sound reaches them.

1. The pinna.
2. The auditory canal.
3. The tympanum.

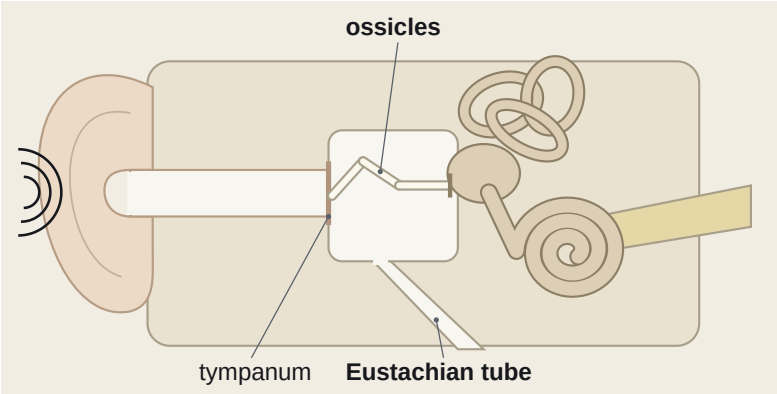
Try it

State what the tympanum does when sound waves reach it.

1. It is a thin sheet.
2. It vibrates.

Slide 2 of 5 · The middle ear

On the last slide, sound made the tympanum vibrate. Behind the tympanum is a small space filled with air: the middle ear.



Key ideas

The **ossicles** are three tiny bones. They cross the middle ear.

They pass the vibrations along and make them **stronger**.

The **Eustachian tube** joins the middle ear to the throat.

It keeps the air **pressure** the same on both sides of the tympanum.

Example

State the job of the ossicles.

1. They pass vibrations from the tympanum to the inner ear.
2. They make the vibrations stronger.

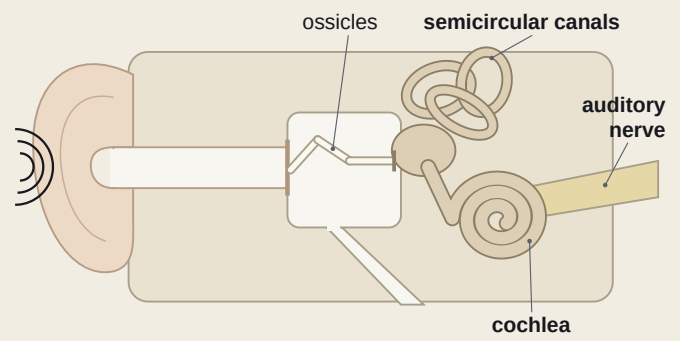
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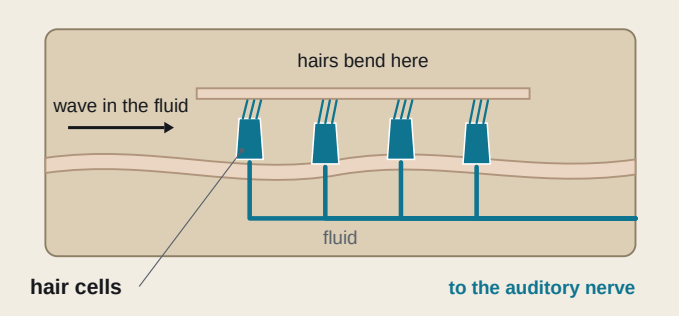
State the job of the Eustachian tube.

1. It lets air into or out of the middle ear.
2. This keeps the air pressure equal on both sides of the tympanum.

Slide 3 of 5 · The inner ear: the cochlea and the organ of Corti

On the last slide, the ossicles carried stronger vibrations to the inner ear. The inner ear is filled with fluid, not air.





Key ideas

The **cochlea** is coiled like a snail shell. It is the part for hearing.

Inside it is the **organ of Corti**, which holds **hair cells**.

A wave in the fluid bends the hairs. The hair cell starts action potentials.

The **auditory nerve** carries them to the temporal lobe.

Example

Describe how a hair cell starts action potentials.

