. Class – X [CBSE] .

. LIFE PROCESS (NUTRITION .)

Life: - Life is a self regulated complex system of molecules where chemical reactions are going on all the time that leads to its maintenance, growth, responsiveness and reproduction.

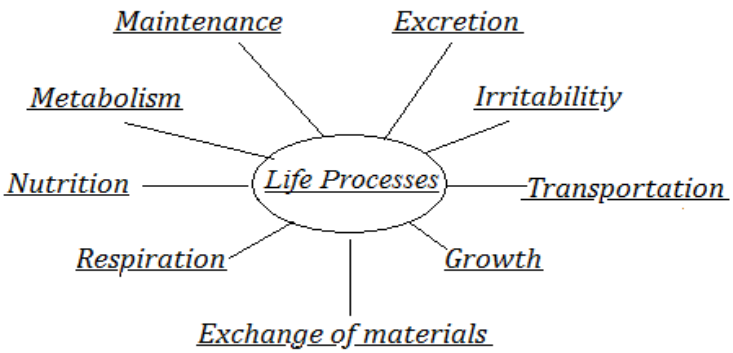
Movements: - Changes in position are called movements. Living beings show both visible and invisible movements.

Visible movements - Visible movements are changes in position of body parts which can be detected by human eyes. Example– moving head.

Invisible movements - are those changes in position which cannot be observed by human senses because they occur at the molecular level, ***Example***–*Entry of nutrients into cell or release of wastes from them.*

Life process:

Life processes are those basic functions of living beings which are essential for their survival. They are the same in all types of living forms whether unicellular or multi–cellular, plants or animals.



Fundamental characteristics of organism-

(i) ***Cellular Organization*** - All organisms are consist of one or more cell (Structural and functional unit of life).
(ii) ***Sensitivity*** - All organism responds to stimuli.
(iii) ***Respiration and energy utilization*** - All Organism do respire and utilize the energy produced.
(iv) ***Growth*** - All living organisms assimilate energy and use if for life and growth
(v) ***Reproduction*** - All organisms reproduce to increase their number.
(vi) ***Regulation*** - All organisms have regulatory mechanisms to co-ordinate internal life–process.
(vii) ***Homeostasis*** –All organisms maintain relatively constant internal condition, different form their environment.
(viii) ***Genetic environment*** - All living organism process genetic material called DNA or RNA.

Metabolism– All chemical reactions which occurs in a living being due to interaction amongst its molecules. All functions of organisms are due to metabolism. It is of two types–

Anabolic Metabolism	*Catabolic Metabolism*
It is constructive metabolism	It is destructive metabolism

It is consists of build up reactions where complex molecules are formed from simpler ones.	It is consists of breakdown reactions where complex substances are broken down into sampler substances
Example:– formation of glycogen from glucose	***Example***:– Respiration

➲***Physiology***- The branch of biology that deals with the study of life processes, activities and body functions is called physiology.

Nutrition- It is the process of intake of food, its digestion, absorption distribution to different parts and assimilation.This term is derived from Nutrire (meaning– to nourish).

Food- Food is the material substance which is used by living organisms for obtaining energy and raw materials to produce bio–chemicalsrequired for body building and regulation.

Type of food:

1. Energy food: – Carbohydrates, Fat rich food.
2. Body building Food: – Protein, Minerals, and Carbohydrates rich food.
3. Regulatory food: – Vitamins, minerals rich food.

Nutrients- The different components of food that have distinct functions like providing energy, materials for body maintenance, regulation and metabolism are called nutrients.

Importance of food: -

a. Energy
b. Body Structure
c. Repair& Growth
d. Regulators
e. Resistance
f. Reproduction

Type of nutrition-

1 *Autotrophic or holophytic Nutrition*

a. It is mode of nutrition in which organisms are able to build up their own organic food from inorganic raw materials with the help of energy.
b. The organisms performing autotrophic nutrition are called auto-trophs or producer.
c. Autotrophic nutrition is of two types, 1. Chemosynthesis and 2. Photosynthesis.
d. In ***chemosynthesis*** (Gk. chemeia-*chemical*, synthesis-*putting together*)the energy used in synthesis of organic food is obtained by oxidation of substances present synthesis of organic food is obtained by oxidation of substances present in the surrounding medium.
e. In photosynthesis the energy is got from solar radiations trapped with the help of pigments like chlorophyll.
f. ***Example:*** –Nitrobacter (nitrifying bacterium), Ferro–bacillus (iron bacterium).

2 *Heterotrophic Nutrition*

a. It is mode of nutrition in which the organisms obtain readymade organic food from outside sources.
b. The organisms that depend upon outside sources for obtaining organic nutrients are called Heterotrophs(Gk. hetero or heteros-*other*,troph or trophe- *nourishment*).
c. Digestion is essential in this type of nutrition.
d. Heterotrophs are also called Consumer as they consume food prepared by auto-trophs.

e. ***Example:*** – Human beings.

Character	Autotrophic Nutrition	Heterotrophic Nutrition
1.Food	It is self manufactured.	Food is obtained readymade from outside
2. External Energy	An external source of energy is required for synthesis of food.	An external source of energy is not required. The required energy is present in the food obtained from outside.
3. Inorganic Substances	They constitute the raw materials for manufacturing food.	Inorganic substances are not much required.
4. Digestion	It is absent.	An external or internal digestion is required for conversion of complex organic materials into simpler and soluble ones.
5. Chlorophyll	It is present for trapping light energy.	Chlorophyll is absent.
6. Status	Organisms performing autotrophic nutrition function as producers.	Organisms performing heterotrophic nutrition function as consumers.
7. Example	Green plants, some bacteria, some protista.	Animals.

Photosynthesis: It is a bio-chemical process of manufacture of organic food from carbon-di-oxide and water by using solar energy inside Chlorophyll containing cells.

➲ Oxygen and glucose are the end products of it. Excess of glucose is stored as starch in plants. In our body glycogen is stored as energy reserve.

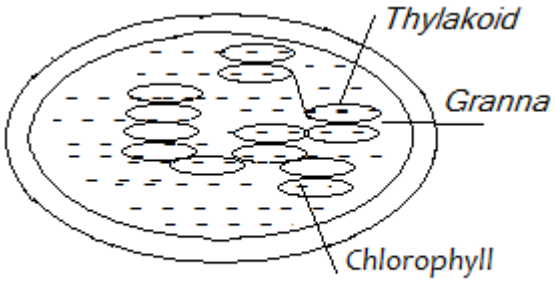
Basic Requirements for Photosynthesis

1. ***Chlorophyll: –***PlantsPosses pigment molecules for absorption of light energy. There are three types of photosynthetic pigments–green ***chlorophylls;*** Orange colored***Carotenes***and Yellowish ***Xanthophylls.*** Chlorophyll are of two main types–(1) ***chlorophyll a*** (2) ***chlorophyll b.*** Chlorophyll a is called *Primary photosynthetic pigments* it takes part in conversion of light energy into chemical energy. Other pigments absorb light energy and hand over the energy to chlorophyll a.

