

## 1.0 The Senses

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### 1.1 The five senses

We are required to know 5 senses:

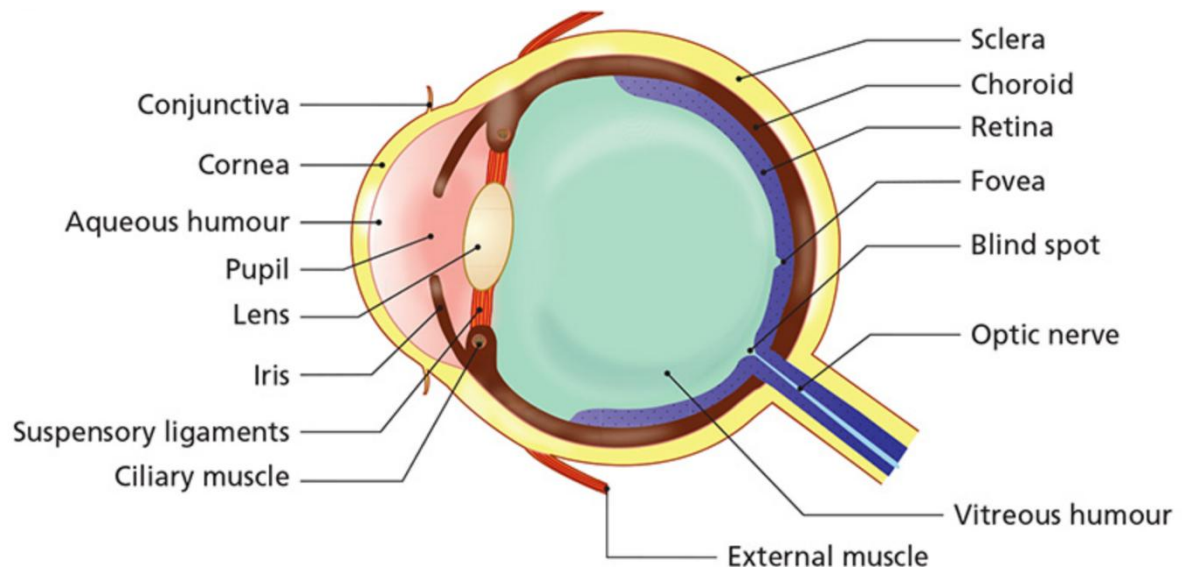
Senses	Sense Organ
Taste	Tongue
Smell	Nose
Touch	Skin
Sight	Eye
Hearing	Ear

