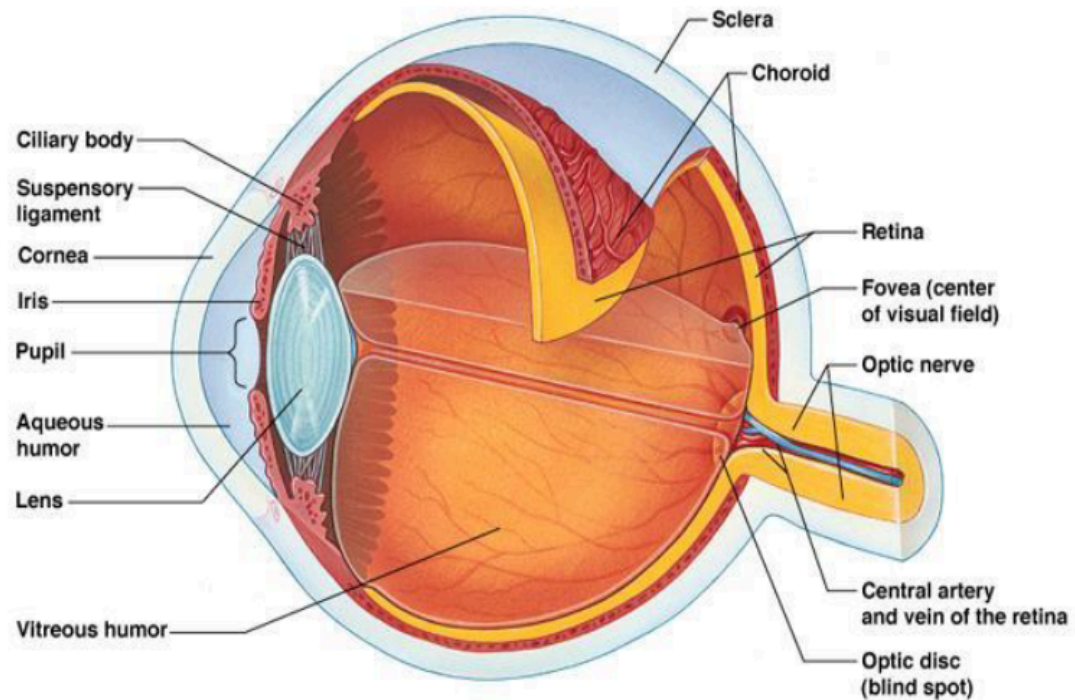


Sense Organs

1. Eye is the sense of sight.
2. Ear is the sense of hearing.
3. Nose is the sense of smell.
4. Tongue is the sense of taste. (Explained in Digestive System)
5. Skin is the sense of touch. (Explained in Excretory System)

Eye

- It allows you not only to view objects, but to see depth, color, size, and detail.
- The eye works by refracting and focusing light onto the retina.
- When light strikes the retina, millions of **rhodopsin**-containing **rods**, which are responsible for night vision, convert the light into electrical impulses, which are sent to the brain.
- The brain then translates what it receives from the optic nerves so that we can understand what we see.
- The retina also contains millions of **cones** that contain **iodopsin** and are used for **bright light vision** and **color perception**.
- There are approximately 17 times more rods than cones - about 120 million rods and 7 million cones - in the retina of each eye.
- The human eye is about 2.5 cm in diameter.



Parts of Human Eye

- **Sclerotic:** It is the white outer part of the eye that you can see. It provides protection and structure for the inner parts of the eye.
- **Cornea:** It is the clear bulging surface in front of the eye. It is the main refractive surface of the eye.
- **Iris:** It controls the size of the pupil and the amount of light that enters the eye. It is the coloured part of your eye.
- **Eye Lens:** It focuses light onto the retina. It is a double convex lens with the help of which image is formed at the retina by refraction of light.
- **Ciliary Muscles:** The eye lens is held by ciliary muscles which helps the eye lens to change its focal length.