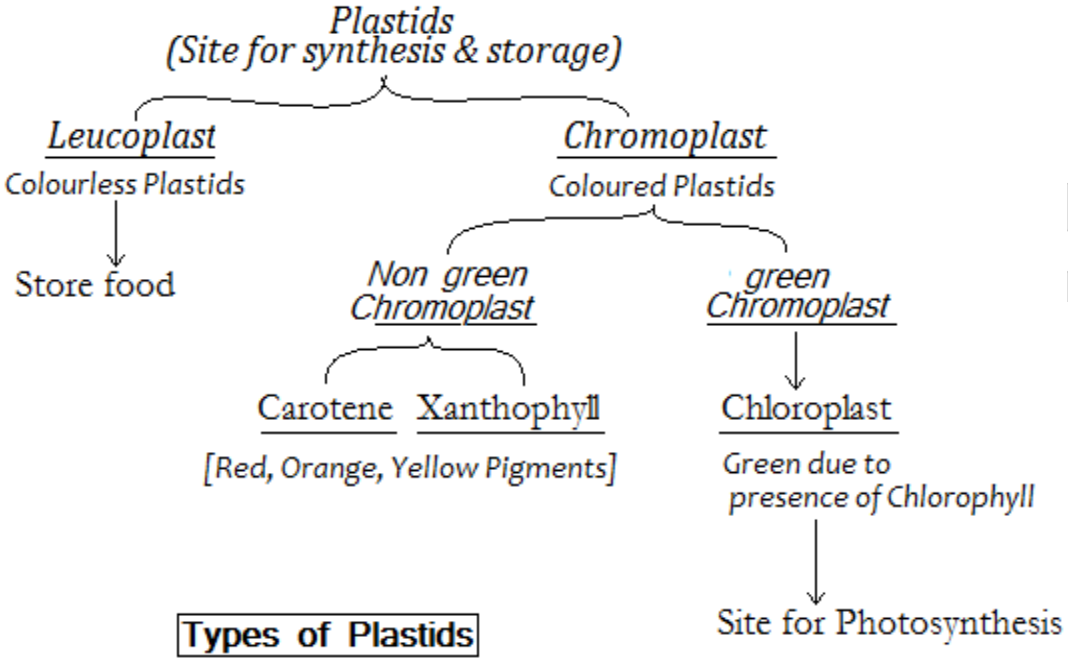
Chlorophyll occurs in green colored cell organelles called chloroplasts.

Structure of Chloroplast: -

Chloroplast has a double membrane envelope, a crystalloid-colloid matrix or ***stroma*** and a number of membrane covered flattened sacs called ***thylakoids***. Thylakoids are small and stacked at places to form ***granna*** (singular granum). They are connected to one another by intergranal or stroma thylakoids. Thylakoids contain molecules of green Chlorophyll and yellow orange pigments which takes part in trapping solar energy. Stroma contains Enzyme for *dark reaction.*



Chloroplast

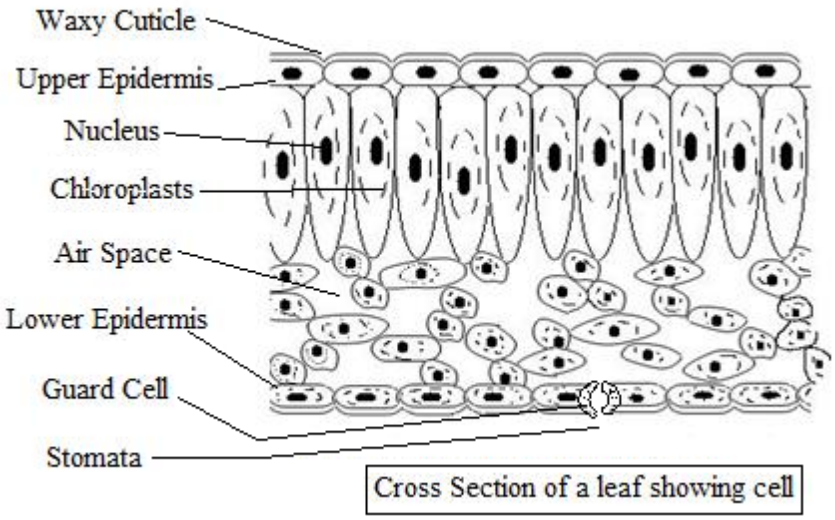


Types of Plastids

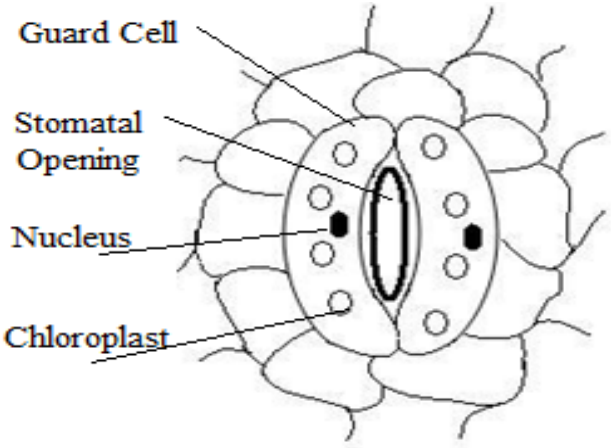
1. ***Carbon Dioxide:*** --It enters the leaves through stomata. Stomata function *as* ***turgor-operated valves***. Their ***guard cells*** are thicker on the inner side and thinner on the outer side. ***Stomata*** generally remain open during the daytime. As carbon dioxide is used internally in photosynthesis, more of it diffuses from outside. During day time the leaves can also use a small quantity of carbon dioxide released in process of respiration. At night the carbon dioxide evolved in respiration remains unutilized

   During evening and early morning, when light intensity is low, the rate of photosynthetic utilization of carbon dioxide may just balance respiratory release of the gas. At this time the leaves neither obtain carbon dioxide from outside nor release the gas. The light intensity wherein the photosynthesizing organ neither absorbs carbon dioxide nor releases the same is called ***compensation point***

Leaf is even otherwise most suitable for photosynthesis as it has stomata for exchange of gases and vascular supply for bringing in water and taking out manufactured food materials.



Cross Section of a leaf showing cell



Stomata

2. *Water:* –Land plants absorb water from soil through their roots. The absorbed water is transported to photosynthetic are through xylem.99% or absorbed water is lost through transpiration. Only a small quantity of water is used in photosynthesis as hydrogen donor. For this, water splits into its components with the help of light energy. The phenomenon is called ***photolysis*** of water. Oxygen is evolved.

$$2H_2O \xrightarrow{\text{Energy}} 4H^+ + 4e + O^2\uparrow$$

3. *Light:* - It is the source of energy for photosynthesis. Plants absorb light mostly in violet-blue light carries more energy as compared to red light. Plants growing under shade of others receive mostly green and some violet light. They have lower rates of photosynthesis. Light is required for ***photolysis*** of water and ***excitation of chlorophyll*** to emit electron.

Mechanism of photosynthesis:-Photosynthesis is formation of organic food from carbon dioxide and water with the help of sunlightt inside chlorophyll containing cells. Oxygen is produced as by product.

$$6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6H_2O + 6CO_2\uparrow$$

Oxygen comes from water. Hydrogen of water is used to reduce carbon dioxide to form carbohydrate. Photosynthesis occurs in two steps:

A. ***Photochemical Phase (Light or Hill Reaction)***. The reactions of this phase are driven by light energy.They are of two types- (1) Photolysis of water and (2) Formation of assimilatory power.