**Note:** The skin is covered in detail in the Excretory System notes.

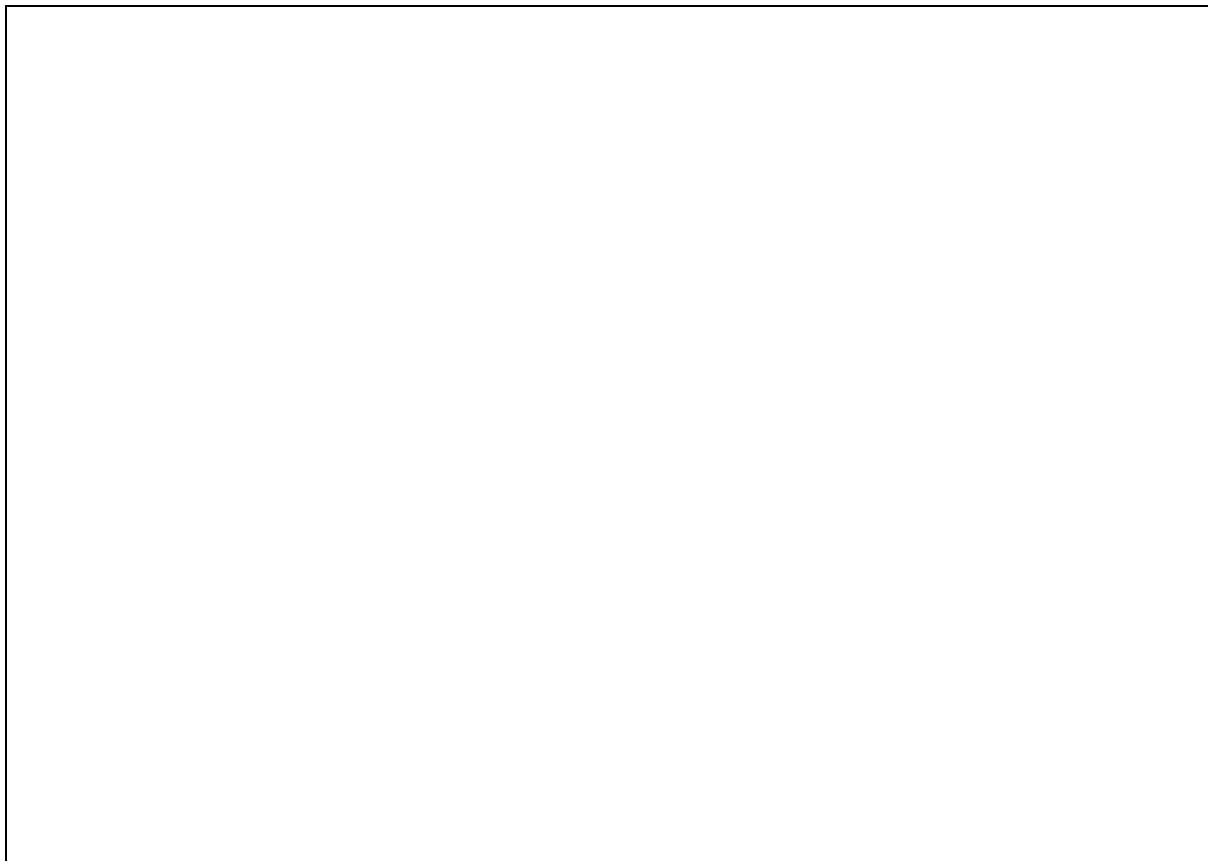
#### **Reflex Arc Revision:**

## 1.2 Sight

The eye is a highly specialised organ responsible for detecting light and enabling vision. It consists of multiple structures, each playing a critical role in capturing and processing visual information.



In the space below, draw the diagram of the eye:

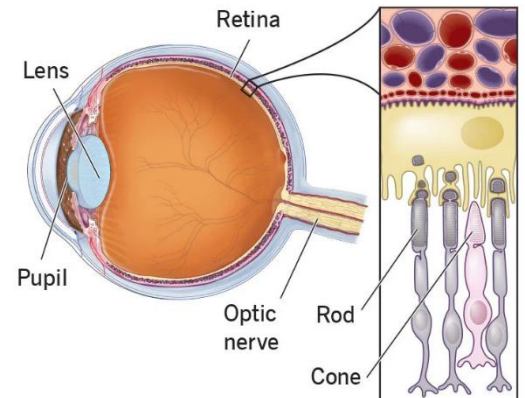


**Parts of the Eye:**

Part	Function
<b>Conjunctiva</b>	Protection from infection
<b>Sclera</b>	Tough protective layer that holds eye in shape
<b>Choroid</b>	Prevents internal reflection/contains blood vessels
<b>Cornea</b>	Allows light in
<b>Retina</b>	Contains light receptors – rods and cones/converts light into nerve impulses
<b>Fovea</b>	Part of retina where most images are formed
<b>Blind spot</b>	Where the optic nerve leaves the retina (no cones or rods)
<b>Optic nerve</b>	Carries impulses from eye (cones/rods) to the brain
<b>Lens</b>	Focuses light onto the retina
<b>Iris</b>	Controls the amount of light let in
<b>Pupil</b>	Let's light into back of eye
<b>Ciliary muscle</b>	Change the shape of the lens
<b>Suspensory Ligament</b>	Holds lens in place
<b>Aqueous/vitreous humours</b>	Give shape to the eye

**Rods and Cones:**

<b>Rods</b>	<b>Cones</b>
Detect black and white	Detect colours (red, green, blue)
Found in retina	Found mostly in fovea
Work in dim light	Work in bright light

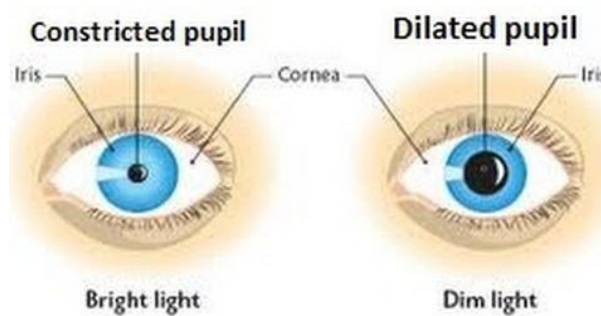


Together, rods and cones allow us to see in varying light conditions and perceive both detail and colour.

