THE RADIANT EDUCATION POINT
(MRITUNJAY MISHRA)
H.N. 1256, 33-FEET ROAD, S.G.M. NAGAR
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LIFE PROCESSES

Introduction
All the plants and animals are alive or living things.

Properties of Living Beings
a. Movement b. Grow c. Need Food d. Excrete e. Respiration f. Reproduce
The movement in animals is fast and can be observed easily but the movement in plants is slow and observed with difficulty. Animals can move from one place to another or they can move their body parts. The plants can only move parts of their body such as leaves, flowers, roots and shoots.
Life Processes - Life processes are processes undergoing in living organisms to sustain life. For example: Reproduction. Excretion, Respiration and Growth etc.

Nutrition -
The Process of taking of food inside the body and converting it into smaller molecules which can be absorbed by the body is called Nutrition.
Need of nutrition: Nutrition is needed to provide energy for doing any activity and provide essential nutrients for life processes.
Nutrients: Materials which provide nutrition to organisms are called nutrients. For example
• Carbohydrates and fats are the nutrients which are used by the organism mainly as a source of energy. These nutrients are found in wheat, rice, corn, chocolates etc. So when you eat them you feel energetic.
• Proteins, vitamins and mineral are nutrients used for making body parts like skin, blood, bones etc. Examples of these nutrients are keratin (protein), elastin (protein), collagen (protein), vitamin A, vitamin B, vitamin E, iron (mineral), calcium (mineral) and many more. These nutrients are found in onions, fish, potatoes, milk, beet root and in many other vegetables and fruits.

Mode of Nutrition -
Mode of nutrition means method of obtaining food by an organism. There are mainly two modes of nutrition:
1. Autotrophic mode 2. Heterotrophic mode
Autotrophic Mode In this mode of nutrition an organism does not depend on other living beings for food. Organism makes (or synthesizes) its own food by photosynthesis.
Those organisms which can make their own food by photosynthesis are called Autotrophs. For example: all green plants, autotrophic bacteria.
Heterotrophic Mode: Heterotrophic nutrition is that mode of nutrition in which an organism cannot make (or Not synthesizes) its own food and depends on other organisms for its food.

Those organisms which cannot make their own food and depends on other organisms for their food are called Heterotrophs. For example: all the animals (man, dog, cat, lion, etc.), most bacteria and fungi.

Now heterotrophs can be further divided into three types.

Carnivores: Organisms those eat only animals are called carnivores. For example: tiger, lion, snake, frog etc.

Herbivores: Organisms those eat only plants are called herbivores. For example: cow. deer, rabbit, elephant etc.

Omnivores: Organisms those eat both plant and animals are called omnivores. For example: crow, human, dog. Sparrow etc.

Types of Heterotrophic Nutrition:

Heterotrophic mode of nutrition is of three types:
(i). Saprotrophic (saprophytic) nutrition
(ii). Parasitic nutrition
(iii). Holozoic nutrition

(i) Saprotrophic nutrition: Saprotrophic nutrition is that nutrition in which an organism obtains its food from decaying organic matter of dead plants, dead animals and rotten bread etc. The organisms having saprotrophic mode of nutrition are called saprophytes.
Saprophytes are the Organisms which obtain food from dead plants (like rotten leaves) dead and decaying animal bodies and other decaying organic matter. For example: Fungi (liker bread moulds, mushrooms

(ii) Parasitic nutrition: The parasitic nutrition is that nutrition in which an organism derives its food from the body of other living organisms without killing it.
A parasite is an organism which feed on another living organism called its host. For example, some animals like Plasmodium and roundworms, a few plants like Cuscuta (amarbel) and several fungi and bacteria.

(iii) Holozoic nutrition: The holozoic nutrition is that nutrition in which an organism takes the complex organic food materials into its body by the process of ingestion: the ingested food is digested and then absorbed into the body cells of the organism. For example: human beings and most of the animal.

Nutrition in Plants -

Green plants prepare their own food. They make food from carbon dioxide and water in the presence of sunlight and chlorophyll. This process is called photosynthesis.

