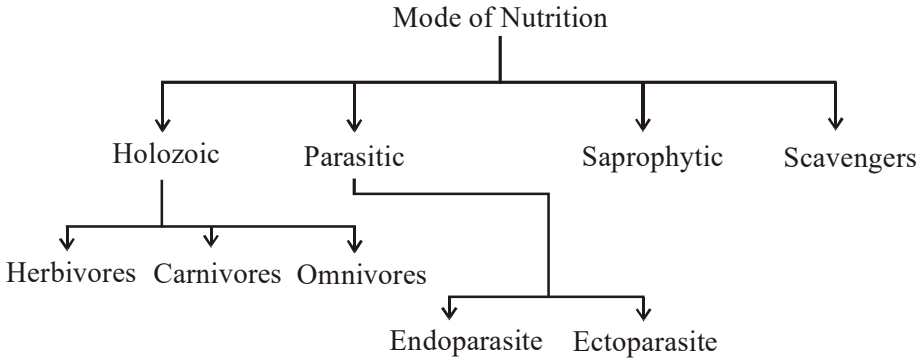
2 NUTRITION IN ANIMALS

NUTRITION IN ANIMALS

Animals are Heterotrophs in Nature. They obtain food from plants or other sources. The mode of nutrition in animals is **holozoic nutrition.** Some animals may be parasites, saprophytes or scavengers.



Herbivores: An animal which feed on plants. **e.g. Cow, Buffalo, Goat, Deer, Rabbit, Horse, Elephant.**
Carnivores: An animal which feed on flesh of other animals. **e.g. Lion, Tiger, Leopard**
Omnivores: An animal which feed on both plant and animals. **e.g. Crow, Man, Pig, Cockroach.**

Parasitic animals :- Obtain food & Shelter from host body. They may be
(i) Ectoparasite - Live outside the host body, e.g. Ticks, Mites, Body louse, Beg bug.
(ii) Endoparasite - Live inside the host body, e.g. Malarial Parasite Plasmodium., Flatworms, Round worms.

Saprophytic animals :- Feed on dead and decaying organic Matter.
e.g. Earthworm, Spiders, Termite, Euglena.

Scavengers :- Feed on decaying animals. eg. Vulture, Crow, Jackal.

BASIC STEPS OF HOLOZOIC NUTRITION

(A) **Ingestion :-** Taking food items into the body through mouth.
(B) **Digestion :-** Break down complex insoluble organic compound into simple soluble compounds by action of digestive enzymes.
(C) **Absorption :-** Simple molecules of digested food are absorbed by intestinal wall and than transported to blood stream.
(D) **Assimilation :-** This digested food is utilized by body cells for energy and synthesize new protoplasm.
(E) **Egestion :-** Getting rid of undigested part of food and is also called **defecation.**

- **Starfish feeds on other animal which are covered by hard shell of calcium carbonate. It opens the shell of prey and pops out its stomach. Through mouth its eats the soft animal present inside the shell. After that stomach goes back into the body and food is slowly digested.**

NUTRITION IN AMOEBA

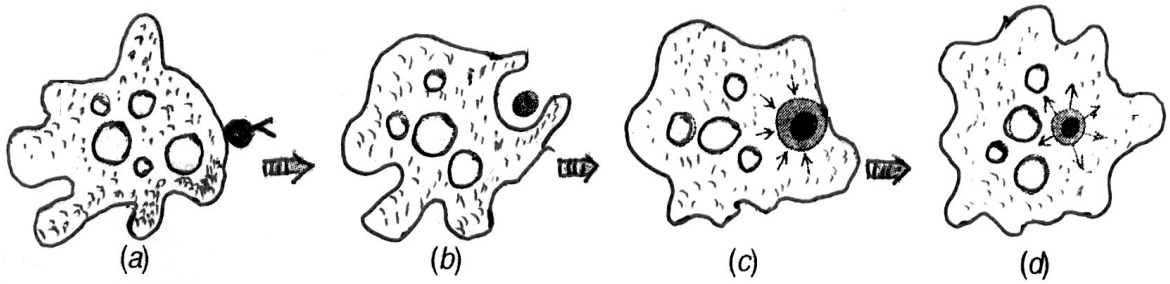
Amoeba feeds on minute microscopic organisms or bacteria. It is a microscopic single celled organisms. The mode of Nutrition in Amoeba is **Holozoic** in which solid food is engulfed in following steps:

Ingestion:- When Amoeba comes in contact with prey, the finger like **Pseudopodia** surrounds it and engulf it. This food is trapped in a **food vacuole**. This food vacuole now moves into the cytoplasm.

Digestion:- Food in the food vacuole is digested by digestive enzymes secreted by cytoplasm. The reaction in the food vacuole is first **acidic** due to **HCl** and than becomes **alkaline.** In acidic medium prey is killed. In alkaline medium the prey is digested.

Absorption:- Digested food now diffuses into the cytoplasm and used for energy growth and repair.

Egestion :- Now food vacuoles moves to the body surface and than ruptures, so undigested food expelled out of the body at any point because amoeba has no **Anus.**



Steps involved in ingestion (a, b), digestion (c) and absorption (d) in *Amoeba*

DIGESTION IN HUMAN BEINGS

Digestion is the process in which the insoluble complex food material is broken down by physical and chemical methods into simple soluble food materials. In this process

(I) Carbohydrates are converted into glucose.

(II) Proteins are converted into Amino Acids.

