



SSIP April – May 2020

LIFE SCIENCES

Topic(s) : EAR

Venue:

SSIP AIMS/GOALS

The four interconnected outcomes that drive the professional development activities for SSIP are:

1. Enhancing Teachers knowledge: deep understanding of subject matter knowledge and students ideas on the content
2. Enhancing quality teaching and assessment for learning: effective instructional approaches that teachers may use to ensure improved understanding by most learners.
3. Developing ICT integration skills :Use of ICT to improve teaching and learning
4. Building professional learning communities: allow teachers to start collaborating and form professional networks in non-formal settings in context of their schools

PROGRAMME

DAY THREE			
SESSION	TIME ALLOCATION	ACTIVITY	RESOURCES
SESSION ONE	08:00 – 10:30	Module 2: Unit 1: Structure and functions of the parts of the human eye, using a diagram. Unit 2: Binocular vision and its importance. Unit 3: Changes that occur in the human eye during accommodation and pupillary reflex, using diagrams. Unit 4: The nature and treatment of visual defects, using diagrams. Activity 2.1 – 2.6 Module 3: Unit 1: Structure of the human ear and the functions of the different parts, using a diagram. Unit 2: Functioning of the human ear in hearing and balance. Unit 3: The nature and treatment of hearing defects. Activity 3.1 – 3.3	Course material Power point Video clips
	10:30 – 10:45	TEA BREAK	

ATP FOR TERM 2

06/05 – 10/05	16		Human Ear ❑ Structure of the human ear and the functions of the different parts, using a diagram ❑ Functioning of the human ear in: • Hearing (include the role of the organ of Corti without details of its structure) • Balance (include the role of maculae and cristae without details of their structure) ❑ Cause and treatment of the following hearing defects: • Middle ear infections (Use of grommets) • Deafness (Use of hearing aids and cochlear implants)			64	
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MODULE 4

Overview of Module 3

In this module we will look at the concept of 'The Ear'

Content

You will study this module through the following units:

Unit 1: Structure of the human ear and the functions of the different parts, using a diagram

Unit 2: Functioning of the human ear in hearing and balance

Unit 3: The nature and treatment of hearing defects

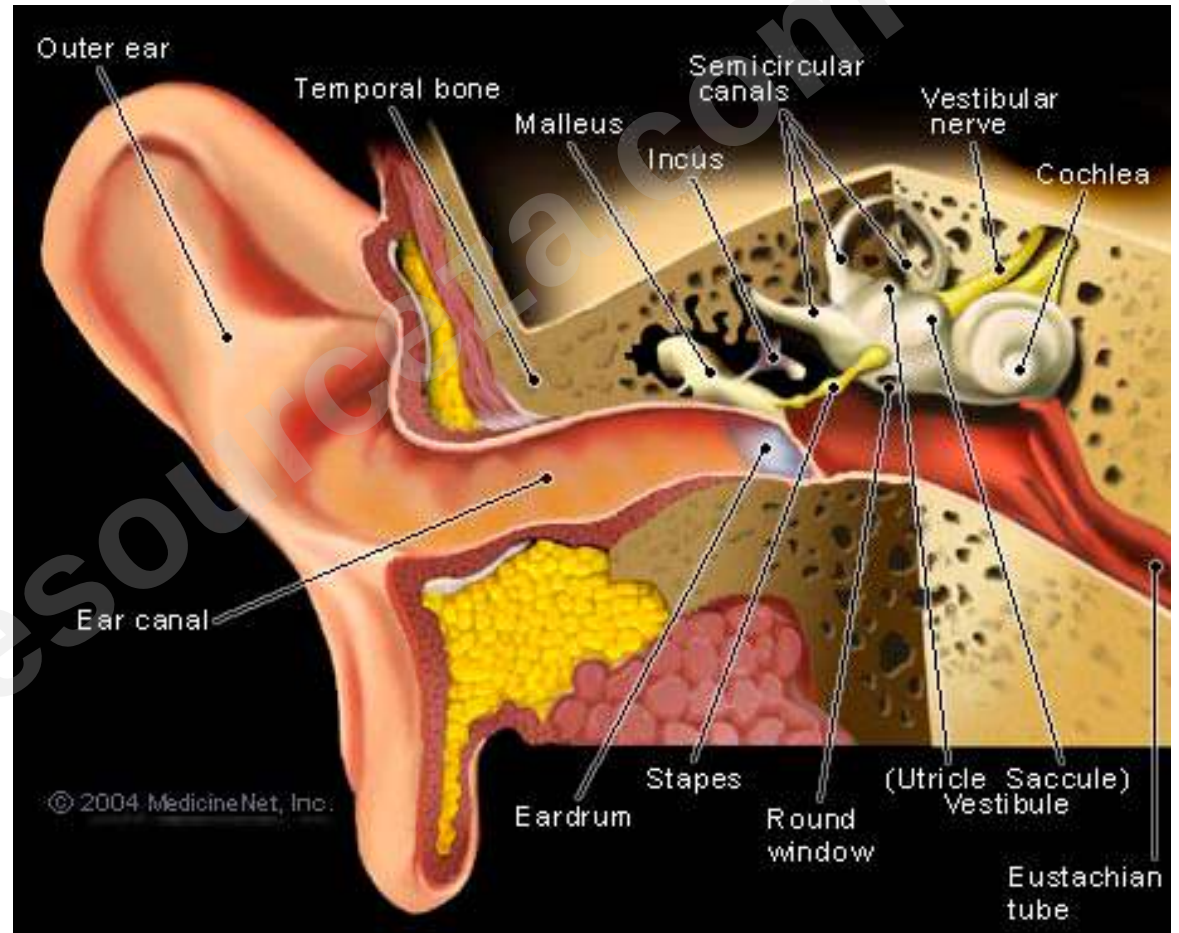
OUTCOMES OF THIS MODULE

Statement of the learning outcomes/objectives

When you complete this module you will be able to:

- Draw and label the parts of the ear.
- Describe the functions of the different parts.
- Briefly describe the path of sound as it travels through the ear
- Briefly describe the functioning of the maculae and cristae and their role in balance
- Briefly describe the defects of the ear

