

## Long Answer Type Questions

**Q. 1. Explain the histology of human gut.**

**Ans.** The alimentary canal consists of four basic layers. From the outer surface inward to the lumen (cavity) the layers are as follows:

**(i) Serosa:** (a) It is the outer most layer made up of a thin mesothelium with some connective tissues.

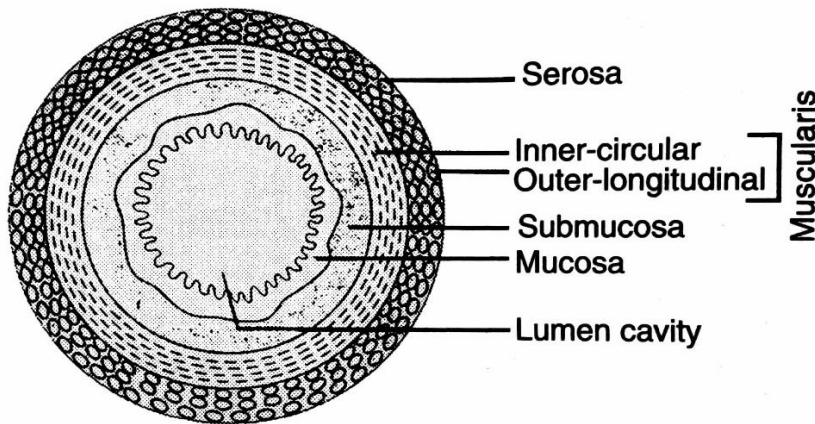
**(ii) Muscularis:**

**(a)** It is composed of outer longitudinal and inner circular muscle fibres.

**(b)** In the stomach an additional layer of oblique muscle fibres is found inner to the circular muscle fibres.

**(iii) Submucosa:** It consists of loose connective tissue richly supplied with blood and lymphatic vessels and in some areas with glands.

**(iv) Mucosa:** It is named so because it secretes mucus to lubricate the inner lining of the gut.



**Fig. Diagrammatic representation of transverse section of gut**

**Q. 2. Explain the types and functions of glands associated with alimentary canal.**

**Ans. Glands associated with alimentary canal are:**

**(1) Salivary glands:** A salivary gland may be defined as any cell or organ which discharges a secretion into the oral cavity. Human salivary glands are classified into two categories: major salivary glands and minor salivary glands.

**(a) Major Salivary glands:** In man the major salivary glands are three pairs: parotid, sublingual and submandibular glands.

**(i) Parotid glands:** These are the largest salivary glands which are situated near the ears. Their ducts open into the oral cavity near the upper second molars. The duct of parotid gland is called Stenson's duct.

**(ii) Sublingual glands:** These are small-sized salivary glands which are located beneath the tongue and their ducts are called sublingual ducts or ducts of Rivinus.

**(iii) Submandibular glands:** These are medium sized salivary glands which are located at the angles of the lower jaw. Their ducts open into the oral cavity near the lower central incisors. The duct of submandibular gland is called Wharton's duct. The parotid salivary glands secrete much of salivary amylase.

**(b) Minor salivary glands:** There are numerous small glands situated in the mucous membrane of the lips (labial glands), Cheeks (buccal glands), tongue (lingual glands) and palate (palatine glands). The secretions of these glands help to keep the mouth moist and provide a protective and lubricant coat of mucus. The fluids secreted by major and minor salivary glands constitute saliva.

**(2) Gastric glands:** These are numerous microscopic, tubular glands formed by the epithelium of the stomach. The following types of cells are present in the epithelium of the gastric glands.

**(i) Peptic cells:** (= chief or Zymogenic or Zymogen cells). They are usually basal in location and secrete gastric digestive enzymes as proenzymes or zymogens; pepsinogen and prorennin.

**(ii) Oxyntic cells:** They are large and are most numerous on the side walls of the gastric glands. They secrete hydrochloric acid and Castle's intrinsic factor.