(III) Lipids are converted into fatty acid and glycerol.

TYPES OF DIGESTION

(A) **Intracellular digestion:-** When digestion takes place inside the cells. **e.g.** *Amoeba*, *Paramecium*, *Euglena,* Sponges.

(B) **Extracellular digestion:-** When digestion takes place outside the cells. **e.g.** Earthworm, Starfish and Human beings etc. Human beings are **omnivorous** feed on different parts of the plant like root, shoot, fruits, seeds and also on animal products like eggs, meat and milk.

- The Human digestive system divided into two parts.

(A) **Alimentary Canal:-** It has following parts

1. Mouth
2. Buccal cavity
3. Pharynx

– Known as bucco - pharyngeal cavity

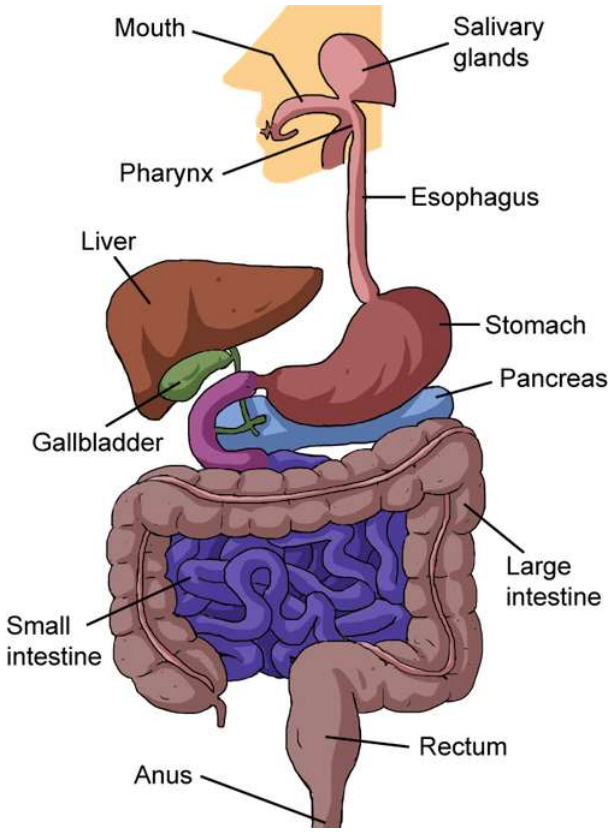
4. Oesophagus or food pipe
5. Stomach.

6. Small intestine — Duodenum, Jejunum, Ileum

7. Large intestine — Caecum, Colon, Rectum

(B) Digestive Glands:-

1. Liver
2. Pancreas
3. Salivary gland
4. Gall bladder - Absent in rat
5. Gastric gland in stomach
6. Intestinal gland in intestine



In human the alimentary canal is about 9 m long tube. The small intestine is about 6 m and large intestine about 1.5 m long.

Mouth and Buccal Cavity:-

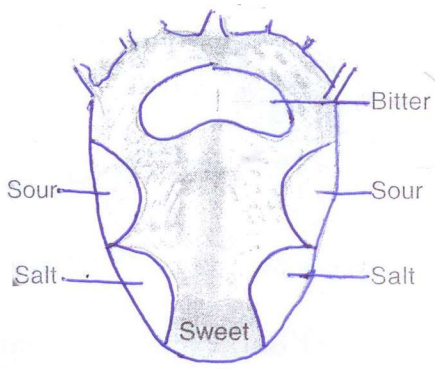
Food is taken into the alimentary canal through mouth. It is called **ingestion.** Mouth is surrounded by lips. The food is chewed with the help of teeth, tasted with the help of tongue and moistened with saliva.

Tongue:- It is a muscular organ found in buccal cavity. It is free in front but posterior region is attached with a structure known as **Frenulum.**

It contain two important structures

1. Papillae 2. Taste buds

Papillae has taste buds for identification of taste. Sweet, Sour, Salty, Bitter.



Tongue showing location of different tastes

Function of the tongue:-

1. Essential for swallowing and mastication.
2. Essential for talking & speech
3. Essential for taste the food.
4. For mixing of saliva with food.

Teeth:- The arrangement of teeths on upper and lower jaw is known as **dentition.** Teeth are rooted in sockets in the gums. Human has **Heterodont** dentition. There are four types of teeths.

1. **Incisors -** For cutting
2. **Canines** - For piercing and tearing

3. **Premolars**
4. **Molars**

– These are also known as **cheek** teeth or **grinders**.

Dental formula:-

$$\frac{\text{No. of teeth in half upper jaw}}{\text{No. of teeth in half lower jaw}} \times 2$$

$$= \frac{I}{I}, \frac{C}{C}, \frac{PM}{PM}, \frac{M}{M} \times 2$$

$$= \frac{2}{2}, \frac{1}{1}, \frac{2}{2}, \frac{3}{3} \times 2 = 32$$

So Total No. of teeth in Human being is **32** in a adult.

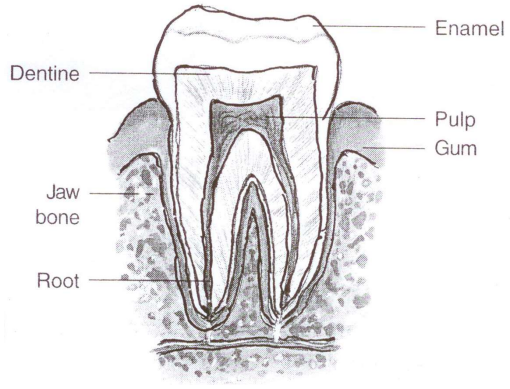
- The Ist set of teeth grows during infancy and they fall off at the age between 6 - 8 years. These are called **milk teeth.** Their number is about 20.
- The second set of teeth that replaces them are called **permanent teeth,** which last through out life or fall off during old age. The number of permanent teeth are 28 including 8 molars.