(a). ***Photolysis of Water***: Light energy splits up water into two components. The step requires an *Oxygen evolving complex*(formerly called *Z-COMPLEX*) having manganese ions. Calcium and chlorine are also required.

$$2H_2O \xrightarrow{\text{Energy}} 4H^+ + 4e^{\mp} + O_2\uparrow$$

(b). ***Formation of Assimilatory*** Power: Electrons released by photolysis of water are picked up by chlorophyll a molecules. On absorption of light energy, each chlorophyll a molecule throws out an electron with gain of energy. This is primary reaction of photosynthesis which converts light energy into chemical energy. Electrons travel along an electron transport system, releasing energy in the process. The energy is used in the formation of ATP (adenosine tri–phosphate)from ADP and inorganic phosphate. Synthesis of ATP from ADP and inorganic phosphate (Pi) with the help of light energy is called **photo–phosphorylation**

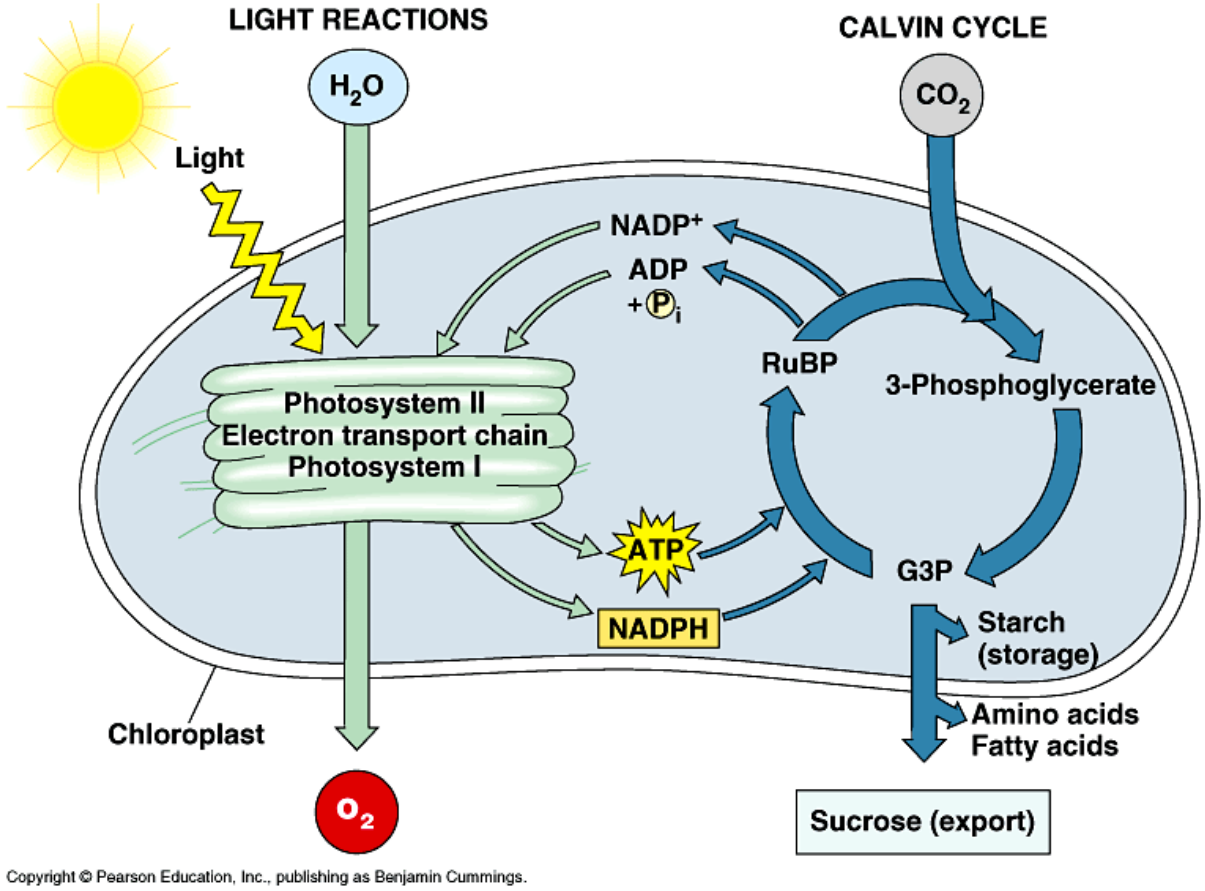
$$ADP + Pi + Energy \rightarrow ATP$$

The electrons ultimately activate NADP and make it combine with Hydrogen to form *$NADPH_2$*.
Both ATP and $NADPH_2$ together form assimilatory Power.

B. ***Biosynthetic phase (Dark or Blackmans Reaction):***

It occurs in Stroma of Chloroplast. It is actually light independent reaction which can occur both in light as well as in dark. .*CO_2*combines withRibulose-bi-phosphate in the presence of Enzyme (Ribulose-bi-phosphate -carboxylase(rubisco)).PGA (phosphor-glyceric acid) is formed. PGA reduced by $NADPH_2$ to form GAP (glyceraldehydes phosphate). GAP is changed into DHAP (di-hydroxy-acetone-phosphate) which generates glucose and Ribulose. Glucose undergoes to form starch Common pathway of biosynthetic phase is Calvin cycle.

$$RuBP + CO_2 \xrightarrow{\text{Rubisco}} 2PGA \xrightarrow[NADPH_2]{\text{Reduced by}} GAP \rightarrow DHAP \rightarrow Glucose + RuBP$$



Difference b/w Light Reaction and Dark Reaction

Character	**Light Reaction**	**Dark Reaction**
1. Light	It is required for the reaction.	It is light independent.
2. Conversion	The reaction converts light energy into chemical energy.	The reaction uses chemical energy in building organic substances.
3. Chlorophyll	It is essential for the reaction.	Chlorophyll is not required directly.
4. Occurrence	It occurs in thylakoids of chloroplasts.	It occurs in stroma, part of chloroplasts.
5. Products	It s products are ATP and $NADPH_2$	Its main product is starch.
6. Oxygen	Oxygen is liberated as a by-product.	It does not produce oxygen
7. Electron Transport	Light reaction involves movement of electrons along a *transport chain*.	There is no involvement of an electron *transport chain.*

Type of Heterotrophic Nutrition:-

(i) Saprophytic Nutrition(Saprotrophic Nutrition):-

a. It is a mode of *Heterotrophicnutrition* inwhich food is obtained from organic remains like dead organism, excreta, and fallen leaves. These organisms are called s***aprophytes or saprotrophs***.
b. They pour digestive enzymes over the external organic substance. Complex organic compounds are broken down into simpler organic compounds which can be absorbed.
c. It is called ***external digestion*** (digestion outside the body).

d. Example in plants:- Fungi(Mash room, Bread mould, Yeast)
e. Saprophytic Nutrition in Animal is called saprozoic nutrition
f. ***Example***: -Monotropa.
g. Importance of saprophytic nutrition:
   i. ***Scavenging***:- saprophytes function as scavengers as they remove the organic remains
   ii. ***Biogeo-chemicals***: - saprophytes bring about circulation of biogeo-chemical.
   iii. ***Spoiling food***: - they attack all type of food and spoil them.
   iv. ***Food poising:*** - some secretes toxic substance.

(ii) *Parasitic Nutrition*

a. It is mode of nutrition in which an organism obtains food and shelter from another organism.
b. Obtainer organism is called ***Parasite.***
c. Provider is called ***Host***.
d. The parasites which cause disease are known as Pathogens. (Plasmodium causes malaria)
e. Example:-
   i. *Human being parasite*–Ascaris, Taenia, Wucheria
   ii. *Plant parasite*–Cuscuta also called Amarbel. It has sucking roots (haustoria) for obtaining food.

(iii) *Holozoic Nutrition*

a. It is a mode of Heterotrophic nutrition which involves intake of solid food.
b. It is also called ***ingestive nutrition.***
c. depends upon the source of food, holozoic organism are of three types:
   i. ***Herbivores:*** -which feed on plants and plant parts. Example: - Cow, Goat.
   ii. ***Carnivores:*** - which feed on other animals. Example: - lion, tiger, snake.
   iii. ***Omnivores:*** - which feed on both plants and animals. Example: - Crow, Humans.

