

Chapter - 16

Digestion and Absorption

Points To Remember

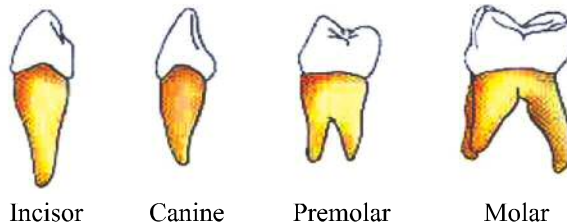
Digestion : The process in alimentary canal by which the complex food is converted mechanically and biochemically into simple substances suitable for absorption and assimilation.

Food : A substance which on taken and digested in the body provides material for growth, repair, energy, reproduction, resistance from disease or regulation of body processes.

Thecodont : The teeth embedded in the sockets of the jaw bone, *e.g.*, in mammals.

Diphyodont : The teeth formed twice in life time *e.g.*, in mammals.

Heterodont : An adult human has 32 permanent teeth which are of four different types.



Different Types of Teeth

- (a) **Canine**—for tearing
- (b) **Incisors**—for cutting
- (c) **Premolars** for grinding
- (d) **Molars** for churning and grinding

Dental formula of man :

(Permanent Teeth)

	1	C	PM	M	
$32 = 2 \times$	2	1	2	3	Upper Jaw
	2	1	2	3	Lower Jaw

Dental formula of man :

(Milk Teeth)

	1	C	PM	
$20 = 2 \times$	2	1	2	Upper Jaw
	2	1	2	Lower Jaw

Peristalsis : The involuntary movement of the gut by which the food bolus is pushed forward.

Deglutition : The process of swallowing of food bolus. It is partly voluntary and partly involuntary.

Ruminants : The herbivorous animals (*e.g.*, cow, buffalo etc.) which have symbiotic bacteria in the rumen ! of their stomach which synthesize enzymes to hydrolyse cellulose into monosaccharides.

Diarrhoea : The abnormal frequent discharge of semisolid or fluid faecal matter from the bowel.

Vomiting : The ejection of stomach contents through the mouth, caused by antiperistalsis.

Dysentery : Frequent watery stools often with blood and mucus and with pain, fever and causes dehydration.

Chyme : The semifluid mass into which food is converted by gastric secretion and which passes from the stomach into the small intestine.

Gastric : Anything associated with stomach is given a prefix 'gastric'.

Proenzyme : The inactive forms of enzymes.

Sphincter : A flap like structure at various junctions of the alimentary canal which facilitates one way traffic in the alimentary canal.

Bolus : The masticated food mixed with saliva.

Hepatic : Anything associated with liver is given a prefix ‘hepatic’.

Goblet cells : The cells of intestinal mucosal epithelium which secrete mucus.

Glisson’s capsule : The connective tissue sheath which covers the hepatic lobules of liver.

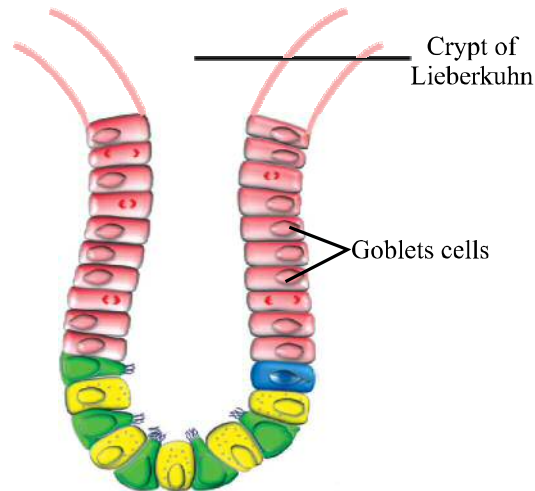
Hepatic lobules : The structural and functional units of liver containing hepatic cells which are arranged in the form of cords.

Sphincter of Oddi : The sphincter which guard the opening of common hepatopancretic duct.

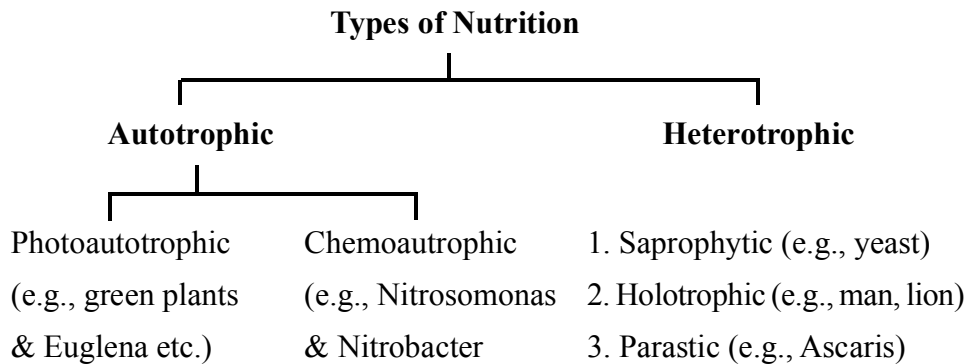
Villi : The small finger-like folding in the small intestine which increase the surface area for absorption of digested food.