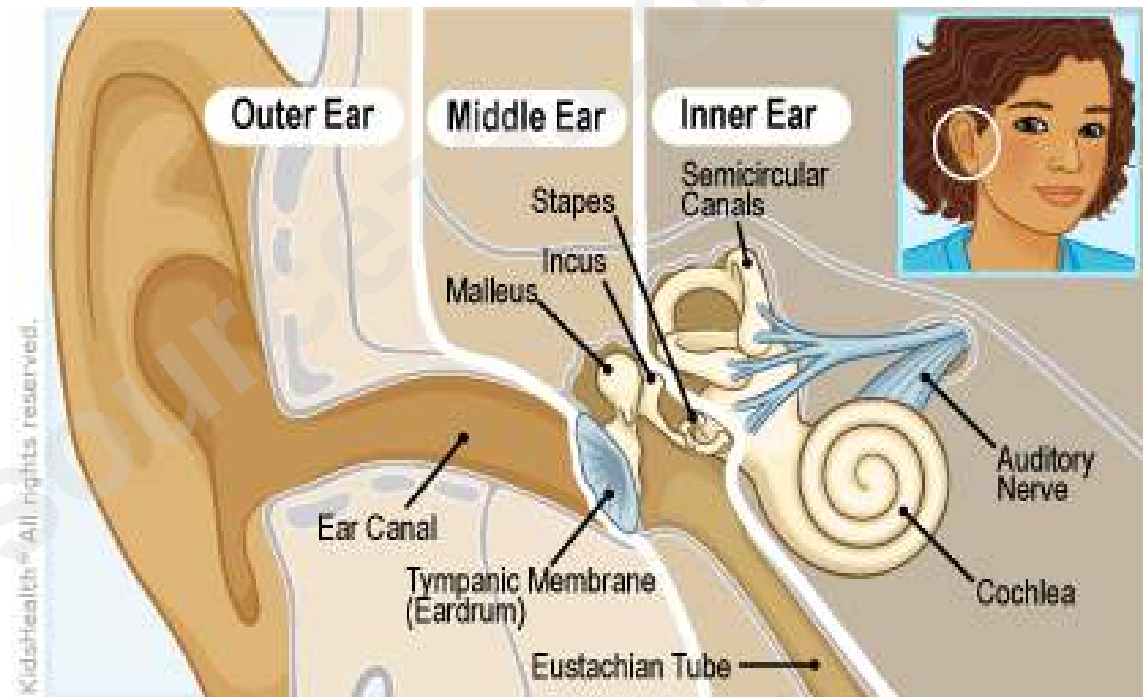
UNIT 1: STRUCTURE OF THE EAR



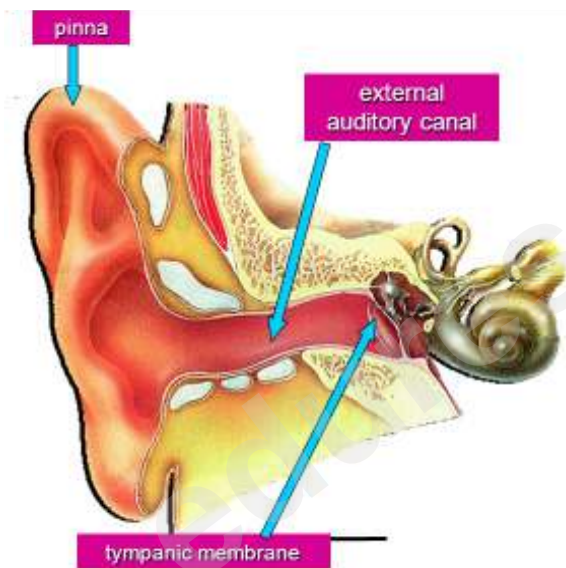
THREE PARTS OF THE EAR

The ear consists of three regions:

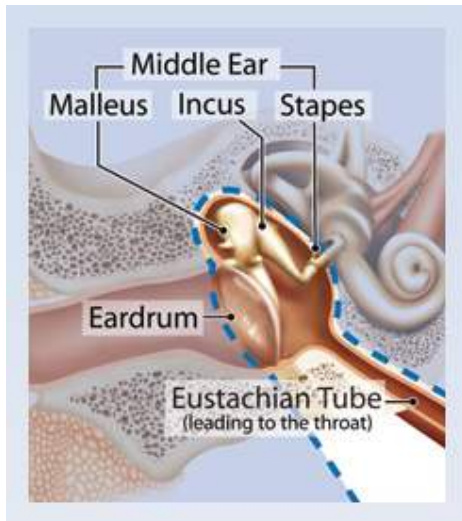
- Outer ear
- Middle ear
- Inner ear



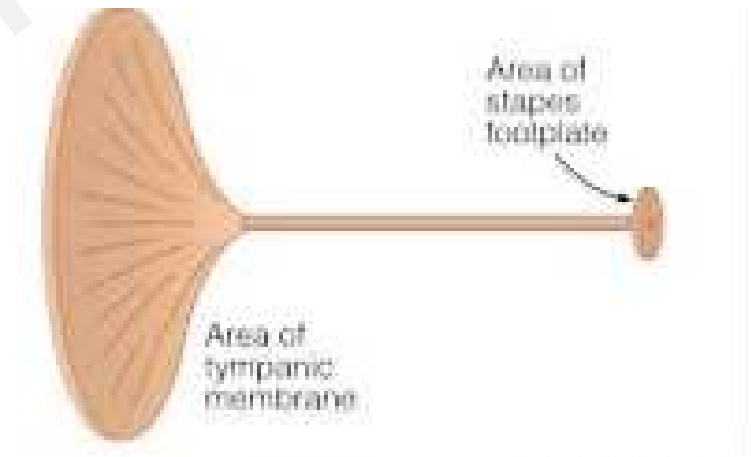
Outer ear



- Pinna
- External auditory canal
- Tympanic membrane
 - Transfers sound waves to the bones of the middle ear
- Cerumen glands
 - Specialized wax glands
 - trap tiny bits of dirt or other tiny foreign materials and move this debris outward, away from the eardrum
 - Lubricates the skin of the ear canal and tympanic membrane

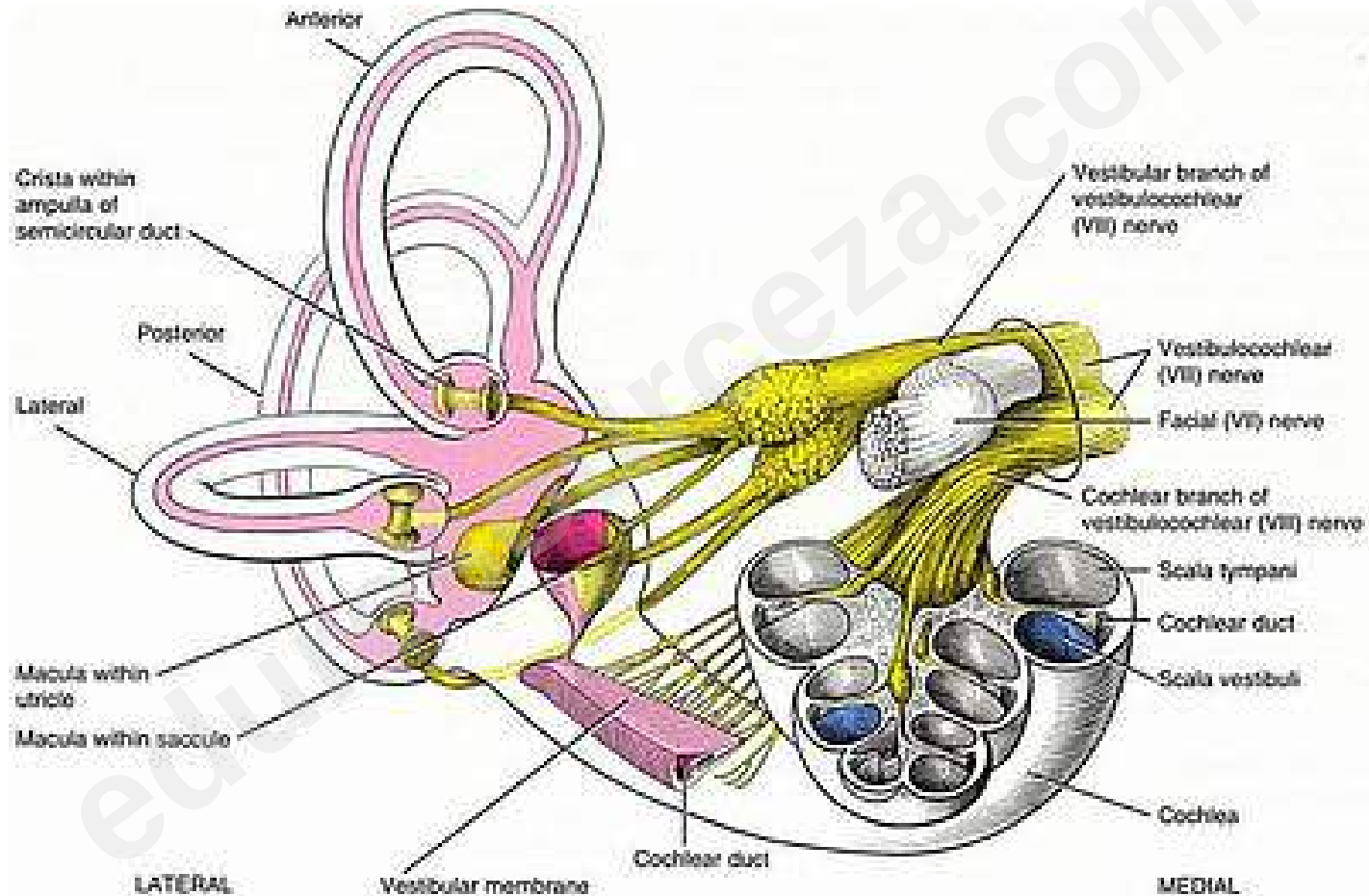


- The area of the tympanic membrane is much larger than the area of the stapes footplate/oval window
- Therefore sound is amplified 20X in the middle ear

