Chapter = 11

Holozoic Nutrition

Living organism perform various activities for this they need energy and also materials to grow and repair the body.

NUTRITION:

Nutrition is the processes by which organisms obtain energy from nutrients to maintain the functions of life, to construct the matters and to preserve their structures.

NUTRIENTS:

Nutrients are food which supplies the energy and elements to living organism's body. For the synthesis of protoplasm and respiratory oxidation an organising need two molecules i.e. the high-energy compounds and the oxygen. Nutrition are of two types autotrophic nutrition and heterotrophic nutrition. In heterotrophic nutrition living organisms depend on the already prepared food which is prepared by other organisms. Heterotrophic nutrition further divided into saprotrophic, holozoic and parasitic nutrition.

HOLOZOIC NUTRITION:

A type of nutrition in which free living animals take in large, complex non diffusible food and digest it into small diffusible compound within alimentary canal which can be then absorbed and assimilated is known as holozoic nutrition. This involves the steps of ingestion, digestion, absorption, assimilation and excretion.

Processes in holozoic nutrition:

i. **Ingestion:** intake of food through cell surface or mouth.
ii. **Digestion:** breakdown of food of complex food into simple food with the help of enzymes.
Iii. **Absorption:** absorption of diffusible food into blood or body through intestine.
iv. **Assimilation:** utilization of the absorbed food.
V. **Egestion:** removal of undigested food from the body through cell surface or anal opening.

TYPES OF DIGESTION:

1.Intracellular digestion:

A type of digestion which takes place inside the cell is called intracellular digestion. It is the characteristic of single cell organisms like protozoans.

2.Extracellular digestion:

A type of digestion which takes place outside the cell is called extracellular digestion. It is the characteristic of multicellular organisms. In these animals they have a particular organ for digestion such as alimentary canal where enzymes are secreted to break the large food particle. In extracellular digestion the size of food is large and cannot enter the cell directly hence they need to break the food outside the cell.

3. Chemical digestion:

It takes place with the help of enzymes. Chemical digestion observes in both extracellular and intracellular digestion. In chemical digestion water is also required for hydrolytic breakdown of large food particles.

4.Mechanical digestion:

In mechanical digestion, food is physically broken down into smaller fragments via the acts of mastication (mouth), churning (stomach) and peristalsis. Mechanical digestion observes only in extracellular digestion. It facilitates the process of chemical digestion.

TYPES OF DIGESTIVE SYSTEM:

There are basically two types of digestive systems, sac like and tube like digestive systems.

i- Sac like digestive system:

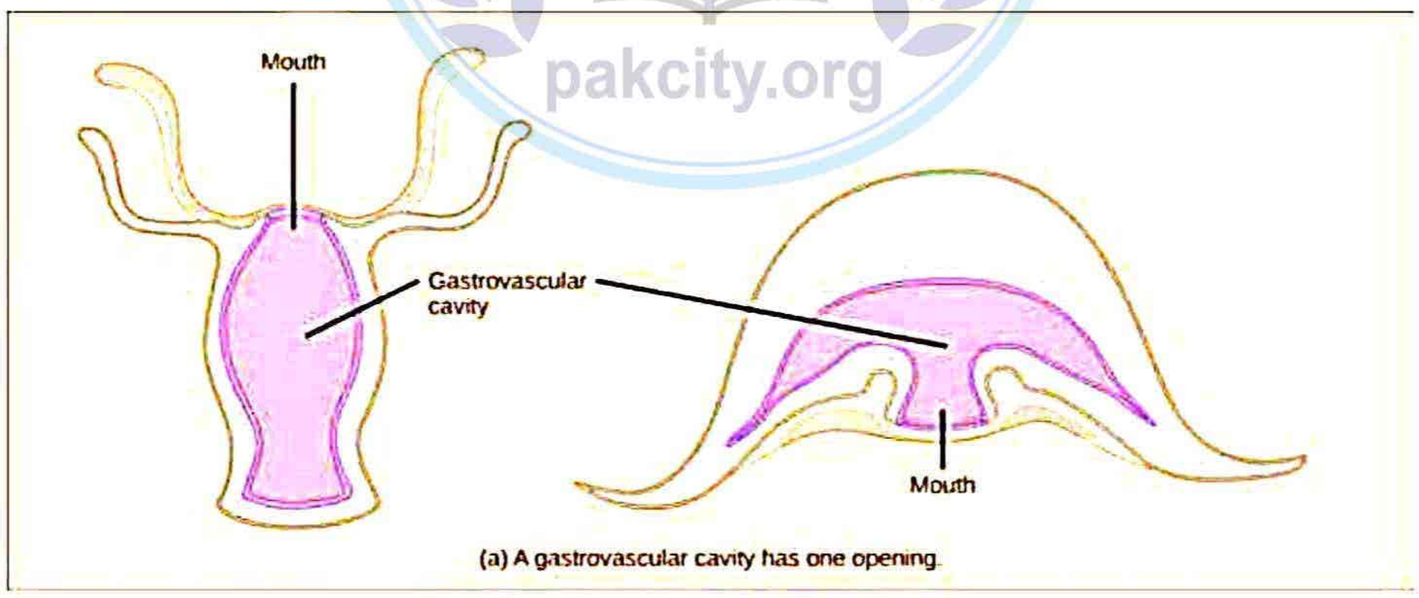
A sac-like digestive system has a single opening. Food travels into it through that, gets digested and excreta comes out of the same opening. This is also known as a digestive cavity. For example, Platyhelminthes.

ii- Tube-like digestive system:

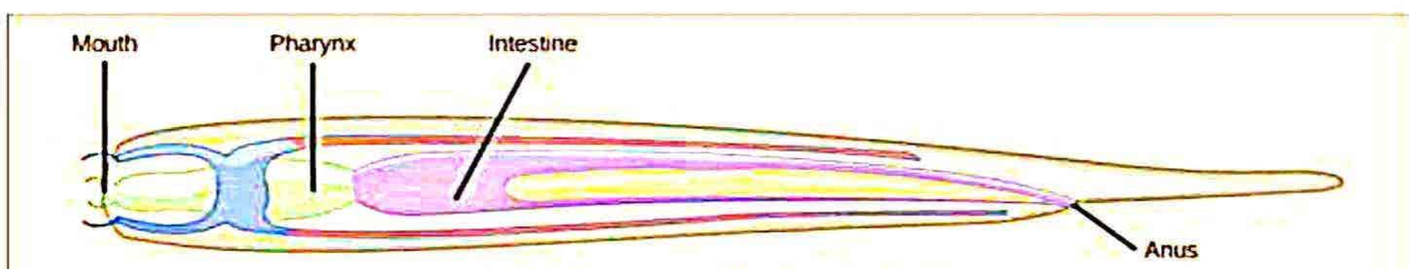
In a tube-like digestive system there are two openings. The food enters through one, gets digested and moves out of the other one in the form of excreta, after the digestion is done. This is also known as a digestive tract. For example: Human beings.

DIFFERENCE BETWEEN SAC LIKE AND TUBE LIKE DIGESTIVE SYSTEM:

SAC LIKE DIGESTIVE SYSTEM	TUBE LIKE DIGESTIVE SYSTEM
Single opening.	Two openings.
Lower animals.	Higher animals.
Food enter and excreta leave through the same opening.	Food enter through one opening (mouth) and excreta leave through the another opening (anus).
Incomplete digestive system without glands.	Complete digestive system with glands.
Chemical digestion only.	Chemical and mechanical digestion both.
Digestive tract has no variable pH.	Digestive tract has variable pH.
Fewer enzymes.	Enormous enzymes.
Digestive tract is not supported by muscles.	Digestive tract is supported by muscles.
No peristalsis.	Peristalsis observe.



(a) A gastrovascular cavity has one opening.



(b) An alimentary canal has two openings.

DIGESTION IN AMOEBA:

Amoeba is micro-phagous i.e. feeds upon small aquatic organisms such as bacteria and minute food particles. The nutrition in Amoeba is holozoic. It involves five different stages which are given below.

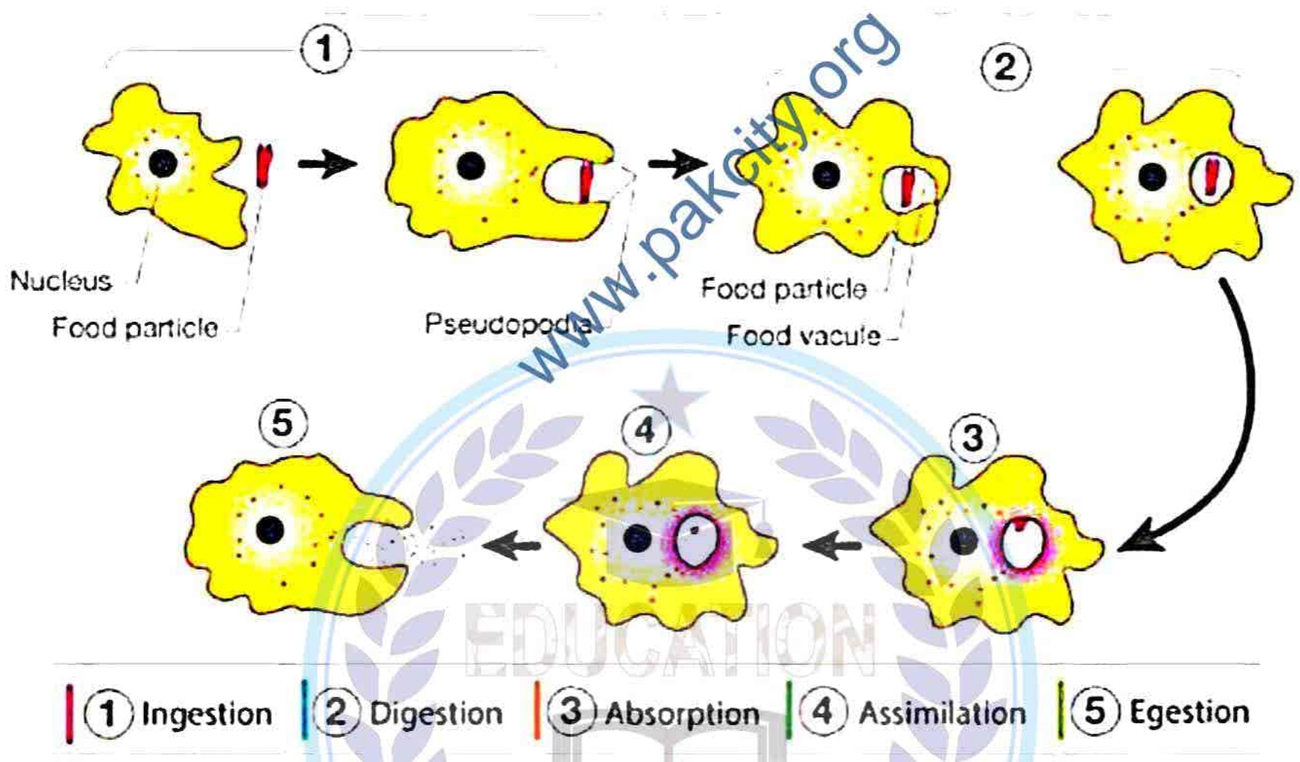
i- **Ingestion;** Amoeba forms food cup by pseudopodia which surrounds food particles and engulf it by endocytosis and forms a food vacuole.

ii- Digestion; enzymes discharge into the food vacuole from lysosomes surrounding food vacuole. Lysosomes contain three types of enzymes, the protease, amylase and lipase. Hence the digestion in amoeba is intracellular. Now vacuole becomes digestive vacuole.

iii. Absorption; absorption takes place through fine canals which radiate from the digestive vacuole along which the soluble products of digestion pass into cytoplasm by pinocytosis.