Crypts of Lieberkuhn—pits of intestine

Success entericus—Intestinal juices.



Intestinal gland showing crypts of lieberkuhn



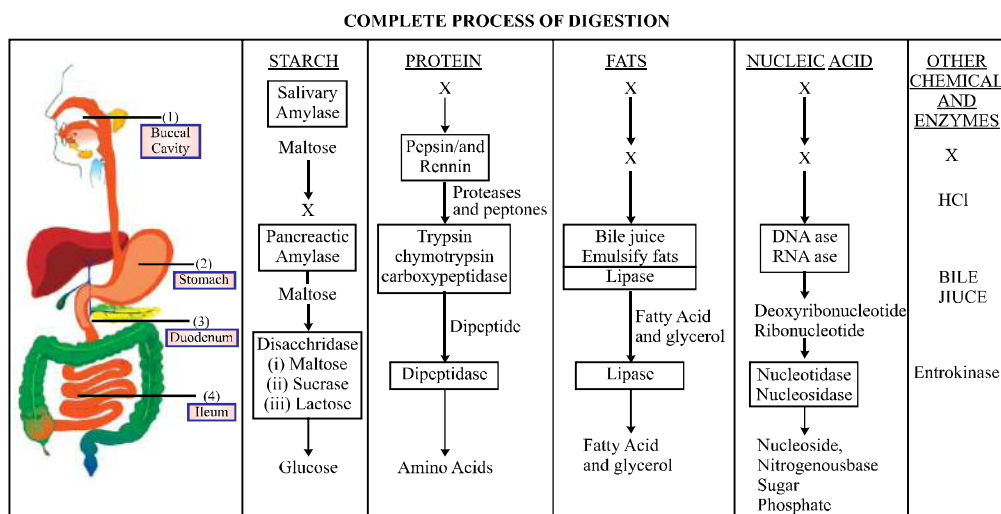
Basic Steps of Holozoic Nutrition :

- (1) **Ingestion** : Intake of food.
- (2) **Digestion** : Breaking down of complex organic food materials into simpler, smaller soluble molecules.
- (3) **Absorption and assimilation** : Absorption of digested food into blood or lymph and its use in the body cells for synthesis of complex components.
- (4) **Egestion** : Elimination of undigested food as faeces :

Digestive glands : (A) Salivary gland—3 types are (1) Parotid (cheek) (ii) (Below the tongue) Sublingula, (iii) Submaxillary or submandibular (lower jaw) Secrete saliva which contains ptyalin (Salivary Amylase)

(B) Pancreas : Secretes pancreatic juice.

Malnutrition—When a person is not getting enough food or getting unbalanced diet.



PEM—Protein Energy Malnutrition

Kwashiorkar	Marasmus
<p>The word means ‘rejected child’</p> <ul style="list-style-type: none"> ● It is a disorder found in children 1-5 years of age, where child is weaned off mother’s milk very early. ● Children get low protein and low carbohydrate diet are affected. 	<p>Word marasmus means working away</p> <ul style="list-style-type: none"> ● Child remaining under-nourished suffer from marasmus. Usually found in children below the age of 1 year. ● It is caused by deficiency of protein & carbohydrate both.

Symptoms

1. Stunted growth	1. Low body weight
2. Dry & scaly skin	2. Wasting of muscles
3. Odema (retention of water in tissues)	3. Prominent ribs
4. Match stick legs	4. Sunken Eyes
5. Protruted Belly	5. Lean body with thin limbs
	6. Mental retardation

Cure

Feeding the child with protein rich diet including milk, soyabean, egg etc.	Child should be given protein diet with enough quantity of carbohydrates & fats.
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Calorific Value : Amount of heat energy required to raise the temperature of 1 kg of water by 1°C.

Calorific value of Carbohydrates is 4.1 k.cal/g

Protein is 5.6 kcal/g

Fats is 9.4 kcal/g (app.)

Questions

Very Short Answer Questions

(1 mark each)

1. What do you mean by the term malnutrition ?
2. Name the hardest substance in the body.
3. What is a lacteal and what is its function ?
4. Name the small projections, found on the upper surface of tongue.
5. Mention the function of epiglottis.
6. Write the names of major parts of stomach.
7. Name the enzyme that digest fats. Mention the end products of fat digestion.
8. In which part of alimentary canal does absorption of water, simple sugars and alcohol takes place ?
9. Why are proteases generally released in inactive form ?

10. Trypsinogen is an inactive enzyme of pancreatic juice. An enzyme, enterokinase, activates it. Which tissue/cell secrete the enzyme ? How is it activated ?
11. What is the role of insulin ?
12. Name any one country where children affected from PEM are found more.