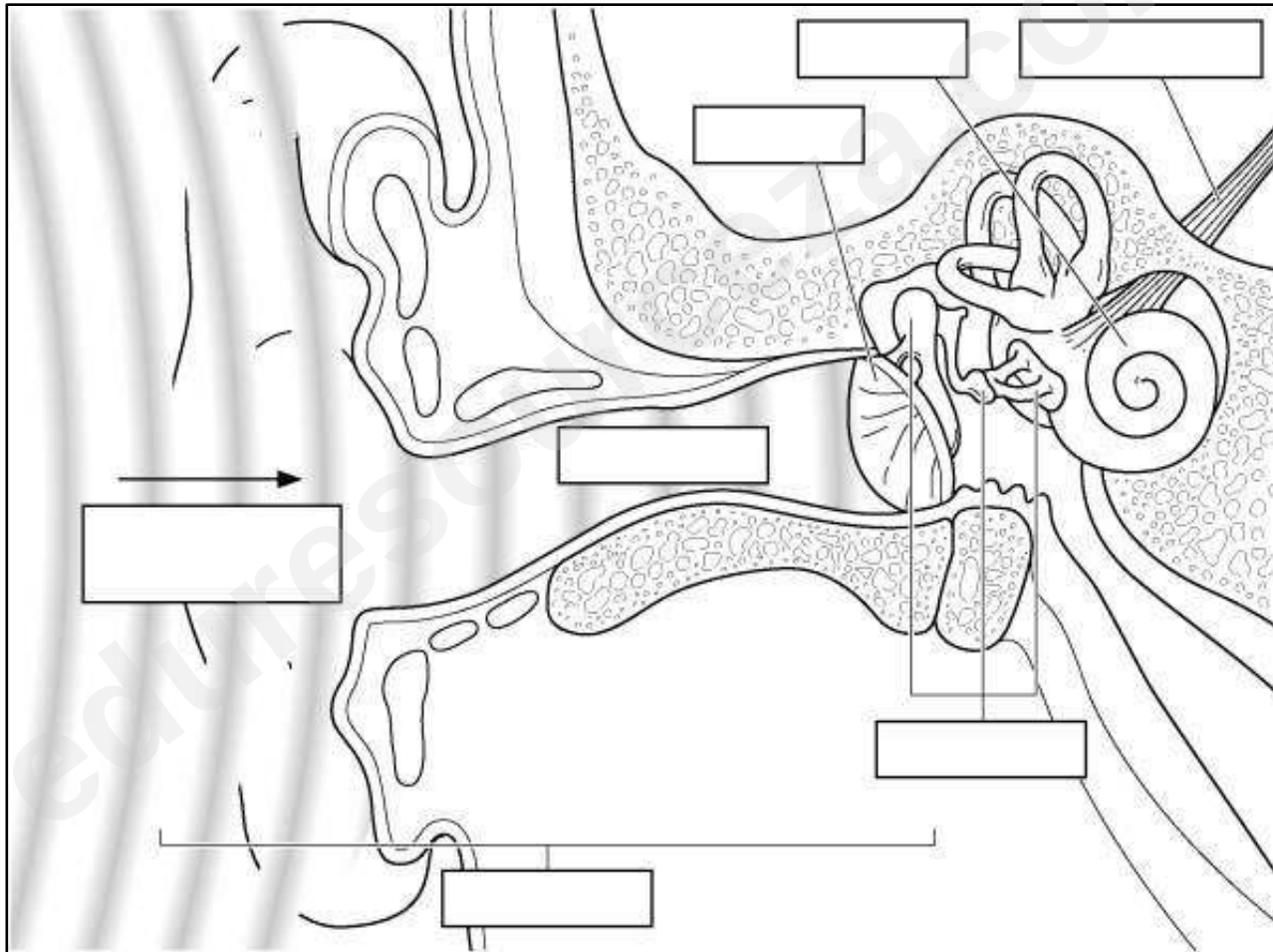


Middle ear
and
amplification
of sound

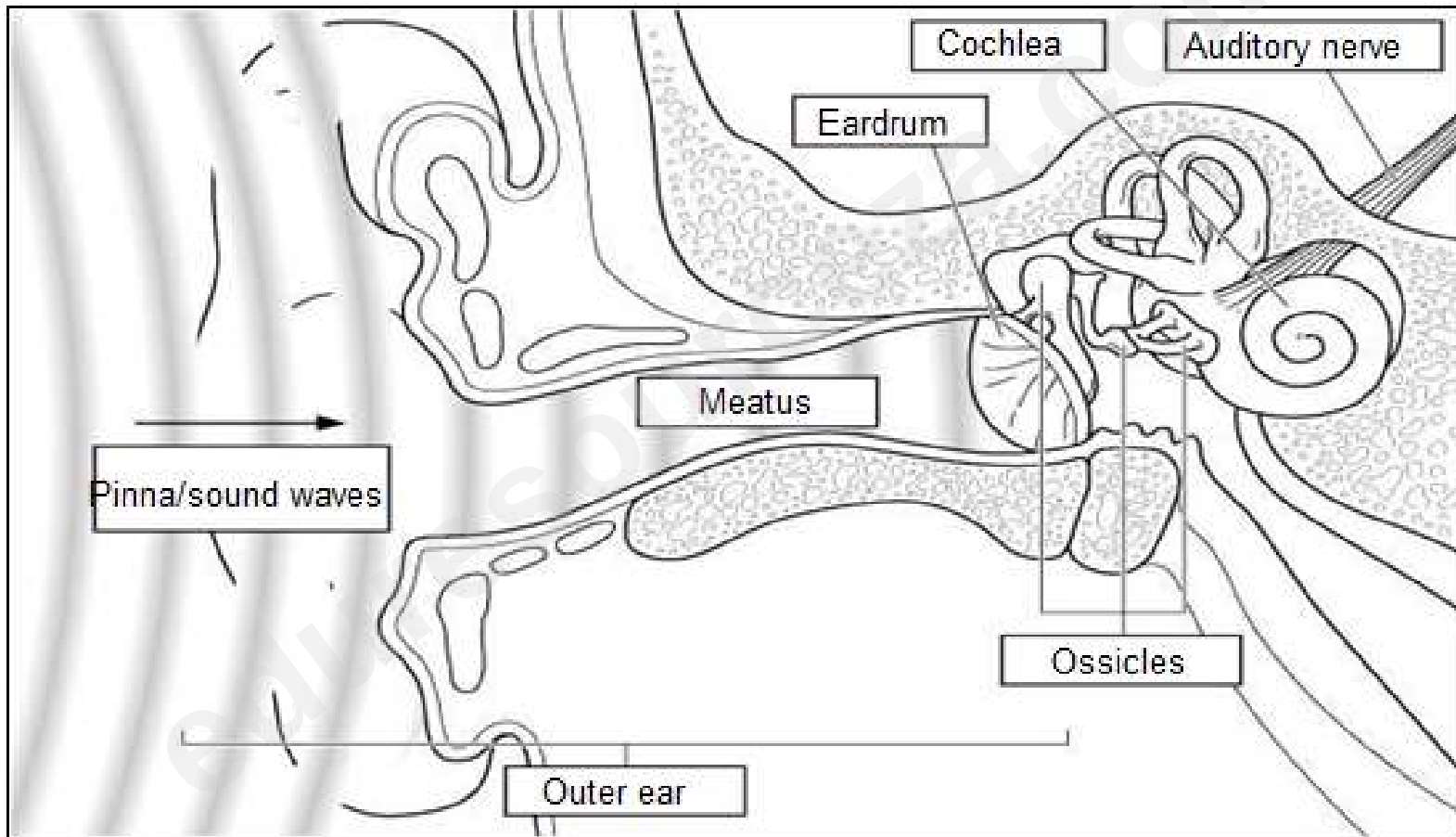
Inner ear



Activity 4.1



Answer 4.1

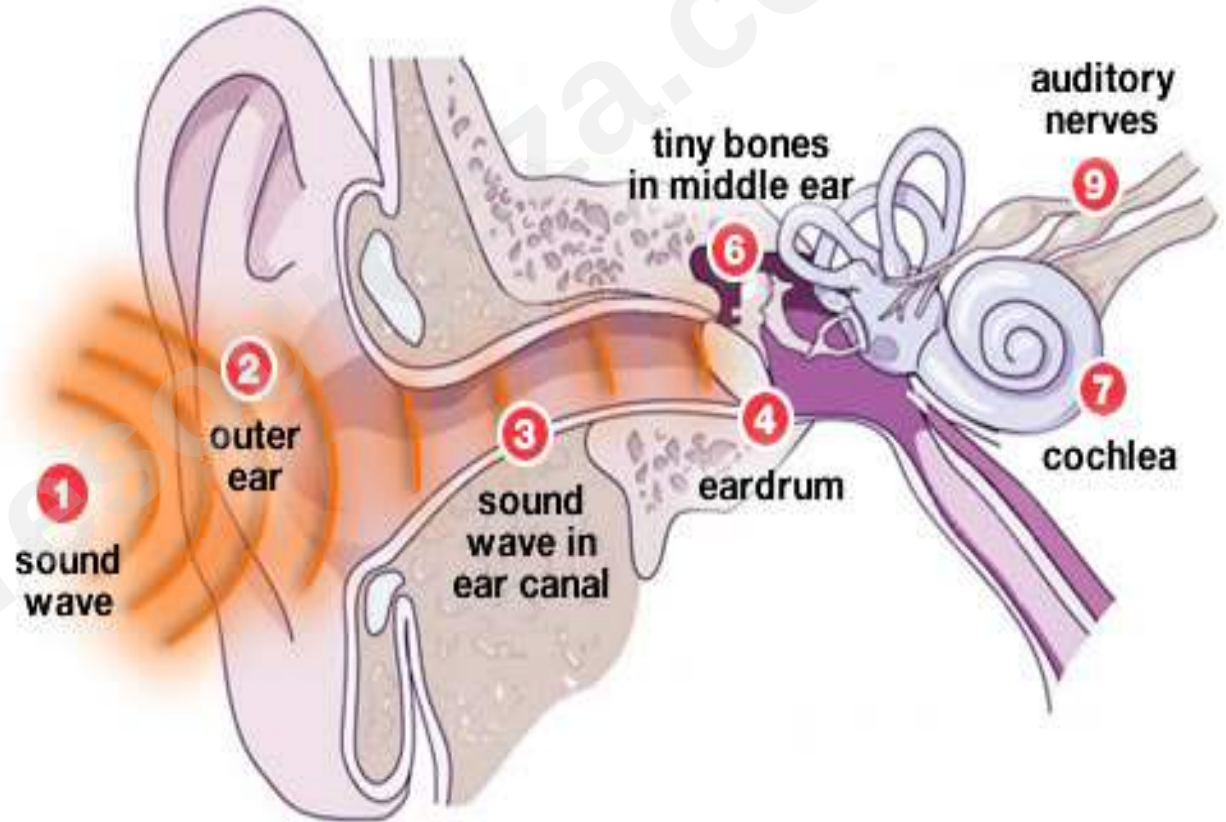


UNIT 2: PATH OF SOUND THROUGH THE EAR

