For XAT , CMAT , MAT , IIFT Exam

LIFE PROCESSES

- Maintenance of life requires processes like nutrition, respiration, transport of Materials within the body and excretion of waste products

AUTOTROPHIC NUTRITION

- Carbon and energy requirements of the **autotrophic organism** are fulfilled by **photosynthesis**
- Autotrophs take in substances from the outside and convert them into stored forms of energy
- The carbohydrates which are not used immediately are stored in the form of starch, which serves as the internal energy reserve to be used as and when required by the plant
- Carbon dioxide and water is converted into carbohydrates in the presence of sunlight and chlorophyll. Carbohydrates are utilized for providing energy to the plant

NUTRITION IN PLANT

- All organisms need food and utilize it to get energy for growth and maintenance of their body
- **Green plants** synthesize food for themselves by the process of **photosynthesis**. They are **autotrophs**.
- A few plants and all animals are dependent on others for their nutrition and are called heterotrophs
- Heterotrophic organisms include animals and fungi
- Plants use simple chemical substances like carbon dioxide, water and minerals for the synthesis of food.

- **Chlorophyll, water, carbon dioxide and sunlight** are the essential requirements for photosynthesis.
- Complex chemical substances such as carbohydrates are the products of photosynthesis.
- **Solar energy** is absorbed by the **chlorophylls** present in **leaves/plants.**
- **Oxygen** is produced **during photosynthesis.**
- **Oxygen released** in photosynthesis is utilised by living organisms for their survival
- **Many fungi derive nutrition** from **dead and decaying matter**. They are **saprotrophs**
- Plants like Cuscutaare parasites. They take food from the host plant. Cascutta does not contain chlorophyll
- **Algae** can prepare their own **food** by **photosynthesis**. They contain **chlorophyll** which gives them the **green colour**
- Green plants are **green** because they contain a **chlorophyll**
- Metal constituent of **chlorophyll** is **Magnesium**

PHOTOSYNTHESIS

- Photosynthesis is the process by which plants some bacteria and some protistans use the energy from sunlight to produce sugar which cellular respiration converts into ATP the fuel used by all living things. The conversion of solar energy into usable chemical energy is associated with the actions of the green pigment chlorophyll. The following events occur during this process
- The following events occur during Photosynthesis
  1. Absorption of light energy by chlorophyll.
  2. Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen
  3. Reduction of carbon dioxide to carbohydrates.

$$6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \underset{\text{(Glucose)}}{C_6H_{12}O_6} + 6O_2 + 6H_2O$$

- Six molecules of water plus six molecules of carbon dioxide produce one molecule of sugar plus six molecules of oxygen
- Desert plants take up carbon dioxide at night and prepare an intermediate which is acted upon by the energy absorbed by the chlorophyll during the day
- **Leaves are the food factories of plants**
- Carbon dioxide from air is taken in through the tiny pores present on the surface of leaves. These pores are surrounded by guard cells. Such pores are called stomata
- Likewise oxygen produced during photosynthesis can only pass out of the leaf through the opened stomata
- Unfortunately for the plant while these gases are moving between the inside and outside of the leaf a great deal water is also lost
- **Rate of photosynthesis** is take place **maximum in red and blue light and photosynthesis** doesn't takes **place in green light**

- Chlorophyll the green pigment common to all photosynthetic cell absorbs all wavelengths of visible light except green which it reflects to be detected by our eyes
- Water used in photosynthesis is taken up from the soil by the roots in terrestrial plants. Other materials like nitrogen, phosphorus, iron and magnesium are taken up from the soil
- Plant transport systems will move energy stores from leaves and raw materials from roots
- The **xylem** moves **water** and **minerals** obtained from the **soil**
- **Phloem transports** products of photosynthesis from the leaves where they are synthesized to other parts of the plant

HETEROTROPHIC NUTRITION

- A **few plants and all animals are dependent on others** for their **nutrition** and are called **heterotrophs**
- The form of nutrition differs depending on the type and availability of food material as well as how it is obtained by the organism
- Some organisms break-down the food material outside the body and then absorb it. Examples are fungi like bread moulds, yeast and mushrooms
- Parasites derive nutrition from plants or animals without killing them. This is called parasitic nutritive strategy. This parasitic nutritive strategy is used by a wide variety of organisms like cuscuta (amar-bel), ticks, lice, leeches and tape-worms.
- Animal nutrition includes nutrient requirement, mode of intake of food and its utilisation in the body
- The breakdown of complex components of food into simpler substances is called digestion
- The mode of taking food into the body varies in different organisms. Bees and humming-birds suck the nectar of plants, infants of human and many other animals feed on mother's milk

NUTRITION IN HUMAN BEINGS

- We take in food through the mouth digest and utilise it.
- The food passes through a continuous canal which begins at the **buccal cavity** and ends at the **anus**
- The canal can be divided into various compartments. These parts together form the alimentary canal (digestive tract):
    1. The buccal cavity.
    2. Foodpipe or oesophagus
    3. Stomach
    4. Small intestine
    5. Large intestine ending in the rectum
    6. The anus
- The inner walls of the stomach and the small intestine, and the various glands associated with the canal such as salivary glands
- The **liver** and the **pancreas** secrete **digestive juices**
- The digestive tract and the associated glands together constitute the digestive system.