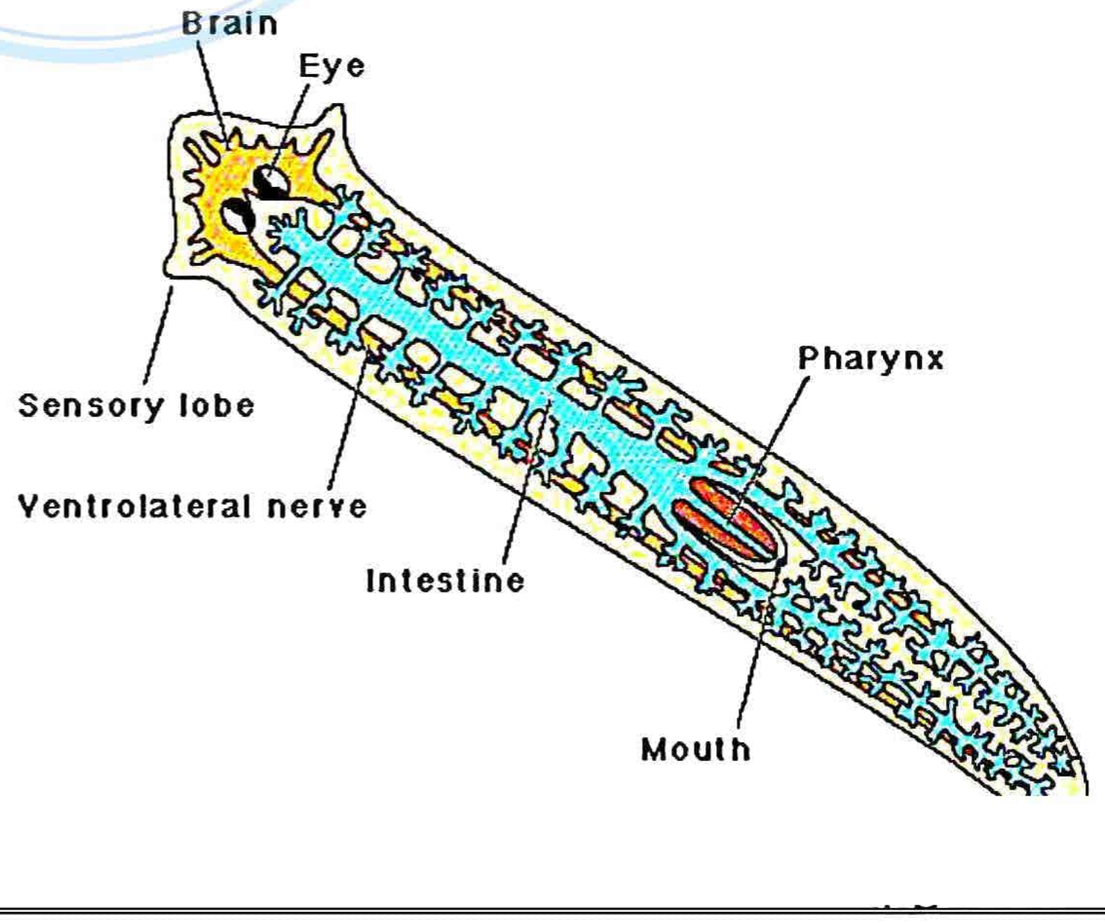
iv- Assimilation; food assimilate into new protoplasm or oxidized to liberate energy.

V- Egestion; undigested food is egested out by exocytosis at the rear end.



DIGESTION IN PLANARIA.

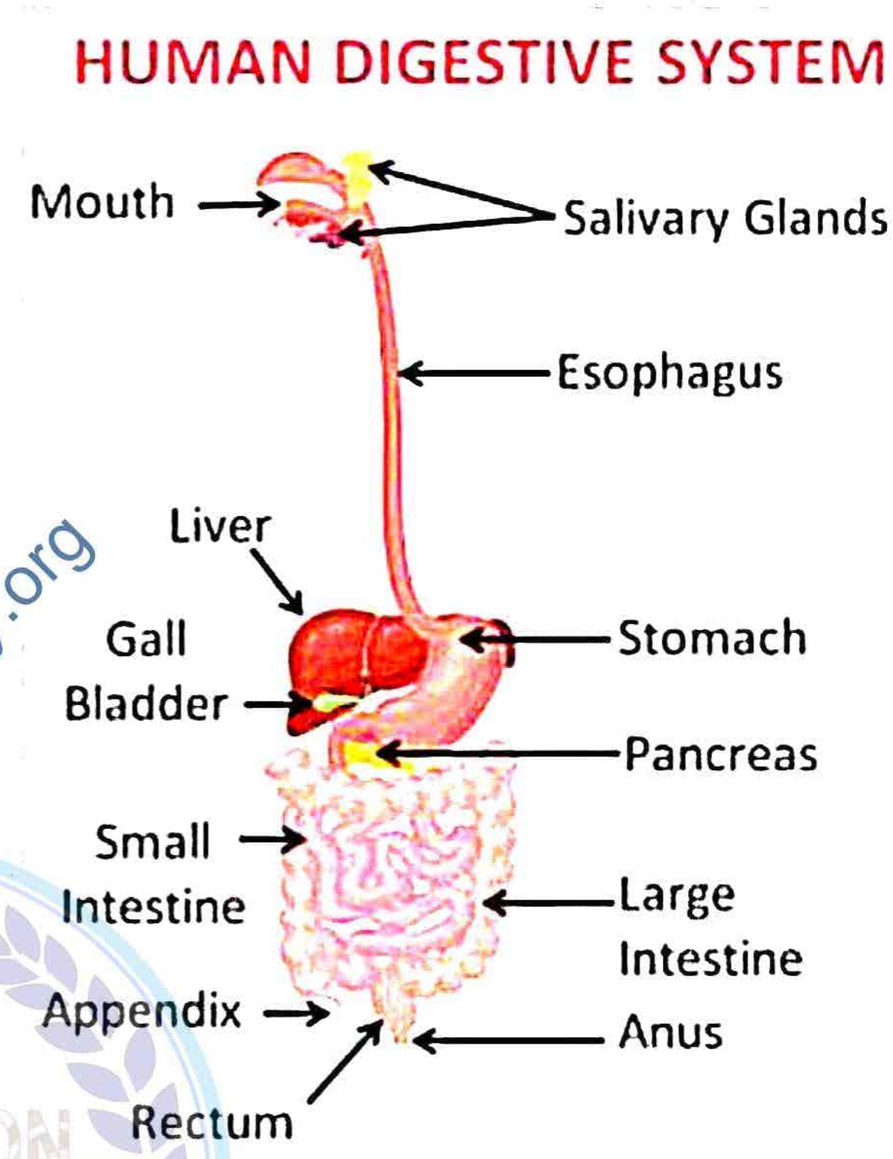
Planaria is carnivorous and feed upon crustaceans, small annelids, snails and debris of dead organism. Its digestive system is sac like or incomplete. Mouth is present on ventral surface. Its pharynx is everted cut like the tongue of frog and can pick the food into the mouth. Pharynx opens into the intestine. Intestine becomes branch into an anterior and two lateral branches. These branches end into diverticula (blind tube like or sac like organ). which are in direct contact with surrounding tissues. Digestion is of two type i.e. extracellular and intracellular digestion. Extracellular digestion takes place in intestine and intracellular digestion takes place in cells.



In intestine the food is partially digested, which may diffuse into the surrounding cells of diverticula and lead to complete digestion.

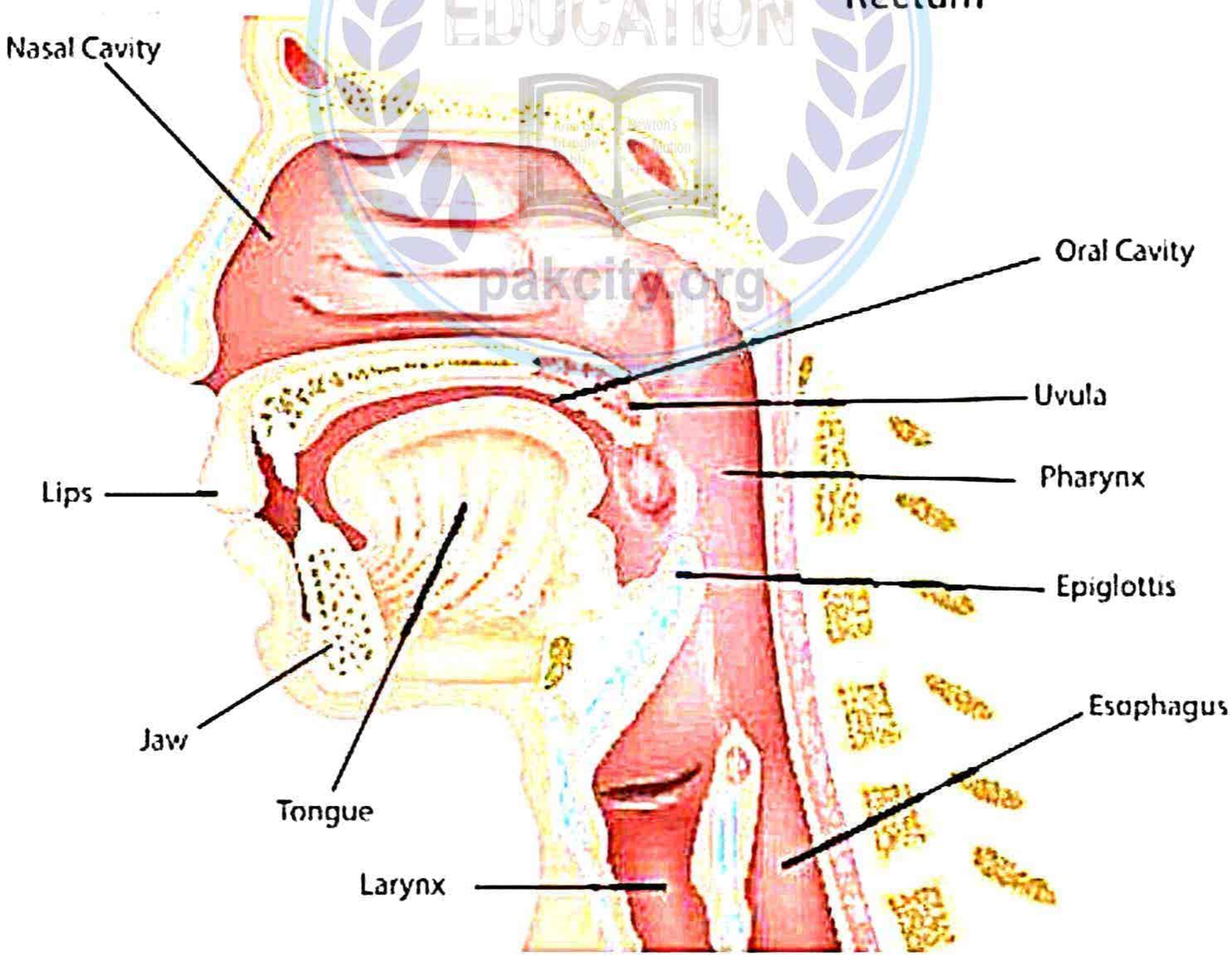
HUMAN DIGESTIVE SYSTEM:

Man having perfect digestive system. Digestive system of man consists of one-way tube which is called gastro intestinal tract. It begins with mouth and buccal cavity and which is followed by pharynx, esophagus, stomach, small intestine, large intestine and anus.



