

Chapter 16: Digestion and Absorption

NCERT Exemplar · Class 11 · Biology

Multiple Choice Questions

Question 1

Select what is not true of intestinal Villi among the followings

A.

They possess microvilli

B.

They increase the surface area

C.

They are supplied with capillaries and the lacteal vessels

D.

They only participate in the digestion of fats

Answer

Correct option: D

Solution

Ans: The correct answer is Option (d).

The small intestine helps in the digestion of all the nutrients like carbohydrates, fats and proteins.

Question 2

Hepato-pancreatic duct opens into the duodenum and carries

A.

Bile

B.

Pancreatic juice

C.

Both bile and pancreatic juice

D.

Saliva

Answer

Correct option: C

Solution

Ans: The correct answer is Option (c) Both bile and pancreatic juice

The bile juice enters through the hepatic tract, and the pancreatic juice enters through the pancreatic tract.

Question 3

One of the following is not a common disorder associated with the digestive system

A.

Tetanus

B.

Diarrhoea

C.

Jaundice

D.

Dysentery

Answer

Correct option: A

Solution

Ans: The correct answer is Option (a) Tetanus

Tetanus is a disorder that affects the muscles.

Question 4

A gland not associated with the alimentary canal is

A.

Pancreas

B.

Adrenal

C.

Liver

D.

Salivary glands

Answer

Correct option: B

Solution

Ans: The correct answer is Option (b) Adrenal

The Adrenal glands are located above each kidney that is included in the excretory system.

Question 5

Match the two columns and select the correct among options given

Column I	Column II
A. Biomacromolecules of food	(i) Alimentary canal and associated gland
B. Human digestive system	(ii) Embedded in jawbones
C. Stomach	(ii) Outer wall of visceral organs
D. Thecodont	(iv) Converted into simple substances
E. Serosa	(v) J-shaped bag-like structure

Options:

- (a) A – (ii), B – (i), C – (v), D – (iii), E – (iv)
- (b) A – (iv), B – (i), C – (v), D – (ii), E – (iii)
- (c) A – (i), B – (ii), C – (iii), D – (iv), E – (v)
- (d) A – (i), B – (iii), C – (ii), D – (iv), E – (v)

Solution

Ans: The correct answer is Option (b) A – (iv), B – (i), c – (v), D – (ii), E – (iii)

Question 6

Match the two columns and select the right one among the options given

Column I	Column II
A. Duodenum	(i) A cartilaginous flap

B. Epiglottis	(ii) Small blind sac
C. Glottis	(iii) U shaped structure emerging from the stomach
D. Caecum	(iv) Opening of windpipe

Options:

(a) A – (i), B – (ii), C – (iii), D – (iv)

(b) A – (iv), B – (iii), C – (ii), D – (i)

(c) A – (iii), B – (i), C – (iv), D – (ii)

(d) A – (ii), B – (iv), C – (i), D – (iii)

Solution

Ans: The correct answer is Option (c) A-(iii), B-(i), C-(iv), D-(ii)

Question 7

Match the enzyme with their respective substrate and choose the right one among options given

Column I	Column II
A. Lipase	(i) Dipeptides
B. Nuclease	(ii) Fats
C. Carboxypeptidase	(iii) Nucleic acid
D. Dipeptidases	(iv) Proteins, peptones and proteases

Options:

(a) A – (ii), B – (iii), C – (i), D – (iv)

(b) A – (iii), B – (iv), C – (ii), D – (i)

(c) A – (iii), B – (i), C – (iv), D – (ii)

(d) A – (ii), B – (iii), C – (iv), D – (i)

Solution

Ans: The correct answer is Option (d) A – (ii), B – (iii), C – (iv), D – (i)

Question 8

Dental formula in human beings is

A.

$3223/3223$

B.

$2123/2123$

C.

$1232/1232$

D.

$2233/2233$

Answer

Correct option: B

Solution

Ans: The correct answer is Option (b) $\frac{2123}{2123}$

Each side of the upper and lower jaw consists of two incisors, one canine, two premolars and three molars.