Conditions necessary for photosynthesis:

The conditions necessary for photosynthesis to take place are:

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1. Sunlight
2. Chlorophyll
3. Carbon dioxide
4. Water

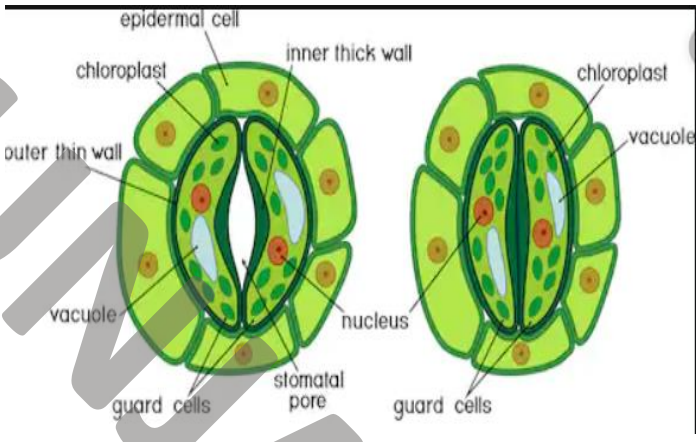
$$6CO_2 + 6H_2O \xrightarrow{\text{chlorophyll + sunlight}} C_6H_{12}O_6 + 6O_2$$

The process of photosynthesis can be represented as:

• the process of photosynthesis takes place in the green leaves of a plant.
• The food is prepared by the green leaves of a plant in the form of a simple sugar called glucose.
• The extra glucose is changed into another food called starch (carbohydrate). This starch is stored in the fruits and leaves of the plant.
• Plants provide food for animals.
• The green plants convert sunlight energy into chemical energy by making carbohydrates.

How the plants obtain carbon dioxide?

• There are a large number of tiny pores called stomata present on the surface of the leaves of plants.
• The carbon dioxide gas enters into the leaves of the plant through the stomata present on the surface of leaves.
• Each stomatal pore is surrounded by a pair of guard cells. 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 guard cells lose water, they shrink, become straight and close the stomatal pores.



How the plants obtain water for photosynthesis?

• The water required by the plants for photosynthesis is absorbed by the root of the plants from the soil through the process of osmosis.
• The water absorbed by the roots of the plants is transported upward through the xylem vessels to the leaves where it reaches the photosynthetic cells.
• The plants also need other raw materials such as nitrogen, phosphorus, iron and magnesium etc. for building their body. Plants take these materials from the soil.
• Nitrogen is essential element used by the plants to make proteins and other compound.

Site of photosynthesis:

• The site of photosynthesis in a cell of the leaf is chloroplasts which contain Chlorophyll.
• Chloroplasts are mainly present in the photosynthetic cells (mesophyll cells) of green plants. These cells contain more chlorophyll than other plant cells.

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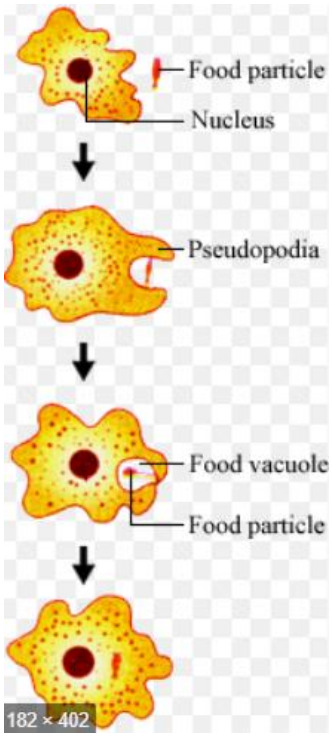
Nutrition in Animals (Heterotrophs) -

Animals are heterotrophs and hence they depend on other organisms (plants and other animals) for their food.

Fruits, vegetable, milk, fish are some small substances which can be used by body to obtained nutrients.

Nutrition in Simple Animals:

Amoeba and paramecium are two very simple unicellular animals. In unicellular animals, all the processes of nutrition are performed by the single cell.



a. Nutrition In Amoeba:

• Amoeba eats tiny plants and animals as food which floats in water in which it lives.
• The mode of nutrition in Amoeba is holozoic.
• The process of obtaining food by Amoeba is called phagocytosis.

Steps involved in the nutrition of Amoeba:

• Amoeba captures food near its body through temporary finger-like projections called pseudopodia to form food vacuole.
• Enzymes enter food vacuole from cytoplasm. The enzymes convert the taken food to smaller substances which can be absorbed by body.
• The digested food diffuses out to reach to the entire body.
• Body uses the food for growth.
• Cell membrane of amoeba ruptures at any point to throw out waste material.

Enzymes: Enzymes are juice like substances secreted by organs in living organisms which act as bio-catalyst in biochemical reactions inside the body.

