CHAPTER 6 : LIFE PROCESSES (PART 1)

OVERVIEW OF THE CHAPTER

All living organisms (unicellular or multicellular) shows some unique activities which distinguishes them from non-living and dead

- Some of these activities are
  - GROWTH · METABOLISM · REPRODUCTION · MOVEMENT
  - CONSCIOUSNESS · HOMEOSTASIS · HEALING etc.
- Some of these activities are very essential for **1. Survival of life** and **2. Maintenance of life**

Hence also called as **'LIFE PROCESSES'** like....

A. NUTRITION – Process of obtaining & consuming nutrients
B. RESPIRATION - Process of obtaining energy as ATP.
C. TRANSPORTATION - Process of transfer of metabolites.
D. EXCRETION - Process of removal of metabolic wastes.

A. NUTRITION

- **Def** :- The process by which living organism **obtain & consume nutrients** in the form of FOOD, and utilize them for various activities of life
- **Nutrients** :- Organic or inorganic chemical substances required by an organism to fulfill all needs of life.
- **Food** :- Source which provides one/more nutrients.

(Most important nutrients are those which provide energy needed to perform all life activities - eg Carbohydrates & fats)

TYPES OF NUTRITION MODE

a. Autotrophic nutrition
(Auto - self, trophic - feeding)
ORGANISM ARE 'AUTOTROPHS'

b. Heterotrophic nutrition
(hetero - other/different)
ORGANISM ARE 'HETEROTROPHS'

a) Autotrophic nutrition

- ✓ Ability to prepare own carbohydrate food using simple inorganic substances
- ✓ **2 types :-**
  - i) **Chemosynthesis** - preparing food using chemical energy
    eg. S-bacteria, Fe-bacteria
  - ii) **Photosynthesis** - preparing food using light energy.
    eg. Algae, Plants, Cyanobacteria

NET PHOTOSYNTHETIC REACTION

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2\uparrow$$

Simplest Carbohydrate (main source of energy for all org.) — $C_6H_{12}O_6$ (glucose)

$6O_2\uparrow$ • By product • used for respiration.

b) Heterotrophic nutrition

- ✓ Process of obtaining & consuming readymade food prepared by others.
- ✓ **3 types :-**
  - i) **Saprophytic** :- feeding on dead/decaying matter
    eg Fungi, many bacteria
  - ii) **Parasitic** :- Absorb nutrient from body of other org.
    eg Ectoparasitic - Leech, Cuscuta
    Endoparasitic - Ascaris, etc
  - iii) **Holozoic** :- To take whole food & digest it within body (In 5 main stages)
    eg. Most animals, human.

⊙NUTRITION IN PLANTS

- Plants and algae are the main autotrophs/producers
- Perform the process of **PHOTOSYNTHESIS** in green cells
- The process occurs inside → **CHLOROPLAST** (green plastid) → site of photosynthesis
- Photosynthesis occurs in following stages

A] LIGHT REACTIONS

i) Absorption of light energy by chlorophyll pigment
ii) Conversion of light energy into usable chemical energy (ATP)
iii) Splitting of H_2O into H and $O_2\uparrow$

B] DARK REACTIONS

i) Reduction of CO_2 using Hydrogen
ii) Formation of hexose sugar - Glucose
iii) Glucose ⟶ Starch.

Factors essential :- Light, Chlorophyll-a, CO_2, H_2O & Temperature
In plants leaf (main organ of photosynthesis) show - STOMATA
Stomata helps in exchange of O_2 & CO_2 & transpiration of H_2O.

⊙ NUTRITION IN ANIMALS :

- All animals show heterotrophic mode of nutrition with three main steps a) Digestion b) Absorption c) Assimilation.
- Different animals have different mechanisms of digestion depending on complexity of body organisation.
  eg Unicellular organism like amoeba shows PHAGOCYTOSIS.
  Multicellular organism have DIGESTIVE SYSTEM.

⊙ NUTRITION IN HUMANS :-

✓ Human shows HOLOZOIC NUTRITION which involves 5 stages which are performed by various parts of DIGESTIVE SYSTEM.

