

Digestive System

Synopsis:

- The food we consume fall into seven different catagories.
 1. carbohydrates
 2. fats
 3. proteins
 4. minerals
 5. vitamins
 6. water
 7. roughage
- **The process of nutrition is conducted in five steps**
 1. ingestion
 2. digestion
 3. absorption
 4. assimilation
 5. egestion
- When some part of food is chewed, the tongue makes it a spherical mass called **Bolus**.
- Peristalsis is a wave of constriction in the circular muscles in the wall of the gut to push the food further into the food canal.
- The food canal is also called alimentary canal which starts from the mouth and ends at the anus.
- The digestive glands include
 1. Salivary glands
 2. Liver
 3. Pancreas
- The teeth which are similar in size and shape are called homodont teeth. They are usually found in fishes, frogs, reptiles etc.
- The last molar on each side in each j aw is called wisdom tooth which appears at the age of 17-20 years.
- The human teeth develop in two sets; the first set is called milk teeth or temporary teeth while the second set which replaces the milk teeth are called permament teeth.
- The milk teeth are twenty in number while the permament are thirty two in number.
- The part of the teeth which can be seen is called **crown** while the part which is fixed in the jaw is called **root**.
- **The tooth is made up of:**
 1. enamel
 2. dentin
 3. pulp
- The hardest substance of the body is called **Enamel**.
- The yellow, stick substance found on the teeth due to poor oral hygeine is called **plaque**. It consists of sugar and bacteria.
- Mineralised or hard plaque is called **tartar**.
- **The functions of tongue are:**
 1. manipulates food while chewing

- 2. helps in tasting the food
- 3. mixes food with saliva
- 4. cleans the teeth.
- 5. helps in speaking.
- The enzyme contained in saliva is called **amylase** which digests starch into glucose.
- The food pipe is the oesophagus. No digestion takes here

Protein $\xrightarrow{\text{Pepsin}}$ **peptones**

Caesin (milk) $\xrightarrow{\text{Rennin}}$ **curd**

Starch $\xrightarrow[\text{amylase}]{\text{pancreatic}}$ **maltose**

Proteins $\xrightarrow{\text{Trypsin}}$ **peptides**

Fats $\xrightarrow{\text{Lipase}}$ **fatty acids and glycerol**

Peptides $\xrightarrow{\text{Peptidases}}$ **amino acids**

Maltose $\xrightarrow{\text{Maltase}}$ **glucose**

The organ which serves for both digestion and absorption of the food is **small intestine**.

- The small intestine is **7 metres** long while the large intestine is **1.5 metres** long.
- No enzyme is secreted by the large intestine.
- Glucose, amino acids, vitamins and minerals are transported to the liver.
- Amino acids are used in the production of proteins for growth and repair of tissues.

Review Questions

Multiple Choice Questions :

1. Put a tick (✓) against the most appropriate alternative in the following statements.

(1) The teeth which help in tearing the food are the:

- (a) Incisors
- (b) Canines
- (c) Premolars
- (d) Molars

(ii) Last molar tooth in human beings is called:

- (a) Adult tooth
- (b) Wisdom tooth

- (c) Child tooth
- (d) Elders tooth

(iii) The hardest substance in your body?

- (a) Dentine
- (b) Bone
- (c) Cement
- (d) Enamel**

(iv) Saliva converts starch into:

- (a) Glucose
- (b) Sucrose
- (c) Maltose**
- (d) Lactose

(v) Proteins of the milk are converted into curd by the enzyme:

- (a) Trypsin
- (b) Rennin**
- (c) Pepsin
- (d) Steapsin

(vi) Bile juice is produced by :

- (a) Stomach
- (b) Liver**
- (e) Pancreas
- (d) Gall bladder

1. Write True or False in the following statements.

1. Molars help in cutting and tearing food.
False
Correct — Molars help in finer crushing and grinding.
2. Carbohydrates are digested into glucose.
True
3. Proteins are digested into fatty acids.
False
Correct — Proteins is digested into amino acids.

