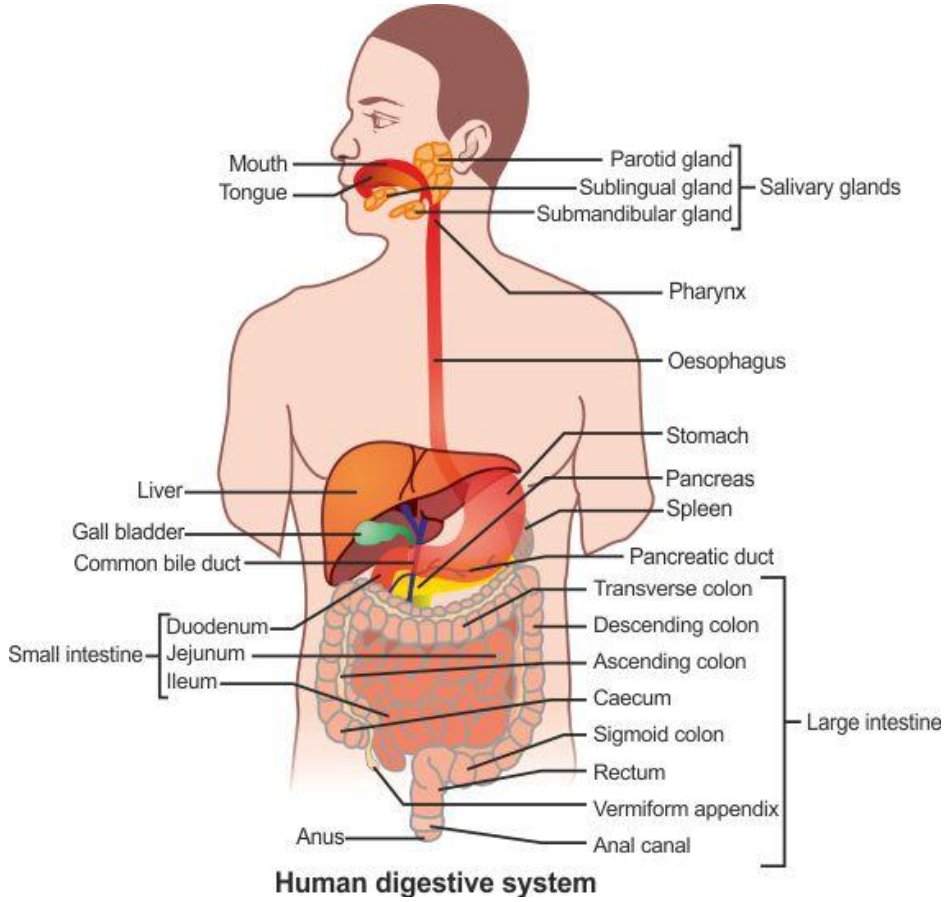
System

- **Digestion** is the process of breakdown of naturally occurring foodstuffs into a diffusible form. It is a process which makes the foods soluble and of such a chemical nature that they can be absorbed through living membranes.

- The enzymes which help in the process of digestion are called **digestive enzymes**.



Human digestive system

Mouth

- The space where the food is chewed and mixed with the saliva is called the mouth or mouth cavity.
- The mouth opens into the buccal cavity which has teeth, a tongue and three pairs of salivary glands.

Functions of the Mouth

- During ingestion, food is taken in through the mouth.

Tongue

- The tongue is a fleshy muscular organ attached to the floor of the buccal cavity at the back region of the mouth.

Functions of the Tongue

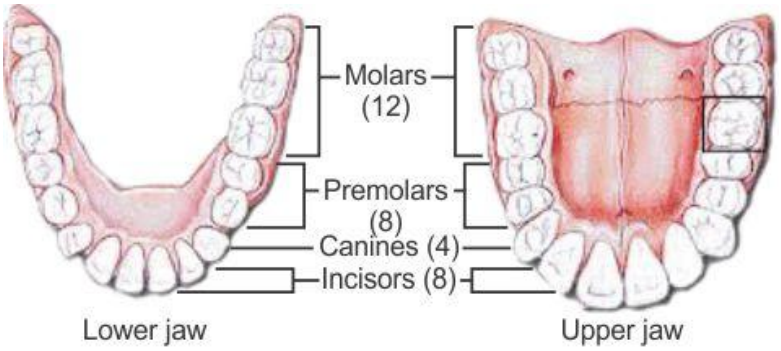
- The tongue helps in mixing of saliva with the food while chewing.
- It also helps in mastication and swallowing of food.
- The tongue has several taste buds at its tip which detects different tastes of food.

Teeth

- The upper and lower jaws are embedded with teeth.
- Teeth of different shapes are called heterodont. Example: Human teeth.
- Teeth which are similar to each other are called homodont. Examples: Teeth of lizard and frog.