THE MOUTH AND BUCCAL CAVITY

- Food is taken into the body through the mouth. The process of taking food into the body is called ingestion
- Our mouth has the salivary glands which secrete **saliva**. . The **saliva contains an enzyme called salivary amylase** that breaks down **starch which is a complex molecule to give simple sugar**. The food is mixed thoroughly with saliva and moved around the mouth while chewing by the muscular tongue.

THE FOODPIPE/OESOPHAGUS

- The swallowed food passes into the foodpipe or oesophagus
- Food is pushed down by movement of the wall of the foodpipe

THE STOMACH

- The digestion in stomach is taken care of by the gastric glands present in the wall of the stomach. These release **hydrochloric acid** a protein digesting enzyme called **pepsin** and **mucus**
- The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin
- The mucus protects the inner lining of the stomach from the action of the acid under normal conditions
- The acid kills many bacteria that enter along with the food and makes the medium in the stomach acidic and helps the digestive juices to act
- The **digestive juices** break down the **proteins** into simpler substances
- The exit of food from the stomach is regulated by a sphincter muscle which releases it in small amounts into the small intestine

THE SMALL INTESTINE

- The small intestine is highly coiled and is about 7.5 metres long
- The length of the small intestine differs in various animals depending on the food they eat.
- **Herbivores** eating grass need a longer small intestine to allow the cellulose to be digested.
- Meat is easier to digest hence carnivores like tigers have a shorter small intestine.
- **Liver secretes bile juice that is stored in a sac called the gall bladder.** The bile plays an important role in the digestion of fats
- **The pancreas secretes pancreatic juice** which contains enzymes like **trypsin** for digesting proteins and lipase for breaking down emulsified fats
- The walls of the small intestine contain glands which secrete intestinal juice. The enzymes present in it finally convert the proteins to amino acids
- The **villi are richly supplied with blood** vessels which take the absorbed food to each and every cell of the body

LARGE INTESTINE

- The **large intestine** is wider and shorter than small intestine. It is about **1.5 metre** in length
- Its function is to **absorb water** and some **salts** from the undigested food material

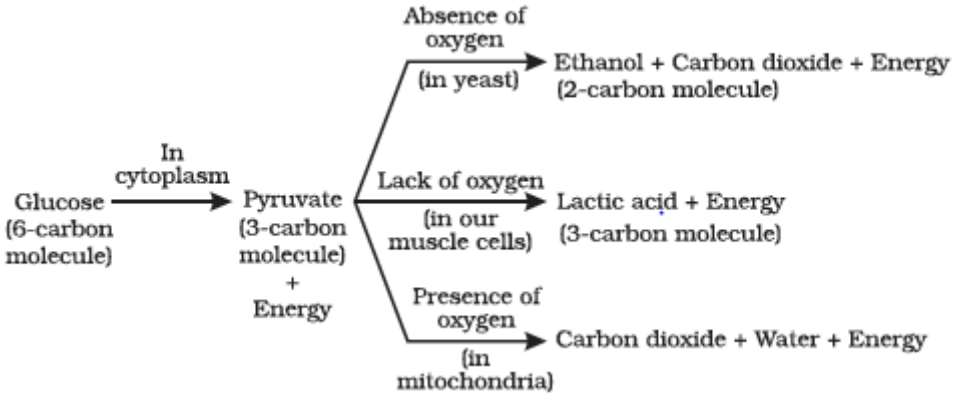
- The rest of the material is removed from the body via the anus. The exit of this waste material is regulated by the anal sphincter

DIGESTION IN GRASSEATING ANIMALS

- The grazing animals like cows, buffaloes and deer are known as **ruminants**. They quickly ingest swallow their leafy food and store it in the rumen. Later the food returns to the mouth and the animal chews it peacefully
- The grass is rich in cellulosea type of carbohydrate. In ruminants like cattle, deer, etc., bacteria present in rumen helps in digestion of cellulose
- Amoeba ingests its food with the help of its false feet or pseudopodia. The food is digested in the food vacuole

RESPIRATION

- Respiration is essential for survival of living organisms. It releases energy from the food
- Each cell of an organism performs certain functions such as nutrition, transport, excretion and reproduction. To perform these functions the cell needs energy
- All living organisms respire to get energy from food.
- In the cell, the food (glucose) is broken down into carbon dioxide and water using oxygen. When breakdown of glucose occurs with the use of oxygen it is called aerobic respiration.
- **Food can be broken down without using oxygen. This is called anaerobic respiration**
- Break down of glucose a six carbon molecule into a three-carbon molecule called pyruvate. This process takes place in the cytoplasm
- Breakdown of pyruvate using oxygen takes place in the mitochondria.