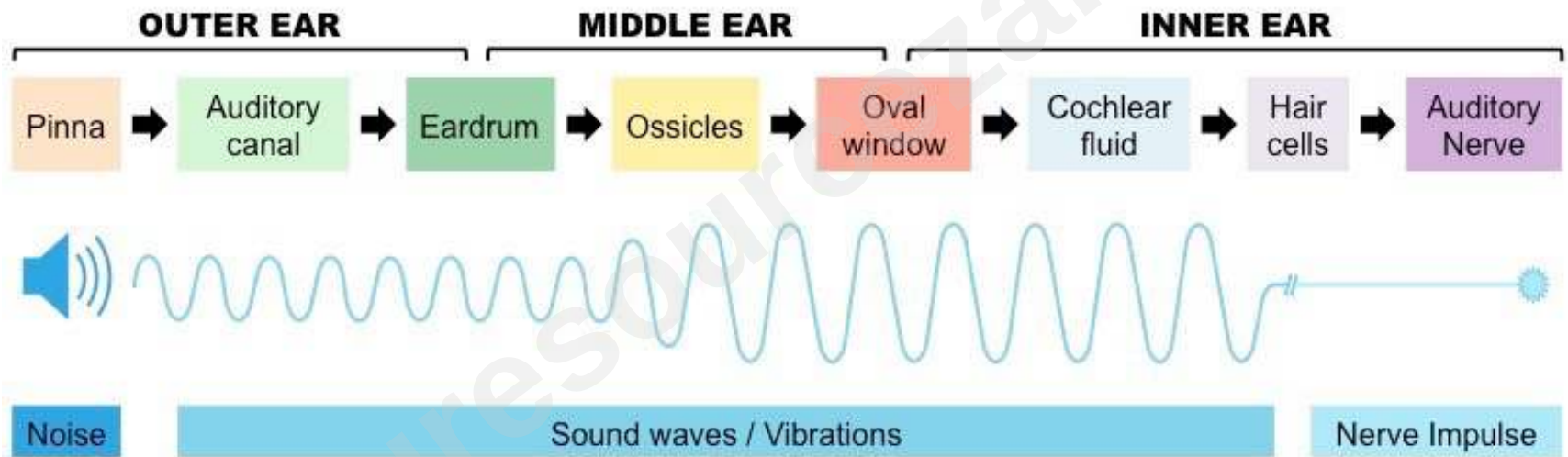
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Write down the path of sound using the numbers and labels

- Pinna
- Auditory canal
- Tympanum
- Hammer
- Anvil
- Stirrup
- Oval window
- Cochlea
- Organ of Corti
- Auditory nerve