**(iii) Mucous cells:** They are present between other types of cells and secrete mucus.

**(3) Liver:** It is the largest gland of the body which secretes heparin (anticoagulant). It also produces bile.

**(4) Pancreas:** It is a soft lobulated pinkish gland which secretes two major hormones:

**(i)** Insulin,

**(ii)** Glucagon.

**(5) Intestinal gland:** These are formed by the surface epithelium of small intestine. These are of two types:

**(i)** Crypts of Lieberkuhn which secrete mucus and digestive enzymes.

**(ii)** Brunner's gland found in duodenum which secretes mucus.

**Q. 3. Differentiate between duodenum, jejunum and ileum.**

**Ans.** Differences between duodenum, jejunum and ileum.

S.No.	Duodenum	Jejunum	Ileum
(i)	Anterior part of the small intestine.	Middle part of the intestine.	Terminal part of the small intestine.
(ii)	Broad leaf-like ridges.	Rounded or tongue-shaped.	Narrow, finger or club-shaped.
(iii)	Brunner's glands present.	Brunner's glands absent.	Glands absent.

(iv)	Peyer's patches absent.	Peyer's patches absent.	Peyer's patches are present.
(v)	Plicae circularis are less in number.	Plicae circularis are abundant in number.	Circularis folds are in moderate number.
(vi)	The wall is thin.	The Wall is thick.	The wall is comparatively thinner.
(vii)	Villi occur in sufficient number.	The villi are abundant in number.	The villi are fewer in the distal part but in good number in the proximal part.
(viii)	Curved (U-shaped) and uncoiled.	About coiled and longer.	More coiled and much longer.
(ix)	Length is 20-25 cm.	Length is 1.8-2.4 m.	Length is 7 m.
(x)	It is 4.5 cm in diameter.	4.0 cm in diameter.	2-3 cm in diameter.

#### Q.4. Mention the functions of liver.

**Ans.** The functions of liver are:

**(i) Production of Bile:** The liver secretes bile (hepatic bile pH 8.6). The bile is stored in the gall bladder (gall bladder bile pH 7.6). About 500-1,000 ml of bile is secreted by liver in a day. Bile salts (sodium bicarbonate, sodium glycocholate sodium laurocholate) help in the digestion of fats in the small intestine by bringing about their emulsification.

**(ii) Deamination:** It is a process by which the amino group ( $-NH_2$ ) is removed from the amino acids resulting in the production of ammonia which is converted into urea.

**(ii) Excretion:** (a) Liver synthesizes urea with the help of ammonia and carbon dioxide. Urea is passed out through excretory system.

**(b)** The bile contains bile pigments (bilirubin-yellow and biliverdin - green) that are excretory products.

**(c)** The liver cells also eliminate certain other waste products like cholesterol, metal ions and waste products of haemoglobin.

**(iv) Glycogenesis :** It is the conversion of glycogen into glucose by the liver cells with the help of insulin secreted by the pancreas.

**(v) Glycogenolysis :** It is the conversion of glycogen into glucose by the liver cells with the help of glucagon secreted by the pancreas.

**(vi) Lipogenesis :** It is the conversion of excess of glucose and amino acids into fats which also takes place in the liver.

**(vii) Gluconeogenesis:** It is the formation of glucose or glycogen from non-carbohydrate sources such as amino acids, fatty acids, glycerol, etc. It also occurs in the kidneys and striped muscles.

**(viii) Detoxification:** Liver converts toxic substances into harmless substances, e.g., harmful prussic acid, formed during metabolism in all body cells, is neutralized and rendered harmless by liver cells.

**(ix) Haemopoiesis:** The process of formation of blood corpuscles is called haemopoiesis. The liver produces red blood corpuscles in the embryo.

**(x) Synthesis of blood protein :** The liver produces blood protein such as prothrombin and fibrinogen that help in the clotting of blood.