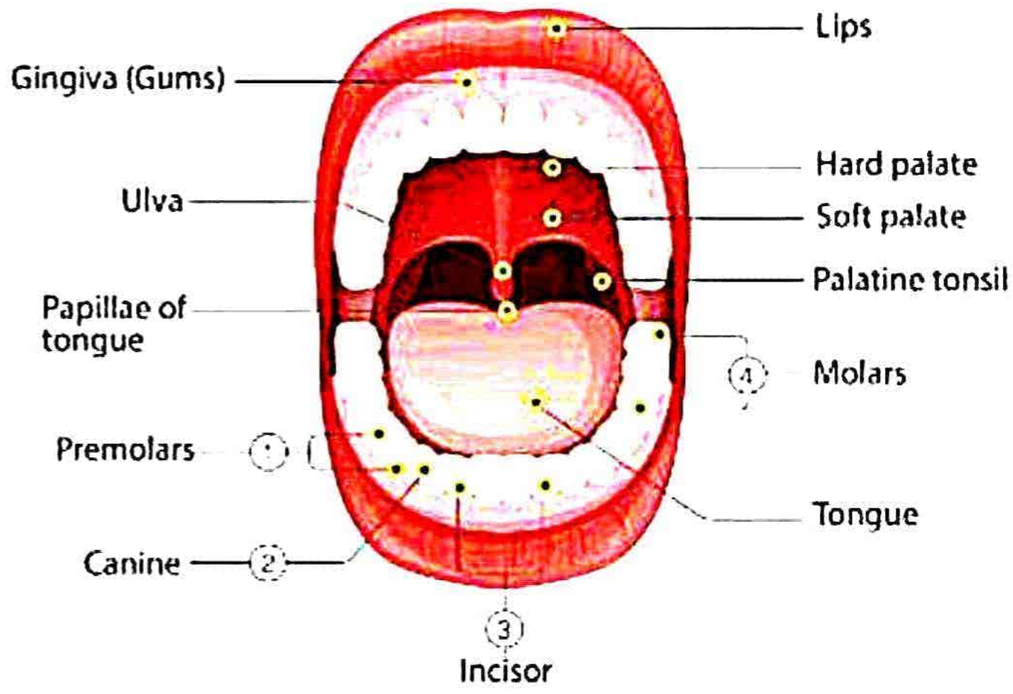
DIGESTION IN ORAL CAVITY:

Oral cavity consists of cheek, tongue, palate and jaws. Jaws are of two types, upper and lower jaw, both are provided with teeth which help in mastication of food. Tongue mixes the masticated food and saliva. Saliva is secreted by salivary glands, which are of three types. Saliva is 95 % water and contain mucus, amylase and lysozyme enzymes. By mastication and mixing with saliva food is converted into bolus which pushes down into pharynx.



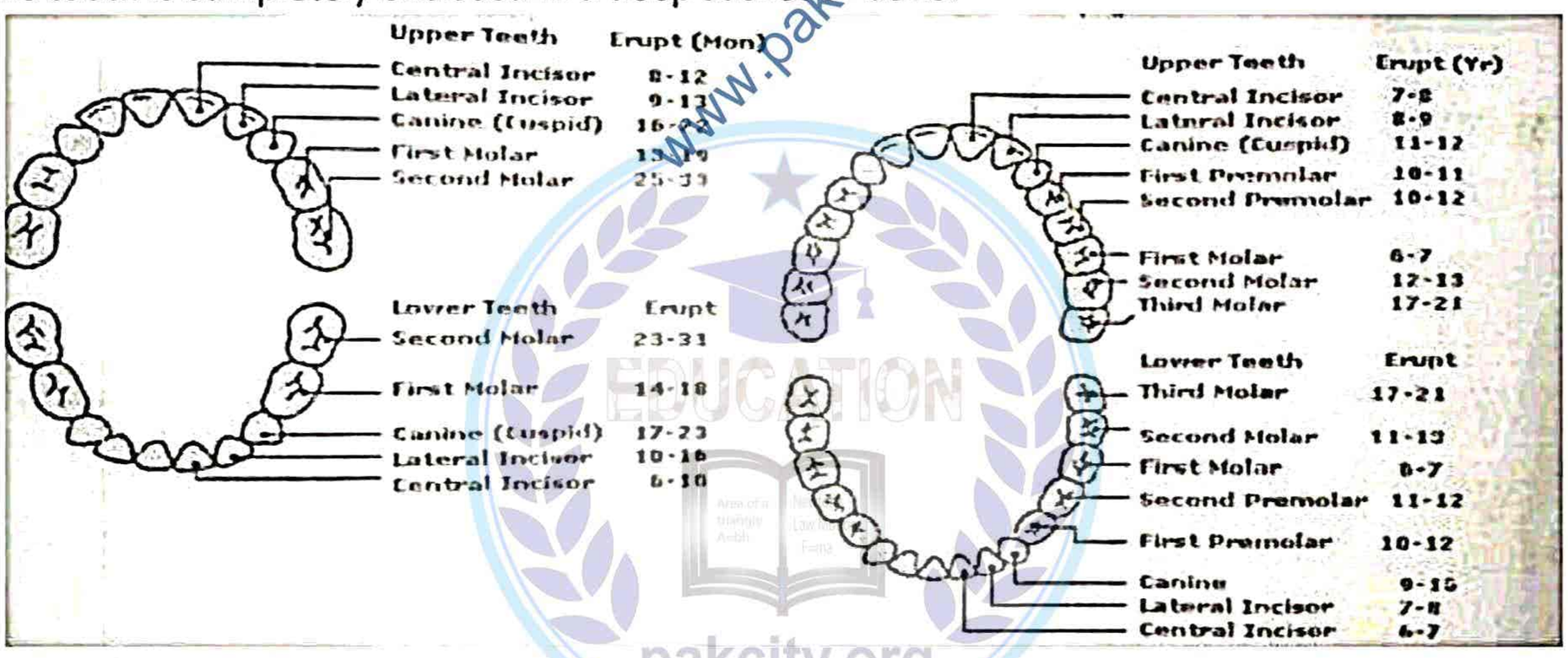
TEETH:

Human teeth are heterodont which indicate that there is difference in shapes of teeth. Human teeth consist of four types of teeth incisor, canine, premolars and molars.



- **Incisor:** 8 total, middle most on the upper and lower jaw, use for cutting and biting.
- **Canine:** 4 total, pointed teeth just outside the incisors, use for tearing and pulling flesh.
- **Pre-Molars:** 8 totals, between the canines and molars, use for grinding food.
- **Molars:** 12 total, rear of the mouth, use for grinding the food. Among molars 4 are wisdom teeth, erupt at around age 18.

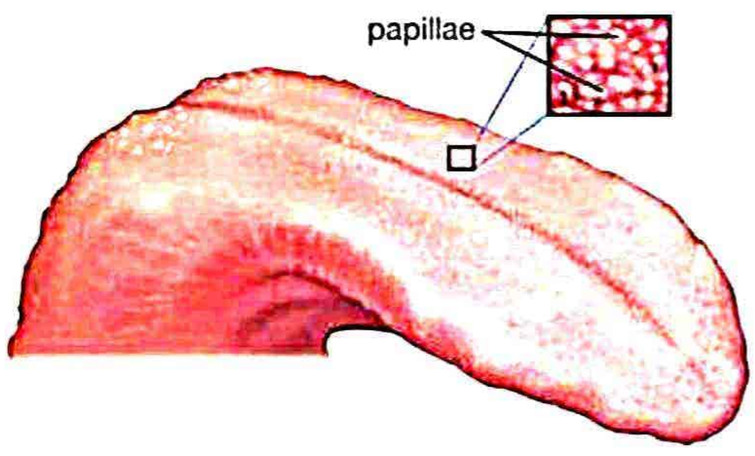
Human teeth are diphyodont, meaning that they develop two sets of teeth. The first set, deciduous teeth, also called "primary teeth" or "milk teeth", normally contains 20 teeth. Second set is the permanent teeth which contain 32 teeth. Human teeth are also described as thecodont means base of the tooth is completely enclosed in a deep socket of bone.



TONGUE:

It is a muscular organ help in the mastication, swallowing, taste and speech. It has papillae on the upper surface for sense of taste.

The human tongue



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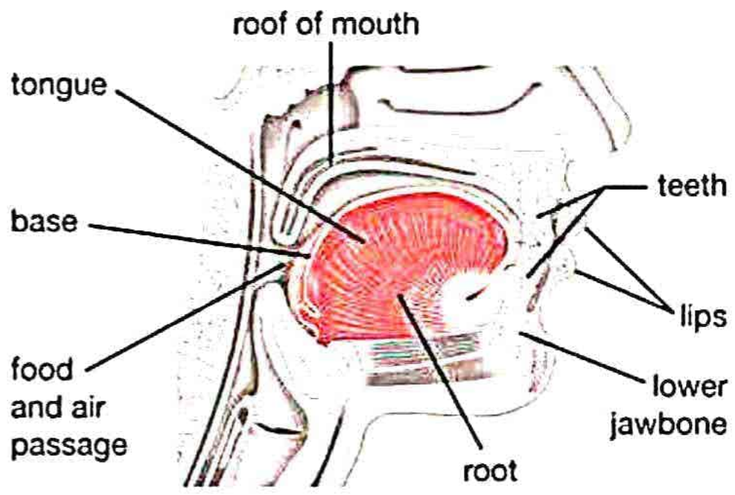