Structure of tooth:- A typical tooth is made up of three parts.

(A) Crown
(B) Neck
(C) Root.

Crown is externally covered by **enamel** whereas **neck & root** is covered by cement. Enamel is formed by **Ameloblast** cells.

The main part of tooth is **dentine** formed by **odontoblast cells** and have a **pulp cavity.** Pulp cavity is **living part** of tooth because it has blood supply and nerve supply.



Structure of a tooth

Tooth Decay:- If we do not clean our teeth after eating, they turn yellowish because a yellowish and sticky film formed from food particles, saliva and bacteria. This is called **plaque.**

The bacteria in the plaque convert sugar and starch of food into **acids**. This acid dissolve the enamel and damage the teeth. This is called **tooth decay.** This leads to the formation of cavity in the tooth & than tooth loss. Chocolates, sweets and cold drinks are responsible for tooth decay and tooth loss.

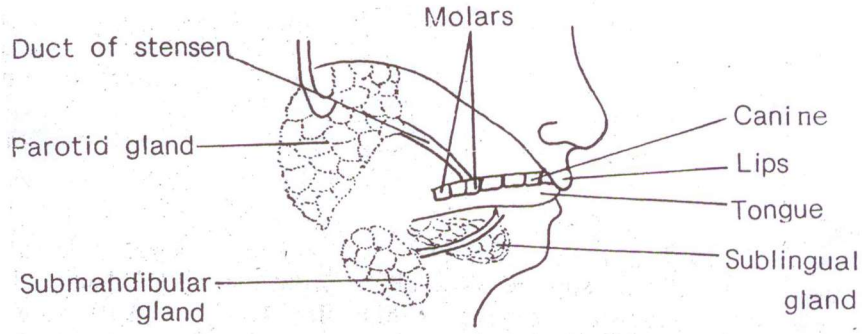
SALIVARY GLAND

This gland secretes **saliva.** In human 3 pair of salivary gland is found. These are

(A) **Parotid gland:-** Found near the ear and open at the **incisor teeth** by **stenson's duct.**

(B) **Sublingual gland:-** It is smallest salivary gland found below the tongue and open by **Bartholin** duct.

(C) **Sub-maxillary gland or sub mandibular** found at the angle of lower jaw and open by wharton's duct.



Salivary gland in man

Saliva helps in digestion of starch because it contains **salivary amylase or ptyalin** enzyme. This enzyme convert starch into maltose. The maltose is than converted into glucose.

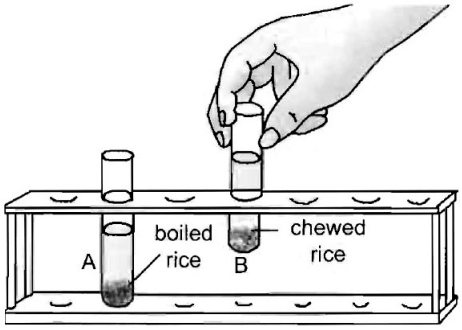
Let us perform Activity to study the role of saliva on food.

Aim : To study the effect of saliva on food.

Procedure:

- Take two test tubes and label them as 'A' and 'B'.
- In test tube A, put some boiled rice. In test tube B, put boiled rice which has been chewed for 4-5 minutes (chewed rice).
- Now, add 4-5 mL of water and 2-3 drops of iodine solution in each test tube.

Observe what happens.
You will find that a blue-black colour develops in test tube A and no such colour develops in test tube B.
Inference: The boiled rice in test tube A contains starch which gives blue-black colour on being tested with iodine. In the chewed rice in test tube B, starch has been broken down (digested) into sugar. Therefore, no blue-black colour develops with iodine.



Effect of saliva on starch

Digestion of starch is completed in the buccal cavity so it is also called **Buccal digestion.**

Palate:- This structure is found only in mammals & Human being which separates respiratory and food passage from each other.

Pharynx:- It is commonly called **throat.** Its main functions are
1. Transmission of air from nose to larynx.
2. Production of voice.
3. Transportation of food from mouth to oesophagus.

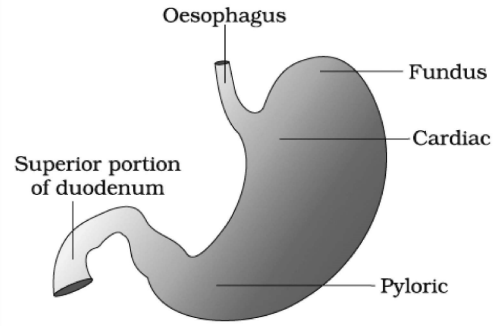
Pharynx → Gullet (food) → Oesophagus
Pharynx → Glottis (O^2) → Larynx

2. The food pipe or Oesophagus:-
After swallowing, food passes from mouth to pharynx and than oesophagus. It is about 25 cm long tube which runs along the neck and chest. Food slides down the oesophagus by the **Peristaltic movements** of its muscular wall. **No digestion occurs in the oesophagus.**