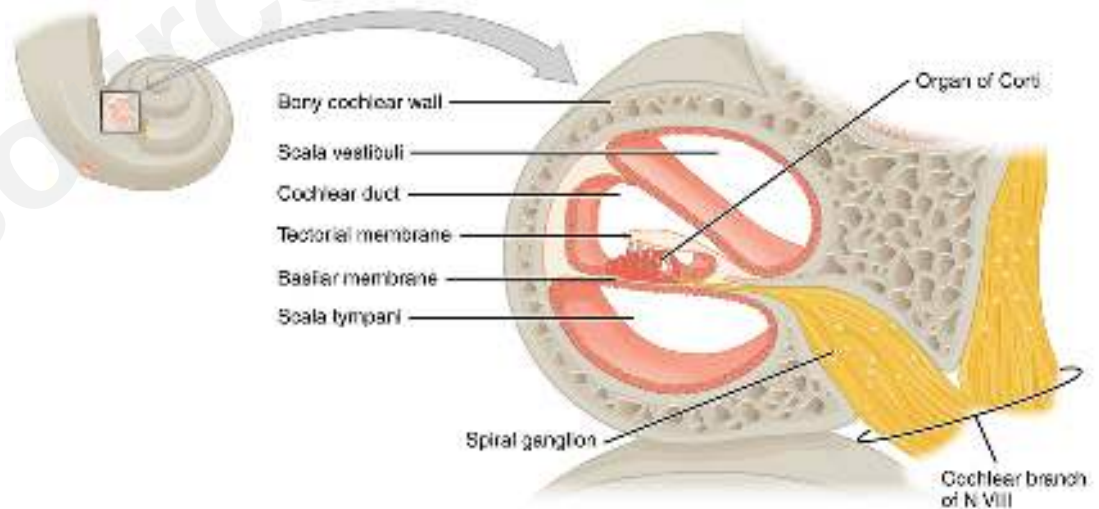
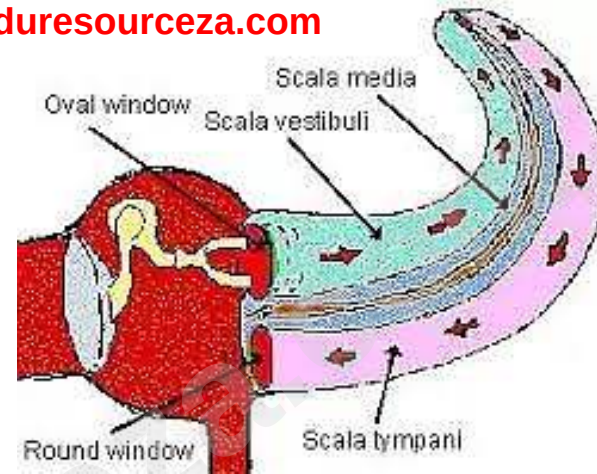


PATH OF SOUND

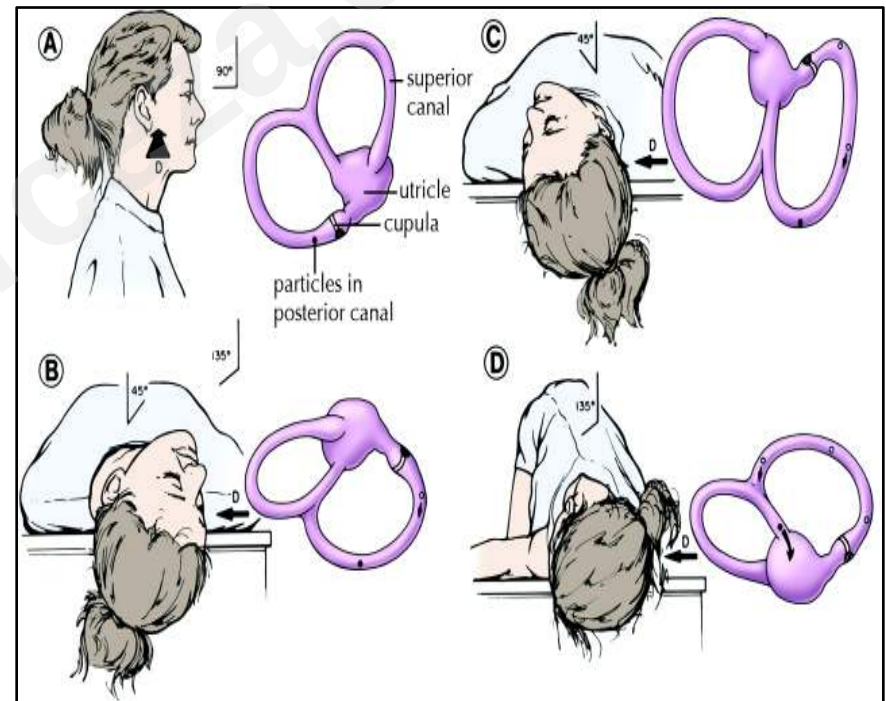
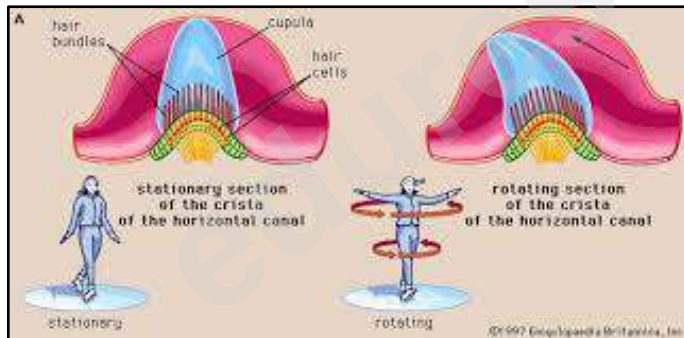
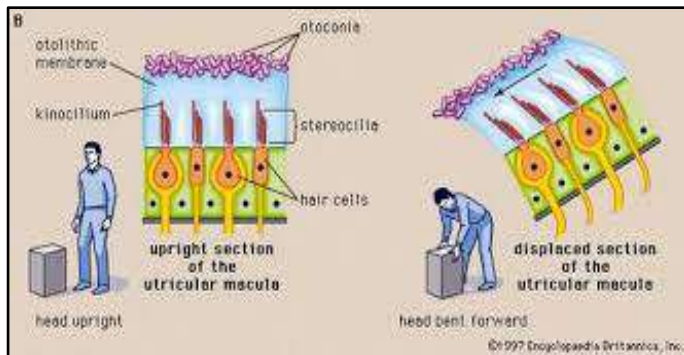


Hearing

- The stirrup causes the membrane of the oval window to vibrate.
- This sets up waves in the perilymph of vestibular canal.
- The organ of Corti in the cochlea canal becomes stimulated.
- The stimulus is converted to a nerve impulse.
- The nerve impulse is carried by the auditory nerve to the cerebrum where the sound is interpreted.