✓ The 5 stages are :-

1. Ingestion :- Process of intake of solid/liquid food via mouth.
2. Digestion :- Conversion of complex, insoluble, non-absorbable food molecules into simple, soluble & absorbable form using various enzymes.
3. Absorption :- Entry of digested food molecules (nutrients) into blood
4. Assimilation :- Utilization of nutrients for body functions.
5. Egestion :- Removal of faecal matter via anus (defaecation)

HUMAN DIGESTIVE SYSTEM

two divisions

A. DIGESTIVE TUBE
→ Alimentary canal

→ 10-11 mtrs. long muscular tube

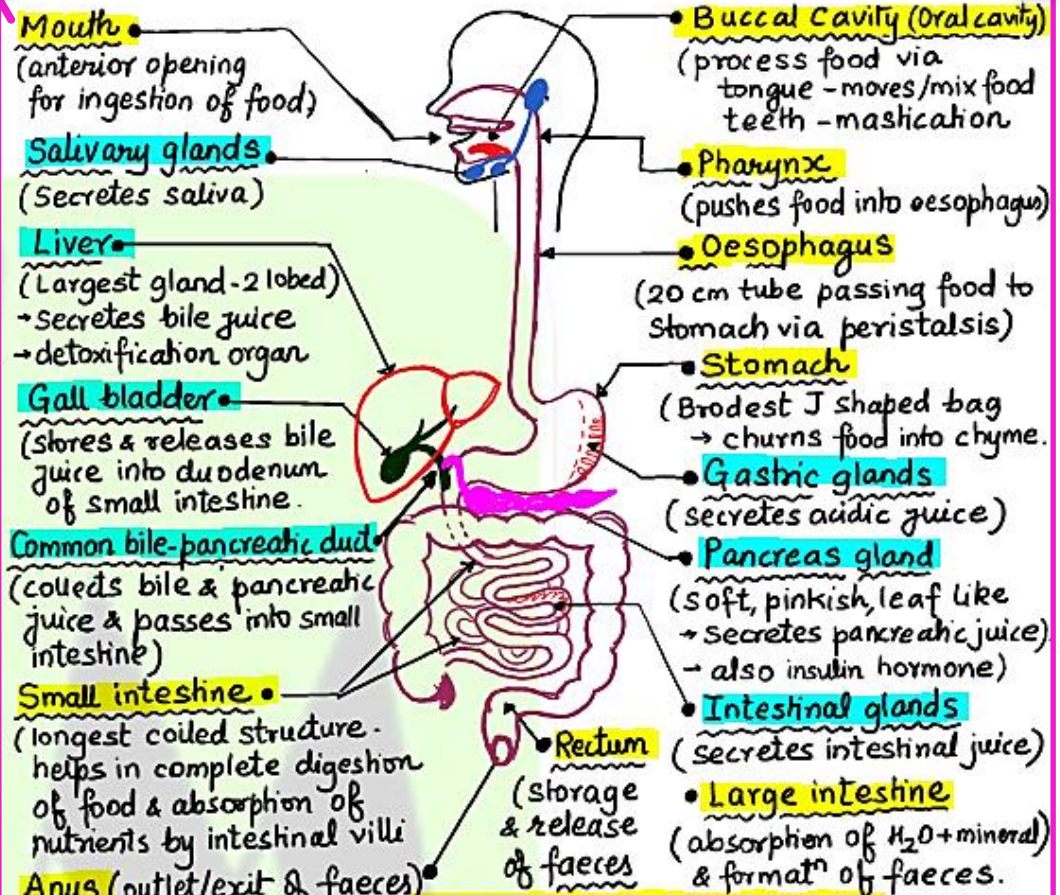
It includes :-

1. MOUTH (guarded by lips)
2. BUCCUAL CAVITY (with tongue + teeth)
3. PHARYNX (throat)
4. OESOPHAGUS (food pipe)
5. STOMACH
6. SMALL INTESTINE → a) Duodenum, b) Jejunum, c) Ileum
7. LARGE INTESTINE → a) Caecum, b) Colon (i) Ascending part, ii) Transverse part, iii) Descending part, iv) Sigmoid part.), c) Rectum
8. ANUS (guarded by sphincter muscle)

B. DIGESTIVE GLANDS
→ Associated glands.

→ Release digestive enzymes

A] Salivary glands (3 pairs)
   i) Parotids → cheek
   ii) Submandibular → below jaw
   iii) Sublingual → below tongue
B] Gastric glands
C] Pancrease
D] Liver + Gall Bladder
E] Intestinal glands



• HUMAN DIGESTIVE SYSTEM •

• Points to remember •

✓ Saliva = H_2O + mucus + amylase enzyme . Amylase digests starch → maltose

✓ Gastric juice = H_2O + mucus + HCl + pepsin . Pepsin digests proteins → peptone

✓ Pancreatic juice = H_2O + carbonates + enzymes trypsin, lipase & amylase
Trypsin digests proteins, Lipase digests fat, amylase digests starch.