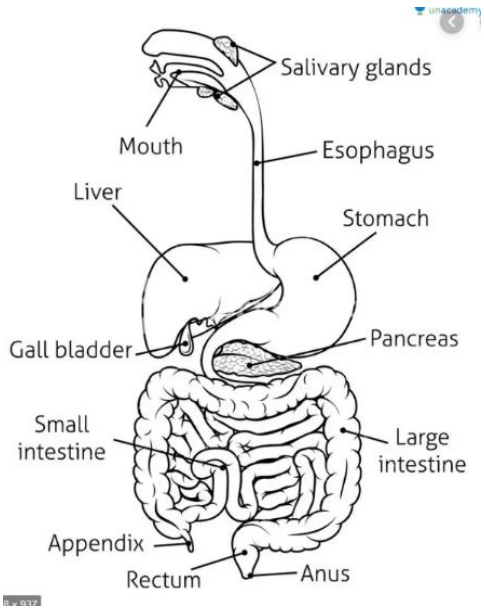
There are five steps in the process of nutrition in animals.

The process of taking food into the body is called ingestion.
The process in which the food containing large insoluble molecules is broken down into small water soluble molecules which can be absorbed by body to get required nutrients is called digestion.
The process of distribution of digested food to body parts is called absorption.
The process in which the absorbed food is taken in by the body cells and used for energy, growth and repair is called assimilation.
The process in which the undigested food is removed from the body is called egestion.

Nutrition in Human Beings (Digestive **System in Human Body):**

Basic organs of the human digestive system are:
1. Mouth (Buccal cavity),
2. Oesophagus (Food pipe),

3. Diaphragm (Sheet).
4. Stomach (J shaped).
5. Small intestine,
6. Large intestine.
7. Rectum,
8. Anus



Notes

Alimentary canal/ Gut is the entire path of food from mouth to anus.

Small intestine is longer than large intestine but still it is called small as it is thinner.

Peristaltic movement: When the slightly digested food enters the food pipe, the walls of food pipe start contraction and expansion movements to move the food along gut. This movement of walls of food pipe is called peristaltic movement.

Sphincters: These are circular muscular structures which control the movement of substance through them. Normally, they remain closed. When movement is required, they open. There are many sphincters in gut.

Glands of human digestive system are:

1. Salivary glands.
2. Liver,
3. Pancreas.

Salivary glands in our mouth produce saliva (watery liquid) which contains enzyme called salivary amylase which digests the starch (carbohydrate) present in the food into sugar (Chemical digestion).

Pancreas lies behind the lower portion of stomach. It secretes pancreatic juice which contains many digestive enzymes (pancreatic amylase, trypsin, and lipase).

Liver secretes greenish yellow liquid called bile. Bile is temporarily stored in gall bladder before it is send to small intestine through bile duct.

Working of Digestive System -

Ingestion: In human beings, food is ingested through the mouth. The food is put into the mouth with the help of hands.

Digestion:

Mouth:

• The digestion of food begins in the mouth itself.
• The teeth cut the food into small pieces, chew and grind It
• The salivary glands in our mouth produce saliva (watery liquid) which contains an enzyme salivary

amylase which digests the starch (carbohydrate) present in the food into sugar. (Chemical digestion)
• Our tongue helps in mixing this saliva with food.
• The digestion of food remains incomplete in mouth.

oesophagus.
• The slightly digested food in the mouth is swallowed by the tongue and goes down the food pipe called oesophagus.

stomach
• The stomach is a J-shaped organ present on the left side of the abdomen.
• The stomach walls contains three tubular glands in it walls which secrete gastric juice.
• The gastric juice contains three substances: Hydrochloric acid, the enzyme pepsin and mucus.
• The hydrochloric creates an acidic medium which facilitates the action of the enzyme pepsin i.e. digestion of protein.
• The mucus helps to protect the stomach wall from its own secretions of hydrochloric acid.
• The partially digested food then goes from the stomach into the small intestine.

Small Intestine.
• From the stomach, the partially digested food enters the small intestine.
• The small intestine is the largest part (about 6.5m) of the alimentary canal.
• The small intestine is very narrow and arranged in the form of a coil in our belly.
• The small intestine in human beings is the site of complete digestion of food
• The small intestine receives the secretion of two glands: Liver and Pancreas.
• Liver secretes bile (greenish yellow liquid made in the liver and stored in gall bladder).

Bile performs two functions:
1. Makes the acidic food coming from the stomach alkaline so that pancreatic enzymes can act on it.
2. Bile salts break the fats present in the food into small globules making it easy for the enzymes to act and digest them.
• The pancreas secretes pancreatic juice which contains enzymes like pancreatic amylase for breaking down starch, trypsin for digesting proteins and lipase for breaking down emulsified fats.
• The walls of the small intestine contain glands which secretes intestinal juice.
• The enzymes present in it finally convert the proteins into amino adds, complex carbohydrates into glucose and fats into fatty acids and glycerol. In this way the process of digestion converts the large and insoluble food molecules into small water soluble molecules.