Detrivores*are animal which feed on dead bodies of other animals. They are also called scavengers.*

Difference b/w saprophyte and parasite

Character	Saprophyte	Parasite
1. Mode of Nutrition	Nutrition is got from organic remains.	Nutrition is obtained from another living organism called host.
2. External Digestion	Saprophytes perform external digestion in order to make soluble the food materials.	External digestion is absent.
3. Sucking Organs	They are absent	Many parasites posses sucking organs.
4. Ingestion	Only digested food is taken.	The ingested food can be predigested, semi-digested or undigested.
5. Disease	It does not cause disease	It often produces disease or ailment in the host.
6. Food	It may spoil food.	It robs the host of food.
7. Ecological role	It has an ecological role in scavenging the earth of dead organic matter and release of trapped biogeochemical.	A useful ecological role is absent. At times it may spread a disease in epidemic form.

Steps in holozoic Nutrition:-

1. ***Ingestion***– it is taking in of solid food with the help of temporary or permanent mouth.
2. ***Digestion***–the conversion of complex insoluble food ingredientsinto simple absorbable form is called*Digestion*. It is a *catabolic process* which occurs with the help of digestive enzyme.It is of two types.

a. ***Inter cellular digestion***: - in higher animals the ingested foods is taken to a digestive track where digestive enzymes are poured over it. As it occurs outside the cell, the digestion is intercellular or extra cellular. Example: -Fish, Human, Lion.

b. ***Intracellular***: - here ingested food is digested in food vacuole. It occurs inside the cell. Example: -Amoeba, Paramecium.

3. ***Absorption***–digested food is absorbed by cells and transport to all body parts.
4. ***Assimilation***–it is ananabolic reaction. Absorbed food materials are used in synthesis of proteins, fats, repair and growth of cells.
5. ***Egestion***–the process of throwing pout of undigested food as faecal matter.

Difference b/w ingestion and Egestion

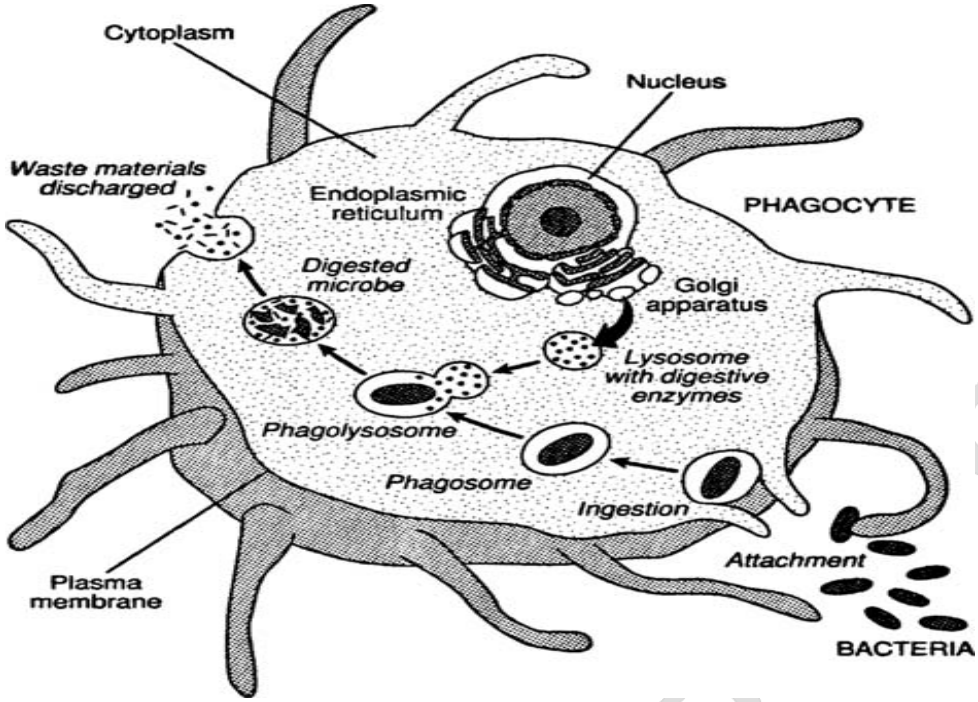
Character	Ingestion	Egestion
1.Process	Ingestion is the process of taking in of food.	It is the throwing of faecal matter out of the body.
2.Steps	It involves catching, holding and putting the food into body through mouth.	It involves piling up of faecal matter and its elimination through anus, cloaca or other opening.
3. Components	Ingested food consists of both digestible and indigestible matter.	Faecal matter consists only of indigestible materials.

Holozoic Nutrition in unicellar organism–

I. Protozoan carries out ***holozoic nutrition*** through intracellardigestion. They feed bacteria, dead particles, decaying matter.
II. Protozoan like amoeba ingest food from any point of body surface. While others like paramecium ingest food from*fixed point*.
III. ***Pseudopodia***–Protozoan like amoeba capture food with the help of temporary finger like processes called Pseudopodia.
IV. Protozoan like paramecium have ***cilia*** (hair like). Beating of cilia creates current in water that pushes food particle through cytostome or cell mouth.
V. ***Phagocytosis***:-The process of ingestion of solid food particle by a cell or unicellular organism is called phagocytosis.
VI. paramecium has definite ***cytopyge*** or cell anus

Nutrition in amoeba: -As soon as amoeba comes in contact with a food particle, it throws ***pseudopodia***. The tips of pseudopodia fuse and the food prey comes to lie in a vesicle or ***phagosome***. This method of intake of food is known as ***circumvallation***. A lysosome fuses with phagosome to produce a food vacuole.(***gestriole=***temporary stomach . Digestion occurs with the help of digestive enzymes of lysosome. The

latter diffuse into the cytoplasm. The old food vacuole with undigested material riches the rear end, passage to surface,fuses with surface membrane and throws out the undigested material.

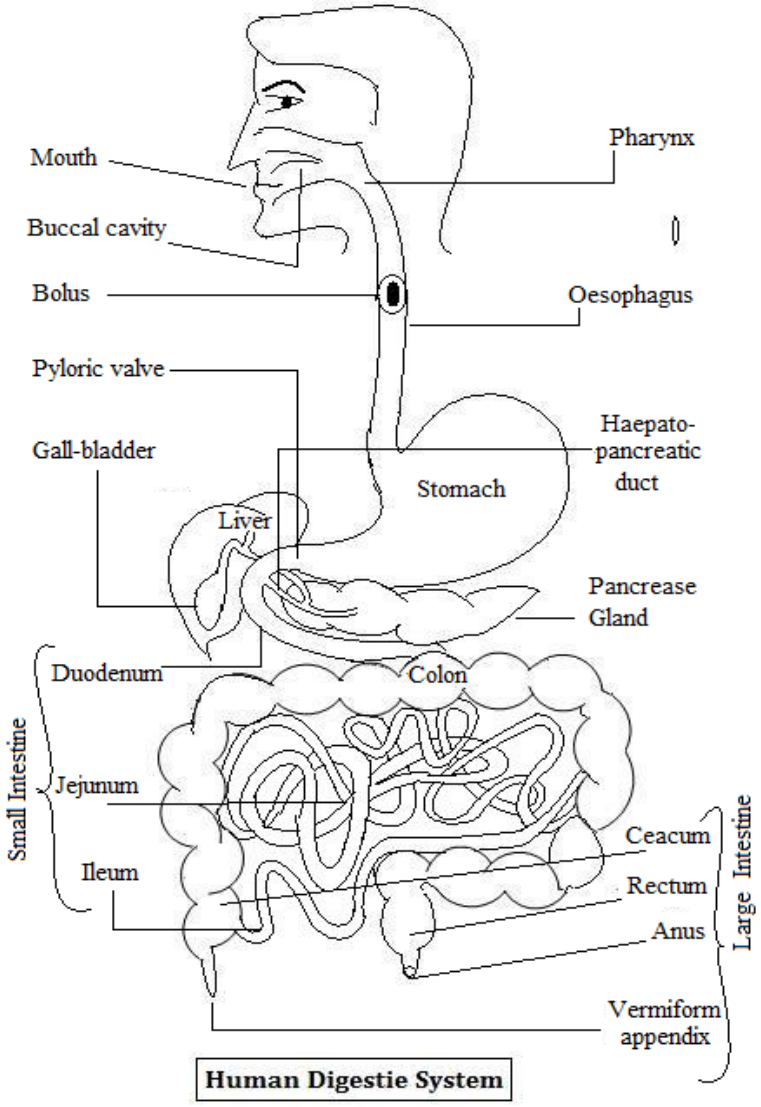


Nutrition in Human being:-

Human beings have a digestive system for nutrition. digestive system is a group of organ and associated digestive glands that take part in ingestion of food, its crushing, dig4estion, absorption of digested materials, a and egestion of indigestiblematter. The digestive organs form a continuous canal called alimentary canal.