**Additional Relevant Notes:**

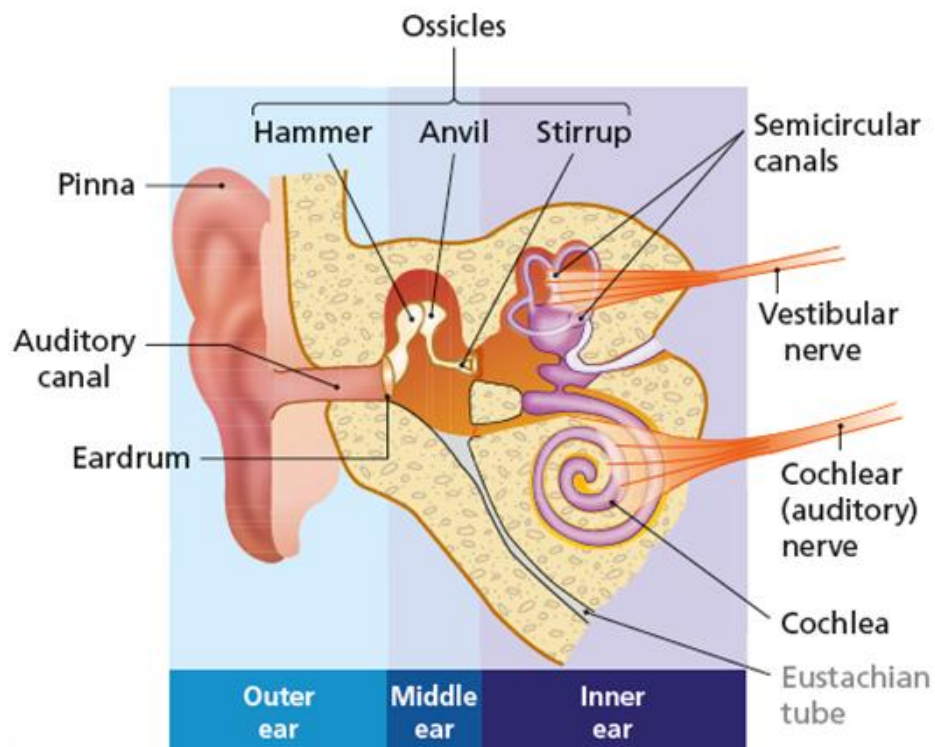
- Adaptations:** Cornea/lens are transparent and curved
- Relevance of two eyes:** Increased visual field and depth perception/3-Dimensional vision
- Location of Eyes:**

<b>Carnivore (middle)</b>	<b>Herbivore (side)</b>
<ul style="list-style-type: none"> <li>▪ Better focus on prey</li> <li>▪ Better judgement of distance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Better detection of predators (due to wider field of vision)</li> </ul>