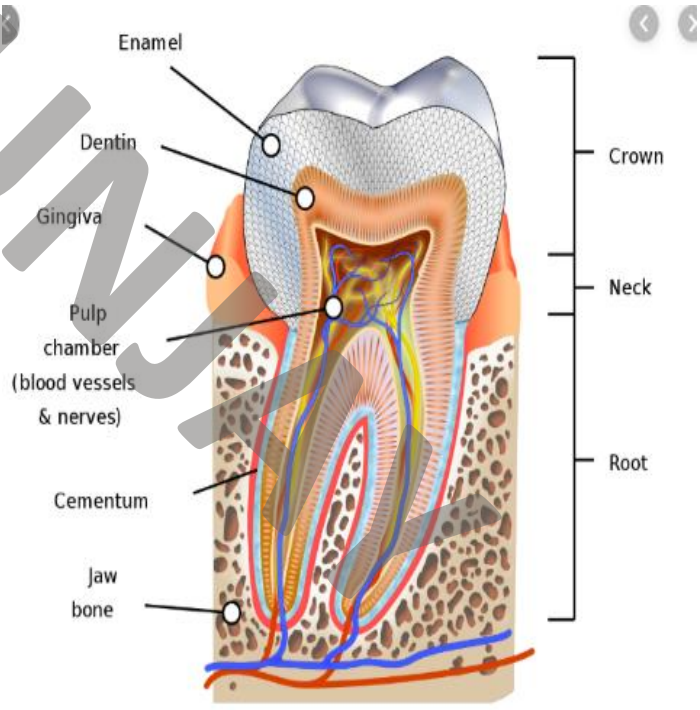
Absorption:
• The small intestine is the main region for the absorption of digested food.
• The inner surface of the small intestine has numerous finger-like projections called villi which

increase the surface area for rapid absorption of digested food.
• The digested food which is absorbed through the walls of the small intestine goes into our blood.

Assimilation:
• The blood carries digested and dissolved food to all the parts of the body where it becomes assimilated as part of the cells and is utilized for obtaining energy, building up new tissues and the repair of old tissues.

Egestion:
• The unabsorbed food is sent Into the large intestine where villi absorb water from this 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.

Tooth Decay / Dental Caries -
Tooth Decay / Dental caries is a demineralization of the tooth surface caused by bacteria.
Basic Structure of Tooth
Structure of tooth mainly contains three parts:
1. Enamel: It's a hardest part in the body, harder than bones.
2. Dentine: It is similar to bone.
3. Pulp cavity. It has nerves and blood vessels.



How tooth decays?
• Sugar is present in food we eat.
• When we eat the food, bacteria in our mouth reacts with sugar and makes acid.
• This acid can destroy enamel and dentine slowly.
• Saliva neutralizes the acid and thus our teeth are saved.
• Improper brushing leads to deposit of food along with bacteria in mouth on teeth. This is called dental plague.
• Due to dental plague, saliva fails to protect corroding of tooth by acid and thus tooth decays.
Effect:
When acid comes In contact with nerves in pulp cavity, It creates toothache and inflammation.

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LIFE PROCESS (BIOLOGY)

Respiration

The process of releasing energy from food is called respiration. The process of respiration involves taking in oxygen (of air) into the cells, using it for releasing energy by burning food, and then eliminating the waste products (carbon dioxide and water) from the body.

Food + Oxygen ⟶ Carbon dioxide + Water + Energy

The process of respiration which releases energy takes place inside the cells of the body. So, it is also known as cellular respiration. Respiration is essential for life because it provide energy for carrying out all the life processes which are necessary to keep the organism alive.

Types of Respiration

In most of the cases, the organisms carry out respiration by using oxygen. However there are some organisms which carry out respiration without using oxygen. Based on this, we have two types of respiration:

1. Aerobic respiration **2. Anaerobic respiration**

1. Aerobic Respiration: The respiration which uses oxygen is called aerobic respiration. In aerobic respiration, the glucose food is completely broken down into carbon dioxide and water by oxidation. Aerobic respiration produces a considerable amount of energy for use by the organism. This step happens in the cytoplasm. Glucose molecule is broken down into pyruvic acid. Glucose molecule is composed of 6 carbon atoms, while pyruvic acid is composed of 3 carbon atoms.

Glucose ⟶ Pyruvate ⟶ 6C02 + 6H20 + energy

Mitochondria are the sites of aerobic respiration in the cells. Thus, the breakdown of pyruvate to give carbon dioxide, water and energy takes place in mitochondria.