3. Stomach:-
Stomach is a J-shaped thick walled bag of muscles. It is located in abdominal cavity, below the diaphragm on left side of body. The junction between oesophagus and stomach is known as **cardiac orifice.** Posterior part of stomach opens into small intestine by **pyloric orifice.**

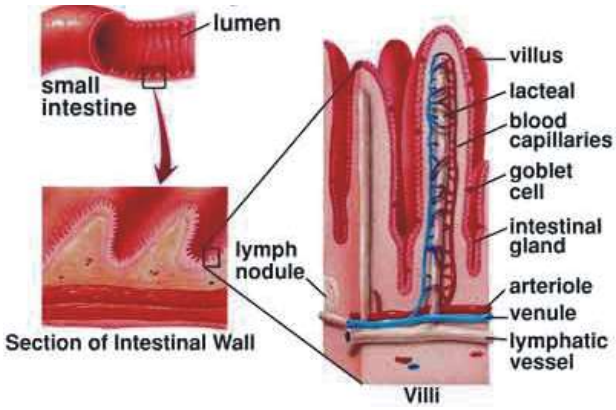
- Stomach is divided into three parts
  (A) Cardiac stomach
  (B) Fundic stomach
  (C) Pyloric stomach
- **Cardiac part** of stomach secrete **mucus** for protection of stomach.
- **Fundic part** have **gastric glands** which secretes **gastric juice** for digestion of proteins and fats.
- **Gastric Juice** have three enzymes.
  (i) **Pepsin** - Act on food proteins and forms peptones & proteases.
  (ii) **Renin** - Act on milk proteins namely **casein** and forms **calcium paracaseinate.** This process is called **curdling of milk.**
  (iii) **Lipase** - Act on fats.
- Stomach is highly acidic due to HCl or Hydrochloric acid. This HCl is secreted by **Oxyntic** or **parietal cells.**

- Acid kills many bacteria present in food and provides acidic medium for the action of digestive juices.



4. The Small Intestine:-

- Stomach is followed by the small intestine.
- It has three regions
  (i) Duodenum - Complete digestion of food
  (ii) Jejunum
  (iii) Ileum - Absorption of food.
- Small intestine is very long and is about 25 feet (7.6 meters). The great length of small intestine helps in complete digestion and absorption of food.
- Intestine have many finger like structure called villi. Each villi has a lymph vessel called **lacteal,** villi helps in absorption of food.
- Digested lipids are absorbed by **lacteal** and **digested** sugar and amino acid are absorbed into the capillaries.



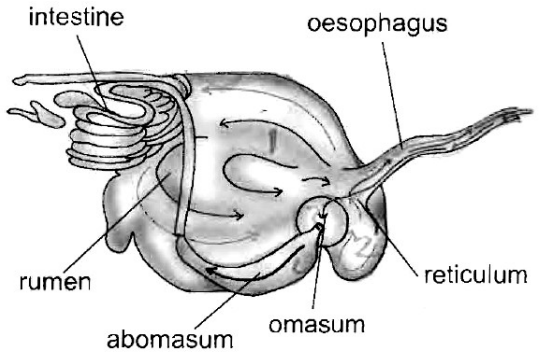
- The digestion of food is completed in the small intestine. It receive **bile Juice** from **liver** or **gall bladder**. (bile stored in gall bladder) and makes the food **alkaline** and helps in the digestion of fat.
- **Liver :** It is the largest gland, secretes bile into the small intestine. Bile contains bile juice and bile pigments. Bile juice does not contain enzymes. It is alkaline in nature and it is temporarily stored in gall bladder and helps in digestion and absorption of fats.
- **Pancreatic Juice** received from pancreas by pancreatic duct helps in the digestion of protein and carbohydrate.
- **Pancreas :** It lies parallel to and below the stomach. It secretes pancreatic juice into small intestine. Pancreas secretes pancreatic juice which contains digestive enzymes like pancreatic amylase, trypsin and lipase.
- **Intestinal glands :** They secrete intestinal juice (succus entericus) and mucus. From the stomach, the partially digested food enters the small intestine.

5. **Large Intestine:-** The small intestine is followed by large intestine. Which have two parts
(i) **Colon -** It absorb water from undigested food.
(ii) **Rectum -** The rectum functions as a reservoir for the faces and followed by **anal canal.** The anal canal opens outside by **anus.**

6. **Caecum:-** It is the structure found between ileum of small intestine and large intestine. Its main function is digestion of cellulose in **ruminants.**
Vermiform Appendix - At the posterior part of small intestine a worm like structure is found it is vestigial part of Alimentary canal.
Egestion of food:- The semisolid undigested food is pushed out of the anus. This is called **egestion or defecation.**

Digestion in Herbivores or Ruminants:

- Grass eating animals like cows, buffaloes, horses etc have a part of their stomach specialised to store half-chewed food. This is called the **rumen** and these animals are called **ruminants.**



Four-chambered stomach of a ruminant (cow)

- The stomach of ruminants have four chambers
(I) Rumen
(II) Reticulum
(III) Omasum
(IV) Abomasum
- Ruminants eat food and store it in rumen where it is partially digested. This partially digested food is called **cud.**
- When ruminants stop feeding, the cud returns to the buccal cavity and again chewed. This is called **rumination.**
- We can't digest **cellulose** because our caecum is small in size and cellulose digesting **bacteria** are absent.