Short Answer Questions-I

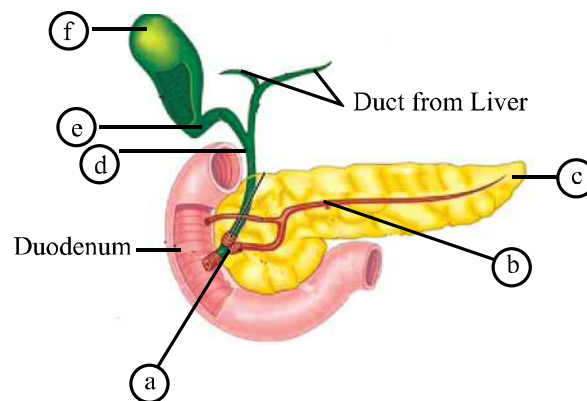
(2 marks each)

13. What is emulsification ? Where and how does it occur ?
14. Name three parts of large intestine. Which vestigial organ arises from the first part of it ?
15. Name the gland which perform/acts as exocrine and endocrine. Also name the product which are secreted by it.
16. The wall of alimentary canal is made up of four layers. Give the names of these four layers.
17. Hydrochloric acid is found in our stomach. What purpose does it serve in alimentary canal ?
18. In which part of the digestive system the absorption of following substances takes place ?
 - (a) Certain drugs
 - (b) Glucose, fructose and fatty acids
 - (c) Water, some minerals and drugs
 - (d) Simple sugar and alcohol
19. Differentiate between chylomicron and micelles.

Short Answer Question-II

(3 mark each)

20. In the following diagram of duct system of liver, gallbladder and pancreas, label a, b, c, d, e and f :



21. Give a diagrammatic representation of transverse section of gut.
22. Draw the sketch of anatomical regions of human stomach and label any four parts in it.
23. How does the nervous system control the activities of gastro-in-testinal tract ?
24. Draw a labelled figure of digestive system of human.
25. Give a summary of cause and symptoms of following disorders of digestive system :
 - (a) Jaundice
 - (b) Vomiting
 - (c) Diarrhoes
 - (d) Constipation
 - (e) Indigestion
26. Navya likes to eat fast food like burgers and fried food. She often complains of constipation and abdominal pain. On medical diagnosis her haemoglobin was also found low.
 - (a) Do you approve her feeding habit ? Why/why not.
 - (b) What can be the cause of Navya's problem ?
 - (c) What will you suggest her ?
 - (d) Which values would you use to convince her to get her condition cured ?

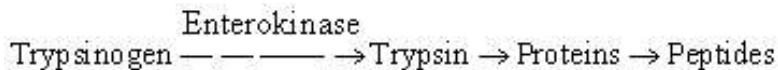
Answers

Very Short Answer

(1 mark each)

1. The state of health due to improper intake of food or nutrients. It covers both under nutrition as well as over nutrition.
2. Enamel
3. Lymph vessel found in villi. They help in absorption of fat globules and then release them into blood stream.
4. Papillae. Some Papillae have taste buds.
5. Prevention the entry of food into the glottis.
6. Cardia, fundic, pyloric.
7. Lipase, fatty acids and glycerol.

8. Stomach
9. If released in active form, they will start digesting the membranes and muscular walls of the alimentary canal.
10. Intestinal Mucosa.



11. Metabolism of sugar
12. Africa

Short Answer Questions–I (2 marks each)

13. The process of breakdown of large fat droplets into smaller ones. It occurs in small intestine. It is brought about by bile salts through reduction of surface tension of large fat droplets.
14. Caecum, colon and rectum. Vermiform appendix.
15. Pancreas. Exocrine secretion is pancreatic juice containing enzymes and exocrine secretions are hormones : Insulin and glucagon.
16. Serosa, muscularis, submucosa and mucosa.
17. (i) Killing of germs present in food
(ii) Conversion of inactive pepsinogen into active form pepsin.
18. (a) Mouth
(b) Small intestine
(c) Large intestine
(d) Stomach

19.	Chylomicron	Micelles
1.	Protein coated water soluble fat droplets released into the lymph.	Formed by combination of fatty acid, monoglycerides and bile salts.
2.	In this form fats lipids are put into circulation	In this form digested fats are absorbed in intestinal cells in alimentary canal.

Short Answers Questions–II (3 marks each)

19. Refer Fig. 16.6, Page no. 261 (NCERT Text Book, XI Biology).
20. Refer Fig. 16.4, Page no. 260 (NCERT Text Book, XI Biology).
21. Refer Fig. 16.3, Page no. 259 (NCERT Text Book, XI Biology).
22. Refer page. 264 (NCERT Text Book, XI Biology).

Long Answers

(5 marks each)

23. Refer Fig. 16.1, Page no. 258 (NCERT Text Book, Class XI Biology).
24. Refer Page no. 265-266 (NCERT Text Book, Class XI Biology).
25. (a) No, I do not approve her feeding habit as it is unbalanced diet which can lead to diseases.
 - (b) Malnutrition.
 - (c) To include vegetables and fruit in her diet, to eat balanced diet.
 - (d) Scientific knowledge, caring about others.