2. Anaerobic Respiration: The respiration which takes place without oxygen is called anaerobic respiration. The microscopic organisms like yeast and some bacteria obtain energy by anaerobic respiration (which is called fermentation). In anaerobic respiration, the microorganisms like yeast break down glucose (food) into ethanol and carbon dioxide, and release energy. Anaerobic respiration produces much less energy. Glycolysis In absence of oxygen

Glucose ⟶ Pyruvate ⟶ 2C2H50H + 2C02 + energy

Sometimes, when there is lack of oxygen in our muscle cells, another pathway for the breakdown of pyruvate is taken. Here the pyruvate is converted into lactic acid (which is also a three-carbon molecule) with the release of small amount of energy. Glycolysis in absence of oxygen

Glucose ⟶ Pyruvate ⟶ 2 Lactic acid + energy

Glucose –
Pyruvic acid –
Lactic acid –

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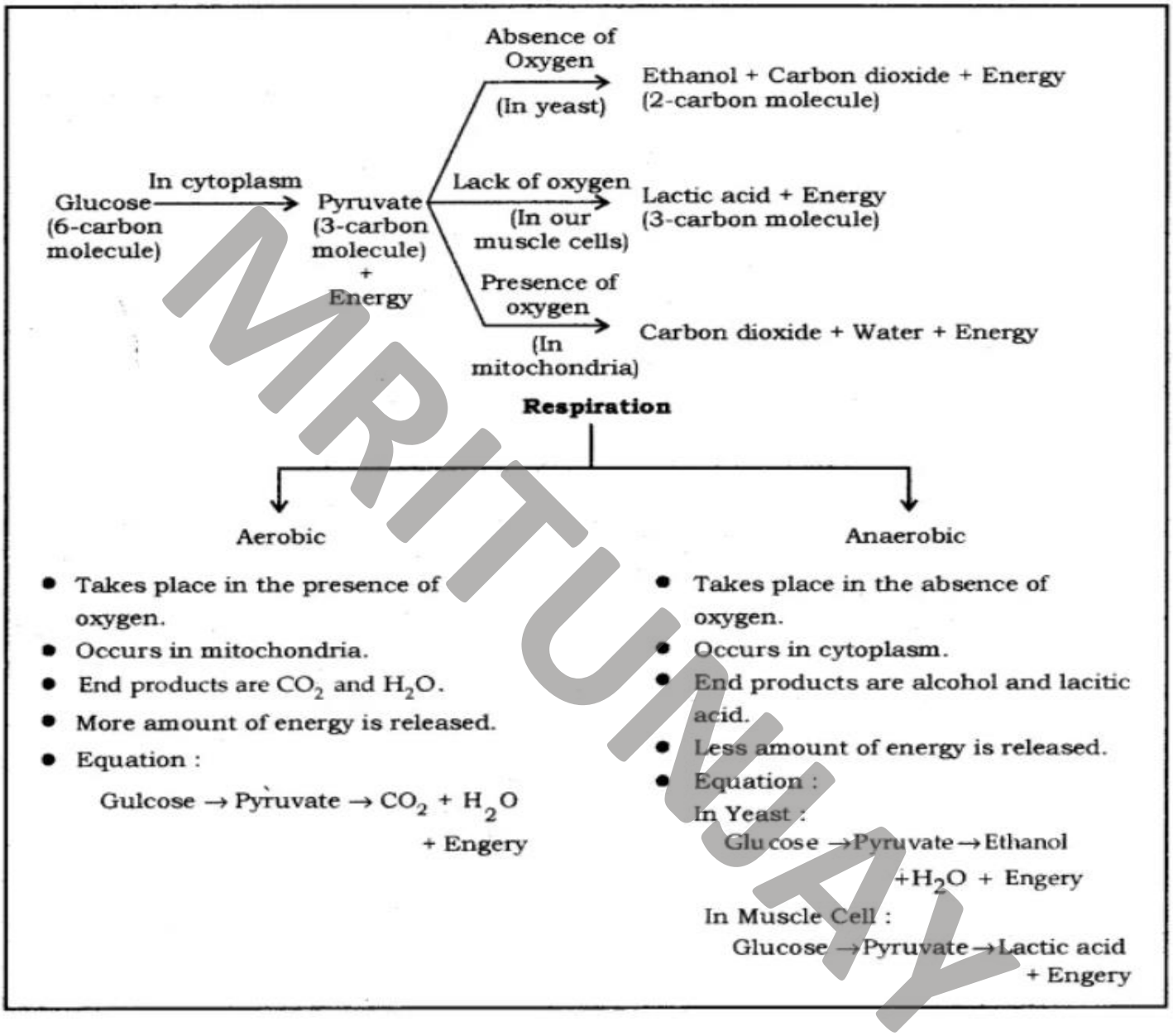

ATP (Energy Currency)

• The energy produced during respiration is stored in the form of ATP molecules in the cells of the body and used by the organism as when required.