(Normally, it's kind of flat. But when you want to focus on something

up close, the ciliary muscles squeeze and make the lens rounder, like squishing the rubber ball. This change in shape helps the lens to bend light more, so you can see things clearly when they're close to you. And when you want to look at something far away, the ciliary muscles relax, letting the lens go back to its flatter shape. It's like releasing the pressure on the rubber ball, letting it return to its original form.)

- **Pupil:** It is the black hole in the center of the colored iris. It contracts when exposed to bright light and expands in darkness to allow more light into the eye.
- **Aqueous humor:** It is the transparent fluid between cornea and eye lens. (Its main job is to provide nutrients to the cornea and the lens, which don't have their own blood supply, and to help maintain the eye's pressure.)
- **Vitreous Humor:** It is the transparent fluid between eye lens and retina. (The vitreous humor helps the eye keep its round shape and supports the retina. It also helps transmit light to the retina so you can see clearly.)
- **Retina:** It is the innermost layer of sensitive tissue that transmits light to the brain. The retina consists of several types of cells, including a layer of rods and cones, which transform light into chemical and electrical energy that is transmitted to the optic nerves.
- **Optic Nerve:** It carries the information from the eye to the brain. It consists of over one million axons, which carry visual information to different parts of the brain.
- **Eyelids :** Its main function is to protect the eyes by blinking. Blinking prevents debris from getting into the eye. The average blink rate is 10 blinks per minute.

Disease related to eyes:

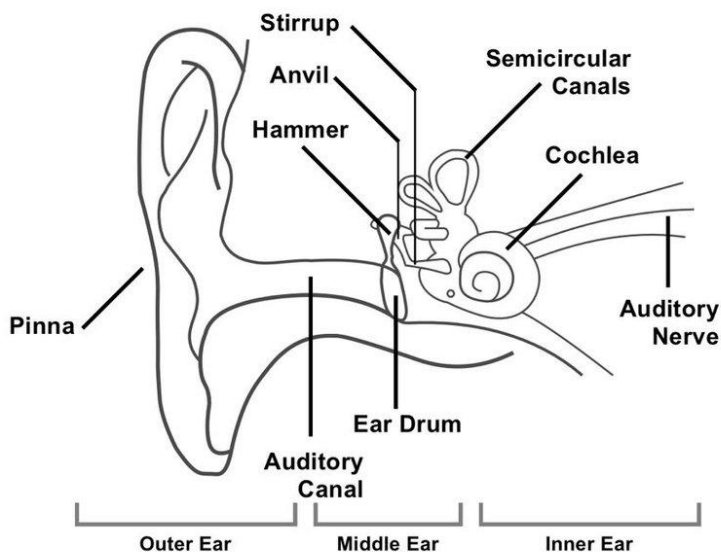
Disease	Explanation
Hypermetropia	Hypermetropia, or farsightedness, is a condition where the light that comes into the eye lands behind the retina. This makes it difficult to focus on near objects, while distant objects can be seen clearly. Hypermetropia is corrected using a convex lens of appropriate power. The convex lens converges the light rays so that the final image from the human eye lens is formed on the retina.
Myopia	Myopia, or nearsightedness, is a condition where the light that comes into the eye is focused in front of the retina. This makes it difficult to see distant objects clearly, while near objects can be seen with no problem. A myopic defect can be corrected by using a concave lens of suitable power. In a myopic eye the image is formed in front of the retina so a diverging lens is used to shift the image to the retina.
Presbyopia	Presbyopia is an age-related condition where the eye's lens hardens, losing its ability to focus on near objects. This typically starts to occur around the age of 40. People with presbyopia often need bifocal or multifocal lenses to help them see clearly at all distances.
Cataract	A cataract is a clouding of the eye's natural lens that happens as we age or due to injury. This clouding can make vision blurry or cause difficulty seeing at night. Cataracts are usually treated with surgery rather than glasses or lenses.
Amblyopia	Amblyopia is a type of poor vision that happens in just one eye. It develops when there's a breakdown in how the brain can't recognize the sight from one eye. Over time, the brain relies more and more on the stronger eye while vision in the weaker eye gets worse.
Trachoma	Trachoma is a contagious and chronic eye infection caused by the bacterium Chlamydia trachomatis .