Question 9

Liver is the largest gland and is associated with various functions; choose one which is not correct

A.

Metabolism of carbohydrate

B.

Digestion of fat

C.

Formation of bile

D.

Secretion of a hormone called gastrin

Answer

Correct option: D

Solution

Ans: The correct answer is Option (d) Secretion of a hormone called gastrin

The stomach secretes the hormone gastrin during digestion.

Question 10

Mark the right statement among the following

A.

Trypsinogen is an inactive enzyme

B.

Trypsinogen is secreted by the intestinal mucosa

C.

Enterokinase is secreted by the pancreas

D.

Bile contains trypsin

Answer

Correct option: A

Solution

Ans: The correct answer is option (a).

Enzyme trypsinogen is secreted by the pancreas in the inactive form. It is activated by enterokinase in the small intestine.

Very Short Answer Questions

Question 1

The food mixes thoroughly with the acidic gastric juice of the stomach by the churning movements of its muscular wall. What do we call the food then?

Solution

Ans: The food churned with gastric juice is known as Chyme.

Question 2

Trypsinogen is an inactive enzyme of pancreatic juice. An enzyme, enterokinase, activates it. Which tissue/ cells secrete this enzyme? How is it activated?

Solution

Ans: The intestinal wall secretes trypsinogen. It is activated into trypsin by enterokinase.

Question 3

In which part of the alimentary canal does absorption of water, simple sugars and alcohol take place?

Solution

Ans: The stomach absorbs water, sugar and alcohol.

Question 4

Name the enzymes involved in the breakdown of nucleotides into sugars and bases?

Solution

Ans: Nucleotides are converted into sugars and base by Nucleases.

Question 5

Define digestion in one sentence.

Solution

Ans: Digestion is the process by which complex food materials are converted into simple, digestible forms.

Question 6

What do we call the type of teeth attached to jawbones in which each tooth is embedded in a socket of jaw bones?

Solution

Ans: The tooth attachment is Thecodont.

Question 7

Stomach is located in the upper-left portion of the abdominal cavity and has three major parts. Name these three parts.

Solution

Ans: The stomach is divided into three major parts: (a) Cardiac (b) Fundus (c) Pylorus

Question 8

Does the gallbladder make bile?

Solution

Ans: No, bile is stored in the gallbladder.

Question 9

Correct the following statements by deleting one of the entries (given in bold).

- (a) Goblet cells are located in the intestinal mucosal epithelium and secrete chymotrypsin/mucus.
- (b) Fats are broken down into di- and monoglycerides with the help of amylase/lipases.
- (c) Gastric glands of stomach mucosa have oxyntic cell/ chief cells, which secrete HCl.
- (d) Saliva contains enzymes that digest starch/protein.

Solution

Ans: (a) Goblet cells are situated in the intestinal mucosal epithelium that helps in the secretion of mucus.

(b) Fats are broken down into diglycerides and monoglycerides in the intestine with the help of lipases.

(c) Oxyntic cells in the gastric glands of stomach mucosa secrete HCl.

(d) Saliva contains enzymes that help in the digestion of starch.

Short Answer Questions

Question 1

What are pancreas? Mention the major secretions of the pancreas that are helpful in digestion.

Solution

Ans: The pancreas is a hormone-secreting complex gland that functions as both an endocrine and an exocrine organ. It is located between the U-shaped duodenum's limbs. The exocrine component of this gland secretes pancreatic juice, which includes digesting enzymes and is discharged in the duodenum. The digestive enzyme is slightly alkaline, neutralising the acid in the meal passing through the stomach and into the duodenum. To keep blood sugar levels stable, the endocrine part of this gland secretes the hormones like insulin and glucagon.

Question 2

Name the part of the alimentary canal where major absorption of digested food takes place. What are the absorbed forms of different kinds of food materials?

Solution

Ans: The small intestine is where most digested food is absorbed. This occurs in the jejunum and ileum, two small intestine sections bordered by finger-like villi projections. Glucose is the type of carbohydrate that is absorbed. Protein absorption takes place in the form of Amino acids. Fatty acids and glycerol are the two forms of fat that are absorbed.