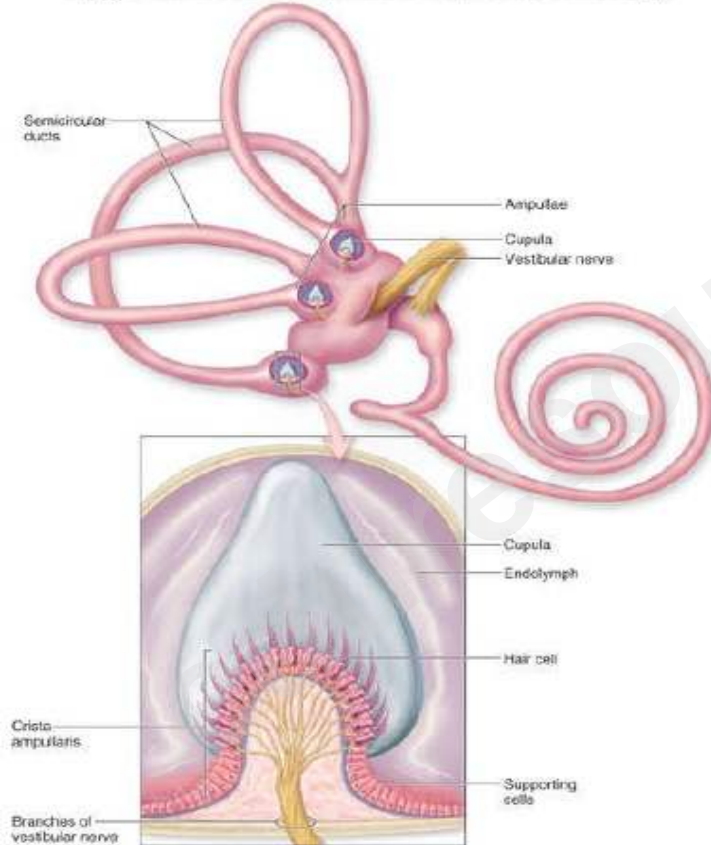


Dynamic balance



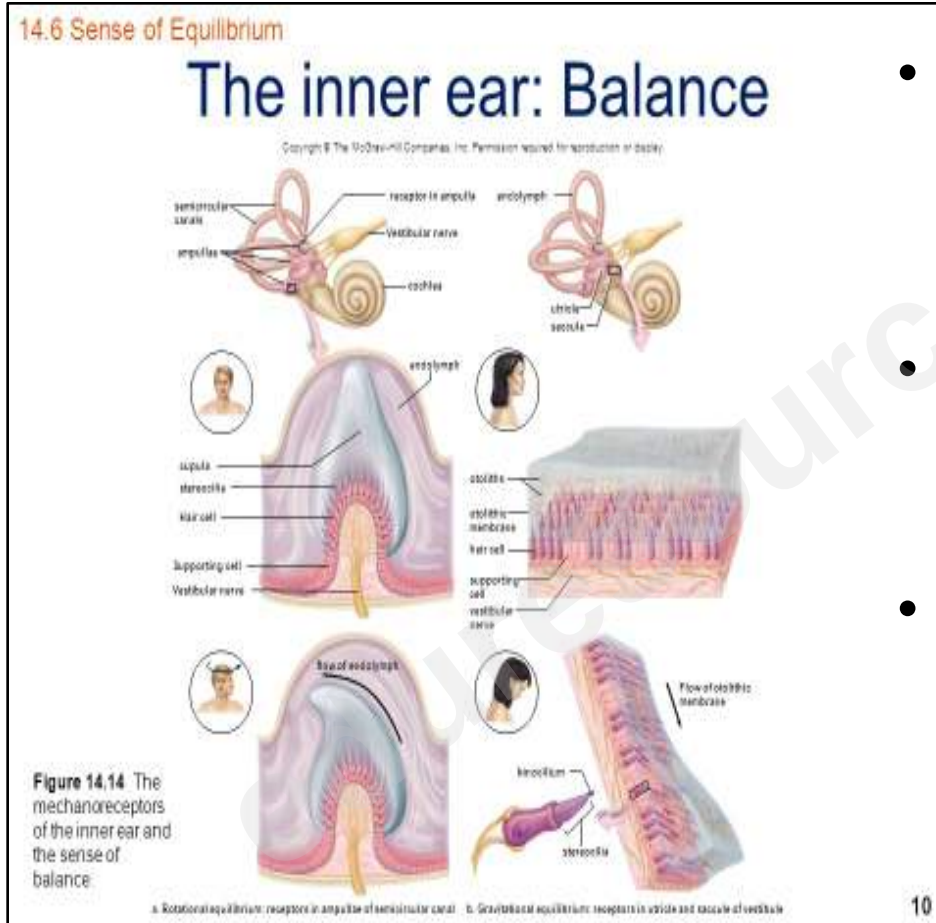
Balance and equilibrium

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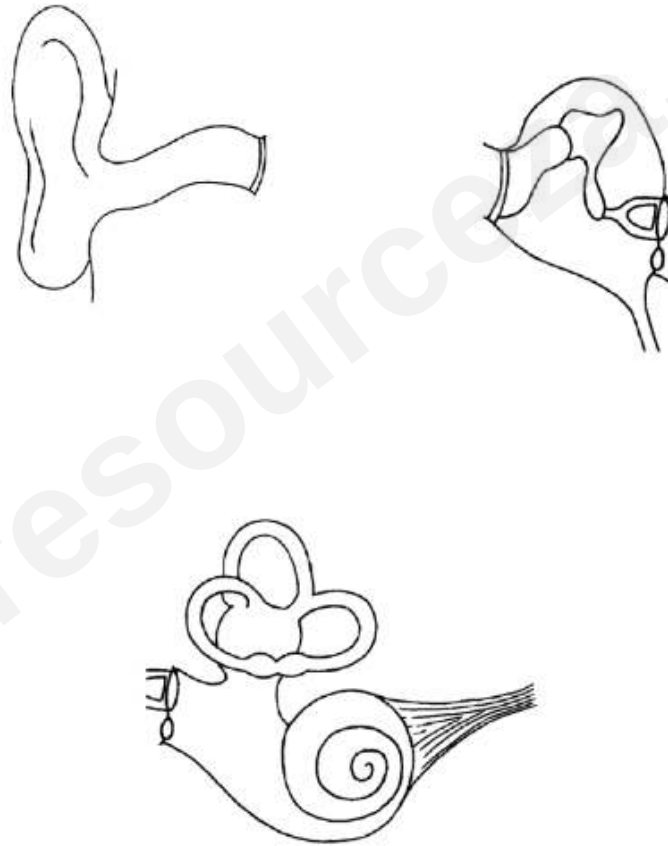
- Sudden changes in speed and direction causes the endolymph within the semicircular canals to move.
- The movement of the fluid stimulates the cristae in the ampullae – situated at the base of the semi circular canal

Balance and equilibrium



- When the direction of the head changes, gravitational pull stimulates maculae – in the sacculus and utricle
- Within the cristae and maculae the stimuli is converted to impulses
- These impulses are sent to the brain by the vestibular branch of the auditory nerve to the cerebellum for interpretation to restore balance.

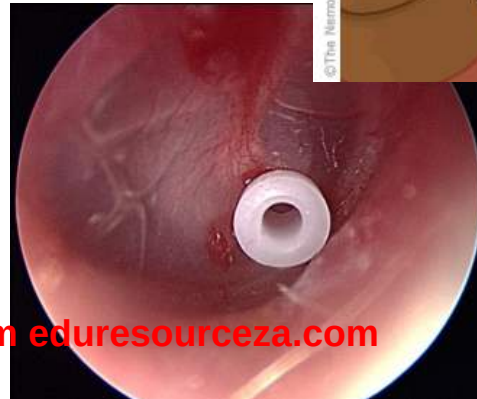
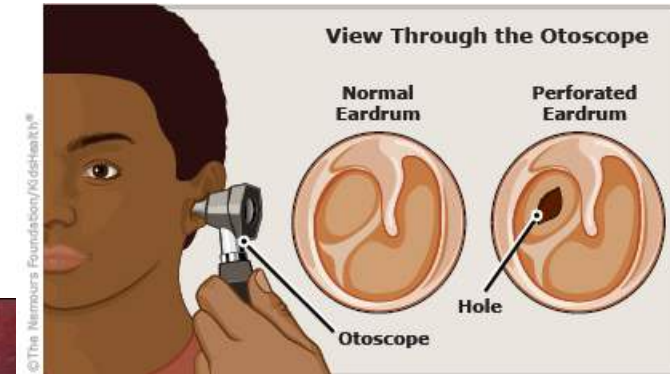
Activity 4.2



Unit 3: Diseases and disorders of the ear

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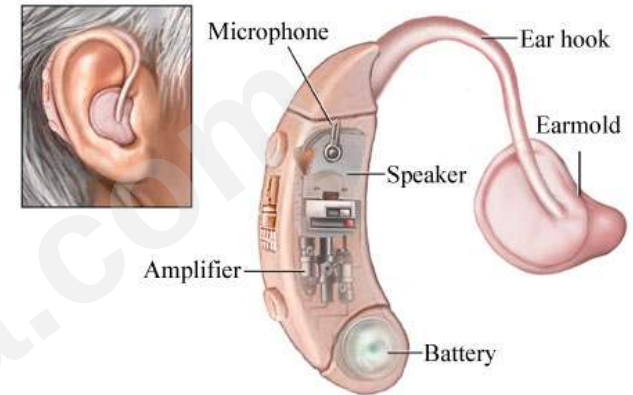
- **Middle ear infections** are the most common causes of earache.
- Micro-organisms cause the production of fluids in the middle ear,
 - the fluid cannot then drain through the eustachian tube as it is swollen,
 - The fluid caused by the infection makes the Eustachian tube to be swollen, inflamed and clogged.
 - the accumulation of the fluids increases pressure in the middle ear causing the ear to ache.
- **Grommets** -tiny plastic buttons with a fine hole down the middle may be inserted into the eardrum to allow drainage of the middle ear until the eustachian tube recovers.