It primarily affects the conjunctiva, which is the thin, clear tissue that covers the white part of the eye and lines the inside of the eyelid. Trachoma is a leading cause of preventable blindness and visual impairment in many parts of the world.

The infection can lead to various eye problems, including inflammation, scarring, and the development of granulomas on the inner surface of the eyelids.

Trachoma is associated with poor hygiene and is more common in areas with limited access to clean water and sanitation.

Ear



- It receives sound and helps in balance and body position.
- The human ear can generally hear sounds with frequencies between **20 Hz and 20 kHz**.
- The ear has external, middle, and inner portions.
- The outer ear is called the pinna also known as the auricle and is made of **ridged cartilage** covered by skin.

- Sound funnels through the **pinna** into the external auditory canal, a short tube that ends at the **eardrum** (tympanic membrane).
- Sound causes the eardrum and its tiny attached bones in the middle portion of the ear to vibrate, and the vibrations are conducted to the nearby **cochlea**.
- The eardrum, also known as the tympanic membrane, is a thin, cone-shaped layer of tissue that separates the outer ear from the middle ear.
- It responds to sound waves, vibrating in response to changes in air pressure, much like a stretched rubber sheet would do when exposed to pressure.
- The spiral-shaped cochlea is part of the inner ear; it **transforms sound into nerve impulses** that travel to the brain.
- The fluid-filled semicircular canals (labyrinth) attach to the cochlea and nerves in the inner ear. They send information on balance and head position to the brain.
- **Eustachian Tube:** It's a narrow tube that connects your middle ear (the space behind your eardrum) to the back of your nose and throat (nasopharynx).
- It plays a big role in keeping the pressure inside your ear the same as the pressure outside. Imagine it like a little pressure regulator for your ear.
- An **otoscope** is a medical device specifically designed for examining the ear, particularly the eardrum and the ear canal. It is equipped with a light source and a magnifying lens, allowing healthcare professionals to visually inspect the ear for signs of infection, injury, or other abnormalities that may affect hearing or balance.

Nose

- It is the body's organ of smell and also functions as part of the body's respiratory system.
- The shape of the nose is determined by the nasal bones and the nasal cartilages, including the septal cartilage (which separates the nostrils) and the upper and lower lateral cartilages.
- The nose has two holes called nostrils. The nostrils and the nasal passages are separated by a wall called the septum.
- Deep inside your nose, close to your skull, your septum is made of very thin pieces of bone.
- Closer to the tip of your nose, the septum is made of cartilage, which is a flexible material that's firmer than skin or muscle. It's not as hard as bone, and if you push on the tip of your nose, you can feel how wiggly it is.
- Behind your nose, in the middle of your face, is a space called the nasal cavity. It connects with the back of the throat. The nasal cavity is separated from the inside of your mouth by the palate (roof of your mouth).

Revision of Endocrine System

Endocrine glands

अंतः स्रावी ग्रंथियाँ

Endocrine glands are part of your endocrine system. They make hormones and release them into the bloodstream.