Question 3

List the organs of the human alimentary canal and name the major digestive glands with their location.

Solution

Ans: The human alimentary canal consists of Mouth, Oesophagus, Stomach, Small Intestine, Large Intestine and Rectum. The primary digestive glands of the body are as follows:

Digestive Gland	Location
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(a) Salivary gland	Mouth
(b) Gastric glands	Stomach
(c) Liver	Adjacent to stomach
(d) Pancreas	Below stomach

Question 4

What is the role of the gallbladder? What may happen if it stops functioning or is removed?

Solution

Ans: The gall bladder takes part in the storage of bile juice secreted by the liver in the duodenum. The digestive processes are unaffected if the gallbladder quits working or is removed. Bile will flow straight to the small intestine when the gallbladder is removed. The concentration of the bile will not be as it was before, but the body adapts to the transition.

Question 5

Correct the statement given below by the right Option shown in the bracket against them

- (a) Absorption of amino acids and glycerol takes place in the. (small intestine/ large intestine)
- (b) The faeces in the rectum initiate a reflex causing an urge for its removal. (neural /hormonal)
- (c) Skin and eyes turn yellow in infection. (liver /stomach)
- (d) Rennin is a proteolytic enzyme found in gastric juice in (infants/adults).
- (e) Pancreatic juice and bile are released through. (intestine-pancreatic/ hepatopancreatic duct)
- (f) Dipeptides, disaccharides and glycerides are broken down into simple substances in the region of the small intestine. (jejunum/ duodenum)

Solution

Ans: (a) The small intestine absorbs the amino acids and glycerol. So, the right option is the small intestine.

(b) In the rectum the faeces initiate a neural reflex that causes the urge to remove them. So, the right option is neural.

(c) A liver infection turns the skin and the eyes yellow. So, the right option is the liver.

(d) The gastric juice in infants contains a proteolytic enzyme called Rennin. So, the right option is Rennin.

(e) The Hepato-pancreatic duct carries the pancreatic juice and bile. So, the right option is Hepato-pancreatic.

(f) In the small intestine, the duodenum is the place where the Dipeptides, disaccharides and glycerides are broken down. So, the right option is the duodenum.

Question 6

What are the three major types of cells found in the gastric glands? Name their secretions.

Solution

Ans: The three main types of cells in the gastric gland and their secretions are given below:

Glands	Secretion
Mucous neck cells	Mucus
Peptic or chief cells	Pepsinogen
Parietal or oxyntic cells	Intrinsic Factor and HCl

Question 7

How is the intestinal mucosa protected from the acidic food entering from the stomach?

Solution

Ans: The goblet cells situated in the intestinal mucosal epithelium secrete the sticky substance called mucus. The mucosal lining and the bicarbonates released by the pancreas protect the intestine's inner lining from the acid.

Question 8

How are the activities of the gastro-intestinal tract regulated?

Solution

Ans: The neurological and hormonal systems control the actions of the gastrointestinal tract, sometimes known as the "GI- tract." The GI tract is connected by several intrinsic and extrinsic nerves. These nerves aid in the regulated working of the alimentary canal's numerous components. Furthermore, several hormones are involved in the coordination of these processes.

Question 9

Distinguish between constipation and indigestion. Mention their major causes.

Solution

Ans: The differences between constipation and indigestion are:

Constipation	Indigestion
(i) Faeces are retained in the rectum due to irregular bowel movement.	(i) Food indigestion leads to a sense of fullness.
(ii) This can occur due to a diet deficient in water and roughage.	(ii) Inadequate enzyme secretion, food poisoning, or stress can all induce this.
(iii) This is generally treated by increasing water and roughage consumption as well as exercising.	(iii) Medicines may be required to treat this.

Question 10

Describe the enzymatic action on fats in the duodenum.

Solution

Ans: Firstly, the fats are emulsified in the small intestine by the bile juice. Secondly, the enzyme lipase breaks down fat into monoglycerides and di-glyceride.