Vitamins:-

- Vitamins are naturally occuring organic substances which are required in minute amount to maintain normal health and are to be supplied with food as they cannot be synthesized by the organisms (except vitamin D, which can be synthesized by skin in sun light.)

Vitamin	Types/forms	Dietary sources	Functions	Deficiency disorders
A	Retinol, retinal, four carotenoids (including beta-carotene)	Liver, orange fruits, carrots, muskmelons, dark green leafy vegetables such as spinach	• Vision • Immune function • Growth • Healthy skin	• Night blindness • Keratomalacia • Xerophthalmia
B	B_1 (thiamine)	Yeast, pork, liver, eggs, cereal grains (whole) oat meal, flax, sunflower seeds, brown rice, whole green rye, asparagus, cauliflower, potatoes, oranges	• Helps in converting blood sugar into energy • Essential for nervous and cardiovascular systems and muscle function	• Beriberi • Wernicke-korsakoff syndrome
	B_2 (riboflavin)	Milk, cheese, liver, kidney, leafy green vegetables, legumes, tomatoes, yeast, mushrooms, almonds	• Energy metabolism • Metabolism of fats, ketone bodies, carbohydrates, and proteins	Ariboflavinosis, which is characterised by sore throat with redness, swelling of mouth and throat mucosa, inflammatory lesions at corners of mouth, cracking of lips and mouth corners, moist scaly skin, decreased RBCs and haemoglobin content
	B_3 (niacin)	Liver, chicken, beef, fish, cereals, peanut, legumes, mushrooms	• Essential for energy release from carbohydrates, fats, and proteins • Helps in DNA synthesis • Necessary for healthy skin, nerves, digestive system	Pellagra
	B_5 (pantothenic acid)	Meat, coldwater fish ovaries, royal jelly, whole grains, vegetables – broccoli, avocados	• Assists in metabolism of carbohydrates, proteins, and fats • Essential for cell metabolism • Required for cholesterol, metabolism, hormone production, and haemoglobin	Paresthesia, which is characterised by sensation of tingling, pricking, or numbness of skin
	B_6 (pyridoxal phosphate)	Meat, whole grain products, vegetables, nuts, bananas	• Macronutrient metabolism • Neurotransmitter synthesis • Haemoglobin synthesis and function • Gene expression	• Anaemia • Peripheral neuropathy
	B_7 (biotin)	Egg yolk, liver, kidney	• Helps in converting food, into energy • Helps to maintain healthy hair, skin, and nail • Assists in cell growth	• Dermatitis • Enteritis

Vitamin	Types/forms	Dietary sources	Functions	Deficiency disorders
B	B_9 (folic acid)	Leafy vegetables – spinach, asparagus; legumes – dried, fresh beans, peas, lentils; liver and liver products, baker's yeast, sunflower seeds	• Synthesise and repair DNA • Required during rapid cell growth and division • To produce healthy RBC	Anaemia, skin pigmentation, fatigue, mental depression; deficiency during pregnancy is linked with birth defects
	B_{12} (cobalamin)	Lean meat, eggs, dairy products such as milk and cheese	• Maintaining a healthy nervous system • Development of RBCs • Affecting DNA synthesis and fatty acid synthesis • Energy production	Megaloblastic anaemia
C (ascorbic acid)	–	Citrus fruits such as oranges; muskmelon, strawberries, tomatoes, broccoli, cabbage, kiwi fruit, sweet red pepper	• Keeps body tissues such as gums and muscles in good shape • Helps to heal wound • Resists infection	Scurvy
D	D_2 (ergocalciferol) D_3 (cholecalciferol)	Liver, egg yolk, fish, fortified cereal, milk fortified with vitamin D	• Regulates body levels of calcium and phosphorus • Supports healthy immune system	• Rickets • Osteomalacia
E (α-tocopherol)	–	Whole grains – wheat and oats; wheat germ, green leafy vegetables such as spinach; nuts and seeds	• Maintains body tissues such as eyes, skin, and liver • Protects lungs from damage by pollutants • Formation of RBCs	Haemolytic anaemia in the newborn
K	K_1 (phylloquinone) K_2 (menaquinone)	Green leafy vegetables, dairy products such as milk and yogurt, liver	• Helps in blood clotting • Protects bone from fracture	• Bleeding disorders • Osteoporosis

Mineral	*RDA/AI	Dietary sources	Functions	Deficiency disorders
Calcium (Ca)	1000 mg	Dairy products such as milk, cheese, and yogurt; canned fish with bones; green leafy vegetables such as broccoli	• Constituent of bone and teeth • Required for nerve function, muscle contraction, and blood clotting	Osteomalacia, osteoporosis, rickets, tetany
Magnesium (Mg)	420 mg	Eggs, milk and dairy products, fish (shell fish) nuts, legumes, whole grains, green vegetables	• Constituent of muscles, soft tissues, and bones • Functions in many enzyme processes	Muscle weakness, abnormal heart rhythm tiredness, cramps, fits
Phosphorus (P)	700 mg	Meat, poultry, fish, dairy products, cereal products, green leafy vegetables	• Essential for bone formation and maintenance • Energy metabolism, nerve function, and acid balance	Anaemia, demineralisation of bones, nerve disorders, respiratory problems, weight loss
Sodium (Na)	1500 mg	Table salt, milk products, eggs, seafoods	• Regulates body fluid volume • Acid-base balance • Nerve and muscle activity	Low blood pressure, weakness, fatigue, thirst, cramps
Potassium (K)	4700 mg	Legumes, potatoes, tomatoes, bananas	• Essential for nerve function, muscle contraction, maintenance of normal blood pressure	Muscle paralysis, heart problems