अंतःस्रावी ग्रंथियाँ आपके अंतःस्रावी तंत्र का हिस्सा हैं। वे हार्मोन बनाते हैं और उन्हें रक्तप्रवाह में छोड़ देते हैं।

These hormones control a number of important functions in a body, such as:

ये हार्मोन शरीर में कई महत्वपूर्ण कार्यों को नियंत्रित करते हैं, जैसे:

- Growth and development
वृद्धि और विकास
- Metabolism
उपापचय
- Mood
मनःस्थिति
- Reproduction
प्रजनन

Endocrine glands include:

अंतःस्रावी ग्रंथियों में शामिल हैं:

1. Adrenal glands
अधिवृक्क ग्रंथियाँ
2. Pituitary gland
पीयूष ग्रंथि
3. Hypothalamus
हाइपोथेलेमस
4. Thyroid
थायराइड
5. Pineal gland
पीनियल ग्रंथि

There are also organs that contain endocrine tissue and act as glands. These include the:

ऐसे अंग भी हैं जिनमें अंतःस्रावी ऊतक होते हैं और ग्रंथियों के रूप में कार्य करते हैं। इनमें शामिल हैं:

- Pancreas
अग्न्याशय
- Kidneys
गुर्दे
- Ovaries
अंडाशय
- Testes
वृषण
- Liver
यकृत

Thyroid gland

थाइरॉयड ग्रंथि

- Thyroid gland is located in the front of your neck, just below your larynx.
थायरॉयड ग्रंथि आपकी गर्दन के सामने, आपके स्वरयंत्र के ठीक नीचे स्थित होती है।
- The hormone secreted by the thyroid gland is **thyroxine(thyroid hormone)**. Thyroid gland. The thyroid gland is a ductless endocrine gland.

- It measures approximately two inches and has a shape similar to a butterfly.
इसका माप लगभग दो इंच है और इसका आकार तितली जैसा है।
- It secretes hormones that affect virtually every tissue in your body.

Thyroid hormones regulate your metabolism, heart, and digestive function.

यह हार्मोन स्रावित करता है जो आपके शरीर के लगभग हर ऊतक को प्रभावित करता है।

- They also play a role in your brain and nerve development, muscle control, and mood.
वे आपके मस्तिष्क और तंत्रिका विकास, मांसपेशियों पर नियंत्रण और मूड में भी भूमिका निभाते हैं।

Pituitary gland

पीयूष ग्रंथि

- Thyroid function is controlled by the pituitary, which is a smallest gland at the base of your brain.
थायराइड का कार्य पिट्यूटरी द्वारा नियंत्रित होता है, जो आपके मस्तिष्क के आधार पर सबसे छोटी ग्रंथि है।
- The pituitary gland is a pea-sized gland at the base of your brain, just behind the bridge of your nose releases the growth hormone (Thyroid Stimulating Hormone TSH).
पिट्यूटरी ग्रंथि आपके मस्तिष्क के आधार पर, आपकी नाक के पुल के ठीक पीछे एक मटर के आकार की ग्रंथि है।
- It's controlled by the hypothalamus, which sits just above it.
यह हाइपोथैलेमस द्वारा नियंत्रित होता है, जो इसके ठीक ऊपर स्थित होता है।
- The pituitary gland is often called the master gland because it controls a number of other hormone glands, including the:
पिट्यूटरी ग्रंथि को अक्सर मास्टर ग्रंथि कहा जाता है क्योंकि यह कई अन्य हार्मोन ग्रंथियों को नियंत्रित करती है, जिनमें शामिल हैं:
 - Thyroid/थाइरोइड
 - Adrenal gland/एड्रिनल ग्रंथि
 - Testes/वृषण

- Ovaries/अंडाशय

Hypothalamus

हाइपोथैलेमस

- The hypothalamus functions as a **communication center** for your pituitary gland, sending signals and messages to the pituitary to produce and release hormones that trigger the production and release of other hormones.
- It is responsible for maintaining the body's temperature within a narrow range, known as **thermoregulation**.
- The **thyrotropin-releasing hormone (TRH)**, **gonadotropin-releasing hormone (GnRH)**, **growth hormone-releasing hormone (GHRH)**, **corticotropin-releasing hormone (CRH)**, somatostatin, and **dopamine** are released from the hypothalamus into the blood
- Your hypothalamus influences a number of your body's functions, including:
 - **Temperature regulation**
 - Food intake
 - Sleep and wakefulness
 - Thirst
 - Memory
 - Emotional behavior

Pineal gland

- Pineal gland is located deep in the center of your brain.
- Its function is not completely understood, but we do know that it secretes and regulates certain hormones, including melatonin.
- **Melatonin** helps regulate your sleep patterns, which are also known as **circadian rhythms**.