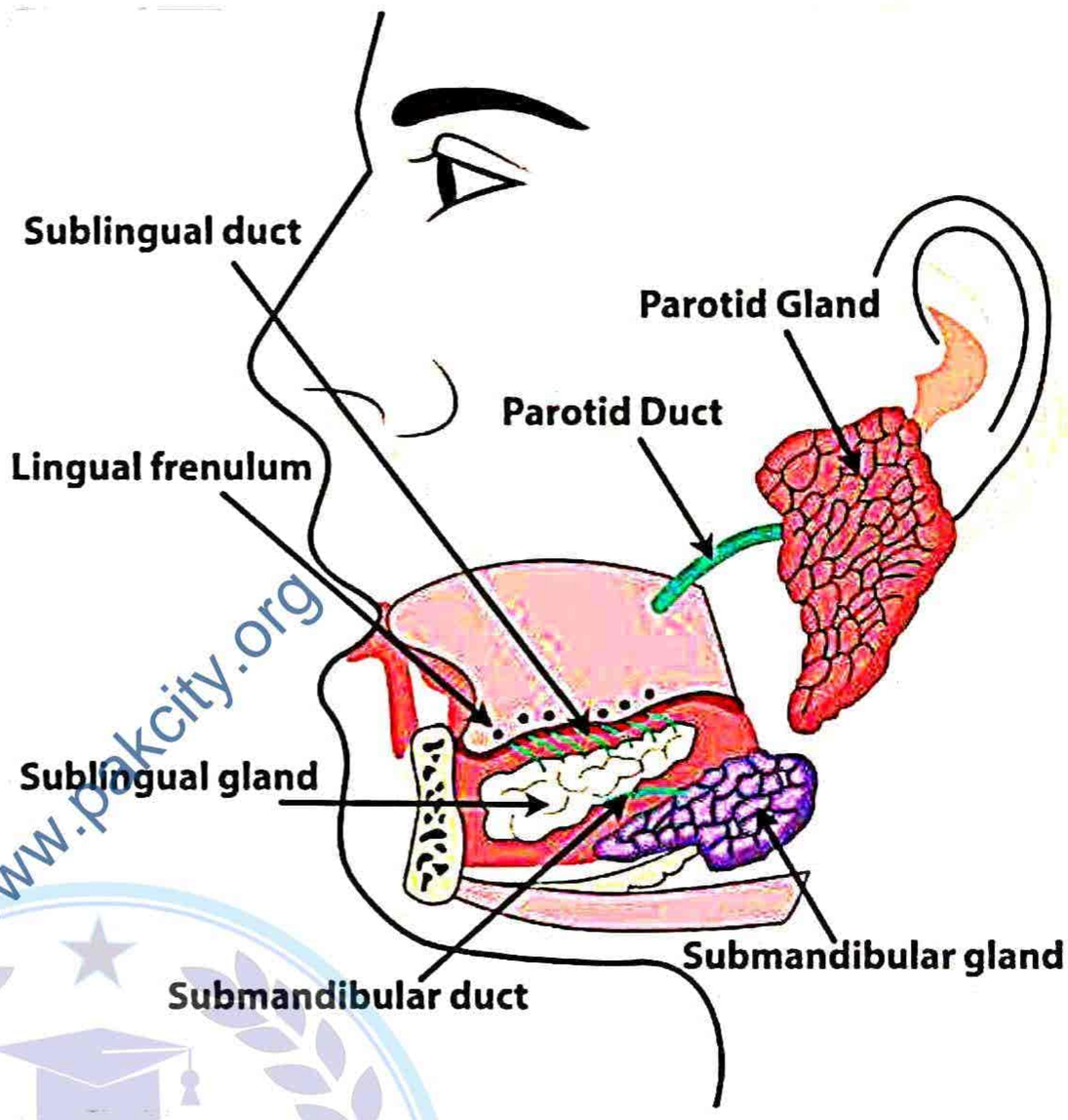
SALIVARY GLANDS:

About 1.5 liter of saliva is produced by salivary glands in 24 hours. Saliva lubricates your mouth, aid in swallowing, digestion and kills the germs. Saliva is composed of mucus, amylase, and lysozyme and electrolyte solution. Mucus serves as lubricant, amylase start the digestion of starch, lysozyme kill the germs while electrolyte (Na+, Cl-, K+) moistens the food. Humans have three paired major salivary glands parotid, submandibular, and sublingual.

- **Parotid:** present at the base of pinnae.
- **Sub-mandibular:** present at the base of lower jaw.
- **Sub-lingual:** present at the base of tongue.

PHARYNX:

Pharynx is a narrow part of oral cavity. It contains glottis and esophagus opening. When bolus passes from pharynx it pushes the epiglottis over glottis. In this way close the opening towards respiratory tract and reach into esophagus.



SWALLOWING:

Swallowing or deglutition is a process in which bolus is pushed behind the tongue into the pharynx. In this process uvula block the nasal pharynx and epiglottis block the glottis to prevent the entrance of food into air passage way.

PERISTALSIS:

Involuntary rhythmic contraction and relaxation of gut muscles which propels the food forward inside the gut is called peristalsis. Gut muscles are of two types, circular and longitudinal muscles. They work opposite to each other means when circular muscles relax then longitudinal muscles contract. This contraction result in the propulsive force that pushes food down the tract. The stimulus for peristalsis is distention.

ANTIPERISTALSIS:

Reverse involuntary contraction and relaxation of gut muscles that propels the food backward through the mouth is called antiperistalsis. It is also known as vomiting. The main reason of antiperistalsis is the over distention of stomach. During antiperistalsis stomach is pressed and cardiac sphincter is relaxed that allow upward flow of content.

ESOPHAGUS:

Esophagus is a narrow muscular tube containing mucus glands, convey food from pharynx to stomach by peristalsis process (propulsion movement of the gastrointestinal tract).

STOMACH:

Duodenun It is a J-shaped muscular expandable bag which serves as to store food, perform mechanical digestion, chemical digestion and convert food into chyme. It is divided into four regions; cardia, fundus, corpus (body) and pylorus.

DIVISIONS OF STOMACH:

i. Cardia: is present near the heart and it contains cardiac sphincter. It receives food from esophagus.
ii. Fundus: it is the upper curved part present below the cardia. It contains gas bubble just after taking meal.
iii. Corpus: is the middle main body of stomach, main reservoir of ingested food, it contains gastric glands.
iv. Pylorus: is present near duodenum and it contains pyloric sphincter which help in the release of food into duodenum.

GLANDS IN STOMACH:

i. Cardiac glands: having mucous gland.
ii. Fundic glands: having three types of gastric glands which secrete gastric juices includes;

a- Mucus secreting cells: secrete mucus.
b- Zymogen cells: secrete pepsinogen which act on protein and convert them into polypeptide.
c- Parietal / Oxyntic cells: secrete dilute HCl. It also secretes intrinsic factor important for RBCs maturation, B12 absorption and health of nervous system.

iii. Pyloric glands: having mucus glands secrete mucus and gastrin hormone. Gastrin hormone is secreted in response of distention of stomach and rising of pH.