Chloride (Cl)	2300 mg	Table salt, seafoods, eggs, milk products	• Regulates body fluid volume • Acid-base balance	Respiratory disorders, decreased blood acidity
Sulphur (S)	No RDA (as sulphur is found in a wide variety of foods, there is no RDA for sulphur)	Cheese, eggs, fish, cauliflower, nuts, onions, broccoli, cucumber, wheat germ, corn	• Healthy skin and nails • Detoxification	Skin disorders, muscle pain, nerve disorders, arthritis, circulatory trouble, inflammation, wrinkles
Iron (Fe)	8 mg	Red meat, liver, eggs, legumes, green leafy vegetables, broccoli, whole grains	• It is important for formation of Hb of RBCs that carries oxygen throughout the body	Anaemia, susceptible to infections
Iodine (I)	150 mg	Seafoods, iodised salt, and food products with iodised salt	• Essential for production of thyroid hormones	• Goitre • Cretinism

- Some times due to infection in alimentary canal, food poisoning or indigestion occurs, watery stool passes out frequently. It is very common in children of India. In severe cases it can be fatal. It causes dehydration due to excess loss of water & salts from the body. Patient should be given plenty of boiled & cooled water with a pinch of salt & sugar dissolved in it. It is called **Oral Rehydration Solution (ORS).**

CONCEPT APPLICATION LEVEL - I [NCERT Questions]

Q.1 What are Villi ? What is their location and function?

Ans. The inner walls of the small intestine have thousands of finger-like outgrowths, these are called villi.
Location of Villi: The Villi are found in the inner wall of the small intestine.
Function of Villi: The villi increase the surface area of the intestine for absorption of the digested food.

Q.2 Where is the bile produced ? Which component of the food does it help to digest?

Ans. Bile is produced in liver. The bile juice is stored in a sac called gall bladder. The bile plays an important role in the digestion of fats.

Q.3 Name the type of carbohydrate that can be digested by ruminants but not by humans. Give the reason also.

Ans. Cellulose is the carbohydrate that can be digested by ruminants. Ruminants have large sac like structure between the small intestine and large intestine. The cellulose of the food is digested by the action of cellulose digesting enzymes, i.e., cellulose and certain bacteria which are not present in humans.

Q.4 Why do we get instant energy from glucose?

Ans. Because glucose can easily broken down in the cell with the help of oxygen and gives carbon dioxide, water and energy.

Q.5 Write one similarity and one difference between the nutrition in *amoeba* & human beings.

Ans.

	Similarity	Difference
Amoeba	During the digestion of food, amoeba secretes digestive juices into the food vacuole. They act on the food and breaks it down to simpler substances.	Amoeba feeds some microscopic organisms. When it senses food, it pushes out pseudopodia around the food particle, surrounds it completely and then the food is trapped as a food vacuole.
Human Beings	In case of human beings, the inner walls of stomach and the small intestine also secrete the digestive juices. The digestive juices convert complex substances of food to simpler ones.	We take food through the mouth, digest and utilize it. The food component gradually gets digested as food travels through the various compartments.

CONCEPT APPLICATION LEVEL - II

Section–A

Q.1 Write the importance of saliva in our mouth.

Ans. The saliva breaks down the starch into sugars that are easier to digest.

Q.2 What is tongue? Write its function.

Ans. The tongue is a fleshy muscular organ attached at the back of the buccal cavity.
The importance of the tongue in human beings is as follows:
(i) Tongue is used for talking.
(ii) It is used to mix saliva with the food during chewing and helps in swallowing of food.
(iii) We also taste food with our tongue.

Q.3 What is tooth decay?

Ans. Normally bacteria are present in our mouth but they are not harmful to us. However, if we don't clean our teeth and mouth after eating, many harmful bacteria also begin to live and grow in them. These bacteria break down the sugars present from the leftover food and release acids. The acids gradually damage the teeth. This is called tooth decay.

Q.4 How do we feel when food particles enter the windpipe? Give the reason.

Ans. When food particles enter the windpipe, we feel choked, get hiccups or cough. The reason behind is that the windpipe carries air from the nostrils to the lungs. It runs adjacent to the foodpipe. But inside the throat. air and food share a common passage.

Q.5 What do you know about the liver as an organ?

Ans. The liver is a reddish brown gland situated in the upper part of the abdomen on the right side. It is the largest gland in the body. It secretes bile juice that is stored in a sac called gall bladder.

Q.6 What is assimilation?

Ans. The surface of the villi absorbs the digested food materials which is transported via blood vessels to different organs of the body where they are used to build complex substances such as proteins. This is called assimilation.

Q.7 What is the function of large intestine?

Ans. The large intestine is wider and shorter than small intestine. Its function is to absorb water and some salts from the undigested food material. The remaining waste passes into the rectum.

Q.8 What is cud?

Ans. In rumen, grass is partially digested and it is called cud.

Q.9 What is rumination?

Ans. Cud returns to the mouth in small lumps and the animal chews it. This process is called rumination or cud-chewing.

Q.10 What are ruminants?

Ans. The animals in which rumination occurs are called ruminants.