- The pineal gland also plays a role in the regulation of female hormones, which affect the menstrual cycle and fertility.

Adrenal glands

- Adrenal glands are located at the **top of each kidney.**
- Regulate Oxygen levels, heart rate
- They produce various hormones, some of which include:
 - **Cortisol** (cortisol as part of the body's "fight or flight" response to help manage the stress also known as 'stress hormone')
 - **Adrenaline** (Adrenaline hormone increases heartbeat and produces a feeling of excitement.)

Pancreas

- The pancreas plays an important role in converting the food you eat into fuel for your body's cells.
- Pancreas is the **second largest gland** in the human body.
- It does this by producing digestive enzymes that are released into your small bowel to break down and digest food.
- It also makes hormones that **control your blood glucose levels.**
- Pancreas is a composite gland which acts as **both exocrine and endocrine gland.**
- A healthy **pancreas releases insulin hormone** when blood sugar gets too high.
- **Insulin** causes your cells to convert sugar to use as energy or to store it as fat.
- In diabetes, your pancreas either doesn't produce insulin or doesn't use it properly, leading to high blood sugar.

Liver

- Liver is the largest gland in the human body.
- It is located in the upper right portion of the abdomen.
- The liver is the only organ which is capable of regenerating itself after damage in adults.
- This regenerative capacity allows the liver to repair and renew its cells, even after significant injury or partial removal.
- The regrowth process is supported by the proliferation of remaining healthy liver cells, ensuring the restoration of the liver's function and structure.
- The liver secrete Bile.
- Bile helps with digestion.
- The liver is reddish-brown in color due to the presence of blood vessels and its composition.

Exocrine glands

- Exocrine glands produce other substances, not hormones, that are released through ducts to the exterior of your body, such as sweat, saliva, and tears.
- The substances released by your exocrine glands play important roles in your body. They do things like help regulate your body temperature, protect your skin and eyes, and even help mothers feed babies by producing breast milk.
- Your exocrine glands include:
 - Salivary
 - Sweat
 - Mammary
 - Sebaceous
 - Lacrimal

Sweat glands

- Regulate your body temperature by releasing water to the surface of your skin when your body temperature rises.

Sebaceous glands

Sebaceous glands are located throughout your skin, though there are few on your hands and feet. They secrete an oily substance called sebum that lubricates your skin.

These glands perform a few functions in your body, such as:

- Regulating your body temperature by working with your sweat glands
- Helping your skin retain moisture
- Helping fight infection caused by bacteria and fungi

Salivary glands

Salivary glands are located in your mouth. You have hundreds of small glands located throughout your:

- Tongue
- Palate
- Lips
- Cheeks

Mammary glands

- Mammary glands, which are a type of sweat gland, are responsible for the production of breastmilk.
- **Oxytocin** is responsible for the release of milk from the mammary gland.

