

CHAPTER - 11 DIGESTIVE SYSTEM

This lesson is for class 9 for the subject of Biology. Topic Digestion occurring in Mouth and Stomach which is covered in Chapter 11 titled Digestive system starting on Page No 104 of your text book titled Concise Biology Selina Publications.

DIGESTION - The process of breaking down of food into diffusible, soluble (smaller units) form so that they can easily pass through the cell membranes.

Enzymes - are the chemicals that help us to speed up the process of digestion.

Characteristics of enzymes

1. Enzymes are proteins. Hence at high temperature enzymes get destroyed and the metabolic activities in an organism stops leading to death of the organism.
2. It is substrate specific eg. a protein digesting enzyme can only digest proteins (not fats).
3. Because it is substrate specific hence the products which are formed, after the break down, are also specific eg digestion of protein releases amino acids.
4. It speeds up the chemical reaction.
5. It can be used again and again in a reaction.
6. It acts on a particular pH. eg Pepsin a protein digesting enzyme acts on acidic pH.
7. Enzymes best work at a particular temperature usually $35 - 40^{\circ}\text{C}$ is best temperature range.

DIGESTIVE SYSTEM. consists of -

(i) alimentary canal (ii) digestive glands

Various organs of digestive system are

1. Mouth - where food is chewed with teeth and mixed with saliva with the help of tongue.
2. Teeth - DENTITION

Teeth cut/breaks the food into smaller sized bits thus increasing their surface area for the enzymes to act upon.

An adult human has 32 teeth as follows:-

- i. Incisors - Four front teeth; sharp and broad hence used for biting and cutting.
2. Canines - on either side of incisors, sharply pointed for holding & tearing
3. Premolars - next to canines, have cusps/projections on the surface hence called as bicuspid
4. Molar - Last 3 teeth on either side, larger than premolars used for grinding and crushing food.

WISDOM TOOTH - Last molar on each side in each jaw.

Wisdom teeth appear at an age of 17-20 years when human body is reaching maturity

HOMODONT = Animals having similar teeth (similar in shape & size eg. Lizard, frog)

HETERODONT - Animals whose teeth are different in size and shape Eg. humans.

Mammalian teeth appear in two sets during life

MILK TEETH / DECIDUOUS / TEMPORARY TEETH.

The first set of teeth consists of 20 teeth (all, but not the ^{pre}molars), they start appearing at an age of 7-8 months and are completed when the child is about 2 years old.

PERMANENT TEETH - When milk teeth fall out (as a result of their roots being dissolved away in the jaw) they are being completely replaced by the permanent teeth (at the age of about 12 years)

DENTAL FORMULA - indicates the number of permanent teeth in mammals. The number of incisors, canines, premolars and molars are given strictly in the same order for one half of each jaw. For example

<u>Human child</u>	I	C	P _m	M		
2 years <u>Upper jaw</u>	=	2	1	0	2	= 20 milk teeth
<u>Lower jaw</u>		2	1	0	2	

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Adolescent upto 17-20 years

28 permanent teeth

$$\begin{array}{r} \text{ICPM} \\ 2, 1, 2, 2 \\ \hline 2, 1, 2, 2 \end{array} = 28$$