**Q.5. Describe the alimentary canal of man.**

**[ V. Imp.]**

**OR**

**Draw a labelled diagram of a portion of human alimentary system showing the location of liver, pancreas and gall bladder and their associated ducts.**

**Ans. Alimentary canal of Man:** The alimentary canal of man is a long coiled tube of varying diameter. It measures from 8 to 10 meters in length. It is divisible into the following parts:

(i) Oral cavity, (ii) Pharynx, (iii) Oesophagus, (iv) Stomach, (v) Small intestine, (vi) Large intestine.

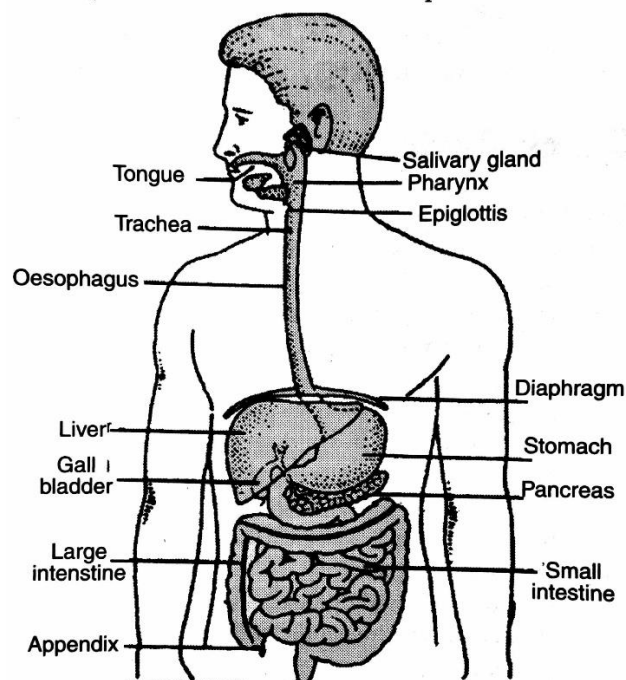
**(i) Oral cavity:** It is the initial enlarged part of the alimentary canal. It opens by mouth and consists of lips, cheeks, gums, teeth and the palate with its muscles. The salivary glands open in the oral cavity.

**(ii) Pharynx:** The oral cavity passes into pharynx.

**(iii) Oesophagus:** It is a muscular tube some 10 inches long through which food passes into the stomach. where it joins the cardiac stomach.

**(iv) Stomach:** The stomach is a sac-like structure and situated below the diaphragm. The wall of the stomach contains many small gastric pits into which ducts of gastric glands open.

**(v) Small intestine:** It is a long tube-like structure measuring about 5-7 meters. It is divisible into 3 parts : duodenum, the jejunum and the ileum. The duodenum is the first part and U-shaped. In this pancreatic duct and bile duct opens.



**Fig. Human alimentary canal and its associated glands**

**(vi) Large intestine:** The large intestine is about 1.5 m long. It consists of caecum with vermiform appendix, colon and rectum. The rectum opens to the exterior by anus.

**Q.6. Differentiate between the large intestine and small intestine.**

**Ans. Differences between the large intestine and small intestine:**

S. No.	Small intestine	Large intestine
(i)	The small intestine is 4.5 to 6 m in length.	The large intestine is only 1.5 m long.
(ii)	Digestion is completed in the small intestine.	Large intestine plays no role in digestion.
(iii)	The small intestine secretes a number of hormones.	The large intestine does not secrete hormones.
(iv)	It absorbs the digested nutrients.	It takes part only in the absorption of water.
(v)	Villi are present	Villi are absent
(vi)	Peyer's patches are present in the Small intestine.	Peyer's patches are absent in the large intestine.
(vii)	The small intestine is narrow and 3.5 to 4.5 cm in width	The large intestine is comparatively broader and 4.6 cm in diameter.