✓ Bile juice = Bile salts + Bile pigments . Bile salts makes food alkaline
Also bile helps in emulsification of fats & removes cholestrol

✓ Pancreatic & intestinal juice → all enzymes for complete food digestion.

Carbohydrate → Simple sugar-glucose
Proteins → amino acids.
Fats/Lipids → fatty acid + glycerol

In mouth → semi solid BOLUS
In stomach → semi liquid acidic CHYME
In small intestine → liquid alkaline CHYLE
In large intestine → semi solid FAECES

⊙ Important Board Questions :-

VERY SHORT ANSWER QUESTIONS — 1 Mark

Q1. Define photosynthesis. (CBSE 2012)

Ans. PHOTOSYNTHESIS is a biosynthetic process in which green plants take in CO_2 and H_2O from environment and prepare CARBOHYDRATE FOOD using SUNLIGHT in presence of CHLOROPHYLL PIGMENT.

Q2. Mention how organisms like bread moulds and mushroom obtain their food. (CBSE 2010)

Ans. Bread moulds and mushroom obtain their food by SAPROTROPHIC NUTRITION,
- → they release digestive enzymes outside the body.
- → digested food is then absorbed.

Q3. What is common for cuscuta, ticks & leeches? (NCERT)

Ans. Cuscuta, ticks and leeches show PARASITIC MODE OF NUTRITION, ie they obtain nutrients from HOST without killing.

Q4. What is the role of saliva in digestion of food? (CBSE 11)

Ans. MUCUS & WATER of saliva LUBRICATES and SOFTEN food, while enzyme SALIVARY AMYLASE (PTYALINE) helps to break down STARCH into MALTOSE.

Q5. State the location and function of gastric glands (CBSE14)

Ans.
- Location → Inner mucosal wall of stomach.
- Function → Release gastric juice (mucus + HCl + enzyme pepsin)

Q6. Define enzyme. Name one enzyme in humans which digests fats. (CBSE 2016)

Ans.
- Enzyme → The BIOLOGICAL CATALYST which affect the rate of biochemical reaction.
- LIPASE → Enzyme which digests Fats.

Q7. What is emulsification? (CBSE 2011)

Ans. Emulsification : The process in which large fat globules are broken in smaller globules with the help of BILE SALTS, so that they can be easily digested by enzyme LIPASE.

SHORT ANSWER QUESTIONS (I) — 2 MARKS

Q1. Is nutrition a neccessity for an organism? Discuss (NE)

Ans. YES, nutrition is essential / vital for an organism.

REASON →
i) It provides energy needed for all life activities.
ii) It is needed for growth, repair & development.
iii) It helps to develop resistance against disease.
iv) Some nutrients helps in regulation & control.

Q2. A gas is released during photosynthesis. (CBSE 2012)
i). Name the gas & also the way in which gas is evolved.
ii). In certain group of plants, stomata remain closed during day. How is food synthesized by such plants? Also name them.

Ans.
i) OXYGEN is released by the process of PHOTOLYSIS OF H_2O.
ii) In desert plants stomata remain closed during day.
- CO_2 is taken at night time when stomata opens.
- CO_2 is converted to an intermediate compound (Malic acid)
- Malic acid releases CO_2 during day in chloroplast in presence of light & chlorophyll and is used to produce glucose (food).

Examples :- CACTUS, OPUNTIA, ALOE VERA, etc.

Q3. What functions is served by the following? (CBSE 2011)
i) Gastric sphincter ii) Anal sphincter

Ans.
i) Gastric sphincter are of two types :-
a) CARDIAC SPHINCTER - regulates passage of food from oesophagus to stomach.
b) PYLORIC SPHINCTER - regulates passage of food from stomach to small intestine (duodenum)

ii) Anal sphincter regulates release of undigested food ie FAECAL MATTER from rectum via anus (DEFAECATION)

Q4. Small finger-like projections are present in inner layer of small intestine. Write their names. Why are they important? (CBSE 11)

Ans.
- Small finger like projections → INTESTINAL VILLI.
- Importance → i) Increases the SURFACE AREA of intestine.
  ii) Helps in increased digestion and absorption.
  iii) Blood capillaries rapidly transport the nutrients.