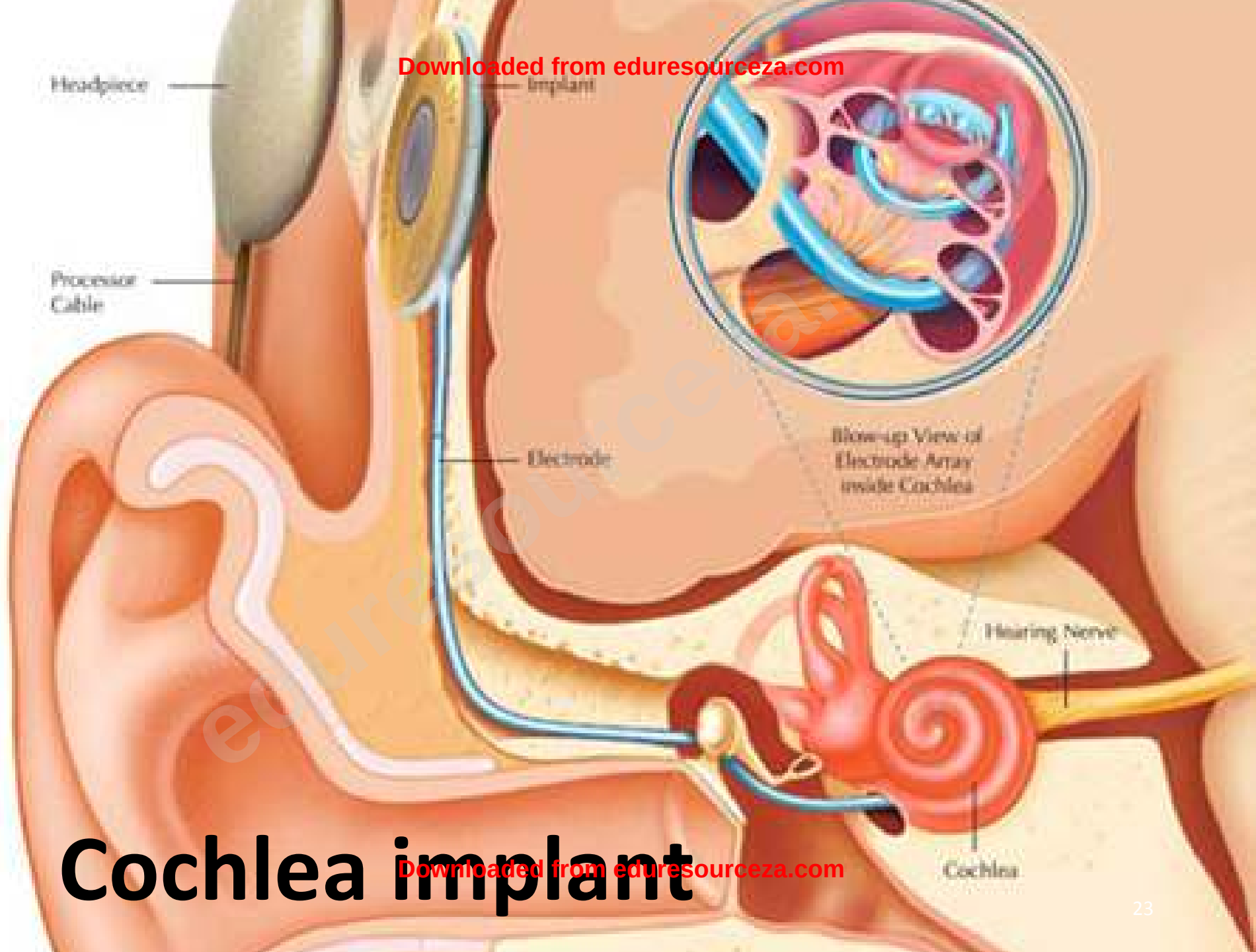


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Deafness and difficulty in hearing

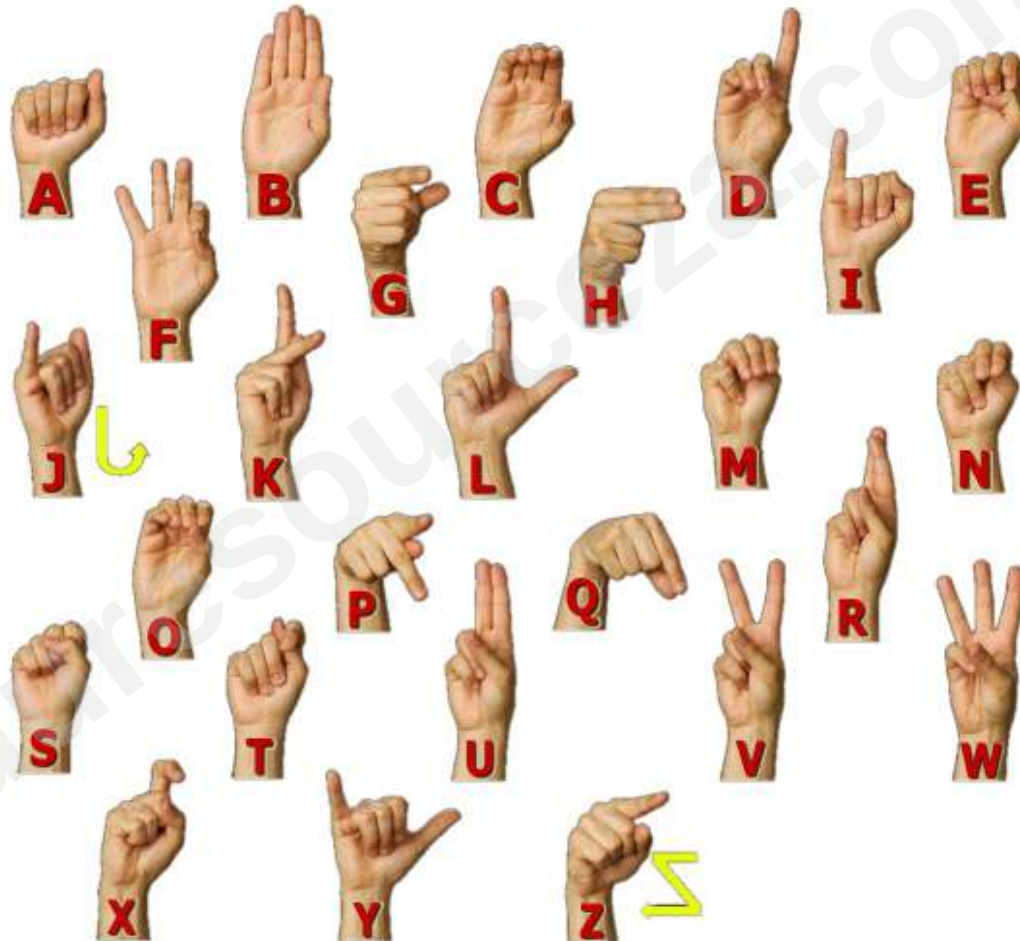
- Causes
 - Damage to hair cells in the cochlea
 - Due to disease, ageing or injury
 - Injury to parts of the ear, nerves or parts of brain responsible for hearing
 - Hardened wax
 - Hardening of ear tissues such as ossicles
- Treatment
 - Hearing aids
 - Cochlea implants