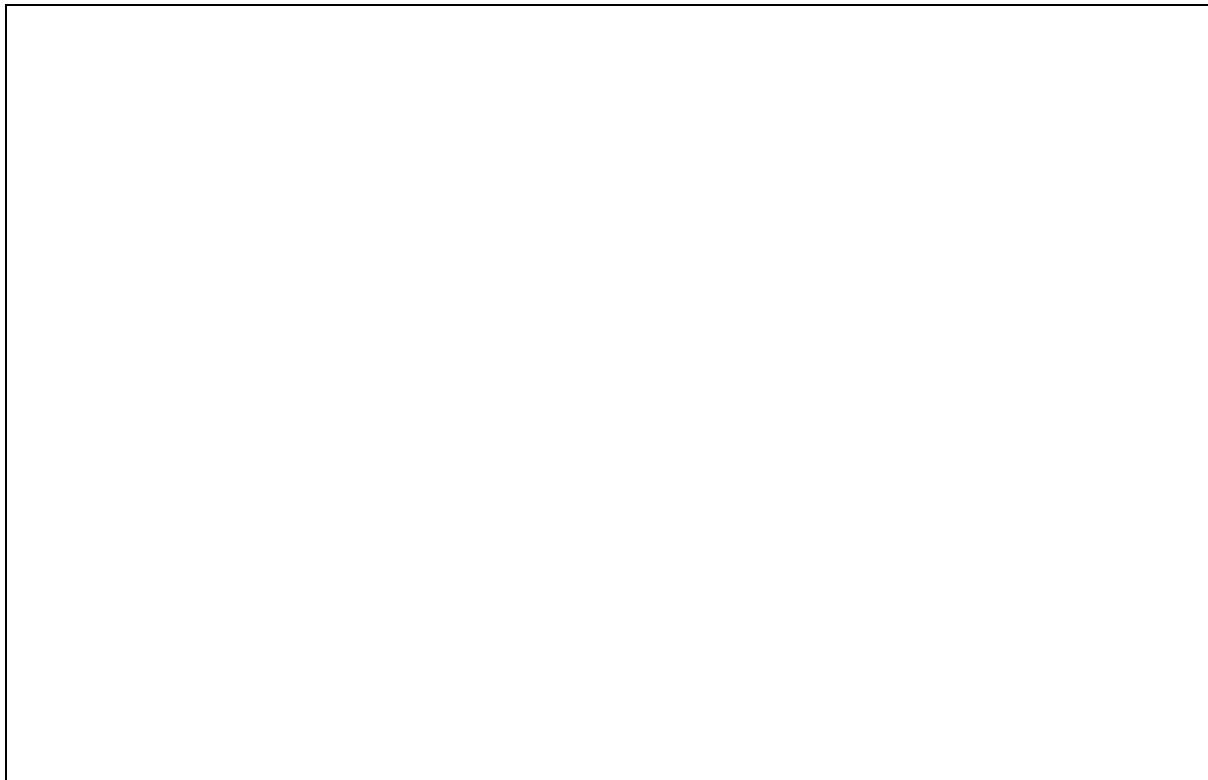
**4. Dim Light vs. Bright Light:**

## 1.3 Hearing

### The Ear:



In the space below, draw the diagram of the ear:



**Functions each part:**

Part	Function
<b>Pinna</b>	Collect sound
<b>Auditory canal</b>	Carry vibrations to eardrum. Lined with wax for protection
<b>Eardrum</b>	Transfer sound vibrations to ossicles
<b>Ossicles (hammer, anvil, stirrup)</b>	Amplify vibrations
<b>Eustachian tube</b>	Equalises pressure Note: connected to throat/pharynx
<b>Cochlea</b>	Hearing (sound converted to nerve impulses)
<b>Semi-circular canals</b>	Balance
<b>Auditory (Cochlear) nerve</b>	Carries impulse from cochlea to brain
<b>Vestibular nerve</b>	Carries balance (and spatial orientation) signals from the inner ear to the brain

**Additional Relevant Notes:**

1. **Why are there 3 semi-circular canals?** For balance in 3-dimension
2. Nerve impulses are generated in the **cochlea** as it contains receptors [Note: retina contains receptors in the eye and plays a similar role]
3. Note: cerebellum's role in muscular coordination and balance.

## 1.4 Hearing Disorder: Glue Ear

Glue ear is a condition in which the middle ear becomes filled with a sticky, glue-like fluid, leading to hearing difficulties.

**Cause:** Blocked Eustachian tube

**Corrective Measure:** Decongestants or grommets

## 1.5 The Senses Exam Questions

### 2023a SEC LCHL [Deferred]

In each of the following cases, state **two** features that show how the named structure is adapted for its function.