Alimentary canal: -It is tubular passage extending from mouth to anus through which food passes during its digestion and absorption. It is about 9 metres in length. Alimentary canal consists

1. Mouth
2. Buccalcavity
   a. Tongue b. Teeth c. Salivary glands
3. Oesophagus
4. Stomach
5. Small intestine:-
   a. Duodenum b. Jejunum c. Ilium
6. Large intestine
   a. Caecum b. Colon c. Rectum d. Anus



Human Digestie System

1. ***Mouth***: -It is transverse slit. Mouth is bounded by two soft moveable lips. That helps in holding food.

2. ***Buccal cavity***: - it is anterior part of alimentary canal that extends from mouth to pharynx and lies between two jaws upper (fix), lower (moveable).

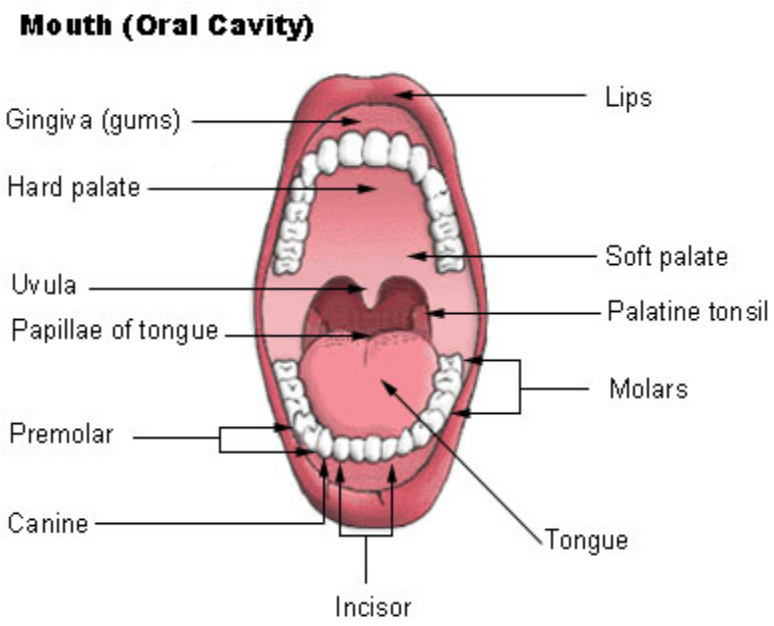
a. ***Tongue***It is muscular, sensitive, movable and flatstructure which is attached posteriorly over the lower jaw. Tonguebears test buds for testing food. Sweet anteriorly, salt- anterio-laterly, sour antero-posteriorly and bitter posteriorly.

Function–

a. It moves food in buccal cavity for crushing under teeth, mixing with saliva.

b. Tongue cleans the teeth.

c. It functions as a movable spoon during drinking.



b. ***Teeth***:-Teeth are hard structures which are partially embedded insockets of jaw- bones. The exposed parts of teeth are covered by a shining and hardest substance called enamel. Human have two sets of teeth Deciduous and permanent.Deciduous (milk teeth) occur in infants. From 6-12 years the milk teeth are lost and replaced by permanent teeth thatare 32 in number. Themolar are called wisdom teeth asthey occur in age of 18 to 25 year.

Type	Shape	Function	Number in Each Jaw
1.Incisors	Chisel –shaped	Biting	4
2.Canines	Dagger-shaped	Tearing(little use in humans)	2
3.Pre-molars	Cusped broad edged	Grinding	4
4.Molars	Cusped broad edged	Grinding	6

3. ***Salivary Glands***: - three pair of salivary glands openintobuccal cavity.

1) Parotid(below ears) 2) sub maxillary(at the angle of lower jaw) 3)sublingual (below tongue)

About *1.0-1.5* l of near *neutral*saliva is poured into buccal cavity each day.Salivaconsists of mucus, water,***lysozyme*** and ***ptyalin*** Enzyme.

Functions of saliva:

(i) Mucus and water makes the food soft ant slippery for crushing and formation of bolus.

(ii) Watering the mouth due to excessive secretion of saliva.

(iii) Lysozyme is anti microbial enzyme which kills bacteria.

(iv) The digestive enzyme ptyalin (***salivary amylase***) acts on starch and glycogen to change them into sweet sugars (maltose)

(v) 30-40 % of starch is converted into dextrins and maltose by salivary amylase.

(vi) It cleans the teeth

(vii) It acts as a solvent for dissolving chemicalspresent in foods.

(viii) It keeps buccal cavity moist.

Action of food:- food is moistened, crushed and partially digested due to action of salivary amylase. At the end

*of it food is known as **bolus***

4. ***Pharynx:*** - it is funnel shaped structure which is common for respiratory and digestive track. Food enters in pharynx in the form of ***bolus***. Soon the muscles of pharynx contract to push the food into oesophagus. The act of pushing food into oesophagus is called ***swallowing*** (deglutition).
5. ***Oesophagus***: - it is also known as ***food pipe***. It is narrow, muscular and tubular part that connects pharynx with stomach. Its length is 258 cm. it does not contain any digestive glands. It wall secrets mucus to lubricant the food. Action of salivary amylase is continuing. *In oesophagus food is pushed toward stomach by a wave of alternate contraction and expansion called **Peristalsis**.*
6. ***Stomach:*** *it is large J- shaped,**widest**, thick walled muscular organ. It lies in the left upper part of abdomen below diaphragm. It has a large number of gastric glands. Thesecretions of these glands are known as gastric juice. Periodic contraction churns the food and mixes it with gastric juice.*
    a. ***Gastric juice****contains HCL, mucus, pepsin, gastric lipase and rennin. Pepsin and renin are secreted in their inactive states of pepsinogen and prorenin.*
        i. ***function of HCl****:- soften the food*
            1. *`Stops the action of salivary amylase.*
            2. *Kills germs and bacteria.*
            3. *Activates t pepsinogen and prorenin in active states.*