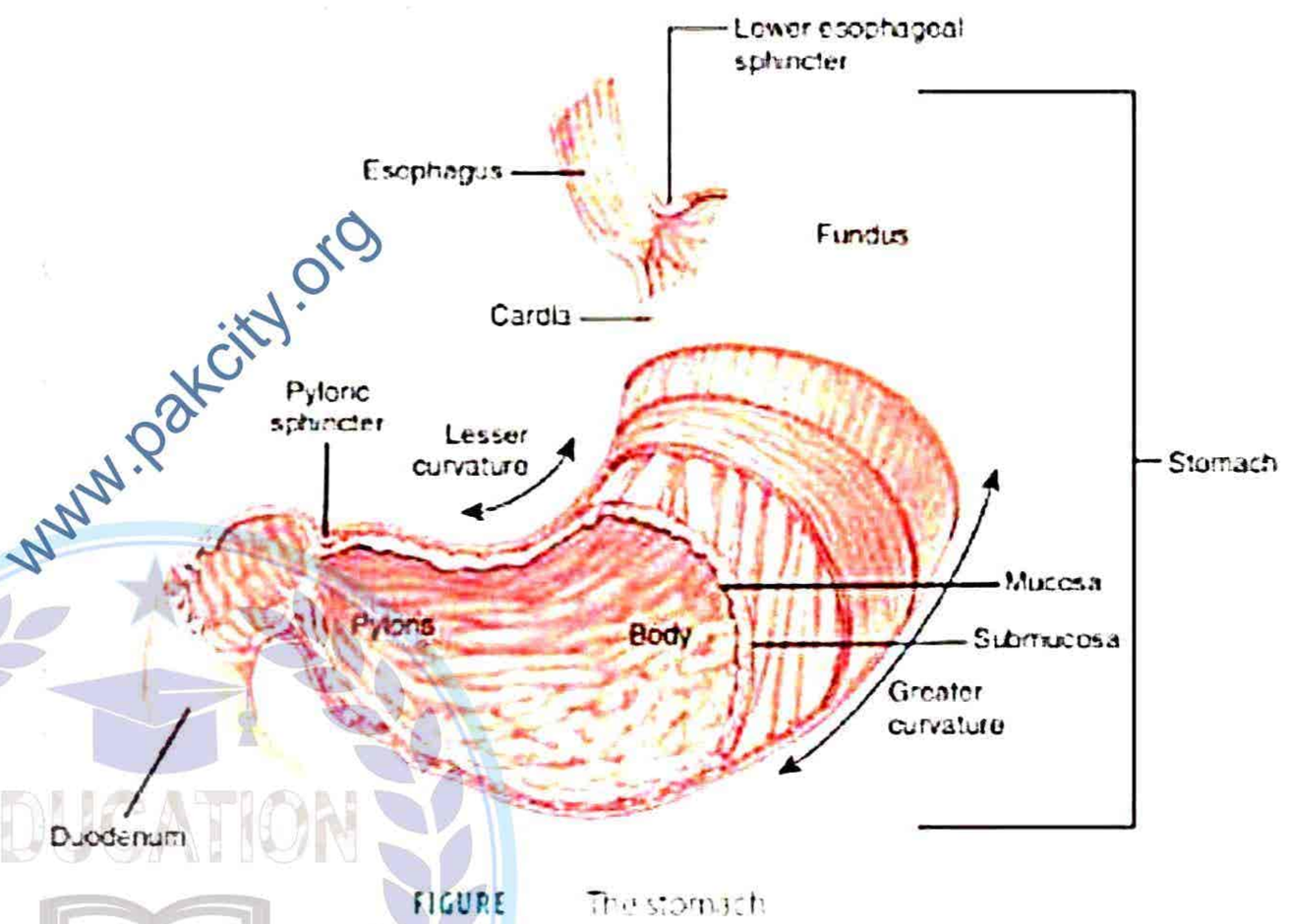


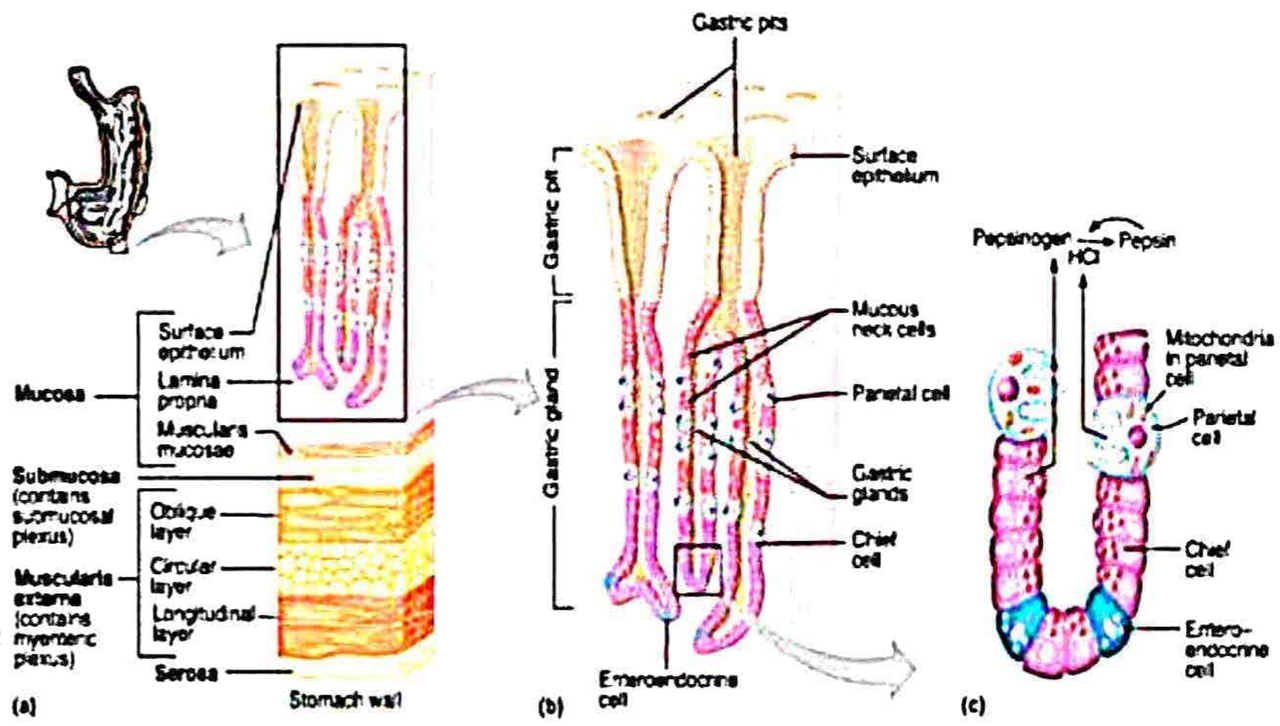
FIGURE The stomach

In addition to these there are certain endocrine glands distributed throughout the stomach that secrete serotonin which inhibit the gastric acid secretion.

PHYSIOLOGICAL PROCESSES OF MECHANICAL AND CHEMICAL DIGESTIONS IN STOMACH:

CHEMICAL DIGESTION IN STOMACH:

As food enter into stomach gastrin hormone is released from brain in response of smell, taste and sight of food and distention of stomach. Gastrin hormone stimulates the gastric glands to release the gastric juice. Gastric juice contains HCl and pepsinogen. HCKsoften the food, kills germs and activate the pepsinogen into pepsin. HCI not harms the inner wall of stomach because it is secured by mucous. Furthermore, the pH value remains different in two regions. It is 7 in mucosal layer and 1.5-2.5 in the lumen of stomach. Pepsin act on protein and turn it into peptones. In infants, renin or chymosin is released for the conversion of soluble milk protein caseinogen into soluble casein protein. Casein is then digested by pepsin.



MECHANICAL DIGESTION IN STOMACH:

It is achieved by the contraction of three types of smooth muscles in the stomach. These are oblique, circular, and longitudinal muscles. These muscles help in the churning and mixing of gastric juice with food. Finally food is pushed into duodenum with help of peristalsis movement.

ABSORPTIVE ROLE OF STOMACH:

Stomach absorbs water, glucose, simple sugar, amino acids and some fats soluble substances.

DIGESTION IN INTESTINE:

i- Small intestine

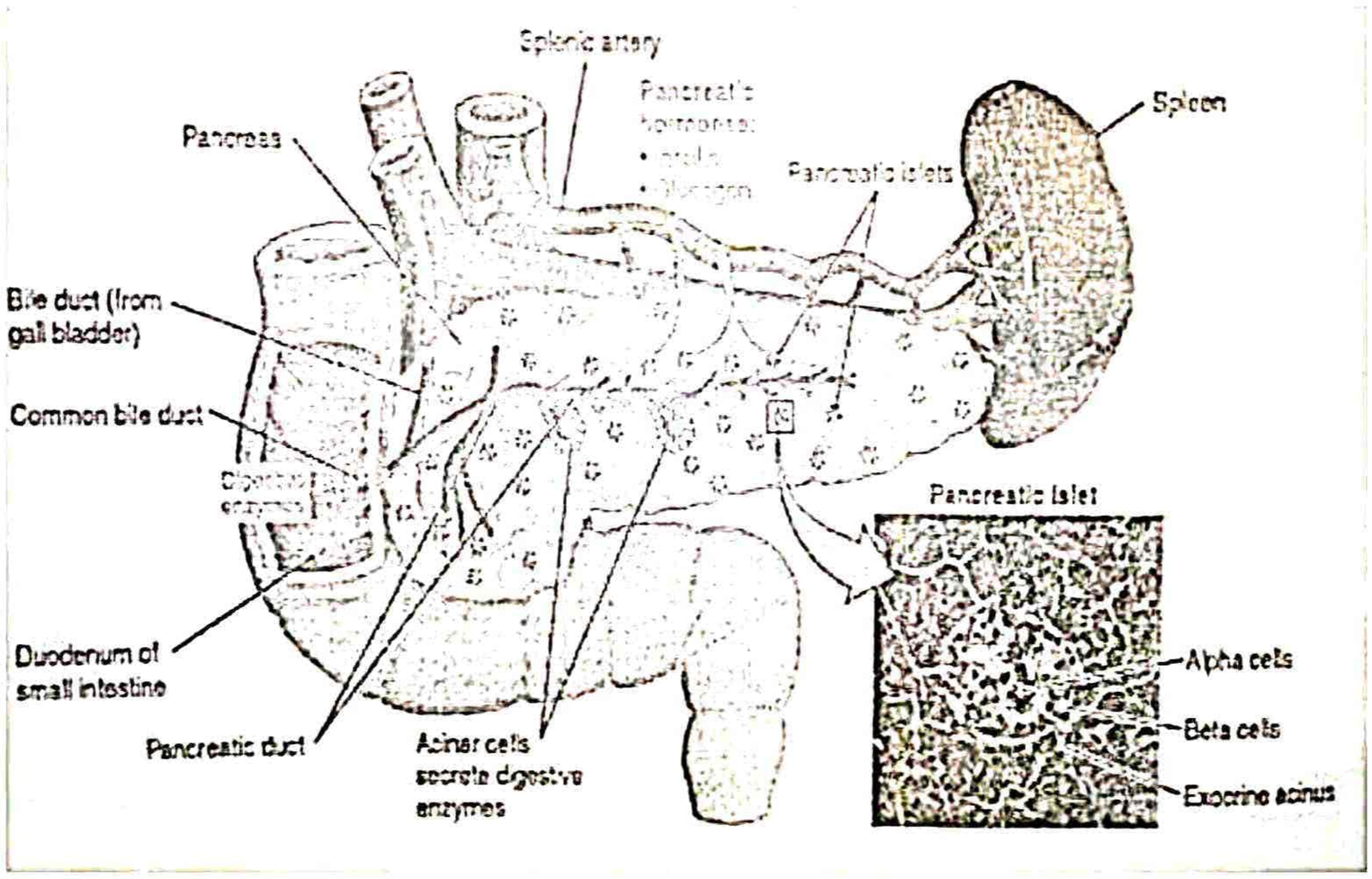
It is about 6-meter-long and 2.5 cm wide. There are three divisions of small intestine.

a- Duodenum:

It is about 30 cm long and present just after pyloric region. It receive chime when pyloric sphincter relax. It also receives bile juice and pancreatic juice through common duct. Bile juice from gall bladder and pancreatic juice from the pancreas is released under the influence of cholecystokinin (CCK) hormone, CCK secretion is stimulated by acidic chyme. Duodenum also secrete secretin hormone which stimulate the pancreas to discharge bicarbonate ions and water. Bile juice act on protein of chyme and bicarbonate ions neutralize the acidic chyme.

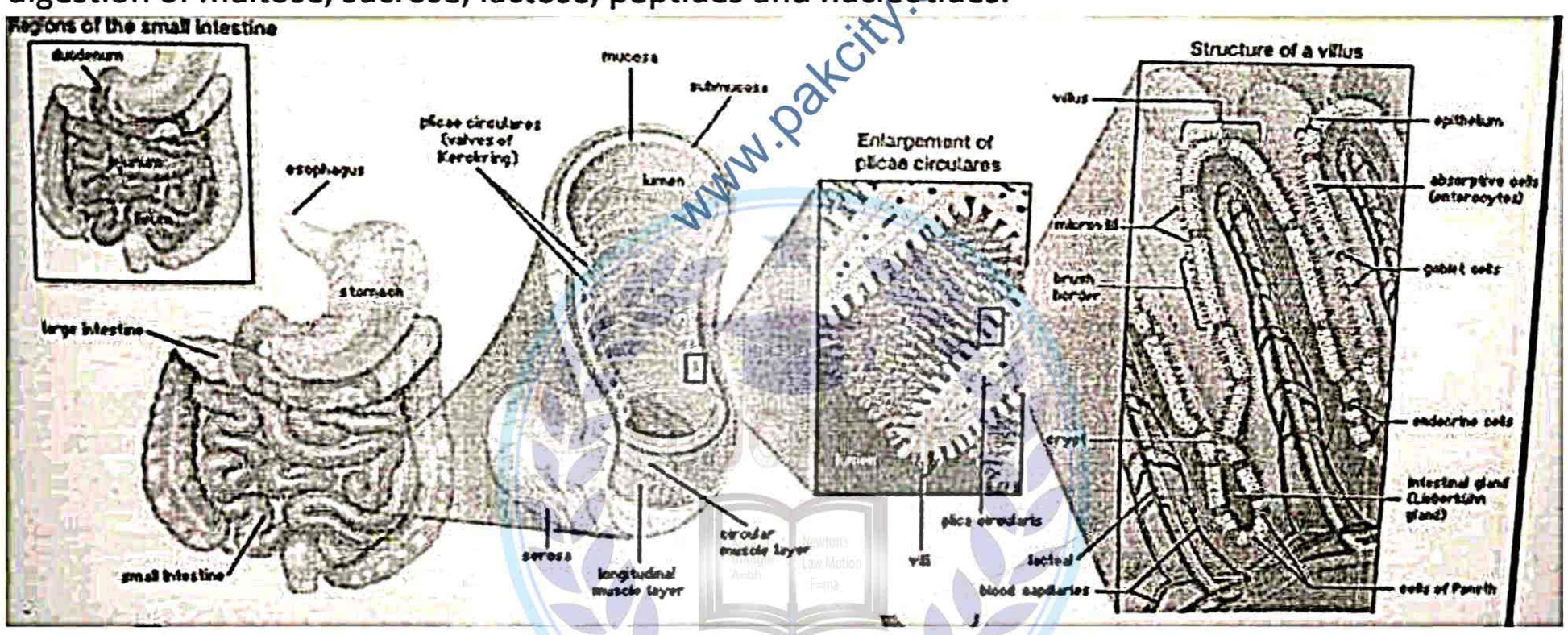
Bile juice consists of water, bile pigments and salts. Bile pigments are of two type bilirubin (yellow) and biliverdin (green) which are excretory. Bile salts include sodium glycholate and sodium taurocholate. Bile salts involved in emulsification of fats.