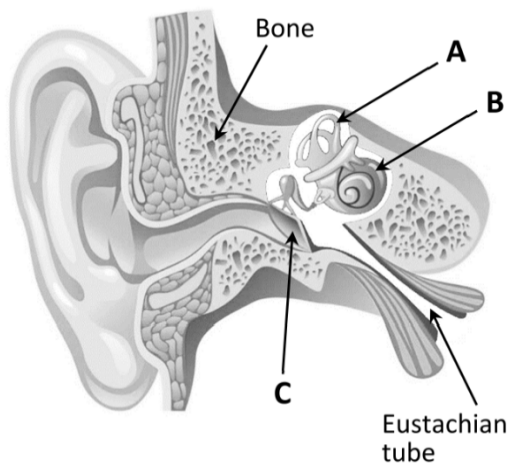
- (e) The lens for focusing light onto the retina.

1.
2.

### 2023b SEC LCHL [Deferred]

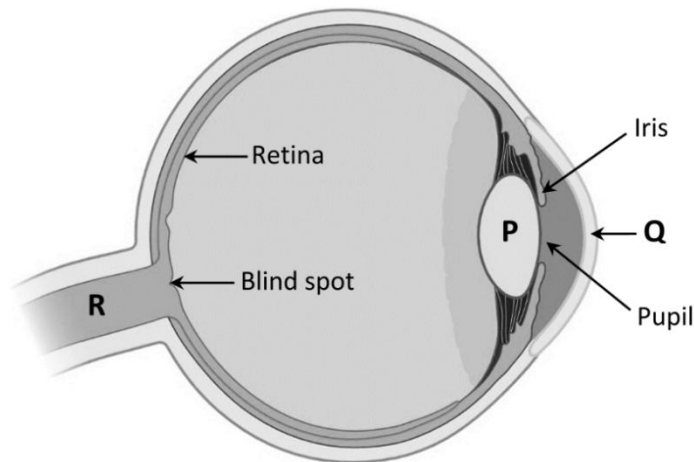
- (b) The diagram shows the internal structure of the human ear.

- (i) Name the parts labelled **A, B and C**.
- (ii) Give the functions of the parts labelled **A and B**.
- (iii) What is the name of the bone that helps to protect the internal parts of the ear?
- (iv) The function of **C** is to transfer sound vibrations to three small bones.  
What is the collective terms for these three bones?
- (v) The Eustachian tube connects the middle ear to another structure.  
Name this other structure.
- (vi) Name any **two** sense organs, other than the eye and the ear.
- (vii) Name **one** disorder of the eye **or** the ear **and** suggest **one** treatment.



**2022 SEC LCHL**

(b) The diagram shows the internal structure of the human eye.



- (i) Name the parts of the eye labelled **P**, **Q** and **R**.
- (ii) Name the **two** types of light receptor cells in the retina **and** give **one** function of **each** type.
- (iii) Explain why damage to the part labelled **R** could result in blindness.
- (iv) The iris and pupil are affected by light intensity.  
Sketch **two** diagrams of the front of the eye to show:
  1. the iris and pupil in bright light
  2. the iris and pupil in dim light.
- (v) Describe **one** corrective measure for one of the following:  
long sightedness **or** short sightedness **or** a named hearing defect.  
In your answer, state clearly to which disorder you are referring.
- (vi) Vision and hearing are two of the five senses in humans.  
Name **one** of the other senses **and** name an organ associated with this sense.

**2022 SEC LCHL [Deferred]**

Indicate whether the following statements are true or false by placing a tick (✓) in the appropriate box in **each** case.

True    False

(b) The cochlea is an organ in the ear involved in balance.

<input type="checkbox"/>	<input type="checkbox"/>
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**2020 SEC LCHL**

Give **one** function of each of the following structures in the human body:

- (a) Cones in the eye.


- (b) The optic nerve.


- (c) Iris in the eye.


- (d) The Eustachian tube in the ear.


- (e) The semi-circular canals in the ear.


**2018 SEC LCHL**

(c) (i) In relation to the human eye, name **and** explain the role of each of the following:

1. The fluid that fills the rear chamber.
2. The **two** types of light receptor cells.
3. The transparent covering in front of the cornea.

(ii) Suggest an advantage to humans of having two eyes.

(iii) Name a disorder of the eye **or** of the ear **and** give a corrective measure for the disorder referred to.

**2017 SEC LCHL**

In each of the following, state **two** features that show how the named structure is adapted to carry out the named function.