Human adult

32 teeth

ICPM

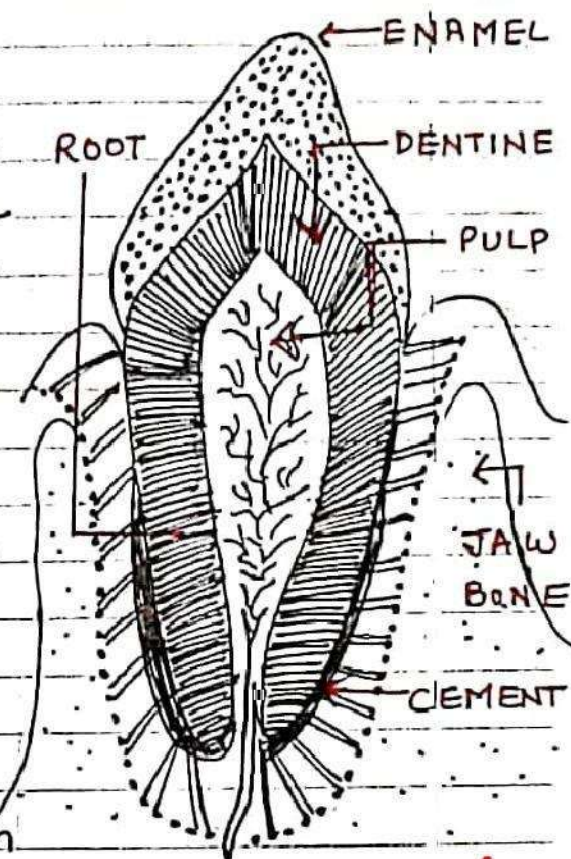
2, 1, 2, 3

2, 1, 2, 3

STRUCTURE OF TOOTH

Parts of tooth -

1. Crown - part exposed above gums
2. Root - part embedded in jaw bone
3. Neck - Slight constriction between root and crown.
4. Enamel - material that covers the crown; it is the hardest substance in the body.
5. Dentine - forms the bulk of the tooth. It has minute canals through which runs the strands of cytoplasm of pulp cavity.
6. Cement - is bone like structure covering and fixing the root in position.
7. Pulp - is soft connective tissue in the central pulp cavity of tooth. It has blood capillaries, lymph vessels and nerve fibers. Thus provides nourishment to the tooth.



Before going further let us take a short break. Answer the following questions during the break -

Q1 - Give the number of milk teeth and permanent teeth in a human adult

Q2 Name a homodont animal i.e. having teeth similar in shape and size.

Q3 Name the hardest substance in human body

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write the answers to above questions

during the break

Break is over children. Listen to the correct answers -

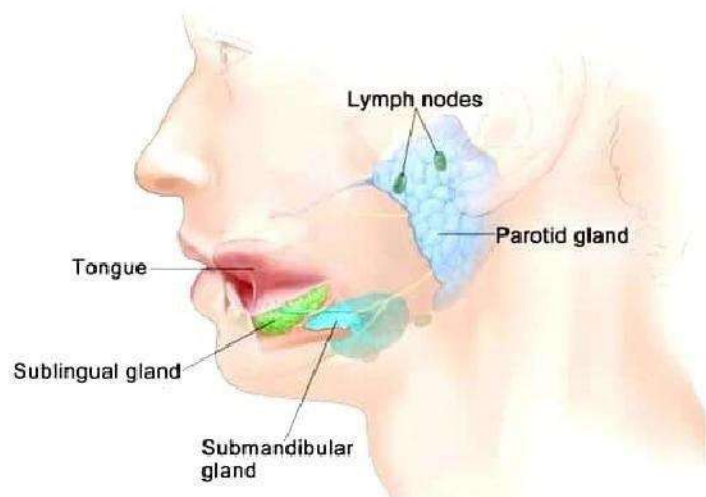
A1. Human being has 20 milk teeth
and 32 permanent teeth

A-2 Lizard is a homodont animal

A3 Enamel is the hardest substance
in human body.

Now let us resume the topic with
the discussion of Salivary glands -

Salivary Glands- Location



SALIVARY GLANDS

1. Parotid gland - located in front of and beneath each ear.
2. Submandibular gland - lying close to the inner side of the lower jaw on each side.
3. Sublingual gland - below the tongue.

Saliva secreted in mouth contains an enzyme -

Salivary amylase or ptyalin. Functions of Saliva -

1. It keeps mouth moist to help in speaking and swallowing.
2. It lubricates food, helping in its movement.

3. It acts as solvent to dissolve food particles that then stimulate taste buds to give you sensation of taste.
4. Food particles stick together with the help of saliva to form bolus so that they can be swallowed easily.
5. Its enzyme - ptyalin converts starch to maltose. Boiled rice (starch) if chewed very well (i.e. mixed with ptyalin) starts to taste sweet (ptyalin digests starch converting it to maltose, a sugar).
6. It has antiseptic property, it kills germs.
7. If there is dryness in mouth (lack of saliva) it gives a feeling of thirst, hence we drink more water replenishing the body water.

SWALLOWING AND PERISTALSIS

The tongue movement forces the bolus into throat. Soft palate closes the opening between the throat and nasal passage. Similarly epiglottis closes the opening of the windpipe. Thus the only passage available to the bolus is that of oesophagus.