1. A wave in the fluid of the cochlea moves the hair cell.
2. Its hairs bend.
3. The hair cell then starts action potentials.

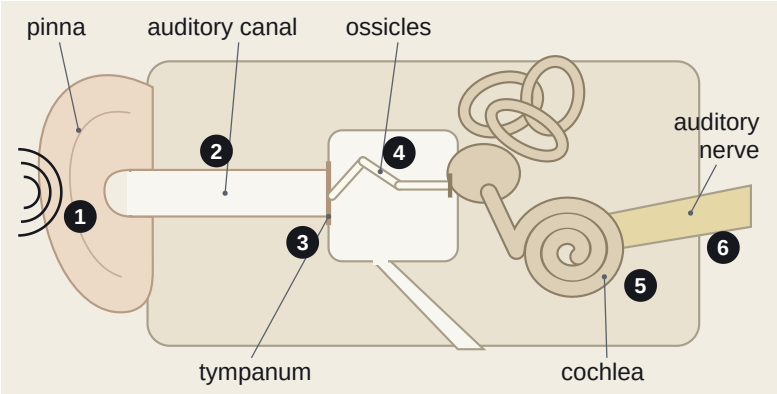
Try it

Name the lobe of the cerebrum where the sensation of sound happens.

1. The auditory nerve carries action potentials to it.
2. It is the temporal lobe.

Slide 4 of 5 · Method: trace sound from the pinna to the brain

You have now met every part that sound passes on its way to the brain. Here the path becomes six steps.



Key ideas

Sound passes the pinna, the auditory canal and the **tympanum**.

The **ossicles** make the vibrations stronger.

In the **cochlea**, hair cells bend.

The **auditory nerve** carries action potentials to the temporal lobe.

Example

List the six parts that carry sound from outside the ear to the brain.

1. Pinna, auditory canal, tympanum.
2. Ossicles, cochlea.
3. Auditory nerve.

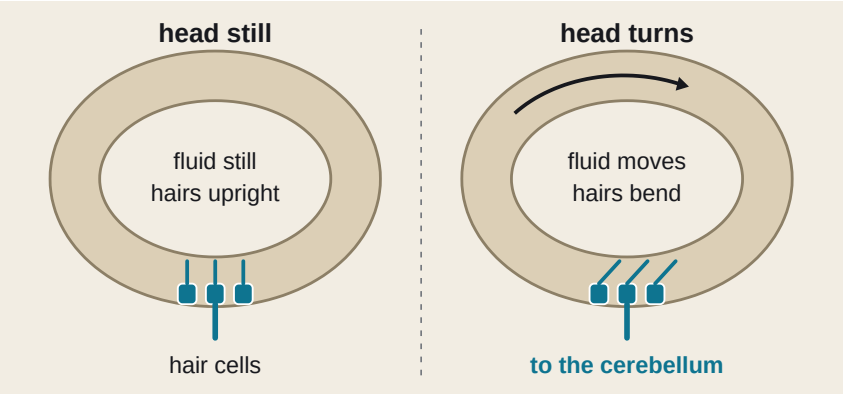
Try it

Use the six steps. The ossicles cannot move. Explain why the ear hears poorly.

1. The tympanum still vibrates.
2. The vibrations are not passed on to the cochlea.
3. The hair cells do not bend, so no action potentials start.

Slide 5 of 5 · Balance: the semicircular canals

On slide 3, the inner ear had a second part: the three semicircular canals. They have nothing to do with hearing.



Key ideas

The **semicircular canals** are filled with fluid.

When you turn your head, the fluid moves and bends the hairs of **hair cells**.

Action potentials go to the **cerebellum**.

The cerebellum uses them to keep your **balance**.

Example

Name the part of the brain that receives action potentials from the semicircular canals.

1. They are used for balance.
2. They go to the cerebellum.

Try it

The semicircular canals of both ears are damaged. The cochlea is healthy. Predict the effect on hearing and on balance.

1. Hearing is normal, because the cochlea still works.
2. Balance is poor, because the cerebellum gets wrong information.