2. Fill in the blanks.

1. The teeth called are a total of four in number on the sides of incisors.
2. The teeth called **canines** are a total of four in number on the sides of incisors.
3. **Pharynx** is a common opening of food pipe and wind pipe.
4. Molars are meant for **crushing** the food.

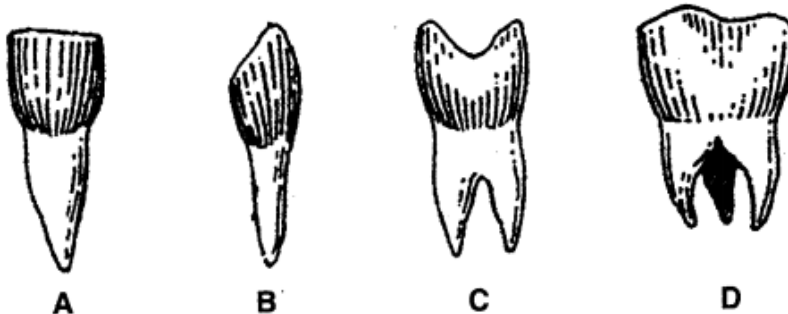
5. Incisors are used for **biting** and **cutting** the food.
6. The **canines** are used for tearing the food.
7. The **premolars** and **molars** are used for crushing and grinding the food.
8. In an adult human, there are a total of **32** teeth.
9. The human teeth appear in two sets, the first set is called **primary** which consists of only **twenty** teeth.

3. Name the following :

1. End product of starch after digestion — **glucose**.
2. The organ where protein digestion-begins — **stomach**.
3. The organ into which the pancreatic juice and the bile juice are poured — **small intestine**.
4. The enzyme which digests fat — **lipases**.
5. The simplest form of carbohydrates — **glucose**.
6. The part of alimentary canal where water from undigested food is absorbed — **large intestine**.
7. The end-product of proteins after digestion — **amino acids**.

4. Identify and name the four type of teeth shown below and give their functions.

Answer :



A — incisor

Function -Its major function is biting and cutting of food.

B — canine

Function — Its major function is tearing of the food.

C — pre-molar

Function — Used for crushing and grinding of food.

D — molar

Function — Used for crushing and grinding of food.

5. State whether the following statements are True or False.

- (i) Wisdom tooth appears at the age of 5-6 years when the child starts going to school.
- (ii) The temporary set of teeth includes incisors, canines and premolars only.
- (iii) The ducts from the salivary glands open into the duodenum.
- (iv) Saliva changes starch into maltose.

Answer :

(iv) True (V) Saliva changes starch into maltose.

6.Fill in the blanks in the table (1-5) by selecting the suitable names of substances from the list given below:

(steapsin, peptones, fatty acids, proteoses, protein).

| Digestive enzymes | acts on | to convert into |
|---------------------|-----------|-----------------------|
| (i) Pepsin | (2) | (3)..... and (4)..... |
| (ii)(1) | fats | (5) |

Answer :

| Digestive enzymes | acts on | to convert into |
|-------------------|--------------|-----------------------------------|
| (i) Pepsin | (2) proteins | (3) peptones and (4) proteoses |
| (ii) Lipases(1) | fats | (5) fatty acids |

Question 7.

(i) Name the juice secreted by the liver.

Ans. Bile

(ii) Name the organ where this juice is temporarily stored.

Ans. Gallbladder

(iii) What is the main function of this juice ?

Ans. The main function of bile is digestion of fats.

Question 8.

Name the three enzymes found in pancreatic juice.

(i)..... (ii)..... (iii)

Answer :

(i) Starch digesting — amylase

(ii) Protein digesting — trypsin

(iii) Fat – digesting — lipases

Question 9.

Name the three regions of the large intestine.

Answer :

1. Caecum
2. Colon
3. Rectum

Question 10.

Given alongside is the diagram of the human alimentary canal.