$$\text{Pepsinogen} \xrightarrow{HCl} \text{Pepsine}$$

$$\text{Prorenin} \xrightarrow{HCl} \text{Renin}$$

            4. Pepsin is major enzyme which functions in acidic medium.

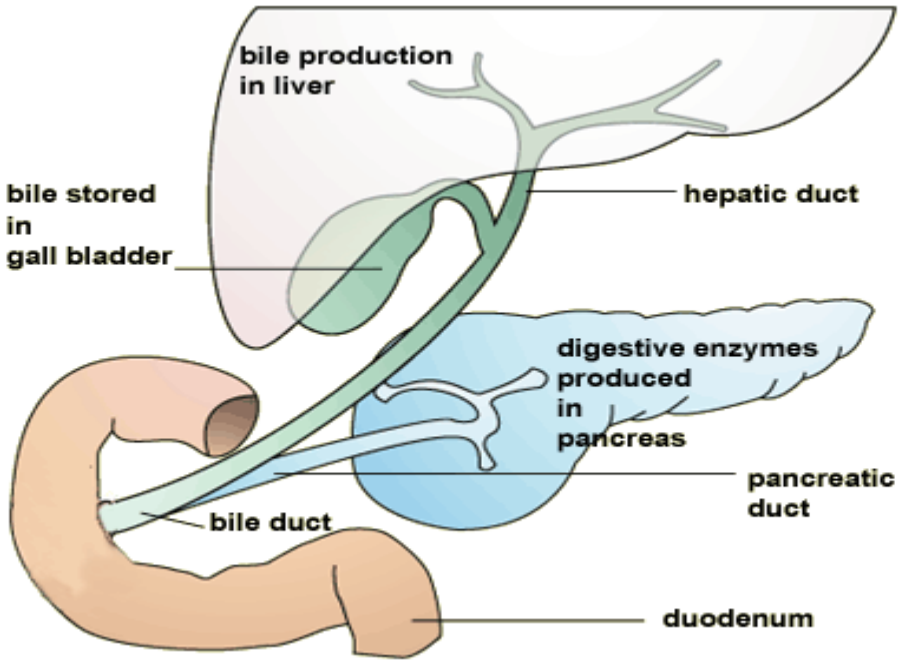
$$\text{Protien} \xrightarrow{\text{Pepsin}} \text{Peptones + Proteoses}$$

            5. Due to action of rennin curdled milk stays in stomach for longer period for pepsin to act on it.

$$\text{Casein} \xrightarrow{\text{renin}} \text{Paracasein(insoluble)}$$

            6. Gastric lipase is active only in infants. It breaks down fat into its components.
            7. In stomach the food stays for **1-6 hr** depending upon type of food. Carbohydrate rich food (**1-2 hr**), protein rich (**2-3hr**), fatrich (**3-6hr)**.during this time period bolus is converted into ***chyma***.Chyma passes into duodenum through a pyloric valve. Water, glucose, alcohol, drugs and some minerals are absorbed in stomach.

7. ***Small Intestine***: -it is longest part of alimentary canal which is about **6 m** in length and **2.5-3.5** cm in diameter. Small intestine is known so because of its lesser diameter. It is seat of major digestion and absorption. its secretion is called succusentericus.it has three parts:-



a. ***Duodenum***: - it is proximal part of small intestine... it receives chyma from stomach. It U- shaped loop. This is about 25 cm in length. Itsglandssecrete alkaline mucus that helps in neutralizing the chyma and protect wall from corrosion.
   i. A common ***hepatopancreatic duct*** pens into duodenum. It is formed of a common ***bile duct*** from liver and gall bladder and a pancreatic duct from pancreas. Bile duct carries a yellowish green bitter liquid from gall bladder and liver. Bile contains alkaline ***organicsalts*** (sodium bi carbonates, potassium bi carbonate.), ***bill pigments*** (greenbiliverdin and yellowish bilirubin) ***and bill salt***. Digestive enzymes are absent.
   ii. ***functions of bill***:-
      1. neutralize the acidity of chyma
      2. protects the wall from corrosion
      3. Makes the food alkaline from action of pancreatic juice.
      4. breaks fat into fine globules for action of lipase
      5. ***Emulsification***: - braking of fat into fine globules is called emulsification.
   iii. ***Pancreatic Juice***: - it alkaline. it contains threemain enzymes–
      1. ***Trypsin***: – it proteolytic enzyme which functions in alkaline medium.It is secreted in inactive form of trypsinogen. Itbreaks down protein, proteoses and peptones to form peptides.
      2. ***Amylase***: – it acts on starch, glycogen,dextrin and other complex carbohydrates to form maltose and other sugars.
      3. ***Lipase***. : – it is also called steapsin. It fat digestive enzyme. It acts on emulsified fat to form fatty acid and glycerol.

$$\text{Starch + Dextrins} \xrightarrow{\text{Prorenin Amylase}} \text{Maltose}$$

$$\text{Proteoses + peptones} \xrightarrow{\text{Trypsin}} \text{Peptides}$$

$$\text{Fat} \xrightarrow{\text{Lipase}} \text{Fatty acid + Glycerol}$$

Difference b/w Pepsin and Trypsin

Character	Pepsin	Trypsin
1.component	It is component of gastric juice.	It is component of pancreatic juice.
2.Inactive State	It is produced in the inactive state of pepsinogen.	Trypsin is produced in inactive state calledtrypsinogen.
3.Activation	The enzyme is activated by HCl of gastric juice.	The enzyme is active by enterokinase of intestinal juice.
4.Region of activity	It is active in stomach.	It is active in duodenum and jejunum.
5.Medium	It functions in acidic medium.	It functions in alkaline medium.

b. ***Jejunum:*** - it is middle coiled part of small intestine. Its length is **1.5-2.0 m**. it is the seat of maximum digestion. Enzymes of intestinal juice complete the process of digestion.

$$\text{Peptides} \xrightarrow{\text{Erepsin}} \text{Amino Acid}$$

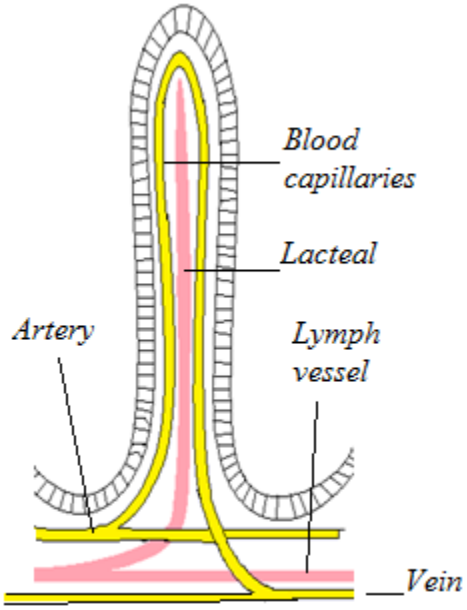
$$\textbf{Sucrose} \xrightarrow{\text{Invertase}} \text{Glucose + Fructose}$$

$$\textbf{Maltose} \xrightarrow{\text{Maltase}} \text{Glucose + Glucose}$$

$$\textbf{Lactose} \xrightarrow{\text{Lactase}} \text{Glucose + galactose}$$

c. ***Ilium:*** - It is the distal coiled part of small intestine. Its length is **3.5 m**. digestive glands are fewer. ***Villi*** are present for absorption. A villus has one lymph vessels (***lacteal***), a number of ***blood capillaries*** and a covering of ***epithelial cell*** (specialized for absorption).absorption occurs by passive transport, active transport.

i. The absorbed fat is taken away bylacteal, other material are taken up by blood capillaries for transport to the region of storage and use.
ii. Glucose id stored as glycogen in liver and muscles. It reaches every cell for absorption. Amino acids are absorbed by cells for assimilation. Excess amino acids are deaminated by liver. Fat is stored in adipose tissue.