Pancreatic juice consists of trypsinogen, chymotrypsin, amylase and lipase. Trypsinogen is activated into trypsin by enterokinase secreted by duodenum. Trypsin breaks peptones into peptides. Chymotrypsin breaks casein into amino acids. Amylase breaks starch and glycogen into maltose. Lipase break emulsified fats into fatty acid and glycerol. Bruners glands of duodenum discharge mucous alkaline secretion that neutralizes the acidic chyme.



b- Jejunum:

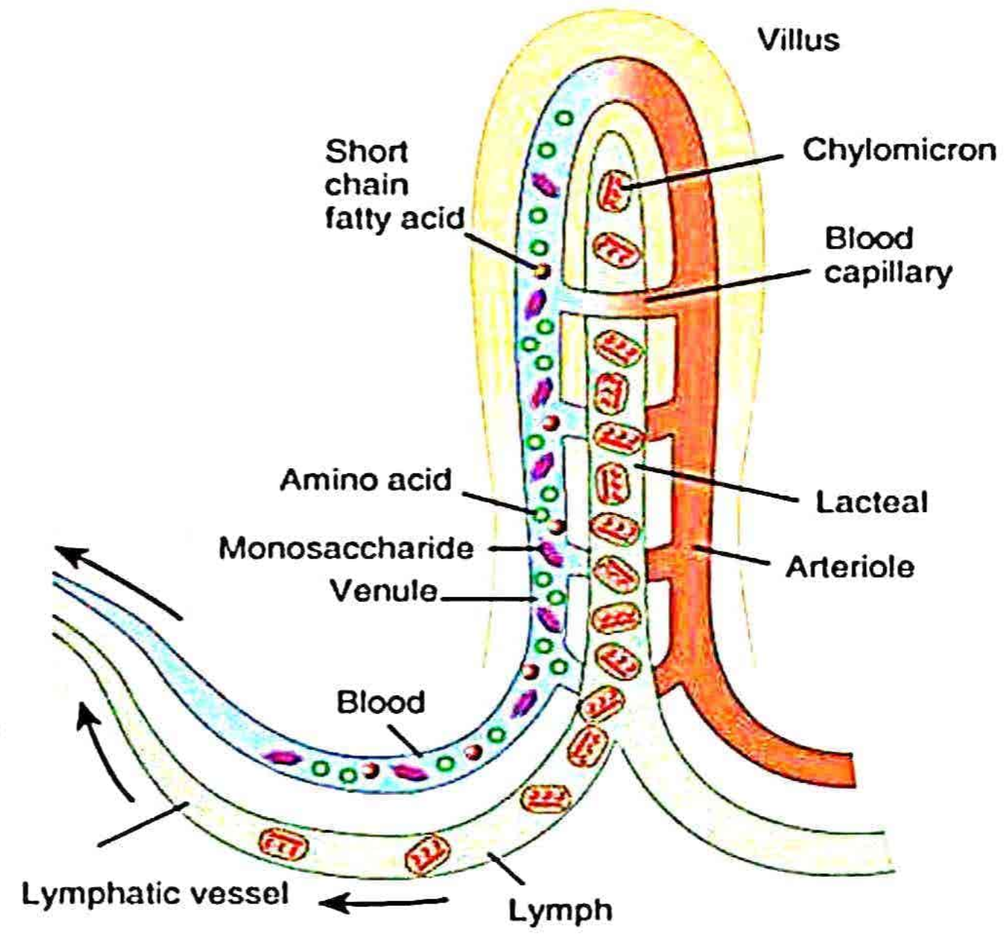
It is 2.5-meter-long tube and present just after the duodenum. It is involved in the digestion and absorption of food. Its cells secrete maltase, sucrase, lactase, peptidase and nucleotidase for the digestion of maltose, sucrose, lactose, peptides and nucleotides.



c- Ileum:

It is about 3.6-meter-long and involved mainly in absorption function. It can absorb vitamin B12, bile salts and digested product.

Internal wall of ileum has circular folds called plica circulares. Villi and microvilli are present on these folds that increase the surface area for absorption. Inside the villus blood capillaries and lacteals are present. Amino acids and monosaccharaides are directly absorbed by blood capillaries while fatty acids and glycerol due to large size absorbed by lacteals. Blood capillaries merge together and form hepatic portal vein that delivers absorbed food into liver storage, distribution and metabolism. Lymph vessels combine and deliver the fatty acids and glycerol into subclavian vein.



LARGE INTESTINE:

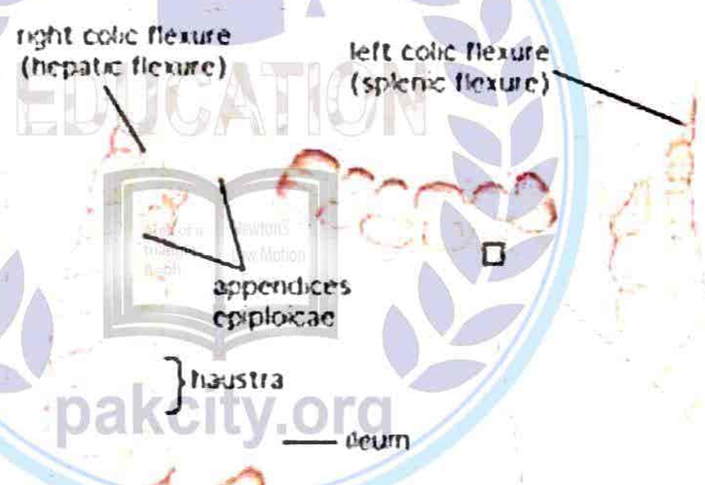
Large intestine is 1.5 meter in length and 6.5 cm in diameter. The main function of large intestine is reabsorption of water, nutrients and electrolytes (Na, Cl), synthesis of some vitamins and formation of faces. It is divided into three regions i.e. caecum, colon and rectum.

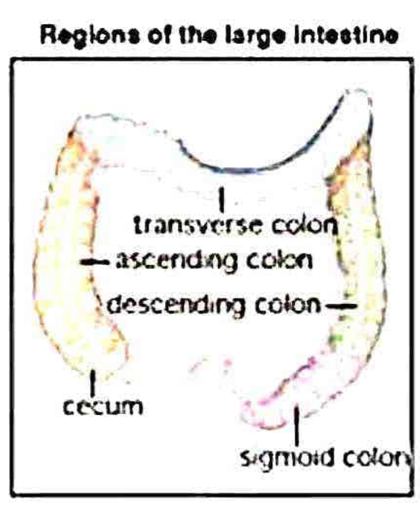
CAECUM:

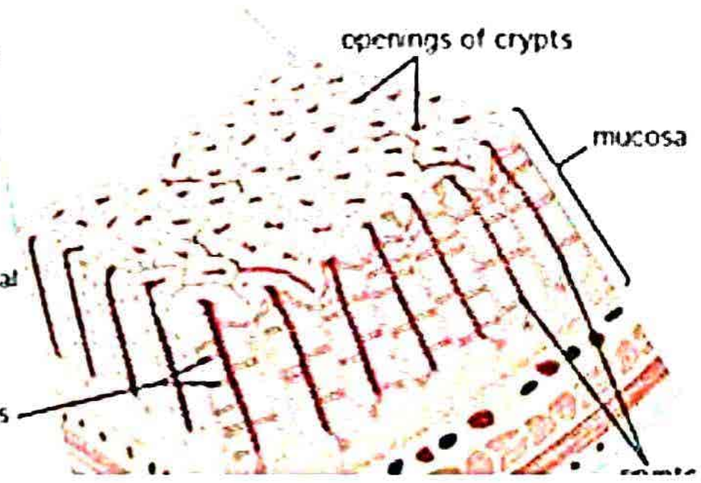
It is located in the lower right side of the abdominal cavity. Ileocaecal valve is present at the junction of ileum and caecum which control the movement of undigested food from ileum to caecum. In the caecum water and salts can reabsorb. In the lower side of caecum there is also a 18 cm blind tube known as appendix. It is vestigial organ.

COLON:

Colon is divided into ascending, transverse, descending and sigmoid colon. In the colon water, salts and vitamin reabsorption takes place. In the colon symbiotic bacteria present that synthesizes niacin, thiamin and vitamin K.



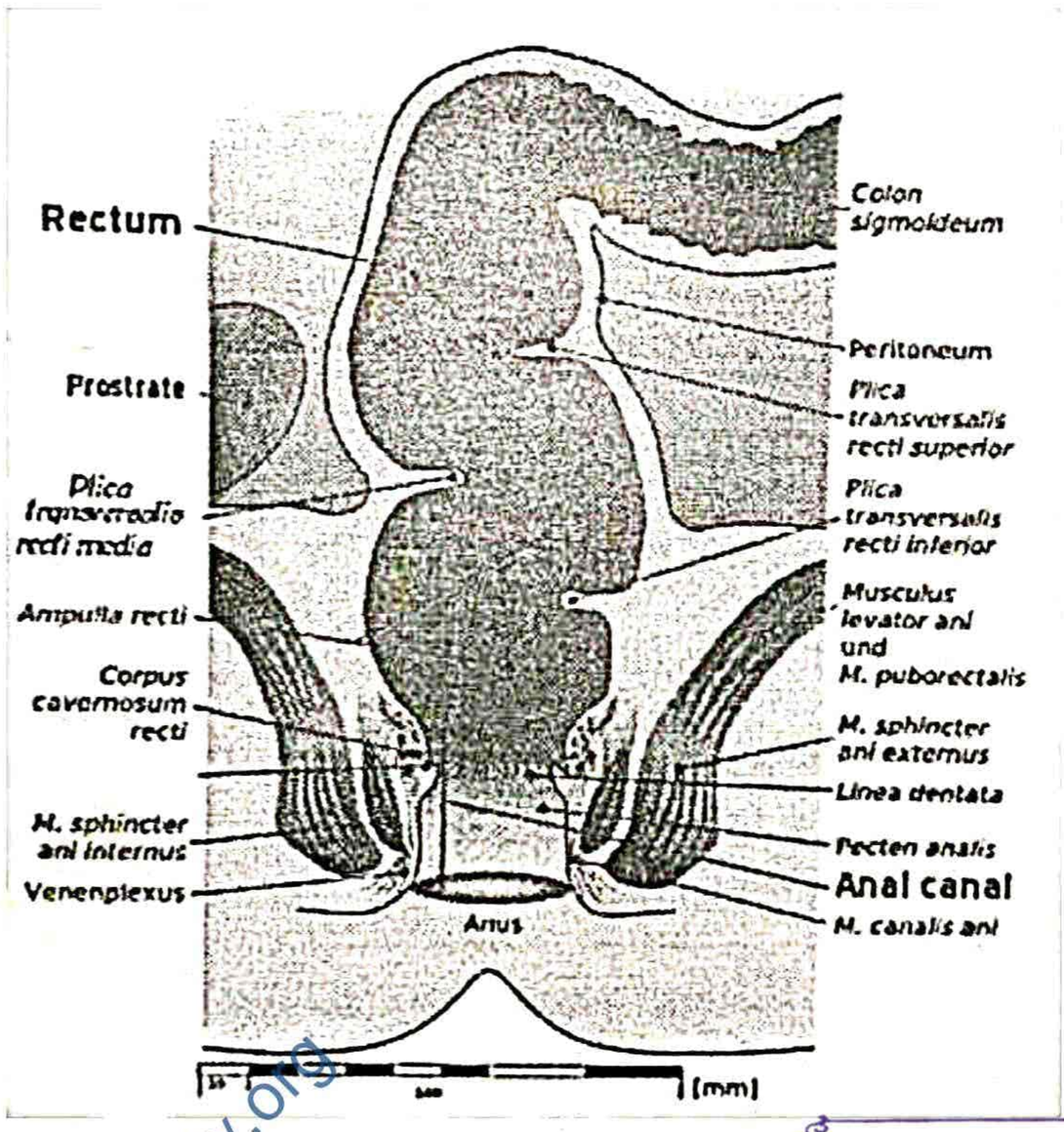




RECTUM:

Rectum is the last part of alimentary canal. It is 13 cm long and end into anal canal. Its last end enlarges to form rectal ampulla. When rectum is filled with feces then it receive stimulus for defecation. Anal canal has two sphincters i.e. inner and outer. Inner sphincter is made up of smooth muscle, having involuntary control and outer sphincter is made up of skeletal muscles having voluntary control. During defecation rectal muscles contract and inner and outer sphincter valves muscles relax.