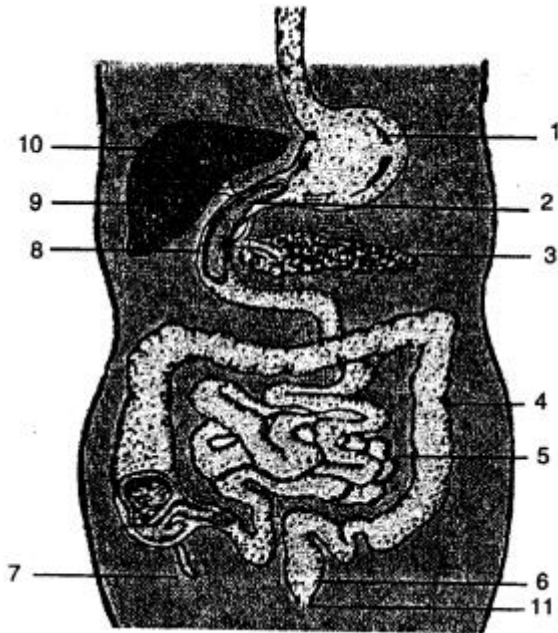
(i) Name the parts 1-11 indicated by guidelines.

1. ... 2. ... 3. ... 4. ... 5. ... 6. ...

7. ... 8. ... 9. ... 10. ... 11.

(ii) State the function of the juice secreted by the part 1.

(iii) State the function of the three enzymes found in the juice secreted by part 3.



Answer :

(i) 1 Stomach

2—Bile duct

3 — Pancreas

4 — Large intestine

5 — Small intestine

6 — Rectum

7—Appendix

8 — Pancreatic duct

9— Gall Bladder

10—Liver

11—Anus

(ii) The gastric juice being acidic kills the germs and activates pepsin.

(iii)

1. **amylase** — digests starch

2. **trypsin** — digests protein

3. **lipase** — digests fat

Long Answer Questions

Question 1.

Define the term nutrition.

Answer :

The process by which living beings receive the food and utilise it to grow and become healthy is called nutrition.

On the basis of nutrition, living beings can be classified into the following types:

1. Holozoites
2. Parasites
3. Saprophytes
4. Symbionts

Holozoits can be further classified into

1. herbivores
2. carnivores
3. ommivores

Question 2.

What is the role of the liver and the pancreas respectively in the digestion of food ?

Answer :

1. **Liver:** It produces a green yellow fluid called the bile which emulsify fats making it easy to be digested. The bile also contains sodium bicarbonate which neutralises the acid of food coming from the stomach and makes it alkaline.
2. **Pancreas:** It produces the digestive juice called the pancreatic juice which acts on carbohydrates, proteins and fats and convert them into simpler units called glucose, amino acids and fatty acids respectively.

Question 3.

Name the digestive juice secreted by the stomach and give its function.

Answer :

The digestive juice secreted by the stomach is the gastric juice.

The gastric juice contains

1. — water
2. — hydrochloric acid
3. — enzyme

Which have the following roles :

1. Hydrochloric acid serves to kill the germs and activates pepsin.
Pepsin converts proteins into peptones and proteoses.
2. Enzyme rennin converts the milk caesin into curd.

Answer the following questions:

Question 4(i).

(i) Name the types of teeth seen in humans.

Answer :

Human teeth are of four kinds:

1. **Incisors** are the four front teeth at the middle of each jaw. They are chisel-shaped for biting and cutting.
2. **Canines** are one on either side of the incisors in each jaw. They are pointed for tearing the food.
3. **Premolars** are two on each side of canines in each jaw. They help in crushing and grinding the food.
4. **Molars** are the last three teeth on each side in each jaw. They have broad uneven surface for finer crushing and grinding of ingested food.

Question 4 (ii).

How is the small intestine best suited for the digestion and absorption of food ?

Answer :

The small intestine's inner lining contain a large number of tiny finger-like projections called villi. The villi greatly increases the inner surface area for the absorption of digested food.

Question 4(iii).

What do you mean by absorption of food ?

Answer :

The absorption of food means to pass the digested food products into the blood system and lymph vessels to be used further by body for various life functions.

Question 5.

Define the following terms

Egestion, digestion, assimilation.

Answer :

Egestion — The process of removal of the undigested food from the body is defined as egestion.

Digestion — The process of breaking the food into smaller and simpler substances so that they can be easily used by the body is called digestion.

Assimilation — The process of using the digested food by the body is called assimilation.