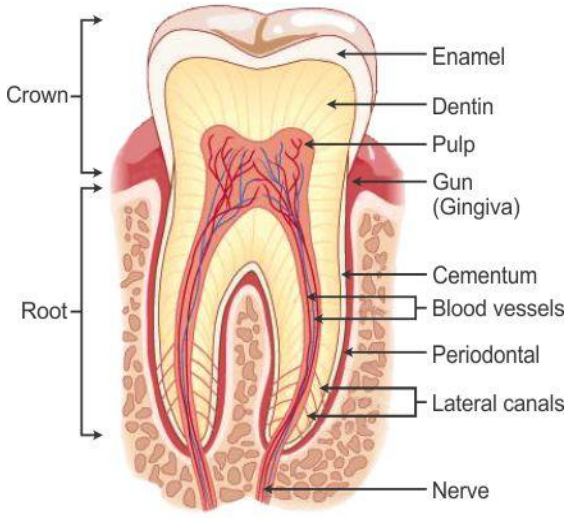
Functions of Teeth

- Teeth help to cut food into small pieces, to chew and to grind it.
- They prepare food for digestion by mastication.
- They help in speaking and add to facial beauty.



Different kinds of teeth

Structure of a Tooth



Structure of tooth

Salivary Glands

- There are three pairs of salivary glands in the wall of the buccal cavity which opens into the mouth. They are the parotid glands, submaxillary glands and sublingual glands.
- Salivary glands secrete a watery fluid called saliva, which initiates digestion in the buccal cavity.

Functions of Saliva

- Salivary amylase present in the saliva converts the starch into maltose and dextrose sugars.
- The mucus present in the saliva lubricates the food and thus helps in the swallowing of food.
- Saliva moistens and lubricates the inner lining of the mouth cavity and the surface of the tongue, and helps us in speaking.

Pharynx

- The pharynx is the common passage for food and air leading to the oesophagus and the larynx, respectively.

Functions of the Pharynx

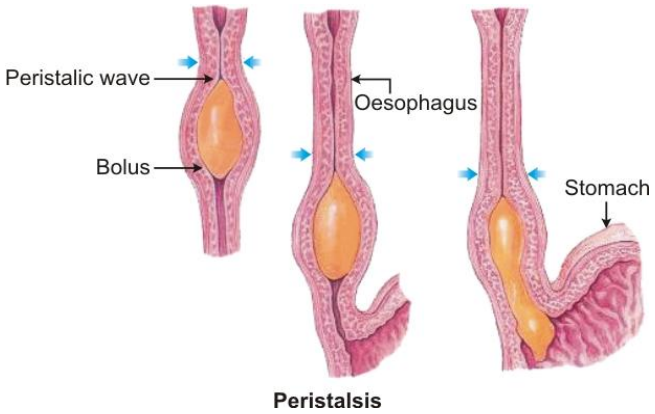
- Food passes through the pharynx to the oesophagus.

Oesophagus

- The oesophagus, also known as the food pipe, is a narrow tube that connects the pharynx to the stomach.

Functions of the Oesophagus

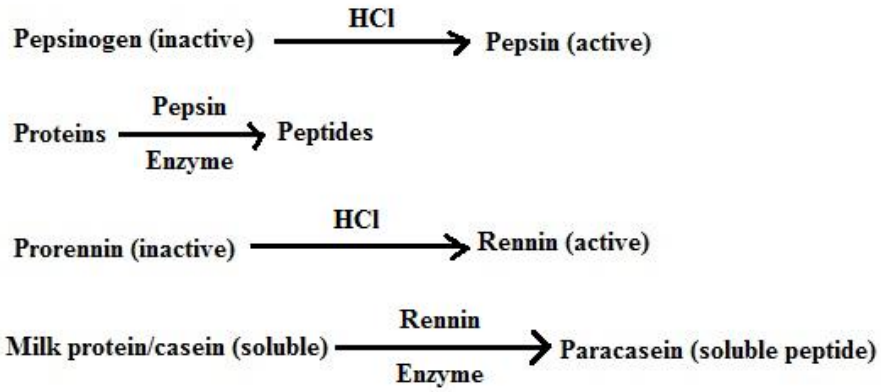
- The oesophagus pushes the chewed food down to the stomach.
- The oesophagus has a sphincter at the front end of the stomach to prevent the backflow of food from the stomach.
- Swallowing is the process which involves the movement of food from the mouth to the stomach through the oesophagus.
- Swallowing involves three phases—buccal phase, pharyngeal phase and oesophageal phase.
- Peristalsis is the rhythmic contraction and relaxation of muscles of the oesophagus.



Peristalsis

Stomach

- The stomach is a J-shaped muscular, bag-like organ with walls made of thick and elastic muscles.
- The gastric glands release three gastric juices—hydrochloric acid, enzyme pepsin and mucus.