Villi

8. ***Large Intestine***: - it is distal region of alimentary canal which is **1.5-1.8 m** long and **4-5 cm** in diameter. It receives semi fluid mixture of undigested matter, mucus, water. It does not contain any digestive glands.
    a. ***Caecum***: - it is a small pouch of about **6 cm** diameter lies at the junction of small and large intestine. A narrow blind tubular outgrowth is connect4ed to caecum it is called **vermiformappendix**. Both caecum and vermiform appendix is vestigial organ.
    b. ***Colon***: -longest, inverted **U-shaped** part of large intestine. Itabsorbs water and converts undigested food into faecal matter. The bacteria presents in colon feed on undigested matter and secreate**Vitamin B, Vitamin K**. gas formation is mostly due to these bacteria.
    c. ***Rectum***: - Last part of intestine Broader than Colon. Length is **13.15 cm**. faecal matter is collected in it.
    d. ***Anus***: - Rectum opens into anus. Faecal matter is egested through it.

Vestigial organ: - those organs which have become reduced and nonfunctional due to evolution but are fully formed and functional in ancestors.

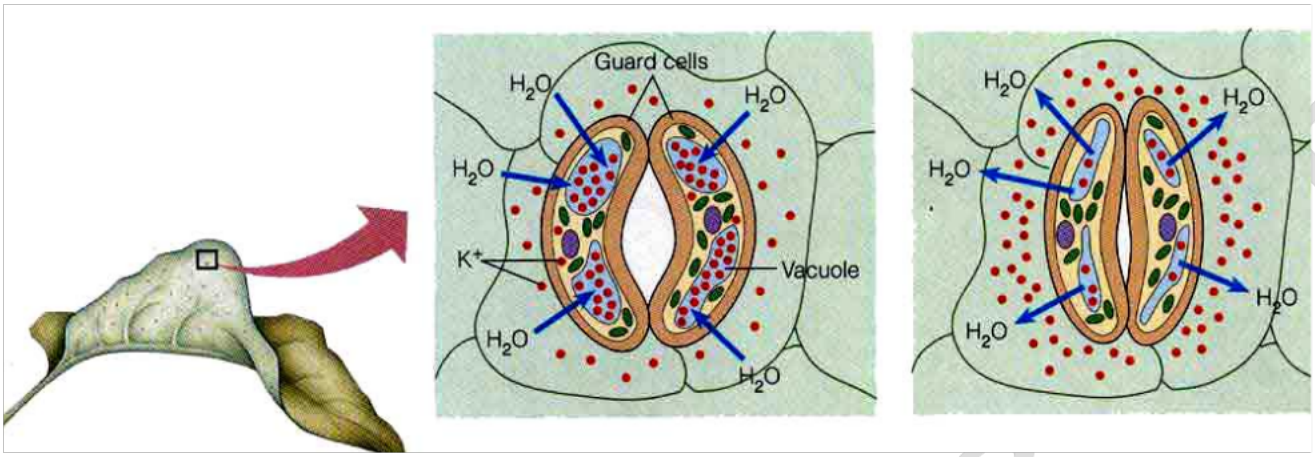
Appendicitis: -infection of vermiform appendix causes acute pain in the lower right part of abdomen. It is called Appendicitis.

Appendectomy: – infected appendix is removed surgically. This practice is called Appendectomy.

Liver:-largest gland of body. Weight 1.5 kg or 1/40 weight of body.Lies in right upper side of abdomen.Softreddish brown in colour.Containing pear shaped yellowish sac called gall bladder. Gall bladder concentrates and store bile. Bile is secreted by liver.

Opening and closing of stomata:the opening and closing of stomatal pores is controlled by the guard cells. When water flows into the guard cells, they swell, become curved and cause the pore to open. On the other hand, when the guard cells lose water, they shrink, become straight and closing the stomatal pore. A large of amount of water is also lost from the cells of the plant leaves through open stomatal pores. So when

the plant does not need carbon dioxide and wants to conserve water, the stomatal pores are closed.



Factor Affecting Photosynthesls

The rate of photosynthetic process is affected by several external (environmental) and internal factors. These factors are :-

1. ***Light***. The ultimate source of light for photosynthesis in green plants is solar radiation (i.e. radiation coming from Sun). out of the total solar energy reaching to the earache, only a very small portion (about 25%) is used in photosynthesis. Light varies in intensity, quality (wave length) and duration. Under low light intensity the rate of photosynthesis is also low. Increase in light intensity causes increase in the rate of photosynthesis up to a certain limit. At very high light intensity, the photosynthesis is decreased due to photo – oxidation of the constituents (solarization).

   The quality of light also affects photosynthesis. Green pigments chlorophylls absorb mostly the blue and the red regions of the spectrum. They reflect green light. Therefore, photosynthesis is high in blue and red light. Photosynthesis does not occur in green light.
2. ***Temperature***. The rate of photosynthesis increases by increase in temperature upto 40°C. above this temperature, there is a decrease in the photosynthesis. Similarly, low temperature also inhibits photosynthesis. The temperature affects photosynthesis by affecting the activity of enzymes. We know that the dark reaction of photosynthesis involves several enzymes. These enzymes function at a specific range of temperature. Low temperature lowers the activity of enzymes and high temperature causes inactivation of enzymes.
3. ***Carbon dioxide***. Carbon dioxide is present in the atmosphere in the concentration of 0.032% by volume. It is really a low concentration for photosynthesis. Thus, the rate of photosynthesis increases by increasing the concentration of CO_2 in the atmosphere if the light and temperature condition are not limiting. At the same time, very high concentration of CO_2 becomes a toxic to plants and inhibits photosynthesis.
4. ***Water.*** Water is an essential raw material in photosynthesis. This rarely acts as a limiting factor because less than 1% of the water absorbed by a plant is used in photosynthesis. However, the rate of photosynthesis is lowered if the plants are inadequately supplied with water. Under water deficient conditions the stomatal apertures remain closed to reduce the loss of water by transpiration. As a consequence, the entry of CO_2 is also stopped into the leaves.

(I) Photosynthetic carbon reduction cycle discovered by Calving, Benson and Bassham (1953). This

cyclic process is called Calvin cycle. In Calvin cycle, 6 molecules of CO_2 are required of fixation, to produce one molecule of glucose.

(II) Chloroplasts are not found in the upper and lower epidermis of green leaf except in guard cells of stomata. They occur in mesophyll cells that occupy the space between upper and lower epidermis. The mesophyll is differentiated into palisade and spongy parenchyma in most of the leaves.

Multiple choice question

1. Nutrition includes the study of _____.

   a. the organism's food
   c. process of digestion
   b. the way an organism obtains food
   d. all of the above

2. Autotrophic organisms include _____.

   a. green plants and sulphur bacteria
   b. green plants and all the bacteria
   c. bacteria and virus
   d. bacteria and fungi

3. Organisms that synthesis their own food are called _____.

   a. green plants
   b. sulphur bacteria
   c. autotrophs
   d. purple-sulphur bacteria

4. Amoeba feeds with the help of _____.

   a. tentacles
   b. pseudopodia
   c. food vacuole
   d. none of the above

5. An example of higher plant parasite is _____.

   a. Pythium
   b. Phytophthora
   c. Agaricus
   d. Cuscuta

6. Example of chemosynthetic bacteria are _____.

   a. E. coli
   b. sulphur bacteria
   c. cyanobacteria
   d. nitrobacter

7. In saprophytes, food is digested _____.

a. within the cells
b. in the digestive tract

c. outside the cells
d. within the food vacuole

8. Parotid gland is a /an_____.

a. gastric gland
b. intestinal gland
c. salivary gland
d. none of the above

9. Erepsin converts _____.

a. proteins into amino acids
b. proteins into peptides
c. peptides into amino acids
d. none of the above

10. An enzyme that acts only in an acidic medium is _____.

a. pepsin
b. trypsin
c. rennin
d. amylase

11. A non-enzyme protein present in the saliva is _____.

a. heparin
b. mucin
c. ptyalin

12. Absorption is maximum in the small intestine because of _____.

a. the presence of villi
b. its length
c. its thin walls
d. all the above

13. Photolysis is _____.

a. the absorption of light by chlorophyll
b. the assimilation of carbon dioxide
c. the splitting of water
d. none of the above