Question 6.

Rewrite the following parts of the human alimentary canal in their correct sequence
Stomach, Oesophagus, Large intestine, Small intestine, Pharynx.

Answer :

Pharynx — Oesophagus → Stomach → Small-intestine → Large intestine.

Question 7.

What is the fate of excess glucose in our body ?

Answer :

The excess glucose is converted by the liver into insoluble glycogen and stores it, whenever required. Liver can reconvert the glycogen into glucose.

Question 8.

Define the term 'digestion'.

Answer :

The process of converting the complex food substances into simpler and smaller units so that they can be easily utilised by the body is defined as digestion.

e.g. proteins are converted to amino acids.

Question 9.

State the four ways in which saliva is useful to us.

Answer :

The four ways in which saliva is useful to us are:

1. Moistens and lubricates the oral cavity and the tongue to make speaking and swallowing easy.
2. Acts as a solvent, dissolving some part of food to stimulate taste
3. Cleans the mouth and destroys germs
4. Initiates digestion by converting starch into simpler form, maltose.

Question 10.

Food are classified into three groups on the basis of the function they perform in our body. Name the three categories, and briefly give their functions. Also give their two sources each.

Answer :**Function**

1. energy giving food
2. bodybuilding food
3. regulatory and protective foods

Nutrient

1. carbohydrates and fats
2. proteins
3. vitamins and minerals

Food

1. cereals, fats, sugar

2. pulses, milk, meat chicken
3. fruits and vegetables

ADDITIONAL QUESTIONS

A. Fill in the blanks.

1. Grinding of food is brought about by **premolars** and **molars**.
2. Steapsin is also called **lipase**.
3. Saliva contains salivary amylase which changes starch to **maltose**.
4. Peristalsis is caused by **wave-like motion of muscles in food pipe**.
5. Pepsin acts on **proteins** to change them into **proteoses** and **peptones**.
6. **Liver** and **Pancreas** help in digestion but food does not pass through them.
7. Removal of undigested food is called **egestion**.

B. Write true or false for each statement. Rewrite the false statements correctly.

1. The process of taking in food is called assimilation.
False. The process of taking in food is called ingestion.
2. The pancreas secretes bile juice.
False. The liver secretes bile juice.
3. Pancreatic juice does not contain any enzyme.
False. Bile juice does not contain any enzyme.
4. Saliva contains lipase which digests carbohydrates.
False. Saliva contains salivary amylase which digests carbohydrates.
5. The wave-like motion of stomach muscles to push the food is called peristalsis.
False. The wave-like motion of oesophagus muscles to push the food is called peristalsis.
6. Digestion of food in intestine takes place in the presence of dilute hydrochloric acid.
False. Digestion of food in stomach takes place in the presence of dilute hydrochloric acid.
7. Absorption of food takes place in small intestine.
True
8. Water is absorbed in large intestine.
True
9. The removal of faeces through anus is called excretion.
False. The removal of faeces through anus is called egestion.
10. All the absorbed nutrients are immediately required by the body.
False. All the absorbed nutrients are not immediately required by the body.

C. Put the following processes in their correct sequence of occurrence during digestion.

peristalsis ; tongue pushes the food ; grinding and mixing saliva ; cutting and tearing of food

Answer :

The correct sequence of the processes occurring during digestion are.

Cutting and tearing of food →grinding and mixing

saliva →tongue pushes the food →peristalsis.

D Find the odd one out. Give reasons for your choice.

1. Oesophagus, gizzard, small intestine, liver.

Ans. Oesophagus: No digestion of food occurs in oesophagus all other helps in digestion of food.

2. canines, incisors, saliva, premolars.

Ans. Saliva: As all are the types of teeth and saliva is a fluid secreted by salivary glands.

3. Salivary amylase, pepsin, trypsin, erepsin.

Ans. Salivary amylase: As it acts on starch and all others act on proteins.

4. Lactase, maltase, lipase, sucrase

Ans. Lipase: It is a fat digesting enzyme all other acts on carbohydrates.

E. Give reasons for the following:

Question 1.

Meat eating animals have strong canines.