• ADP (Adenosine Di-Phosphate, low energy content), Inorganic Phosphate (Pi) and ATP (Adenosine Tn-Phosphate, high energy content) are the substances present inside a cell.

• The energy released during respiration is used to make ATP molecules from ADP and inorganic phosphate.

ADP + Phosphate + Energy ⟶ ATP

• Thus, energy is stored in the form of ATP,

• When the cell needs energy, then ATP can be broken down using water to release energy.

ATP ⟶ ADP + Phosphate + Energy

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• The energy equivalent to 30.5KJ/mole is released in this process.
• ATP is known as energy currency of cells.

Exchange of Gases during Respiration -

Different organisms use different methods for exchange of gases. Diffusion is the method which is utilized by unicellular and some simple organisms for this purpose. In plants also, diffusion is utilized for exchange of gases. In complex animals like human, respiratory system does the job of exchange of gases.

Animals	Respiratory Organ
• Unicellular animals like Amoeba	Cell membrane
Earthworm	Skin
• Aquatic animals like Fish, Prawns	Gills
• Insects like Grasshopper, Cockroach	Spiracles and tracheae
• Land animals like human, birds	Lungs

Exchange of gases in plants

Plants get Oxygen by Diffusion:

• Plants have a branching shape, so they have quite a large surface area in comparison to their volume. Therefore, diffusion alone can supply all the cells of the plants with as much oxygen as they need for respiration. Diffusion occurs in the roots, stems and leaves of plants.

1. **Respiration in Roots:**

• Air occurs in soil interspaces. Root hairs of the roots are in direct contact with them.
• Oxygen of the soil air diffuses through root hair and reaches all internal cells of the root for respiration.
• Carbon dioxide produced by root cells diffuses in the opposite direction.
• In water-logged conditions, soil air becomes deficient. In the absence of oxygen, metabolic activity of the root declines and the plant may wither.

2. Respiration in Stems:

• The stems of herbaceous plants have stomata. The oxygen from air diffuses into the stem of a herbaceous plant through stomata and reaches all the cells for respiration.
• The carbon dioxide gas produced during respiration diffuses out into the air through the same stomata.
• In woody stems, the bark has lenticels for gaseous exchange.

3. Respiration in Leaves:

• The leaves of a plant have tiny pores called stomata. The exchange of respiratory gases in the leaves takes place by the process of diffusion through stomata. Net gaseous exchange in the leaves of the plant:

I. During day time when photosynthesis occurs oxygen is produced. The leaves use some of this oxygen for respiration and rest of the oxygen diffuses out into air. Again, during the day time, carbon dioxide produced by respiration is all used up in photosynthesis by leaves. Even more carbon dioxide is taken in from air. Thus, net gas exchange in leaves during day time is: 02 diffuses out; CO2 diffuses in.
II. At night time, when no photosynthesis occurs and hence no oxygen is produced, oxygen from air

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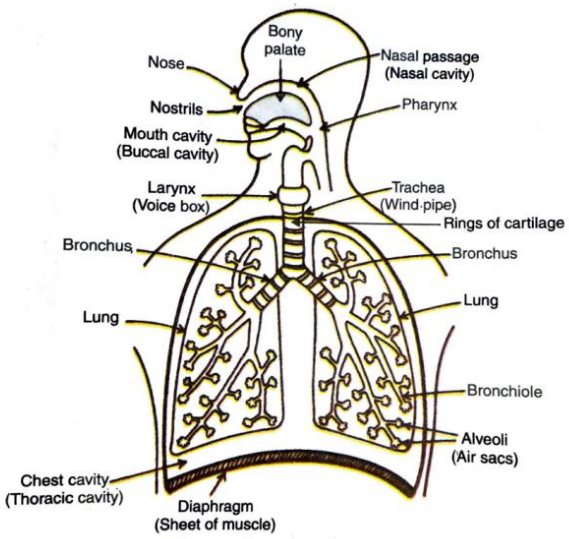
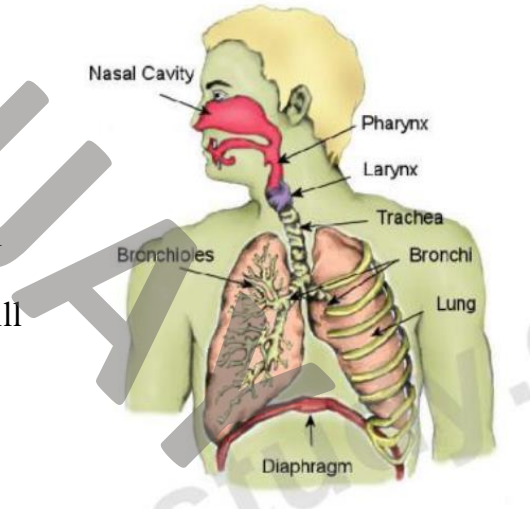
diffuses into leaves to carry out respiration. And carbon dioxide produced by respiration diffuses out into air. Thus, net gas exchange in leaves at night is: 02 diffuses in; CO2 diffuses out.