Long Answer Questions

Question 1

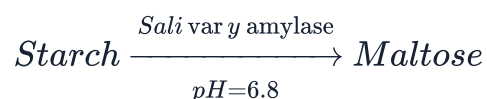
A person had roti and dal for his lunch. Trace the changes in those during its passage through the alimentary canal.

Solution

Ans: Roti is rich in carbohydrates and fibre, but dal is full of proteins. Dal may include fat due to the inclusion of oil or ghee during the cooking process. During their journey through the alimentary canal, these foods would undergo the following transformations.

Oral Cavity:

Food is chewed in the oral cavity until it becomes a semisolid paste. Food is combined with saliva. Saliva aids in the digestion of meals. Furthermore, salivary amylase digests starch. During this process, starch is transformed into maltose.



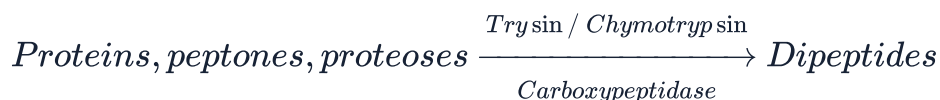
Stomach: Food passes from the buccal cavity into the stomach via the oesophagus. In the oesophagus, there is no digestion of food. Food is churned into an even smoother paste in the stomach. Further, the food is mixed with hydrochloric acid. If there are germs in the food, HCl destroys them and makes the pH acidic enough for pepsin to work appropriately. In the stomach, just a portion of the protein is digested. Pepsin converts dal protein into peptones and proteases in this step.



Small Intestine: Pancreatic amylase present in the pancreatic juice converts the polysaccharides into disaccharides. In this step, the carbohydrates in the roti are further assimilated.



The proteins, peptones and proteases are converted by Chymotrypsin present in pancreatic juice into dipeptides.



Lipase digests the fats in the roti.



Intestinal juice includes several enzymes that aid in the breakdown of all nutrients. The digestion of several nutrients in roti and dal are shown below:



The simple molecules are absorbed by the small intestine walls after all of the nutrients have been transformed into simpler compounds.

Food that has not been digested is subsequently passed via the large intestine and stored into the rectum until it is ejected through the anus

Question 2

What are the various enzymatic types of glandular secretions in our gut helping digestion of food?

What is the nature of end products obtained after complete digestion of food?

Solution

Ans: The various glandular secretions in our stomach that aid in food digestion are listed below.

Secretions from Gastric glands: Stomach juice, which comprises hydrochloric acid and the enzyme pepsin, is secreted by the gastric glands. The stomach also releases rennin in infants—Rennin aids in milk digestion.

Secretions from the Liver: Bile juice is produced by the liver. Bile does not contain any enzymes. However, it is essential for digestion. Bile aids in the emulsification of lipids, making fat digestion simpler. Bile also offers an alkaline environment for the small intestine's enzymes to function correctly.

Secretions from Pancreas: Pancreatic juice, which comprises inactive enzymes such as amylase, lipase, and nuclease, as well as trypsinogen and chymotrypsinogen, is secreted by the pancreas. Enterokinase, an enzyme released by the intestinal mucosa, converts trypsinogen into active trypsin. Additional enzymes in the pancreatic juice are then activated by trypsin. Trypsin/chymotrypsin metabolises protein, while amylase digests carbohydrates.

Secretions from Small Intestine: The small intestine secretes succus entericus, which includes a range of enzymes such as Dipeptidases, lipase, and lactase.

End Products of Digestion: The products of digestion formed are simple substances such as glucose, fatty acids, amino acids and glycerol. The villi situated in the intestine easily absorb these materials.

Question 3

Discuss mechanisms of absorption.

Solution

Ans: The Villi in the small intestine absorb the majority of the digestive end products. Passive, active, and assisted transport methods are used to absorb digested food. The processes of absorption of different end products of digestion are discussed below.

Simple Diffusion:

Diffusion absorbs small quantities of simple sugars like monosaccharides, amino acids, and certain electrolytes. The concentration gradient influences the transit of these chemicals into the bloodstream.