Answer :

Meat eating animals have strong canines as they have to tear the flesh. Meat eating animals like dog, wolves and lions eat raw meat by tearing it so they have sharp canines.

Question 2.

All teeth in the mouth are not alike.

Answer :

The dentition in animals is based on the type of food they eat. So we have different kinds of teeth. All teeth in the mouth are not alike as we eat both meat and plants. Due to different type of food eating habits teeth are of different types.

F. Differentiate between.

Question 1.

Digestion and Absorption.

Answer :

Digestion

1. It is the process of converting complex food into a simple absorbable form.
2. It is a series of mechanical and chemical reactions.
3. Many enzymes are associated with digestion

Absorption

1. It is the process of passing digested food through thin walls of blood capillaries and enters the blood stream.
2. No mechanical or chemical reaction occurs in absorption.
3. No enzyme is associated with absorption.

Question 2.

Mechanical digestion and Chemical digestion.

Answer :

Mechanical digestion

1. In mechanical digestion the ingested food is broken down in the mouth by chewing it.
2. Teeth help in mechanical digestion
3. Food is not completely digested in it.

Chemical digestion

1. In chemical digestion the food is digested by the action of enzymes.
2. Enzymes are involved in chemical digestion.
3. Proper digestion of food occurs in it.

Question 3.

Small intestine and Large intestine.

Answer :

Small intestine

1. It is 7 metres long and 2.5 cm wide.
2. It has finger like projections called villi.
3. Food is completely digested here.

Large intestine

1. It is 1.5 – 1.8 m long and 6.5 m wide.
2. Villi are absent in large intestine.
3. Excess of water is absorbed here

G. Write short answers.

Question 1.

What is ingestion ?

Answer :

The process of taking in food through the mouth is called ingestion.

Question 2.

What is dental plaque ?

Answer :

When a mixture of saliva, food and bacteria begins to form over the teeth within half an hour of eating, is called a dental plaque.

Question 3.

Define homodont dentition.

Answer :

An homodont dentition all the teeth in the jaws are similar in shape and structures, e.g. in frogs and fish.

Question 4.

What is peristalsis ?

Answer :

The process by which the food passes from the pharynx to the stomach through the oesophagus by a series of contractions is known as peristalses.

Question 5.

What do you mean by emulsification of fat?

Answer :

Digestion of fats into tiny droplets to provide larger surface area for the enzymes to act is called emulsification of fats.

Question 6.

Write the names of three enzymes which are found in pancreatic juice.

Answer :

Three enzymes found in pancreatic enzymes are :

1. **Trypsin** – act on proteins, proteoses and peptones and changes them into polypeptides.
2. **Lipase** – acts on fats and changes them to fatty acids and glycerol.
3. **Erepsin** – acts on peptones and peptides and changes them to amino acids.

H. Complete the following enzymatic reactions.

1. **Proteins** $\xrightarrow{\text{pepsin}}$ +

2. **Fats** $\xrightarrow{\text{lipase}}$ +

3. **Maltose** $\xrightarrow{\text{maltase}}$ +

4. **Sucrose** $\xrightarrow{\text{sucrase}}$ +

Answer :

1. Proteins $\xrightarrow{\text{pepsin}}$ proteoses + peptones

2. Fats $\xrightarrow{\text{lipase}}$ fatty acids + glycerol

3. Maltose $\xrightarrow{\text{maltase}}$ glucose

4. Sucrose $\xrightarrow{\text{sucrase}}$ glucose + fructose

I. Answer in detail.

Question 1.

What is meant by digestion ? How does it differ from nutrition ?

Answer :

The process of changing complex food into simple, absorbable form by the action of certain enzymes is called digestion. Many organs are associated with digestion. Digestion is of two types mechanical and chemical digestion. In mechanical digestion, food is broken down in the mouth when we chew it with our teeth. In chemical digestion, the food is digested by the actions of certain enzymes. Digestion is necessary because the food which is obtained is in complex form and our body is not able to absorb nutrients from it. So it is converted in to simple absorbable form.

Nutrition is the process of obtaining and using food by the organisms. It is different in different organisms. Ingestion, digestion, absorption, Assimilation and egestion are the various steps involved nutrition.