Q5. Explain the significance of peristaltic movement. (CBSE 201

Ans a) Propels food b) Physical digestion (churning) c) Mix food with enzymes

SHORT ANSWER QUESTIONS (II) — 3 Marks

Q1. What are the final products of carbohydrate, proteins, and fats after their digestion? (CBSE 2011)

Ans.
1. CARBOHYDRATES → Simple sugars (GLUCOSE)
2. PROTEINS → Amino acids.
3. FATS → Fatty acids & glycerol.

Q2. Name three glands associated with the digestive system in human. Also name their secretions. (CBSE-2012)

Ans.

Sr.	GLAND TYPE	SECRTIONS
1	Salivary glands	SALIVA (H_2O + Mucus + enzyme AMYLASE-ptyalin
2	Gastric glands	GASTRIC JUICE (mucus + HCL + enzyme PEPSIN)
3	Liver	BILE JUICE (Bile salts + bile pigments)
4	Pancreas	Pancreatic juice (enzyme TRYSIN + LIPASE + AMYLASE
5	Intestinal glands	Intestinal juice (Sucrase, pephidase, lactase, maltase)

Q3. Explain parasitic mode of nutrition with two examples :- (CBSE 11)

Ans. • PARASITIC MODE OF NUTRITION :-
The mode of nutrition in which the organism (PARASITE) derives nutrients directly from body of other organism (HOST) without killing them.

• EXAMPLES → 1) ECTOPARASITISM :- Deriving nutrition by living outside or on the body of host. • Cuscuta is a parasitic plant
• Leech is ectoparasite.

2) ENDOPARASITISM :- Deriving nutrition by living within or inside the body of host. • Tapeworm is endoparasite.
• Pathogens (germs)

Q4. Differentiate between autotrophs & heterotrophs. (NE)

Ans.

AUTOTROPHS	HETEROTROPHS
1. Organisms which can prepare their own carbohydrate food.	1. Organism which cannot prepare their food & depends on others.
2. They are PRODUCERS	2. They are CONSUMERS & DECOMPOSERS
3. They use light energy & possess chlorophyll pigment.	3. They cannot use light & lack chlorophyll pigment.
4. Stores food as STARCH	4. Stores food as GLYCOGEN.

Q5. DRAW the diagram of alimentary canal & label the following parts : Mouth, Desophagus, Stomach, Intestine. (NE)

Ans. Refer pg. no. 2 (drawing of digestive system) → simple way.

Q6. Mention the major events during photosynthesis. (NE)

Ans. Refer pg. no. 1. (topic nutrition in plants → photosynthesis)

LONG ANSWER QUESTIONS — 5 MARKS

Q1. Explain an experiment to prove 'Sunlight is necessary for photosynthesis'! (CBSE 2011)

Ans. GANONG'S EXPERIMENT → to prove sunlight in essential

• Procedure :-
1. A potted plant is kept in dark for 24 hours to destarch the leaves.
2. A portion of leaf is covered by 'Ganong screen' or opaque black strips on both surface.
3. The plant is placed in sunlight for 4-6 hours.
4. Strips are removed & leaf is boiled in H_2O + alcohol.
5. Leaf is washed and treated with IODINE.

• Observation :- • The portion of leaf covered by strips turns yellow.
• While the portion uncovered ie exposed to light turned BLUISH-BLACK (indicating starch presence)

• Conclusion :- i) Part of leaf covered with black strip do not perform photosynthesis since it was not exposed to light.
ii) Part exposed to light performed photosynthesis.

• Result :- LIGHT is essential factor → necessary for photosynthesis

Q2. Explain the nutrition process in an Amoeba with help of diagram. (CBSE 12)

Ans. Amoeba (unicellular protozoan) show HOLOZOIC NUTRITION (5 stages)

A] EGESTION :-
1. Amoeba detects the food and engulfs it by the process called PHAGOCYTOSIS (for liquid food → PINOCYTOSIS)
2. Phagocytosis occurs via finger like extensions → PSEUDOPODIA
3. Engulfed food is enclosed inside FOOD VACUOLE in cytoplasm.

B] DIGESTION :-
1. Food vacuole is fused with LYSOSOME containing digestive enzymes forming PHAGOLYSOSOME.
2. Enzymes converts complex molecules into simpler substances.

C] ABSORPTION :- simpler substances diffuse into cytoplasm.

D] ASSIMILATION :- Nutrients are used for cellular activities

E] EGESTION :- Remaining undigested material in phagolysosome is now called RESIDUAL BODY.
It moves to cell surface and is thrown out.