(vii)	The small intestine has three parts: duodenum jejunum and ileum	The large intestine has four parts : caecum, colon, rectum and Anus.
(ix)	Circular folds (Plicae circularis) are present in the small intestine.	Circular folds are absent in the large intestine.

**Q.7. Discuss the main steps in digestion of proteins as the food passes through different parts of the alimentary canal.**

**Ans. Digestion of proteins :** (i) Protein digestion does not take place in the mouth.

(ii) Gastric juices of the stomach contains the proteolytic proenzymes, pepsinogen and prorennin which are activated by the hydrochloric acid present in the gastric juice. Pepsin acts on proteins and converts them into proteoses and peptones. Rennin hydrolyses milk protein caesin into paracaesin.

Proteins  $\xrightarrow{\text{pepsin}}$  Proteoses, peptones and large peptides.

Caesin  $\xrightarrow{\text{Rennin}}$  Paracaesin

Paracaesin + Ca  $\rightarrow$  Calcium paracaesinate

Calcium paracaesinate  $\xrightarrow{\text{pepsin}}$  Peptones

(iii) In small intestine, digestion of protein takes places with the help of enzymes of pancreatic juice and intestinal juices.

(a) Pancreatic juices contains trypsin chymotrypsin and carboxypeptidase.

Trypsin acts on proteins, proteoses and peptones and converts them into smaller peptides or dipeptides.

Caryboxypeptidase acts on the terminal peptide bond and release the last amino acid and progressively shorten the peptide chain.

(b) Intestinal juice contains enterokinase, aminopeptidase and dipeptidases.

**Q.8. Describe the following processes in our body:**

**(i) Coagulation of milk in alimentary canal**

**(ii) Digestion of starch in alimentary canal.**

**Ans. (i) Coagulation of milk in the alimentary canal:**

(a) When the food or milk reaches stomach, the protein digestion starts.

(b) Pepsin stimulates the digestion of proteins in milk (casein). HCl activates pepsinogen into pepsin.

(c) It hydrolyses soluble casein into paracasein which gets precipitated as calcium paracaseinate to make solid curd i.e., coagulation of milk.

(d) There is a milk-coagulating enzyme called rennin which is found in calf gastric juice.

(e) Rennin is secreted as pro-rennin (inactive state) but in presence of HCl it is hydrolysed into active rennin.

(f) Rennin hydrolyses casein into paracasein leading to milk coagulation.

**(ii) Digestion of starch in the alimentary canal:**

(a) In man and most of the other mammals, digestion starts in mouth or buccal cavity.

(b) There are three pairs of salivary glands present in the mouth. These glands secrete an alkaline fluid called saliva.

(c) The crushed food is mixed with saliva and is converted into a pulpy mass called bolus.

(d) Saliva contains enzyme ptyalin (salivary amylase) which acts on cooked starches (polysaccharides) changing them to the disaccharide maltose.

(e) Optimum pH for this reaction is 6.8. As soon as the food reaches the stomach, the ptyalin stops because of the acidic reaction of gastric juice, pH 1.5 to 1.8. The stomach contents entering the duodenum are now called as chyme.

(f) When acid chyme passes into the small intestine it is mixed first with the pancreatic juice and bile and then with the intestinal juice.

(g) Pancreatic juice contains enzyme amylase which converts all digestible polysaccharides (starches) not affected by ptyalin to disaccharides (sugars).

(h) Intestinal juice also contains amylase, sucrase, maltase and lactase.

(i) These enzymes convert disaccharide into monosaccharides and hence digestion starch is completed.