Question 2.

Name the four types of teeth and their functions

Answer :

The four types of teeth are :

Incisors: These are situated at the front and are flat and straight with sharp edges. Which are used for biting and cutting the food.

Canines: These are situated one on either side of the incisors in each jaw. There are two canines in each jaw. These are sharp and pointed and are used for holding and tearing the food.

Premolars: There are 4 premolars in each jaw, situated next to the canines. Each

premolar has one or two roots and two cusps. These are used for crushing and grinding the food.

Molars: These are 6 molars in each jaw. The molars have more than one root. These are used for crushing and grinding the food. The last molar of each side in each jaw is also called wisdom tooth because it appears last generally at the age of 17-20 years. The ingested food is first broken down in mouth when we chew it with our teeth. This process is called mastication or mechanical digestion. It prepares the food for chemical digestion that is, the digestion by the action of enzymes.

Question 3.

Liver does not secrete any enzymes yet it helps in digestion. How ?

Answer :

Liver does not secrete any enzyme yet it helps in digestion it secretes bile which helps in digestion of fats by breaking down fats in to tiny droplets to provide larger surfaces area for the enzymes to act. This process is called emulsification of fats. Bile secreted by liver is stored in gall bladder. Bile provides an alkaline medium in the duodenum for the action of enzymes of the pancreatic juice.

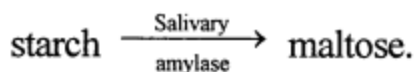
Question 4.

What changes occur in food in the mouth ?

Answer :

The mouth is the first part of digestive system. It receive food and start mechanical digestion. The ingested food is first broken down in the mouth when it is chewed. Simultaneously it get mixed with the saliva. This process is called mastication or mechanical digestion. It prepares the food for chemical digestion, that is, the digestion by action of enzyme. The teeth help in chewing down the food. There are 4 kinds of teeth. These are incisors, canines, premolars and molars, incisors are the cutting teeth. These help in biting and cutting the food. Canines are the tearing teeth that helps to tear and hold the food. Premolars and molars are the crushing and grinding teeth which helps in grinding the food.

When we chew the food it is mixed with saliva, secreted by salivary glands softens the food. Saliva contains an enzyme called salivary amylase also called ptyalin, acts on starch to convert it in to maltose.



Question 5.

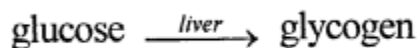
What happens to the nutrients absorbed in the blood stream from the small intestine ?

Answer :

The villi of the small intestine increase the inner surface area for absorption of digested food. Villi contain blood capillaries, The digested food passes through these blood capillaries and enters the blood stream. This process is called absorption. All the absorbed nutrients are not required immediately by the body. So they are changed in to

various forms that can be stored until they are needed. This process is called assimilation.

1. Glucose is converted in to glycogen and is stored in the liver. When it is required by the liver glycogen is converted in to glucose. Excess of glucose is also converted in to fat and stored in the adipose tissue. Fatty acids either provide energy or are used for synthesis of fats which is stored under the skin.
2. Amino acids are used for synthesis of protein. Excess amount of amino acids are converted in to urea which is removed by the kidneys.



Amino acids \rightarrow Proteins

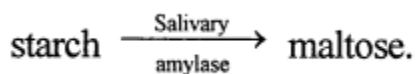
Amino acids \rightarrow urea

Question 6.

You had eaten bread in the morning. Starting from the mouth, explain how it is digested ?

Answer :

Bread contains starch. The digestion of starch starts in the mouth. When we chew the bread, saliva gets mixed with it. It softens the food. Saliva is secreted by salivary glands. Saliva contains the enzyme salivary amylase (ptyalin) which acts on starch to convert it in to maltose



After chewing, the food is swallowed in to the pharynx. No further digestion takes place in pharynx. From here the food moves in to the oesophagus, by peristaltic movements it is pushed in to the alimentary canal. In the small intestine (duodenum) rest of the starch is broken down in to smaller units by pancreatic amylase. Further Maltose is changed in to glucose by maltase in small intestine (ileum).