In infants there is no voluntary control of outer sphincter hence they defecate inconveniently anytime.



ROLE OF ACCESSORY GLANDS:

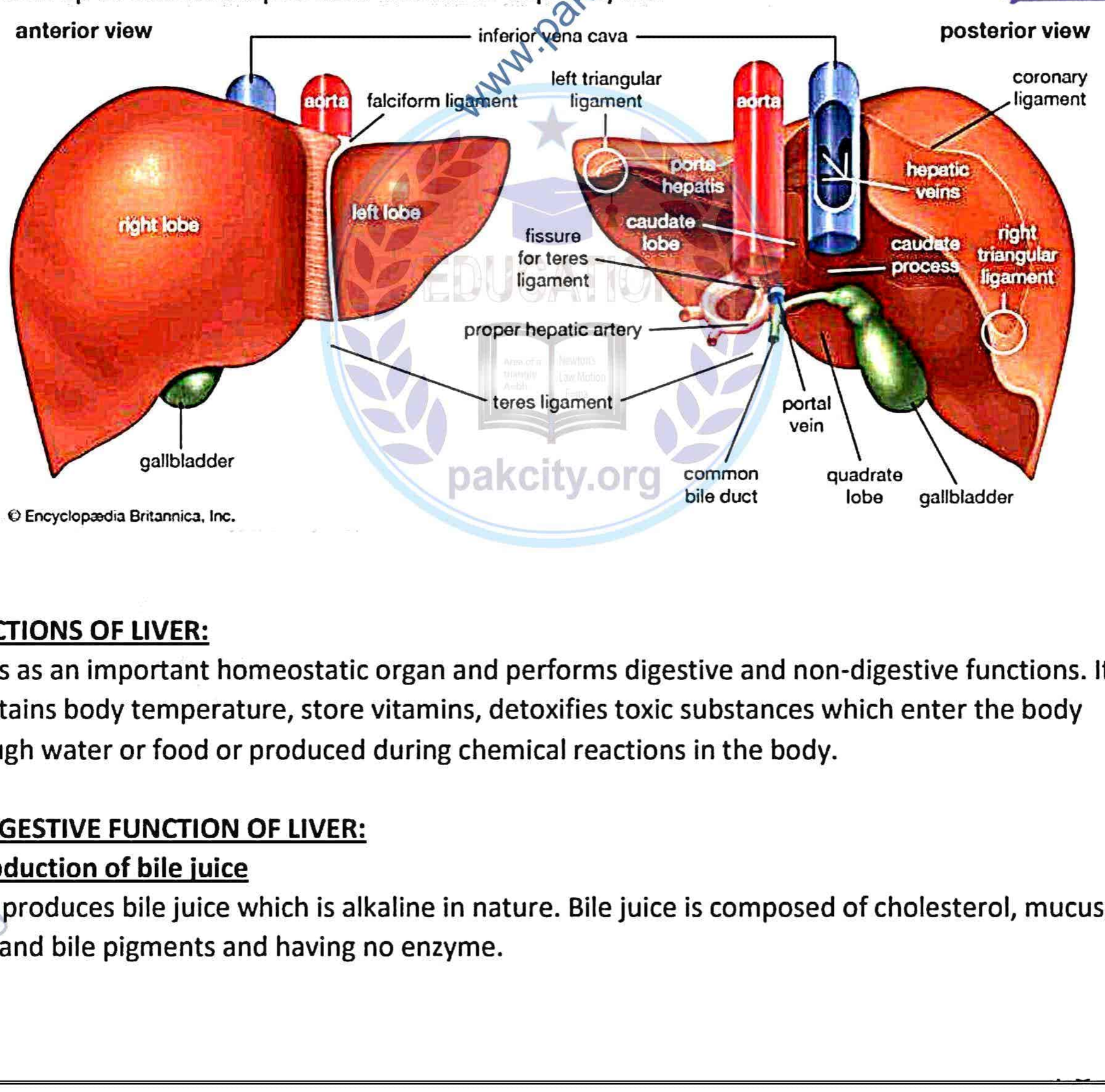
Three types of exocrine glands are involved in the process of digestion in human. These glands are known as accessory glands.

SALIVARY GLANDS:

Salivary glands are of three types and discussed earlier in this chapter.

LIVER:

Liver is the largest gland in human body. It is situated in the upper part of duodenal cavity bellow the diaphragm. It is covered by peritoneum. It is divided into four lobes anterior right and left lobe and posterior caudate and quadrate lobes. These lobes are made up of hexagonal lobules which are made up of cubical shaped cells known as hepatocytes.



FUNCTIONS OF LIVER:

It acts as an important homeostatic organ and performs digestive and non-digestive functions. It maintains body temperature, store vitamins, detoxifies toxic substances which enter the body through water or food or produced during chemical reactions in the body.

A) DIGESTIVE FUNCTION OF LIVER:

i- Production of bile juice

Liver produces bile juice which is alkaline in nature. Bile juice is composed of cholesterol, mucus, bile salts and bile pigments and having no enzyme.

Functions Of Bile Juice:

- It is involved in the process of emulsification (conversion of fats into fat droplets).
- It activates pancreatic lipase which converts fat droplets into fatty acids and glycerol within duodenum.
- It increases the efficiency of protein and carbohydrate digesting enzyme.
- It stimulates digestive hormone secretion. It helps to absorb vitamin k in small intestine.
- It increases uptake of vitamin A, D, and K.

B) NON-DIGESTIVE FU CTION OF LIVER:

i. Synthesis function:

Synthesize plasma proteins (pro-thrombin, fibrinogen, albumin), lipids, cholesterol, lipoproteins, phospholipids and nitrogenous wastes (NH3, urea, and uric acid), vitamin A from carotene.

ii. Conversion of glucose:

Excess amount of glucose is stored in the liver in the form of glycogen in the presence of insulin. When body needs extra energy then this glycogen is converted back to glucose in the presence of glucagon.

iii. Fat metabolism:

When there is not enough insulin in the blood then the excess amount of glucose will not have converted into glycogen so, fat must be break down instead of glucose for energy. Liver oxidized fat into fatty acids and triglyceride to release energy.

iv. Protein metabolism and ornithine cycle

Our body cannot store excess protein therefore it must be broken down.

- Deamination (removal of amino group).
- Amino group converted to ammonia, which is highly toxic,
- Ammonia combines with CO_2 and changed to urea, which is less toxic by a cycle called ornithine cycle.

v. Recycling :

The hemoglobin of destructive RBC's is supplied to liver where the Kupffer cells break it into heme and globin. Because of this process, iron (Fe amino acid and bile pigments are produced. Iron (Fe^{+}) is supplied to bone marrow for further formation of RBC's while bile pigments are remained in liver and along with bile juice these pigments are eliminated from the body.

vi. Defence:

Kupffer cells are hepatic macrophages provide protection against the microorganism.

vii. Storage function:

Liver stores iron, glycogen, vitamin A, D, E, K, B12, folic acid and riboflavin, niacin, pyridoxine.

viii. Detoxification:

Liver has an ability to detoxify toxic substances such as food additives, pesticides and drugs etc.
For example: Alcohol, toxins produced by micro-organisms.

viii. Inactivation of hormones

Liver in activate insulin, glucagon, cortisol, aldosterone, thyroid and sex hormones.

ix. Thermoregulation:

Liver regulates body temperature, because liver has efficient blood supply, large size and high metabolic rate.

PANCREAS:

The pancreas is an organ and a gland. Glands are organs that produce and release substances in the body. Pancreas releases the pancreatic enzymes into small ducts (tubes) that flow into the main pancreatic duct. Main pancreatic duct connects with bile duct. Both the bile duct and pancreatic duct form hepatopancreatic ampulla that enter duodenum through duodenal papilla.

The pancreas performs two main functions:

- **Exocrine function:** Produces substances (enzymes) that help with digestion.
- **Endocrine function:** Sends out hormones that control the amount of sugar in your bloodstream.

Pancreas produces enzymes that help to break down food (digestion). Your pancreas releases the following enzymes:

- **Lipase:** Works with bile to break down fats.
- **Amylase:** Breaks down carbohydrates for energy.
- **Protease:** Breaks down proteins.

DISORDERS RELATED TO DIGESTIVE SYSTEM AND FOOD HABITS:

ULCER

Ulcer is painful wound develop in the digestive tract. It is also known as peptic ulcer, gastric ulcer or intestinal ulcer. It happens when HCl of digestive juice cut the protective layer of mucous membrane. Peptic ulcer is caused by bacteria (H. pylori), aspirin, stress, alcohol and spicy food.

Symptoms: Symptoms of ulcer are loss of appetite, abdominal pain, nausea and vomiting.
Treatment: Antibiotics and proton pump inhibitor to reduce secretion of acid in stomach.

FOOD POISONING:

Food poisoning is caused by polluted, spoilt and toxic food. Polluted food contains bacteria such as staphylococcus, viruses and parasites. One main reason is uncooked food.
Symptoms: stomach cramp, vomiting, fever and diarrhea.
Treatment: antibiotics, rehydration, and electrolyte solutions.

DYSPEPSIA:

Dyspepsia is also known as indigestion. Dyspepsia occurs just after taking food or water. Its symptoms are pain in upper abdomen, blotting, nausea, and heart burn.

Causes Of Dyspepsia:

- Overeating or eating too quickly.
- Fatty, greasy or spicy foods.
- Too much caffeine, alcohol, chocolate or carbonated.
- Smoking.
- Anxiety.
- Certain antibiotics, pain relievers and iron supplements.

OBESITY:

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese. BMI is obtained by dividing weight of a person with its height.

Causes Of Obesity:

- Eating more calories than you burn in daily activity and exercise.
- Having a sedentary lifestyle and no doing no exercise.
- Genetics, which can affect how your body processes food into energy and how fat is stored.
- Growing older.
- Not sleeping enough.

Effects Of Obesity:

- Type 2 diabetes.
- Heart disease.
- High blood pressure.
- Cancer.
- Arthritis.
- Infertility.

Treatment:

- Medication.
- Healthy Diet.
- Exercise.

ANOREXIA NERVOSA:

It is the loss of appetite due to prolong refusal to eat. It is psychological disorder in young women. They don't eat due to the fear of gaining weight. It result in weight loss spontaneous or induce vomiting in some patients.