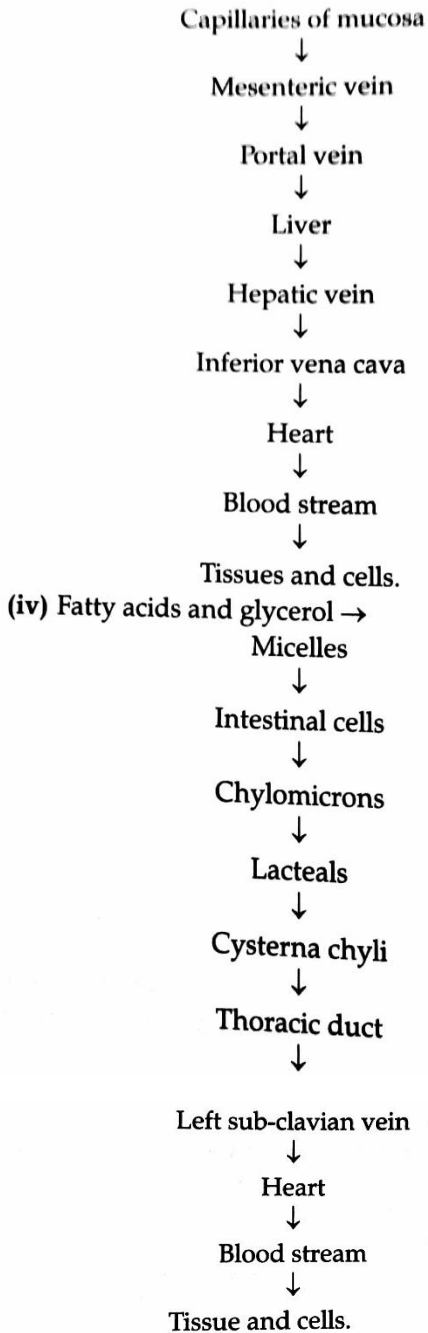
**Q. 9. Mention the pathways for absorption.**

**Ans. There are two pathways for absorption i.e.,**

(i) Water, mineral salts, water soluble vitamins, monosaccharides and amino acids are carried to the liver by the hepatic portal system. From the liver, these materials finally enter the blood stream.

(ii) Fatty acids, glycerol, steroids and fats soluble vitamins are absorbed by lymphatic system and then carried into the blood stream.

(iii) Amino acids and simple sugars  $\xrightarrow{\text{Chyle}}$



**Q. 10.. Write about some disorders of digestive system.**

**Ans. Disorders of digestive system:**

**(i) Jaundice :** The liver is affected, skin and eyes turn yellow due to the deposit of bile pigment.

**(ii) Vomiting:** It is the ejection of stomach contents through the mouth and controlled by the vomit centre in the medulla oblongata.



**(iii) Diarrhoea :** Abnormal bowel movement and the faecal discharge with more liquidity, which leads to dehydration.

**(iv) Constipation :** The feces are retained within the rectum due to irregular bowel movement.

**(v) Indigestion:** Food is not properly digested leading to a feeling of fullness due to inadequate enzyme secretion, anxiety, food poisoning, over eating and spicy food.

**Q.11. What is meant by digestion ? Briefly describe the process of digestion of food in the small intestine of man.**

**Ans.** Digestion is a process in which complex food materials are broken down by enzymes into simpler substances, which can be easily assimilated by the body. The pancreatic duct and bile duct open into the duodenum of the Here the food gets mixed by bile juice and pancreatic juice. Bile juice does not contain any enzyme.

However, it plays an important part in digestion as it provides an alkaline medium to food and helps in emulsification of fat. The pancreatic juice contains the following enzymes, which act upon different kinds of food stuffs.

**(i)** Trypsin, which acts on proteins and changes them to peptones.

**(ii)** Pancreatic amylase, which acts on carbohydrates and changes them to maltose or to other complex sugars.

**(iii)** Lipase, which acts on fats and changes them to soluble fatty acids and glycerol.

**The intestinal glands secrete enzymes like,**

**(a)** Erepsin, which helps to convert peptides into amino acids.

**(b)** Maltase, which changes maltose to glucose.

**(c)** Lactase, which changes lactose into glucose and galactose.

**(d)** Sucrase, which changes sucrose into glucose and fructose.

In this way, the digestion of food is completed in the small intestine.