Section–B

PREVIOUS YEARS NSO QUESTIONS

Q.1 In a normal adult heart beats about 70 to 72 times a minute. In a child the heart beats up to __X__ times a minute. What will come at the place of X ? **[NSO-2010]**

(A) 120 (B) 65 (C) 80 (D) 75

Direction (Q.2 to Q.3) : Study the figures shown and answer the following questions. **[NSO-2010]**

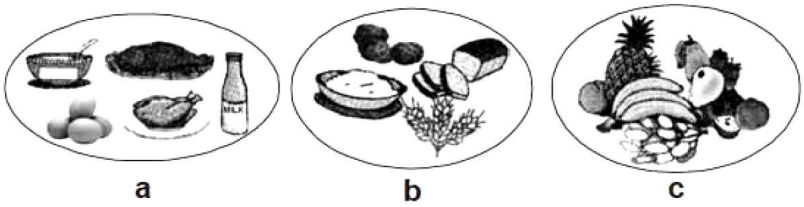
Q.2 Which beak belongs to a bird that does not feed on animals?

(A) (a) only (B) (b) & (d) (C) (a) & (c) (D) (c) only

Q.3 The bird with beak as shown in figure 'c' feeds on

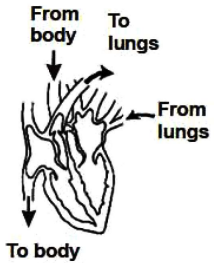
(A) Fish (B) Fruits (C) Nectar (D) Insects

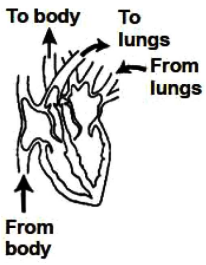
Q.4 Study the figures given below. Which of the following is/are protective food(s)? **[NSO-2010]**

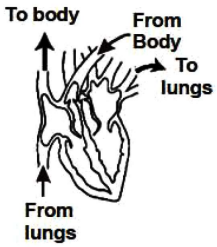


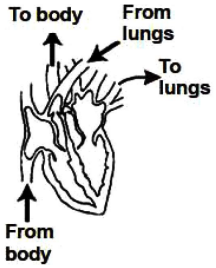
(A) a (B) b (C) c (D) All of these.

Q.5 Which figure shows the correct flow of blood in and out of the heart? **[NSO-2010]**

(A) 

(B) 

(C) 

(D) 

Q.6 Which of the following are good sources of roughage? **[NSO-2011]**

(A) Milk, meat, soyabean, grains (B) Egg, cu rd, pulses, fruit juice

(C) Broccoli, fruits, carrot, spinach (D) Onion, yoghurt, cheese, pulses.

Q.7 From which of the four chambers of ruminant stomach, semi-digested food is moved back to mouth? **[NSO-2011]**

(A) Rumen (B) Abomasum (C) Omasum (D) All of these

Q.8 Which one of the following is a correct match? **[NSO-2011]**

Type of teeth	**Function**
(A) Incisors	Biting and cutting
(B) Canines	Crushing and grinding
(C) Molars & premolars	Piercing and tearing
(D) Molars	Smaller than premolars

Q.9 The function of scissors is synonymous with the function of _____. **[NSO_2012]**
(A) Incisors (B) Premolars (C) Canines (D) Molars

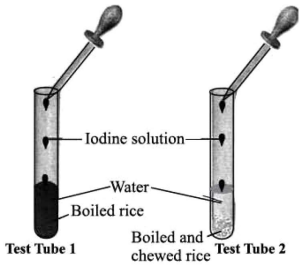
Q.10 Match **Column-I** with **Column-II** and select the correct option from the codes given below.

Column-I	**Column-II** **[NSO_2012]**
(a) Salivary gland	(i) Breaks down fats
(b) Intestinal gland	(ii) Breaks down proteins into peptides
(c) Pancreas	(iii) Breaks down peptides into amino acids
(d) liver	(iv) Breaks down starch into sugar

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

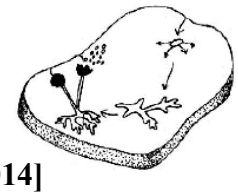
Q.11 Saurabh's younger brother Harshit is 3 years old. He is having difficulty in walking due to deformity in his legs. He always complains about body pain.
Which of the following can be the reason for it? **[NSO_2012]**
(A) His diet is deficient in vitamin C and K due to which his body absorbs excess amount of calcium and phosphorus present in food.
(B) His diet is deficient in vitamin D due to which his body is not able to absorb sufficient amount of calcium and phosphorus present in food.
(C) Major part of his diet is milk and green vegetables.
(D) None of these

Q.12 Ridhima took two test tubes labelled as 1 and 2 as shown in the figure. In test tube 1, she put one table spoon of boiled rice and in test tube 2, she put one table spoon of boiled rice after chewing it for 3-5 minutes. Then she added 3-4 mL of water in both the test tubes. Thereafter, she poured 2-3 drops of iodine solution in each of the test tubes.
Which of the following would be the expected observation by Ridhima? **[NSO_2013]**



(A) Colour changes to blue-black in test tube 1 as rice is rich in starch.
(B) Colour doesn't change to blue-black in test tube 2 as saliva breaks down the starch into sugars.
(C) Colour changes to blue-black in both the test tubes.
(D) Colour does not change in either of the test tubes.