Respiratory System in Humans -

• In human beings, many organs take part in the process of respiration. These organs are called organs of respiratory system.
• The main organs of human respiratory system are: Nose, Nasal passage, Trachea (wind pipe), Bronchi, Lungs and Diaphragm.
• The human respiratory system begins from the nose. The air then goes into nasal passage.
• The nasal passage is lined with fine hair and mucus.
• When air passes through the nasal passage, the dust particles and other impurities present in it are trapped by nasal hair and mucus so that clean air goes into lungs.
• The part of throat between the mouth and wind pipe is called pharynx.
• From the nasal passage, air enters into pharynx and then goes into the wind pipe. Trachea does not collapse even when there is no air in it because it is supported by rings of soft bones called cartilage.
• The trachea runs down the neck and divides into two smaller tubes called bronchi at its lower end.
• The bronchi are connected to the two lungs. The lungs lie in the chest cavity or thoracic cavity which is separated from abdominal cavity by a muscular partition called diaphragm.
• Each bronchus divides in the lungs to form a large number of still smaller tubes called 'bronchioles.
• The pouch-like air sacs at the ends of the smallest bronchioles are called alveoli.
• The walls of alveoli are very thin and they are surrounded by very thin blood capillaries. It is in the alveoli that gaseous exchange takes place.





Mechanism of Respiration:

• When we breathe in, we lift our ribs and flatten our diaphragm and the chest cavity becomes larger as a result. Because of this, air is sucked into the lungs and fills the expanded alveoli.
• The alveoli are surrounded by thin blood vessels called capillaries carrying blood in them. So, the oxygen of air diffuses out from the alveoli walls into the blood.
• The oxygen is carried by blood to all the parts of the body. As the blood passes through the tissues of the body, the oxygen present in it diffuses into the cells.

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• The oxygen combines with the digested food present in the cells to release energy.
• Carbon dioxide gas is produced as a waste product during respiration in the cells of the body tissues. This carbon dioxide diffuses into the blood.
• Blood carries the CO2 back to the lungs where it diffuses into the alveoli.
• When we breathe out air, the diaphragm and muscles attached to the ribs relax due to which our chest cavity contracts and becomes smaller. This contraction movement of the chest pushes out CO2 from the alveoli of lungs into the trachea, nostrils and then out of the body into air.
Note: During the breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.
• Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported in the dissolved form in our blood.

Rate of breathing:
• Breathing occurs involuntarily but the rate of breathing is controlled by the respiratory system of brain.
• The average breathing rate in an adult man at rest is about 15 to 18 times per minute, This breathing rate increases with increased physical activity.
• Oxygen required for breathing and respiration is carried by hemoglobin pigment present in our blood. The normal range of hemoglobin in the blood of a healthy adult person is from 12 to 18 grams per deciliter of blood.
• The deficiency of hemoglobin in the blood of a person reduces the oxygen carrying capacity of blood resulting in breathing problems, tiredness and lack of energy.

Respiration in Amoeba:
• Amoeba is single-celled animal. Amoeba depends on simple diffusion of gases for breathing.
• The exchange of gases in Amoeba takes place through its cell membrane.
• Amoeba lives in water. This water has oxygen dissolved in it. The oxygen from water diffuses into the body of Amoeba through its cell membrane.
• Since the amoeba is very small in size, so the oxygen spreads quickly into the whole body of Amoeba.
• This oxygen is used for respiration inside the Amoeba cell. The process of respiration produces carbon dioxide gas continuously. This carbon dioxide gas diffuses out through the membrane of amoeba into the surrounding water.

Respiration in Earthworm:
• The earthworm exchanges the gases through its skin. The earthworm absorbs the oxygen needed for respiration through is moist skin.
• The oxygen is then transported to all the cells of the earthworm by its blood where it is used in respiration.
• The carbon dioxide produced during respiration is carried back by the blood. This C02 is expelled from the body of the earthworm through its skin.