Facilitated Transport:

Carrier ions such as Na^+ aid in the absorption of fructose and several amino acids. This approach is termed Facilitated transportation.

Transport of Fatty Acids and Glycerol:

Because these molecules are insoluble, they cannot be absorbed into the bloodstream. They are initially formed into micelles, which are minute droplets. The micelles go to the intestinal mucosa. Here, these micelles are transformed into very tiny protein-coats. These globules are called chylomicrons. The chylomicrons are carried into the villi's lymph vessels. They are subsequently released into the bloodstream through lymph veins.

Question 4

Discuss the role of hepatopancreatic complex in the digestion of carbohydrate, protein and fat components of food.

Solution

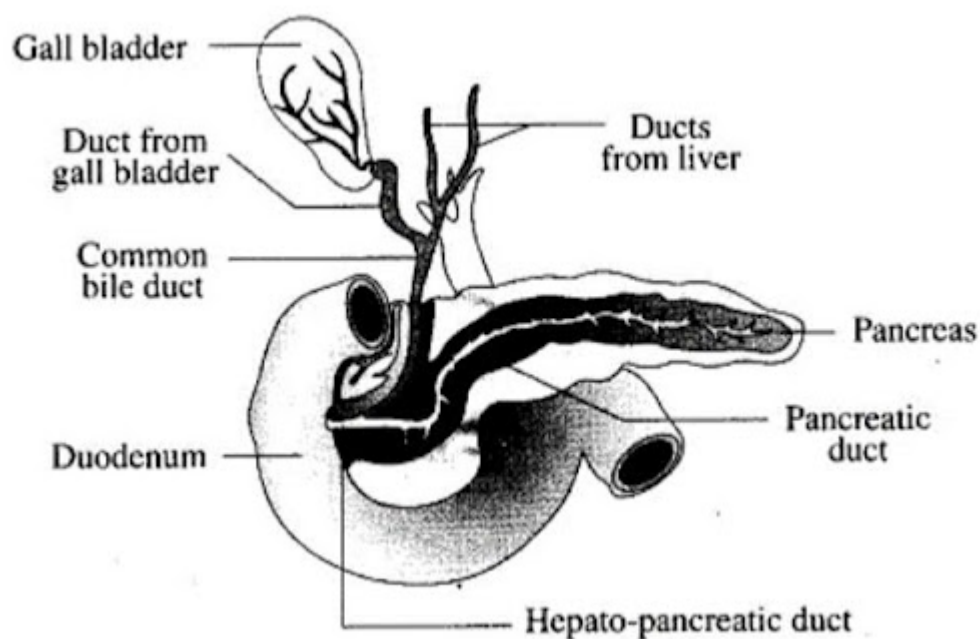
Ans: The carbohydrates, proteins and fats are mainly digested in the Hepato-pancreatic complex.

Role of Liver:

The primary function of the liver is to produce bile juice. Bile does not comprise any enzymes. However, it is essential for digestion. Bile aids in the emulsification of lipids, making fat digestion simpler. Bile offers a suitable alkaline environment for the proper functioning of the small intestine,

Role of Pancreas:

Pancreatic juice, which includes inactive enzymes such as amylase, lipase, nuclease, trypsinogen, and chymotrypsinogen, is secreted by the pancreas. Enterokinase, an enzyme released by the intestinal mucosa, converts trypsinogen to active trypsin. Other enzymes in the pancreatic juice are then activated by trypsin. Trypsin/chymotrypsin breakdown proteins, while amylase digests carbs. Lipase is an enzyme that breakdowns down triglycerides into diglycerides and monoglycerides.