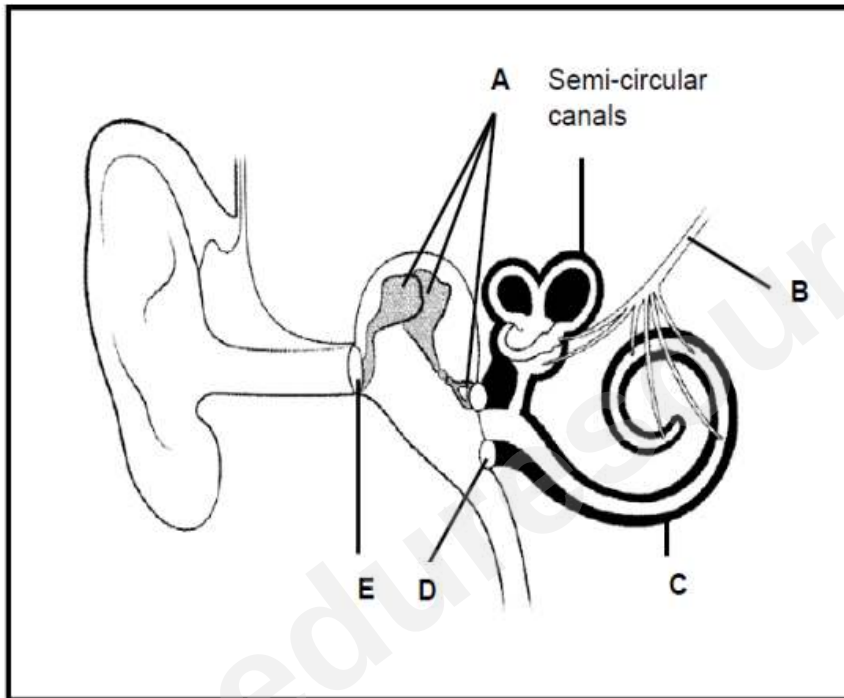


Cochlea implant

Sign language alphabet



Activity 4.3



1.1. Identify:

(a) B

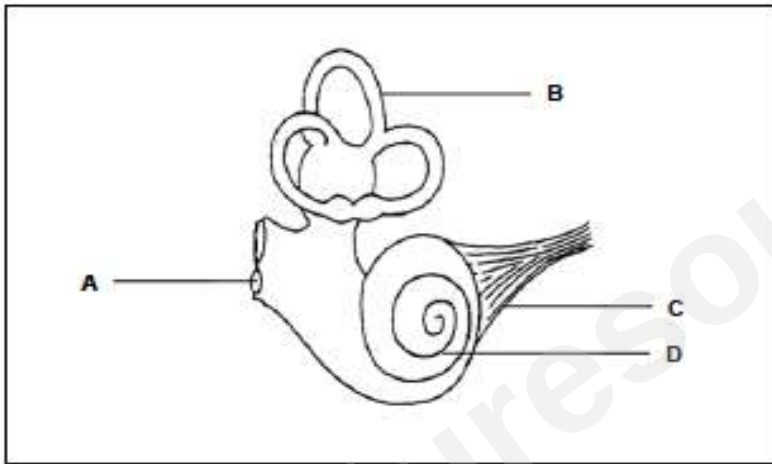
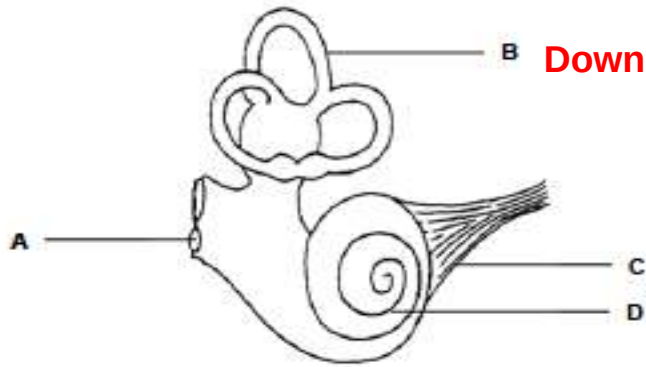
(b) D

1.2 Describe the role of the semi-circular canals in maintaining balance.

1.3 Describe how an increased production of mucus in the nose and throat may lead to the bursting of part E.

1.4 Explain why fusion of the structures at A may lead to hearing loss.

1.5 Which part of the brain will receive impulses from part C?



QUESTION 2:

(Taken from

DBE Feb/March 2016)

The diagram represents a part of a human ear.

2.1 Identify part:

- a) A
- b) D

2.2 Name the receptors that are found in part B.

2.3 Explain the consequence to the human body if:

- a) Part C is damaged
- b) Part A becomes hardened

2.4 Explain why people with middle-ear infections are usually advised not to travel by aeroplane.

QUESTION 3:

(Taken from DBE Nov 2015 P1)

Describe how the sacculus and utricle in the human ear maintain balance in the human body.

Answers 4.3

Question 1

1.1. (a) Auditory nerve ✓

(b) Round window ✓

1.2.

- The cristae ✓ in the semi-circular canals
- are stimulated by changes in speed and direction ✓ of movement
- The cristae convert the stimuli to nerve impulses ✓
- The nerve impulses are transported along the auditory nerve ✓
- to the cerebellum ✓ to be interpreted

1.3.

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- The mucus will block the opening of the Eustachian tube ✓
- Air cannot enter or leave the middle ear ✓
- to equalise pressure ✓ /causing imbalance in pressure

OR

- Mucus may move through the Eustachian tube to the middle ear ✓
- Build-up of mucus causes pressure in the middle ear ✓
- pushing on the tympanic membrane ✓ /part E

1.4. - The ossicles/structures at A will not be able to vibrate ✓

- and hence no vibrations will be passed to the inner ear✓/cochlea will not be stimulated

1.5. Cerebrum ✓

QUESTION 2

2.1.(a) Round window✓

(b) Cochlea✓

2.2 Cristae✓

2.3 (a) - Impulses from the cochlea cannot be transmitted to the brain ✓

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- and therefore hearing will not occur ✓

(b)- Part A will not be able to vibrate ✓

- The round window will not absorb the sound waves from the cochlea - and hearing will be affected ✓
(Any 2)

2.4. - Mucus in the middle ear ✓

- will lead to the blockage of the Eustachian tube ✓

- which will not be able to equalise the pressure ✓
in the middle ear

- resulting in pressure on the tympanic membrane ✓

- that may cause the tympanic membrane to burst ✓

- leading to hearing loss ✓

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Question 3

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Changes in the direction and speed of movement:

- Causes the endolymph in part D ✓ /semi-circular canals to move

- The cristae ✓ are stimulated

- and converts the stimulus into an impulse ✓

- which is transmitted via the auditory nerve ✓

- to the cerebellum ✓

from which impulses are transmitted via motor neurons ✓

- to the skeletal muscles ✓ /effector

- to restore balance of the body ✓

KEY POINTS FOR THE MODULE

- In the process of hearing, learners need to know that *sound* coming from a source is the *stimulus*.
- This stimulus moves as *sound waves* from the source through the auditory canal until it reaches the tympanic membrane.
- From here the stimulus of sound moves as *vibrations* through the tympanic membrane, ossicles and oval window.
- When the vibrations pass into the endolymph of the inner ear then the stimulus is in the form of *pressure waves* which then
- stimulate the organ of Corti.
- This is when the stimulus is converted into an *impulse* which can be transmitted to the cerebrum.
- The ear also plays an important role in maintaining balance.

KEY POINTS FOR THE MODULE

- Teachers must emphasise that the parts involved in amplification are the tympanic membrane, the ossicles and the oval window. The following features of the structures involved help in the amplification process:
 - * The sound vibrations move from the large tympanic membrane to the smaller oval window
 - * The ossicles that transmit the vibrations decrease in size
from the hammer to the anvil to the stirrup
- The above features concentrate/intensify the sound vibrations causing it to be amplified.