(i) The lens of the eye for focusing light.

**2016a SEC LCHL**

(b) (i) Draw a large diagram to show the structure of the human ear, labelling each of the following parts:

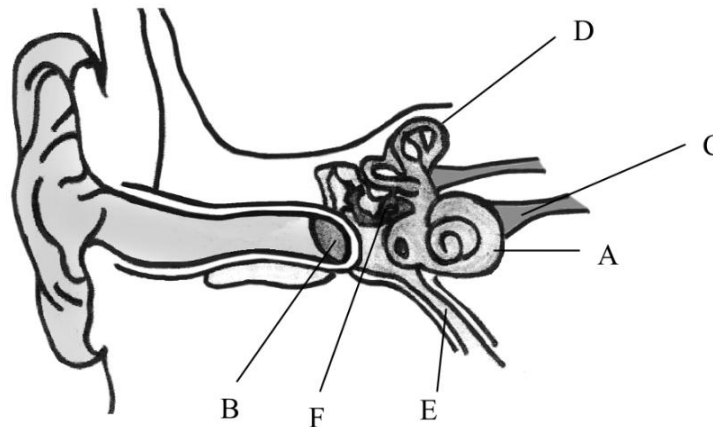
**pinna      semi-circular canals      stirrup      ear drum      cochlea      Eustachian tube**

- (ii)
1. Briefly outline the function of the pinna.
  2. To which part of the body does the Eustachian tube link the ear?
  3. What is the role of the Eustachian tube?
  4. Name another part of the ear that has a function similar to that of the stirrup.
  5. The semi-circular canals play a role in balance.  
Suggest why there are three semi-circular canals in each ear.

(27)

**2016b SEC LCHL**

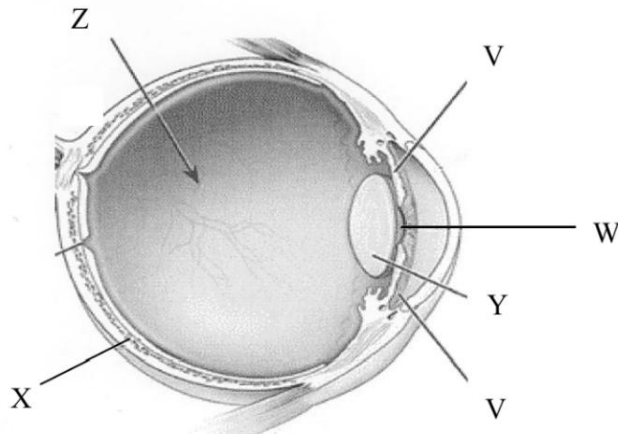
- (c) (i) Name the part of the eye that has a corresponding function to the cochlea of the ear.  
Explain your answer.
- (ii) Light passes through the pupil in the eye.
1. Name the structure that determines the diameter of the pupil.
  2. Why is there a mechanism for changing the diameter of the pupil?
- (iii) Certain parts of the eye are transparent and have curved surfaces.
1. Name **two** such parts.
  2. How does the curvature contribute to the functioning of the eye?
- (iv) The eyes of carnivores are located relatively close together at the front of the skull.  
In herbivores they tend to be located more to the sides of the skull.  
Referring clearly to either carnivores **or** herbivores, suggest a benefit of **either** arrangement.

**(24)****2011 SEC LCHL**

- (a) (i) The diagram above shows the internal structure of the human ear.
1. Name the structures labelled A, B, C.
  2. Give the functions of parts D and E.
  3. Which letters denote the parts of the ear in which nerve impulses are generated?
- (ii) In what part of *the eye* are nerve impulses generated?
- (iii) Suggest **one** way by which the ear may be protected.
- (iv) Explain how a corrective measure for a **named** defect of hearing **or** vision works.

**2009 SEC LCHL**

(b)



The diagram shows the human eye.

- (i) Name the parts labelled V, W and X.
- (ii) Give the functions of parts Y and Z.
- (iii) 1. Suspensory ligaments. 2. Cones. 3. Optic nerve. 4. Brain.  
Outline the roles in vision of any **three** of the above structures.
- (iv) Explain how the iris works.
- (v) Suggest a reason why two eyes are better than one.