Food thus reaches oesophagus and then moves throughout the gut through special movement called PERISTALSIS - is the wave of constrictions caused by the circular muscles of the gut pushing the food along.

Mucus secreted by all the regions of the gut is a slimy fluid which lubricates the food.

OESOPHAGUS is a tube which transports the food from throat to the stomach. It does not produce any digestive enzyme.

STOMACH - located below the diaphragm in abdominal cavity. In an average adult it can hold 2-3 litres of food. Its highly muscular walls churn the food and release gastric juices.

PYLORUS - opening of stomach into intestine.

The opening of oesophagus into stomach and similarly stomach into intestine is guarded by the presence of sphincter muscles. These muscles prevent the back flow of food. (i.e. from stomach into oesophagus or from stomach into intestine until it is thoroughly churned up.) Thus these sphincter muscles prevent the regurgitation of food.

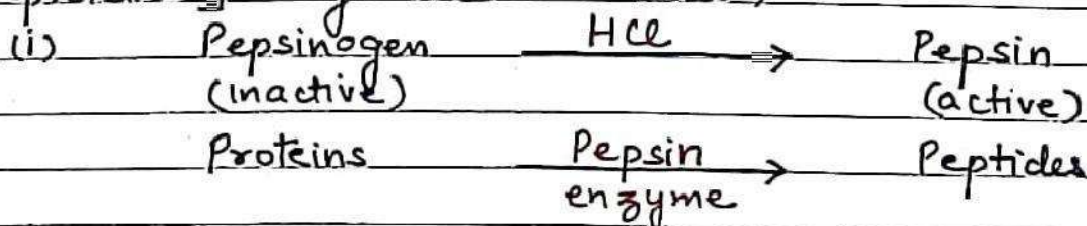
Vomiting - when stomach is disturbed, cardiac sphincter (present at the front end of stomach between stomach and oesophagus) opens, and through antiperistalsis throws the contents (causing disturbance) out through the mouth.

GASTRIC JUICE - secreted by the inner lining of stomach. It majorly contains water, some salt, Hydrochloric acid (HCl) and enzyme - Pepsin.

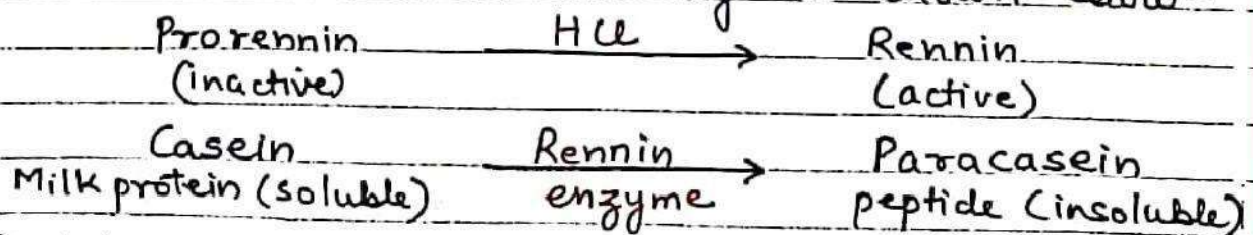
Functions of HCl in stomach =

- (i) It kills germs that may have entered with food.
- (ii) It activates pepsin to act on (digest) proteins.

Pepsin is secreted as pepsinogen (inactive - which cannot digest proteins). This pepsinogen is converted to Pepsin [(active form), which is able to digest proteins] by HCl. Thus, -



- (ii) Similarly Prorennin and Casein digesting
Rennin is working as shown below -



Peptides are the smaller products formed after digesting proteins

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Food stays in the stomach for about 3 hours and forms a pulp like form called chyme.

NOTE FOR STUDENTS

Students are required to go through the notes given by the teacher carefully along with the topics as being discussed in the chapter.

It may require multiple readings to grasp the topic completely.

HOME ASSIGNMENT

1. Draw well labelled diagram of internal structure of tooth. (given on Page 106 of book).
 - A. Canine or incisor (with one root)
 - B. Premolar (with two roots)in your notebook.
2. Answer the following Review questions given at the end of the Chapter 11 [Page 115-116]
 - B. Very short answer type
Q No 2
 - C. Short Answer type
Q No 1, 4
 - E. Structured / Application / Skill type
Q No 4 and 5

Answer all these mentioned questions in your notebook