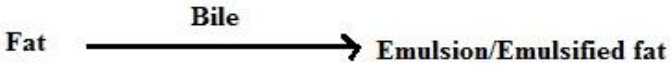


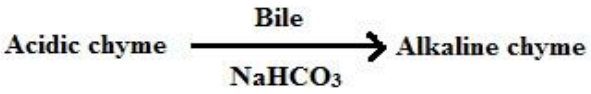
Liver

- The liver is a reddish-brown gland situated in the upper part of the abdomen on the right side.
- It secretes bile which is temporarily stored in a sac called the gall bladder.

Functions of Bile

- Bile juice helps in the digestion of fats.



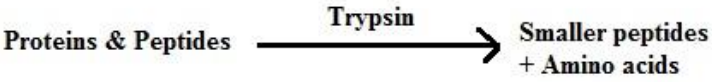


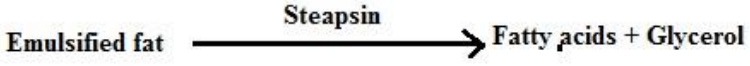
Functions of Liver

- Production of bile, fibrinogen and heparin.
- Control of blood sugar levels and amino acid levels.
- Synthesis of foetal red blood cells.
- Regulation of blood volume.

Pancreas

- The pancreas is a long, leaf-like transparent gland, about 15-20 cm long.
- The pancreas secretes pancreatic juice. It has digestive enzymes trypsin, enterokinase, steapsin and pancreatic amylase, which partly digest proteins, fats and carbohydrates.





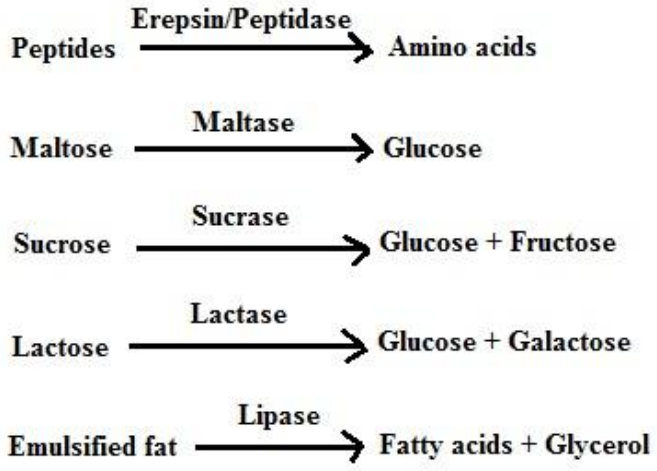
- The pancreatic alpha cells secrete hormone glucagon and the pancreatic beta cells secrete the hormone insulin.

Small Intestine

- The small intestine is a very long tube found in the abdomen. It is about 6-7 metres in length and about 2.5-3 cm wide.
- The small intestine is divisible into three regions—duodenum, jejunum and ileum.

Functions of Small Intestine

- The small intestine serves both, for digestion and absorption.
- The intestinal glands are present in the walls of the ileum, which secrete the intestinal juice. The intestinal juice contains peptidase, maltase, sucrase, lactase and lipase which complete the process of converting the proteins to amino acids, complex carbohydrates to glucose and fats to fatty acids.



- The digested food is absorbed by the blood vessels in the small intestine.

Large Intestine

- The large intestine extends from the ileum to the anus and is about 1.5 metres in length. It is divided into the caecum, colon and rectum.

Functions of large Intestine

- It is the place for temporary storage of undigested food. It helps in absorbing water and salts from the undigested food.
- The absorbed food is carried to each and every cell of the body through blood. This process is called assimilation.
- The food digested and absorbed by the gut is transported in two ways, through the hepatic portal system and the lymphatic system.

Food Tests

TEST	PROCEDURE	OBSERVATION
Test for glucose	• Add glucose to blue-green Fehling's solution in a test tube. • Heat the test tube over a flame, until bubbles begin to appear. • Do not overboil the solution.	The colour of the solution changes from blue-green to brick-red along with the formation of a precipitate.
Test for starch	• Take a small quantity of starch powder. Put it into a test-tube containing water and boil to make a solution. • Cool the solution and add 2-3 drops of dilute iodine solution to it.	The colour of the solution changes to blue-black.
Test for proteins	• Take a piece of hard-boiled egg white in a test tube. • Add few drops of dilute nitric acid to it. • Heat the test tube gently. • Rinse off the acid with water and add few drops of ammonium hydroxide to it.	The colour of the solution changes, first from colourless to yellow and then from yellow to orange red.
Test for fats and oils	• Rub a piece of groundnut, castor or walnut on a piece of paper. • Make sure that the paper does not tear in the process. • Next, open up the paper, straighten it and observe it carefully against light.	An oily patch can be seen. When you hold the paper against light, you will see the light faintly through this patch.
Test for water	• Take a piece of cobalt chloride paper. • Touch the paper with the cut surface of a potato or a banana.	The blue paper turns pink in colour.
Test for minerals	• Place a piece of banana or a potato in a crucible. • Heat it till it burns completely.	Some ash is left behind which does not burn even on further heating.