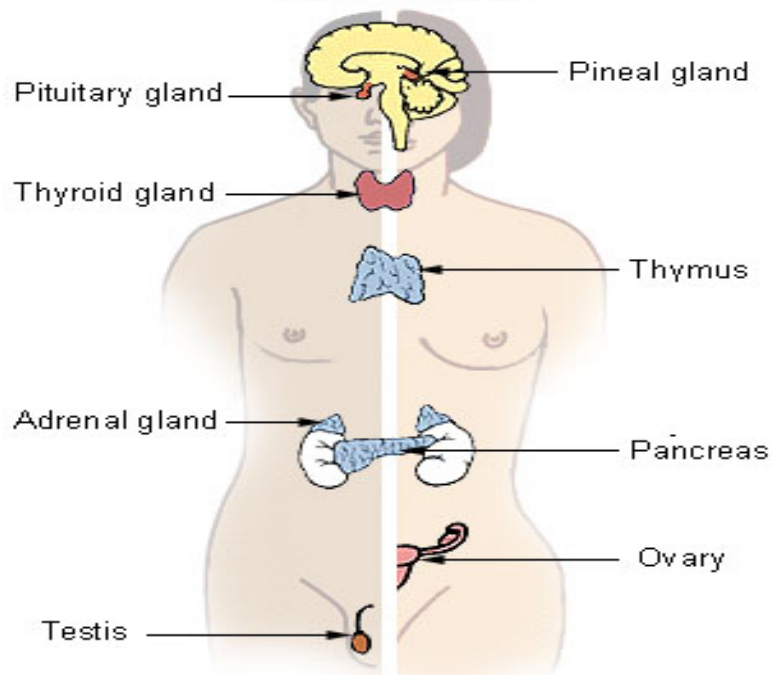
- **Colostrum** is a special fluid secreted by new mothers during the initial days of lactation, typically within the first few days after giving birth.
- It is rich in antibodies, proteins, and other nutrients that provide essential immunity-boosting elements for the newborn's developing immune system.
- Colostrum plays a crucial role in protecting the baby from infections and illnesses, promoting healthy growth and development, and establishing a strong foundation for the baby's overall health and well-being.

Lacrimal glands

- The lacrimal glands are
- These glands are located above the **outer corner of each eye.**
- Tears produced by the lacrimal glands contain a combination of water, oils, mucus, and special proteins that help **protect the eyes** from infection and keep them moist.
- Tears play a crucial role in **lubricating the eyes**, washing away foreign particles, and protecting the eyes from potential damage.
- The lacrimal glands can also be stimulated by emotions, resulting in the production of emotional tears.

Major Endocrine Glands

Male Female



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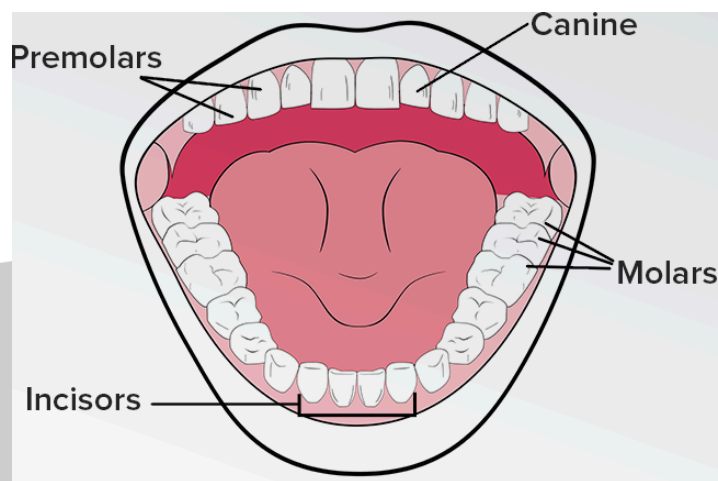
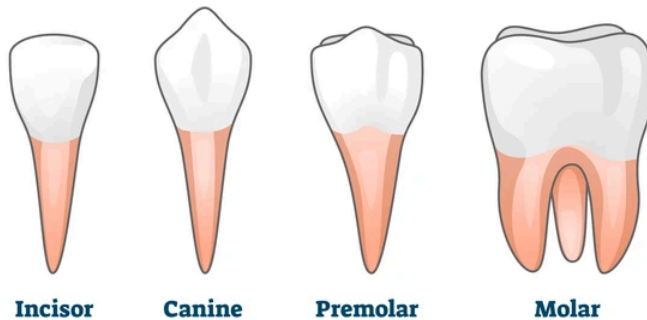
Digestive System

- The digestive system of humans consists of-
 - An alimentary canal
 - Associated digestive glands.