14. The optimum level of carbon dioxide in the atmosphere is _____.

a. 0.3%
b. 0 .04%
c. 0 .1%
d. 0 .03%

15. Pyloric valve is present in the _____.

a. Heart
b. Liver
c. stomach
d. intestine

16. In the mouth the food is formed into _____.

a. chyme
b. chyle
c. bolus
d. pellets

17. An example of a herbivore is _____.

a. amoeba
b. Hydra
c. grasshopper
d. none of the above

18. Appendix is a part of _____.

a. Ileum
b. duodenum
c. caecum
d. Colon

19. Bile juice is secreted by _____.

a. Liver
b. pancreas
c. salivary gland
d. intestine

20. Bile juice is _____.

a. alkaline
b. acidic
c. neutral
d. near acidic

21. The three portions of the small intestine, in the correct order, are _____.

a. caecum, colon, rectum
b. ileum, duodenum, jejunum
c. colon, caecum, rectum
d. duodenum, jejunum, ileum

22. The enzyme that is secreted in an inactive form is _____.

a. Lipase
b. trypsin
c. rennin
d. ptyalin

23. Photosynthesis is _____.

a. a catabolic reaction
b. an anabolic reaction
c. an energy releasing reaction
d. none of the above

24. The digestive juice that is almost neutral is _____.

a. gastric juice
b. bile juice
c. pancreatic juice
d. none of the above

25. Haustoria of parasites are modified _____.

a. Roots
b. Branches
c. Leaves
d. none of the above

26. The molecules known as the energy currency of the cell are _____.

a. NAD
b. NADP
c. ATP
d. ADP

27. The mode of nutrition in non-green plants is called _____.

a. autotrophic
b. heterotrophic
c. holozoic
d. holophytic

28. Large intestine in man mainly carries out _____.

a. digestion of fats
b. Absorption
c. assimilation
d. digestion of carbohydrates

29. The largest gland of the body is _____.

a. parotid gland
b. Liver
c. pancreas
d. submandibular gland

30. Chlorophylls, carotenes, and xanthophylls are:
(a) enzymes (b) hormones

(c) steroids (d) pigments

31. Which of these is required for photosynthesis:

(a) oxygen (b) carbon dioxide (c) nitrogen (d) ozone

32. Abeaker is filled with water and twigs of hydrilla are inserted in the funnel so that the cut ends are in the tube of the funnel, and the funnel is put in the water. Then a test tube full of water is inverted over the inverted funnel. Air bubbles from the plant collect at the tip of the tube. This experiment demonstrates that oxygen is evolved during photosynthesis; but if boiled water is used instead of pond water in which hydrilla grows, then:

(a) air bubbles are not produced

(b) air bubbles are produced in large numbers

(c) only a few air bubble are produced

(d) only one air bubble is produced

33. Oxygen liberated during photosynthesis comes from:

(a) chlorophyll (b) water (c) C02 (d) air

34. The site of dark reaction during photosynthesis is:

(a) grana (b) chlorophyll (c) stroma (d) nucleus

35. Which one of the following enzymes is present in saliva?

(a) pepsin (b) trypsin (c) ptyalin (d) chymotrypsin

36. Wisdom teeth are:

(a) incisors (b) canines (c) molars (d) premolars

Answer key

1. d	7. c	13. c	19. a	25. a	31. b
2. a	8. c	14. d	20. a	26. c	32. a
3. c	9. c	15. c	21. d	27. b	33. b
4. b	10. a	16. c	22. d	28. b	34. c
5. d	11. b	17. c	23. b	29. b	35. c
6. d	12. d	18. c	24. c	30. d	36. c

QUESTION

1. What is the difference between the epiglottis and the uvula?

Ans: The epiglottis is made of cartilage and is what covers the opening of the trachea to prevent food and other foreign bodies from entering the airway.

The uvula is found in the back of the mouth (you can see it dangling from the roof of your mouth when you look in the mirror.) It has several functions, including preventing food from entering the nasal cavity, causing the gag reflex, and aids in creating several types of speech sounds

2. Why is diffusion insufficient to meet the oxygen requirement of multi-cellular organisms like us?

Ans: Every living cell requires oxygen for performing cellular respiration. In unicellular organisms (e.g., Amoeba), the single cell is in direct contact with environment. Oxygen passes into it through diffusion. In simple multi-cellular organisms (e.g., Hydra), every cell may also get oxygen through diffusion from environment. This is not possible in complex multi-cellular organisms like humans. The body is covered by dead cells. The living cells are not in contact with external environment. Diffusion cannot carry oxygen to each and every cell through a small opening meant for passage of air because cell to cell diffusion is a very slow process. Passage of oxygen from lungs to toes through cell to cell diffusion will take about three years.

3. How are fats digested in our body? Where does this process takes place?
Ans: Digestion of Fat:
Digestion of fat takes place in the small intestine. The fats are present in the form of large globules in the small intestine. Fat-digesting enzymes are not able to act upon large globules efficiently.
Bile juice secreted by the liver is poured into the intestine along with pancreatic juice. The bile salts present in the bile juice emulsify the large globules of fats. So, due to emulsification large globules breakdown into small globules, which provide larger surface area to act upon by the enzymes.
Lipase enzyme present in the pancreatic juice causes breakdown of emulsified fats. Glands present in the wall of small intestine secrete intestinal juice which contains lipase enzyme that converts fats into fatty acids and glycerol.
4. What is the role of saliva in the digestion of food?
Ans: Saliva is secreted by salivary glands. It has important roles in the digestion of food:
(a) It moistens the food which help in chewing and breaking of the food particles into smaller ones, so that the digestive enzyme salivary amylase can digest the starch efficiently.
(b) Saliva contains a digestive enzyme called *salivary amylase*, which breaks down starch into sugars like maltose.
5. What are the necessary conditions for autotrophic nutrition and what are its by-products?
Ans: The following the necessary conditions for autotrophic nutrition:
1. Presence of chlorophyll in the living cells.
2. Provision of supply of water to green parts or cells of the plant either through roots or by surrounding environment.
3. Availability of sufficient sunlight to provide the energy required to carry out photosynthesis.
4. Sufficient supply of carbon dioxide which is one of the important components for the formation of carbohydrates during photosynthesis.
The by-products of autotrophic nutrition are starch (carbohydrate) and oxygen.

Sample Questions

Q.1: Which pigment captures solar energy?
Ans: Chlorophyll

Q.2: Name any three life processes.
Ans: Nutrition, respiration and blood circulation

Q.3: Answer the following questions:
(i) What is the first reaction in photosynthesis?
(ii) In which form do plants store food?
Ans: (i) The first reaction in photosynthesis is the photolysis of water.
(ii) The product of photosynthesis is glucose, which is stored in plants in the form of starch.

Q.4: What are the inorganic sources used by plants for making food?
Ans: Carbon dioxide, water and sunlight.

Q.5: What are the outside raw materials used by an organism?
Ans: Various outside raw materials used by an organism are as follows:
1. Food as a source of supplying energy and materials.
2. Oxygen for the break-down of the food to obtain energy.
3. Water for proper digestion of food and other functions inside the body.
The raw materials required by an organism will vary depending on the complexity of the organism and its environment.

Q.6: Plants have lower energy need and relatively slow transportation system than those of animals. Give reasons.
Ans: Energy needs differ between different body designs. Unlike animals, plants do not move and plant bodies

have also a large proportions of dead cells in many tissues. As a result, plants have lower energy needs and also relatively slow transportation than those required by animals.