BULIMIA NERVOSA:

Bulimia nervosa is the reverse of anorexia nervosa. It is the psychological disorder of adult women. It involves episodes of uncontrollable eating and excessive food consumption. This condition is known as binge eating. It results in weight gain and purging. This disorder may lead to kidney failure, heart problem, teeth decay, electrolyte or chemical imbalance.

SHORT QUESTION ANSWER

Q#1: . List out the stages of holozoic nutrition.

vi. Ingestion: intake of food through cell surface or mouth.

vii. Digestion: breakdown of food of complex food into simple food with the help of enzymes.

viii. Absorption: absorption of diffusible food into blood or body through intestine.

ix. Assimilation: utilization of the absorbed food.

x. Egestion: removal of undigested food from the body through cell surface or anal opening.

Q#2: Enlist the role of large intestine.

The large intestine has 5 primary functions:

i. Absorbing water and electrolytes,

ii. Producing and absorbing vitamins,

iii. Formation and storage of feces,

iv. Propelling feces toward the rectum for elimination and.

v. Fermentation of some of the indigestible food matter by bacteria.

Q#3: What accounts for the presence of bacteria in large intestine?

Large intestine normally contains a microflora with total concentrations of 10^{11} bacteria/g of stool. A decrease in oxygen concentration and antimicrobial compounds along the intestine leads to an increase diversity in the large intestine with several obligate anaerobic bacteria. E.g. Streptococci, E.Coli etc.

Q#4: List out some factors that may lead to obesity?

Factors that cause obesity are given bellow;

- Eating more calories than you burn in daily activity and exercise.
- Having a sedentary lifestyle and no doing no exercise.
- Genetics, which can affect how your body processes food into ergy and how fat is stored.
- Growing older.
- Not sleeping enough.

Q#5: What is anorexia nervosa?

It is the loss of appetite due to prolong refusal to eat, It is psychological disorder in young women. They don't eat due to the fear of gaining weight. It result in weight loss spontaneous or induce vomiting in some patients.

Q#6: Define plica circulare.

One of numerous permanent cresc folds of mucous membrane found in the small intestine especially in the lower part of the duodenum and the jejunum. They are also called valvula connivens.

Q#7: Which mode of nutrition is holozoic?

Holozoic nutrition is a mode of nutrition in which organisms take in food from outside and digest it inside their bodies.

Q#8: Where are the taste buds located?

Taste buds contain the taste receptor cells, which are also known as gustatory cells. The taste receptors are located around the small structures known as papillae found on the upper surface of the tongue, soft palate, upper esophagus, the cheek, and epiglottis.

Q#9: What are the main functions of the oral cavity? or Give oral cavity.
The oral cavity performs several functions, the most important are the
- Selection of food.
- Grinding or mastication.
- Lubrication.
- Digestion.

Q#10: Give the names and location of salivary glands found in man.
- Sublingual glands situated below the tongue.
- Submaxillary glands behind the jaws.
- Parotid glands in front of the ears.

Q#11: What is saliva? What are ingredients of saliva? or what is composition of Saliva. Give their role or What is pH and composition of saliva?
Saliva is the secretion produced by salivary glands present in the oral cavity. Fresh saliva is alkaline with a pH nearly 8 quickly loses carbon dioxide and gets to pH 6. It is composed of Water and mucous, to lubricate food

Sodium bicarbonate and some other salts, to stabilize pH.
Enzyme amylase or ptyalin, to digest carbohydrates.

Q#12: What is ptyalin or amylase?
Ptyalin is a carbohydrate-digesting enzyme, which digests starch and glycogen to maltose.

Q#13: What is bile? Give its function.
The bile is green, watery fluid. It contains no enzymes, but its green colour is due to the bile pigments, which are formed from the breakdown of haemoglobin in the liver. The bile also contains bile salts, which act on fats, and emulsifies them.

Q#14: What are villi?
The internal surface of ileum has many folds, which show velvety appearance due to the presence of numerous finger-like outgrowths called villi.

Q#15: What is the difference or differentiate between appendix and appendicitis? or What is appendicitis?
Appendix is the finger like process that arises from blind end of caecum whereas appendicitis is an infection caused due to entrapment and then putrification of food in appendix.

Q#16: How tubular digestive system is more efficient than sac like digestive system? or Differentiate between sac like system and tube type digestion.
The tubular digestive system of cockroach is more efficient system than sac like digestive system of Hydra or Planaria, in having specialized organs or partitions for efficient digestion and absorption of food. Sac-like digestive has a single opening which is used both as mouth as well as anus.

Q#17: What is the function of water and mucus found in saliva?
Water and mucus together make a slimy liquid which serves to moisten and lubricate the food so that it can be chewed efficiently and passed through the esophagus smoothly.

Q#18: What is peristalsis?
It consists of the wave of contraction of the circular and longitudinal inuscles of digestive ract preceded by the wave of relaxation thus squeezing the food down along the canal.

Q#19: What is antiperistalsis?
Sometimes peristaltic movements are reversed and food may be passed from the intestine back into the stomach and even into the mouth. This movement is called antiperistalsis.

Q#20: What is the composition of stomach wall?
The stomach wall is composed of three principal layers an outer layer of connective tissue, middle layer of smooth muscles and inter layer (mucosa) of connective tissue with many glands.

Q#21: What is gastric juice? What is the composition / ingredients of gastric juice?
The secretion of different types of cells of gastric glands is collectively called gastric juice which contains mucus, hydrochloric acid and pepsinogen.

Q#22: What is the function of hydrochloric acid released by gastric glands?
Hydrochloric acid is secreted in concentrated form. It adjusts the pH of stomach contents ranging from 2-3 for the pepsin to act on proteins. It also softens the food and kills microorganisms taken in along with the food. many

Q#23: What is pepsin? or What is difference between pepsin and pepsinogen? or Give two ways by which pepsinogen is activated.
Pepsin is an enzyme secreted in an inactive form called pepsinogen. Pepsinogén is activated to pepsin when exposed to the acidic medium or to some already activated pepsin. Pepsin hydrolyzes protein to yield peptones and polypeptides.

Q#24: What is chyme?
The muscles of stomach wall thoroughly mix up the food with gastric juice and eventually convert it to semi-solid mass called chyme.

REASONING QUESTIONS

Q1: Why holozoic nutrition is important?

Just like a vehicle needs fuel to move a living cells needs supply of food to perform its various biological functions through this process the cells get mineral to grow repair themselves.

Q2: In which substance food of an organism consist of why nutrients are required for?

The food of an organisms consists of different substances, "The Nutrients", which are essentially required by the protoplast m to perform its different biological functions.

Q3: Why digestion in planaria is intracellular as well as extracellular?

Planaria has an incomplete digestive system This digestive system consists of mouth, carynx and gastro vascular cavity. This incomplete digestive system is the reason for both extra cellular & intra-cellular digestion.

Q4: How digested food is diffuses in planaria?

In planaria the digested food is diffuses through the cells of the gastro vascular cavity into the mesenchyme cells.

Q5: Why are many proteases released in an inactive form?

Proteases should breakdown proteins of food. But not the cells walls of the digestive tract, it they were produced in the active form, they would digest the cell, which produce them, as well as other cell in the living of the digestive system.

Q6: Why epiglottis is present on larynx?

B/c epiglottis does not allow water & food particles in larynx.

Q7: Why saliva is release?

The saliva is a watery secretion containing 95% water, some mucus and amylase & lysozyme enzymes. The mucus moistens and lubricates the food for comfortable swallowing. The salivary amylase begins the digestion of starch into maltose.

Q8: How pancreases served as both endocrine & exocrine gland?

Pancreases is exocrine as well as endocrine in function. The exocrine parts produces pancreatic juice and the endocrine part produces insulin and glycogen hormones.

Q9: How obesity is considered as source of several killer diseases?

It is related to the accumulation of excessive body fats, which causes in excesses weight gain (BMI) due to excessive accumulation of fat, obesity increases the risk of diabetes cardiovascular diabetes pertension & some cancer too.

Q#10: How stomach itself is TOY tected against the strong HCl?

Stomach protects itself from strong HCl in two ways. First inside of the stomach is protected by the mucus and second, the pH value remains different in two regions of stomach. It is 7 in mucosal layer and 1.5-2.5 in the lumen of stomach.

Q11: Why mucous is present on mucous living?

On the sight of food input especially proteins in stomach, it causes in release and can cause damage to stomach living. The stomach itself through its thick mucous, having pH of 7 causes protection of stomach lining.

Q12: Why pepsin is absent in infants?

In infants, pepsin is absent and rennin is present instead of pepsin. Rennin is secreted that turns soluble milk protein, casinogen into insoluble protein, casein which is then digested by pepsin.

Q13: Why churning movement is needed?

Churning movement on peristaltic construction is an essential part of digestion. It causes in mixing of gastrin enzyme with food and also causes in movement of food from one to another place.

Q14: What causes in un-mixing of like and pancreatic juice?

Bile and pancreatic juice share a common duct for release on food. In-mixing of Bile and pancreatic juice is prevented by a sphincter, which prevent them from intermining.

Q15: Why bicarbonate and ions are needed?

Ions and Bicarbonate are needed for the neutralization of chime in duedonum for the purposal of protection of alimentary canal living from acidic pH of chime.

Q16: Why bile is necessary?

Bile is has nothing to do with digestion, it contains only alkaline salts. Salts of file, neutralization acidic nature of chime and these salts are essential for emulsification of fats.

Q17: How villi can contract?

Each villus, has a dense plexus of blood capillaries, lacteals & smooth muscles. These smooth muscles causes in contraction of villi (on the light of tab)

Q18: Why large intestine lacks villi?

In large intestine, there is no absorption of complex molecules. These molecules are absorbed into small intestine. In large intestine, molecules like water, some minerals and nutrients are absorbed, on the other hand no absorption of fats.

Q19: Why infants have different muscles in Rectum?

In case of infants, because of lack of voluntary control, the defection reflex is automatic & that's why they defecate inconveniently anytime.

Q20: Why appendix is considered as vestigial organ?

Vermiform appendix is a blind tube in caecum. Formerly it had purpose of cellulose digestion but by the passage of time cellulose digestion is totally reduced in human body that's why mass appendix has no purpose and role in digestion.

Q21: Why jaundice is not considered as a disease?

Jaundice may indicate a serious problem with the function of your red blood cells, liver, gallbladder or pancreas. Jaundice itself is not a disease, but it is a symptoms of several problems.

Q22: How pancreas is served as exocrine as well as endocrine organ?

Pancreas secrets pancreatic juice by secretory cells, it serves as exocrine part. While there are α & β cells in pancreas, which causes in release of glucose and insulin hormone which serve as endo-crine part.

Q23: How uncooked food is considered as contaminated sour of food poisoning?

The uncooked food is a common factor of for food contamination in such a way that uncooked food may contained some bacteria, some viruses, parasites or other pathogens.

Q#24: Why infants defecate inconveniently any time?

Children typically are unable to control the overflow because of the impact on the rectum's sensitivity to stretch. In most cases, the overflow is involuntary and not intentional. Infants ts of defecate inconveniently because they lack voluntary control and defecation reflex is automatic.