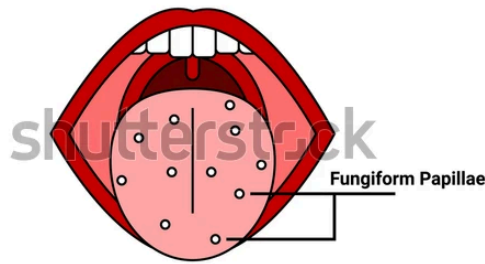
Alimentary Canal

- The alimentary canal, also known as the **digestive tract**, is a continuous muscular tube that starts from the mouth and ends at the anus, and is responsible for the digestion and absorption of food.
- The **alimentary canal** consists of the mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and the anus. The mouth leads to the buccal cavity or oral cavity. The oral cavity has a number of teeth and a muscular tongue. Each tooth is embedded in a socket of jaw bone. This type of attachment is called **thecodont**.
- An adult human has **32 permanent teeth** which are of four different types (Heterodont dentition), namely,
 - Incisors (I)
 - Canine (C)
 - Premolars (PM)
 - Molars (M)

TYPES OF TEETH



- The hard chewing surface of the teeth, made up of **enamel**, helps in the mastication of food.
- The **tongue** is a freely movable **muscular organ** attached to the **floor of the oral cavity** by the **frenulum** (The frenulum is a small fold of tissue that connects two body parts) The upper surface of the tongue has small projections called **papillae**, some of which bear taste buds.



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- **Oral Cavity and Pharynx:**

The oral cavity, or mouth, leads into a short area called the pharynx. The pharynx is like a hallway where both food and air pass through. It's located at the back of your throat.

- **Oesophagus and Trachea:**

Two different tubes open into the pharynx. The first one is the oesophagus, which is a long, thin tube that carries food from your throat to your stomach. The second one is the trachea, also known as the windpipe, which carries air to your lungs.

- **Larynx:**

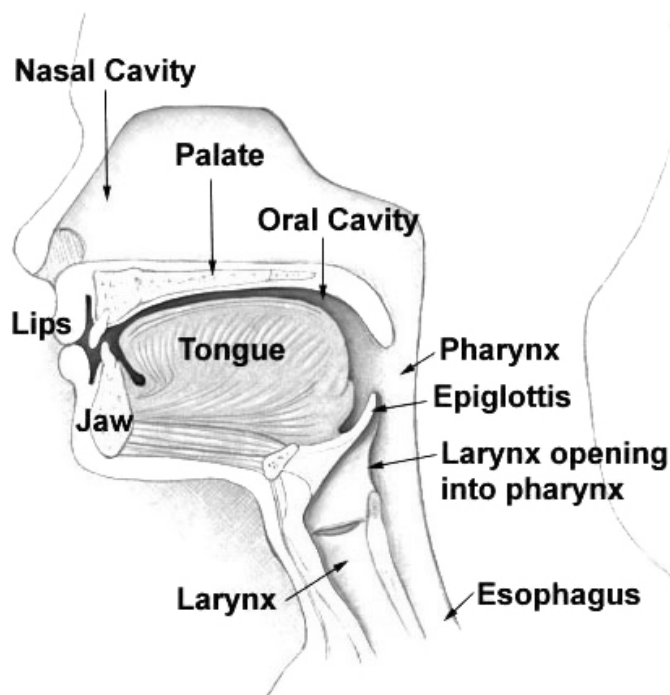
The larynx, often called the voice box, is a tube in your neck, sitting above the trachea and behind the oesophagus. It helps you make sounds when you talk and also allows air to go from your throat to your trachea and then to your lungs.

- **Epiglottis:**

There is a small flap of cartilage called the epiglottis located at the entrance to your windpipe (the glottis). When you swallow food, the epiglottis closes this entrance to stop food from entering the windpipe. This helps to make sure that food goes down the oesophagus to your stomach, not into your lungs.