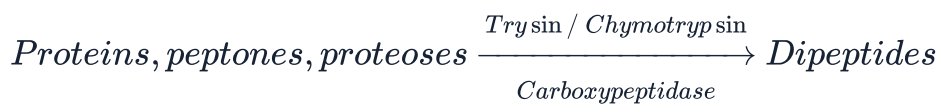
Hepato-pancreatic complex

The conversions occurring in the Hepato-pancreatic complex are as follows:

Carbohydrate digestion:



Protein digestion:



Fat digestion

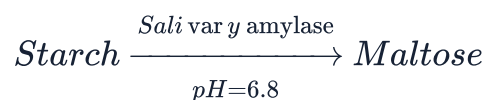


Question 5

Explain the process of digestion in the buccal cavity with a note on the arrangement of teeth.

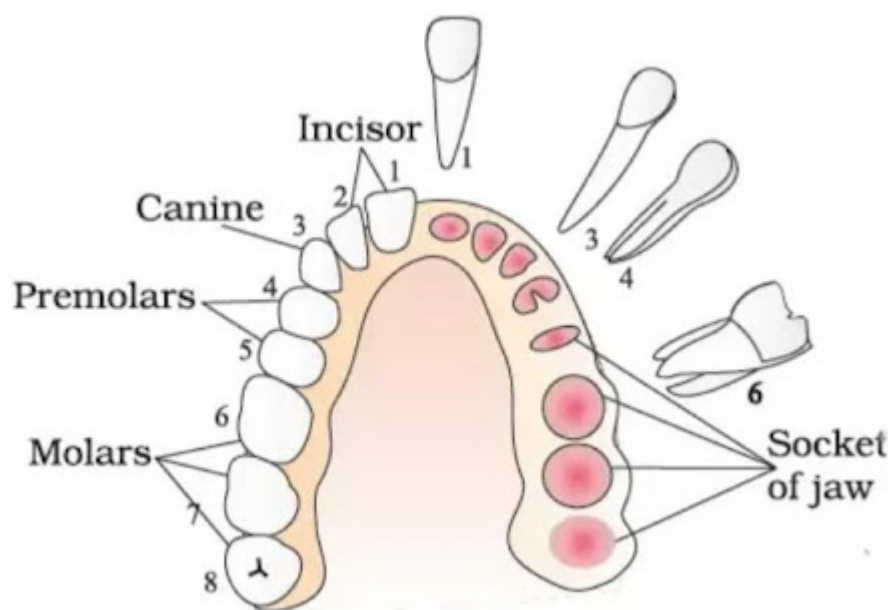
Solution

Ans: Food is chewed in the mouth cavity and combines with the saliva to form a semisolid paste called Chyme. Saliva aids in the formation of a bolus from meal particles. Saliva assists in the digestion of food. It is possible to say that the oral cavity conducts the functions of chewing and swallowing. Furthermore, starch is digested by salivary amylase. During this step, starch is transformed into maltose.



Arrangement of Teeth:

Every tooth in a human being is contained in a socket inside the jaw bone. This form of tooth attachment is termed phycodont. Humans have two sets of teeth during their lifetime: temporary teeth and permanent teeth. Temporary teeth, often known as milk teeth, are lost and replaced with permanent teeth. This is known as a diphyodont arrangement.



Arrangement of teeth

In humans, there are four main types of teeth: incisors, canines, premolars, and molars. In brief, they are denoted by the letters I, C, PM, and M. Each half of a jaw has a specific number of each tooth type.

The dental formula of human teeth is given below:

$$\text{Dental formula} = \frac{2123}{2123}$$

The above formula demonstrates that in humans, each half of the jaw has two incisors for cutting, one canine for tearing, two premolars, and three molars for grinding and crushing. In a human adult, there are a total of 32 teeth.

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Some of the topics which have been covered in the Biology Chapter 16 - Digestion and Absorption chapter are:

- Digestive system
- Alimentary canal
- Digestive glands

- Digestion of food
- Absorption of digested food
- Disorders of the digestive system

The digestion and Absorption chapter describes the digestion and absorption process. It takes place in the alimentary canal which is a long tunnel starting from our mouth and ending at the anus. The digestive system contains the oesophagus, stomach, large intestine, small intestine, mouth, and glands such as the salivary gland, and gallbladder. It has a description of the digestive system and its processes. This chapter is a very important chapter in Biology for both school exams and competitive exams like NEET.

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