- Organisms such as **yeast** that can survive in the **absence of air**. They are called **anaerobes**. They respires **anaerobically** and during this process yield alcohol. Because they used to make wine and beer
- Our muscle cells can also respire an aerobically but only for a short time when there is a temporary deficiency of oxygen. During heavy exercise, fast running, cycling, walking form any hours or heavy weight lifting, the demand for energy is high
- Hot water bath or massage improves circulation of blood As a result the supply of oxygen to the muscle cells increases

- The energy released during cellular respiration is immediately used to synthesise a molecule called ATP which is used to fuel all other activities in the cell. In these processes, ATP is broken down giving rise to a fixed amount of energy which can drive the endothermic reactions taking place in the cell
- Respiration may be aerobic or anaerobic. **Aerobic respiration** makes more energy available to the organism.

BREATHING

- In human beings air is taken into the body through the nostrils. The air passing through the nostrils is filtered by fine hairs that line the passage
- Rings of cartilage are present in the throat. These ensure that the air passage does not collapse
- The taking in of air rich in oxygen into the body is called inhalation and giving out of air rich in carbon dioxide is known as exhalation
- During inhalation our lungs expand and then come back to the original state as the air moves out during exhalation
- In earthworm the exchange of gases occurs through the moist skin. In **fishes** it takes place through **gills** and in **insects through the tracheae.**
- In a plant the roots take in air present in the soil. Leaves have tiny pores called stomata through which they exchange gases. The breakdown of glucose in the plant cells is similar to that in other living beings.
- Terrestrial animals can breathe the oxygen in the atmosphere but animals that live in water need to use the oxygen dissolved in water
- The rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms
- In human beings, the respiratory pigment is haemoglobin which has a very high affinity for oxygen. This pigment is present in the red blood corpuscles

TRANSPORTATION

TRANSPORTATION IN HUMAN BEINGS

- Blood is the fluid which flows in blood vessels
- It transports substances like digested food from the small intestine to the other parts of the body. It carries oxygen from the lungs to the cells of the body. It also transports waste for removal from the body
- One type of cells are the red blood cells (RBC) which contain a red pigment called haemoglobin. Haemoglobin binds with oxygen and transports it to all the parts of the body and ultimately to all the cells.
- The blood also has white blood cells (WBC) which fight against germs that may enter our body
- The clot is formed because of the presence of another type of cells in the blood called platelets

HEART

- The heart is an organ which beat continuously to act as a pump for the transport of blood
- The human heart is four chambered
- The two upper chambers are called the atria and the two lower chambers are called the ventricles

- The carbon dioxide rich blood has to reach the lungs for the carbon dioxide to be removed, and the oxygenated blood from the lungs has to be brought back to the heart. This oxygen rich blood is then pumped to the rest of the body
- The separation of the right side and the left side of the heart is useful to keep oxygenated and deoxygenated blood from mixing
- Arteries carry oxygen-rich blood from the heart to all parts of the body. Blood emerges from the heart under high pressure .the arteries have thick, elastic walls
- Veins are the vessels which carry carbon dioxide-rich blood from all parts of the body back to the heart. They do not need thick walls because the blood is no longer under pressure
- The force that blood exerts against the wall of a vessel is called blood pressure.
- The normal systolic pressure is about **120 mm of Hg** and diastolic pressure is **80 mm of Hg**
- Amphibians or many reptiles have **three-chambered hearts**
- Fishes have only two chambers to their hearts
- The human heart has **four chambers.** Two atria and two ventricles
- **Pulmonary veins** transport oxygenated blood to the heart from the lungs.
- **Pulmonary arteries** move deoxygenated blood from the heart to the lungs
- **Lymph** carries digested and absorbed fat from intestine and drains excess fluid from extra cellular space back into the blood.

TRANSPORTATION IN PLANTS

- **Plant transport systems** will move **energy stores from leaves** and **raw materials from roots**. These two pathways are constructed as independently organised conducting tubes. One, **the xylem moves water and minerals obtained from the soil**. The other, **phloem transports products of photosynthesis from the leaves** where they are synthesised to other parts of the plan
- A lot of water is lost by plants in the form of vapour through stomata during transpiration

EXCRETION

- The biological process involved in the removal of these harmful metabolic wastes from the body is called excretion
- The parts involved in excretion form the excretory system

EXCRETION IN HUMAN BEINGS

- The excretory system of human beings includes a pair **of kidneys, a pair of ureters, a urinary bladder and a urethra**
- Urine produced in the kidneys passes through the ureters into the urinary bladder where it is stored until it is released through the urethra
- In human beings excretory products in the form of soluble nitrogen compounds are removed by the nephrons in the kidneys.

- The purpose of making **urine** is to filter out **waste products from the blood**. Nitrogenous waste such as urea or uric acid are removed from blood in the kidneys
- An adult human being normally passes about 1–1.8 L of urine in 24 hours. The urine consists of 95% water, 2.5% urea and 2.5% other waste products
- The **nephron** is **functional unit** of the **kidney**

EXCRETION IN PLANTS

- Plants use a variety of techniques to get rid of waste material. For example, waste material may be stored in the cell-vacuoles or as gum and resin, removed in the falling leaves, or excreted into the surrounding soil.