Stomach:

- The esophagus is connected to the stomach, a 'J' shaped bag-like structure. After traveling down the esophagus, food reaches the stomach where it begins to be digested. The stomach is located in your abdomen, just below your ribs.
- A muscular sphincter (gastro-oesophageal) regulates the opening of esophagus into the stomach.
- The stomach, located in the upper left portion of the abdominal cavity, has three major parts –
 - A cardiac portion into which the esophagus opens
 - A fundic region
 - A pyloric portion which opens into the first part of small intestine
- The stomach secretes hydrochloric acid, a strong acid that plays a vital role in the digestive process. Hydrochloric acid aids in the breakdown of food, particularly proteins, into smaller, more digestible components.
- Its highly acidic nature also serves as a defense mechanism, helping to kill pathogenic bacteria and other potentially harmful microorganisms that may be ingested along with food.
- In the stomach mainly protein digestion takes place. Absorption of simple sugars, alcohol and medicines also takes place in the stomach.



- The accessory digestive glands include the salivary glands, the liver (with gallbladder) and the pancreas.
- Inside the mouth the teeth chew the food, the tongue tastes the food and manipulates it for proper churning by mixing with the saliva.
- Saliva contains a starch digestive enzyme, salivary amylase that digests the starch and converts it into maltose (disaccharide).
- The food then passes into the pharynx and enters the oesophagus in the form of bolus (a small rounded mass of a substance, especially of chewed food at the moment of swallowing), which is further carried down through the esophagus by peristalsis into the stomach.

Small Intestine

- The small intestine in human beings is a part of the **gastrointestinal tract** responsible for the digestion and absorption of nutrients.
- It is approximately 7 to 7.5 meters long, exhibiting a coiled structure to maximize the surface area for nutrient absorption.
- The chyme (food) enters into the **duodenum portion** of the small intestine and is acted on by the pancreatic juice, bile and finally by the enzymes, so that the digestion of carbohydrates, proteins and fats is completed.
- The food then enters into the **jejunum and ileum portions** of the small intestine.

Carbohydrates are digested and converted into monosaccharides like glucose. Proteins are finally broken down into amino acids. The fats are converted to fatty acids and glycerol.

- The digested end products are absorbed into the body through the epithelial lining of the intestinal villi.

Large Intestine

- The **undigested food** (feces) enters into the **caecum of the large intestine** through **ileo-caecal valve**, which prevents the backflow of the fecal matter.
- This is a thick, long tube measuring around 5 feet in length.
- It **absorbs water** and consists of bacteria (symbiotic) that support the breakdown of wastes to fetch small nutrients.

Rectum

The undigested food becomes semi-solid in nature and then enters into the rectum (end of the large intestine), anal canal and is finally egested out through the anus as a solid matter called stool.

Accessory Organs

Pancreas

- It is a large gland present just behind the stomach.
- It is short with its anterior connected to the duodenum and posterior pointing towards the left part of the abdominal cavity.
- The pancreas releases digestive enzymes to complete the process of chemical digestion.

Liver

- The liver is a roughly triangular, reddish-brown accessory organ of the digestive system located to the **right of the stomach**.
- It is the **largest gland** in the human body.
- It **produces bile**, which helps in the digestion of fat in the small intestine.
- The bile is stored and recycled in the **gallbladder**.
- Gallbladder is a small, pear-shaped organ which is located just next to the liver.
- The liver secretes bile, which is stored in the gallbladder and then released into the small intestine to **help break down fats**.
- Carbohydrates are stored as glycogen primarily in the liver and muscles.

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- The **liver** serves as a **storage site for glycogen**, which can be broken down into glucose when the body needs energy.
- **Glycogen stored in the liver** can be released into the bloodstream to maintain normal blood sugar levels and provide energy for various bodily functions.

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