Q.13 Which of the following statements best describe the organism growing on the given piece of bread?
(i) It belong to flowering plants.
(ii) It reproduces by spores.
(iii) It is a chlorophyllous organism.
(iv) It prepares its own food.
(v) It obtains food from dead and decaying organic matter. **[NSO_2014]**

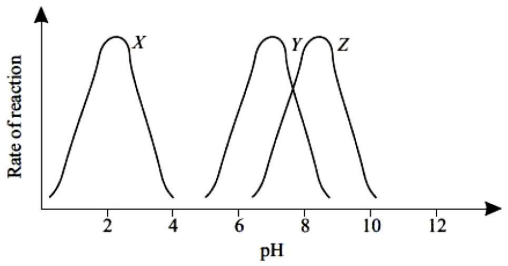


(A) (ii), (iii) and (iv) (B) (i), (ii) and (v) (C) (ii) and (v) (D) (iii) and (iv)

Q.14 Refer to the given graph which shows the effect of pH on the activities of three enzymes, X , Y and Z. **[NSO_2014]**

The three enzyme samples, X, Y and Z are taken from which paris of the human alimentary canal?

	X	Y	Z
(A)	Duodenum	Mouth	Stomach
(B)	Mouth	Stomach	Duodenum
(C)	Stomach	Duodenum	Mouth
(D)	Stomach	Mouth	Duodemml

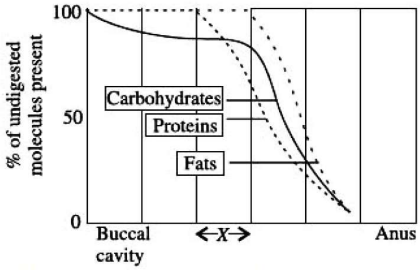


Q.15 Match the problems given in Column-I with their remedies in Column-ll and mark the correct option from the given codes. **[NSO_2014]**

	Column-I		**Column-II**
a.	Indigestion	(i)	Calamine solution
b.	Bee sting	(ii)	Calcium carbonate
c.	Tooth decay	(iii)	Milk of magnesia
d.	Wasp sting	(iv)	Vinegar

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

Q.16 The given graph shows the percentage of undigested carbohydrates, proteins and fats through successive parts of the human alimentary canal.



Why does the percentage of undigested carbohydrates remain constant in part X? **[NSO_2014]**
(A) All the starch has been digested and only other carbohydrates remain.
(B) Protease at part X prevents the salivary amylase from acting on starch.
(C) The acidic conditions of part X prevent salivary amylase from acting on starch.
(D) All the carbohydrates have been digested before reaching part X.

Q.17 Match **column I** with **column II** and select the correct option from the codes given below. **[NSO_2014]**

Column I (Foods)	**Column II (Major Nutrient present)**
(a) Cheese, egg, milk	1. Iron
(b) Yellow or orange coloured fruits or vegetables	2. Vitamin D
(c) Guava, tomato, citrus fruit	3. Calcium
(d) Green leafy vegetables	4. Vitamin A
	5. Vitamin C
	6. Proteins

(A) a-3; b-2,5; c-5; d-1,4
(B) a-3,6; b-4; c-5; d-1,2
(C) a-3,6; b-1,2; c-4; d-5
(D) a-4,5; b-1; c-3,6; d-2

CONCEPT APPLICATION LEVEL - III

SECTION-A

- **Fill in the blanks with suitable words.**

1. The main steps of nutrition in humans are _____ , _____ , _____, _____ and _____.
2. The largest gland in the human body is _____.
3. The stomach releases hydrochloric acid and _____juices which act on food.
4. The inner wall of the small intestine has many finger-like outgrowth called _____.
5. Amoeba digests its food in the _____.

SECTION-B

- **Match the following**

1. Match the items of Column I with suitable items in Column II

Column I	**Column II**
(a) Salivary gland	(i) Bile juice secretion
(b) Stomach	(ii) Storage of undigested food
(c) Liver	(iii) Saliva secretion
(d) Rectum	(iv) Acid release
(e) Small intestine	(v) Digestion is completed
(f) Large intestine	(vi) Absorption of water
	(vii) Release of faeces

SECTION - C

1. Which part of the digestive canal is involved in:

(i) Absorption of food _____
(ii) Chewing of food _____
(iii) Killing of bacteria _____
(iv) Complete digestion of food _____
(v) Formation of faeces _____

SECTION - D

1. Mark 'T' if the statment is true and 'F' if it is false:

(a) Digestion of starch starts in the stomach. **(T/F)**
(b) The tongue helps in mixing food with saliva. **(T/F)**
(c) The gall bladder temporarily stores bile. **(T/F)**
(d) The ruminants bring back swallowed grass into their mouth and chew it for some time. **(T/F)**

ANSWER KEY

CONCEPT APPLICATION LEVEL - II

SECTION - B

Q.1	A	Q.2	D	Q.3	C	Q.4	C	Q.5	B	Q.6	C	Q.7	A
Q.8	A	Q.9	A	Q.10	A	Q.11	B	Q.12	B	Q.13	C	Q.14	D
Q.15	B	Q.16	C	Q.17	B								

CONCEPT APPLICATION LEVEL - III

SECTION-A

(1) ingestion, digestion, absorption, assimilation, egestion (2) liver
(3) gastric (4) villi (5) food vacuole

SECTION-B

1. (a)- iii, (b) - iv, (c) - i, (d) - vii, (e) - v, (f) - ii

SECTION - C

1. (i) small intestine (ii) mouth (iii) stomach (iv) small intestine (v) rectum

SECTION - D

1. (a) T, (b) T, (c) T, (d) T