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Why simple respiratory systems can not be used in humans?
1. **Surface moist:** If humans would have used simple respiratory system then our skin would be more moist.
2. If gases diffuse through skin in human, they will not receive sufficient oxygen.
3. If gases were to travel in human body through diffusion, it will take years to reach from one end to another.

Respiration in Fish:
• The fish has special organs for breathing called 'gills. The fish has gills on both the sides of its head.
• The fish lives in water and water contains dissolves oxygen in it. The fish breathes by taking in water through its mouth and sending it over the gills.
• When water passes over gills, the gills extract dissolved oxygen from this water. The water then goes out through the gill slits.
• The extracted oxygen is absorbed by the blood and carried to all the parts of the fish.
• The carbon dioxide produced by the respiration is brought back by the blood into the gills for expelling into the surrounding water.

Note:
1. Human die under water, because their lungs are made to work in air not in water.
2. Terrestrial animals can breathe in the atmosphere, but animals that live in water (aquatic animals) need to use the oxygen dissolved in water. Since the amount of dissolved oxygen in water is fairly low compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms.

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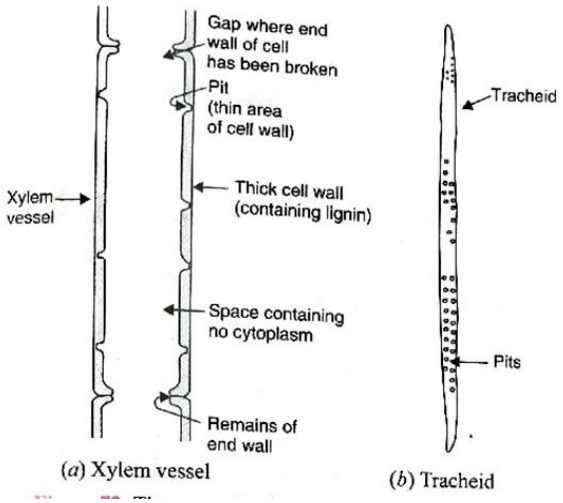
LIFE PROCESS (BIOLOGY)

Transportation in Plants

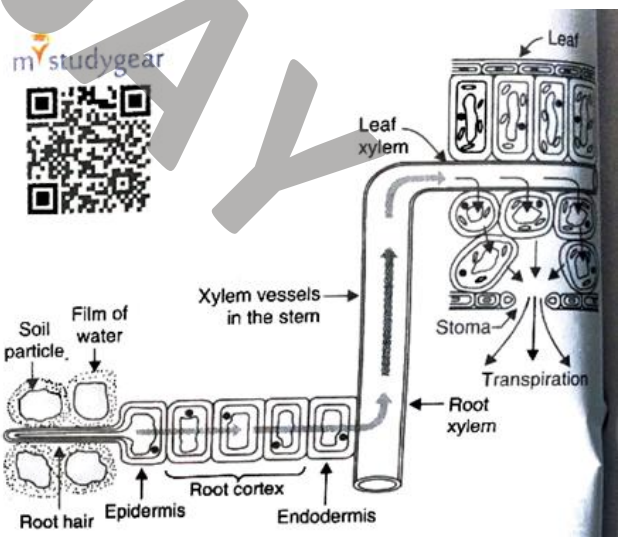
Plants have specialized vascular tissues for transportation of substances. There are two types of vascular tissues in plants, viz, xylem and phloem.

Xylem.-Xylem is responsible for transportation of water and minerals. It is composed of trachieds, xylem vessels, and xylem parenchyma and xylem fibre. Trachieds and xylem vessels are the conducting elements. The xylem makes a continuous tube in plants which runs from roots to stem and right up to the veins of leaves.



Xylem vessels: The xylem vessel is a non-living, long tube which runs like a drainpipe through the plant. A xylem vessel is made of many hollow, dead cells (called vessel elements), joined end to end. Xylem vessels run from the root of the plant right up through the stem and reach the leaves. The xylem vessels branch into every leaf of plant.

Tracheids: tracheids are long, thin, spindle shaped cells with pits in their thick cell walls .water flows from one trachieds to another through pits. Tracheids are dead cell and they do not have open ends, so they do not form vessels. Although all plants have tracheids , they are the only water conducting tissue in the non-flowering plants.



Mechanism of transport of water and mineral in plant:

The roots of a plant have hair called root hairs. The root hairs absorb water and minerals from the soil by the process of diffusion. The water and minerals absorbed by the root hair from soil pass from cell to cell by osmosis through epidermis, root cortex, endodermis and reach the root xylem.

Then water enters from root xylem vessels into stem xylem vessels and then xylem vessels distribute it to each and every part of leaf.

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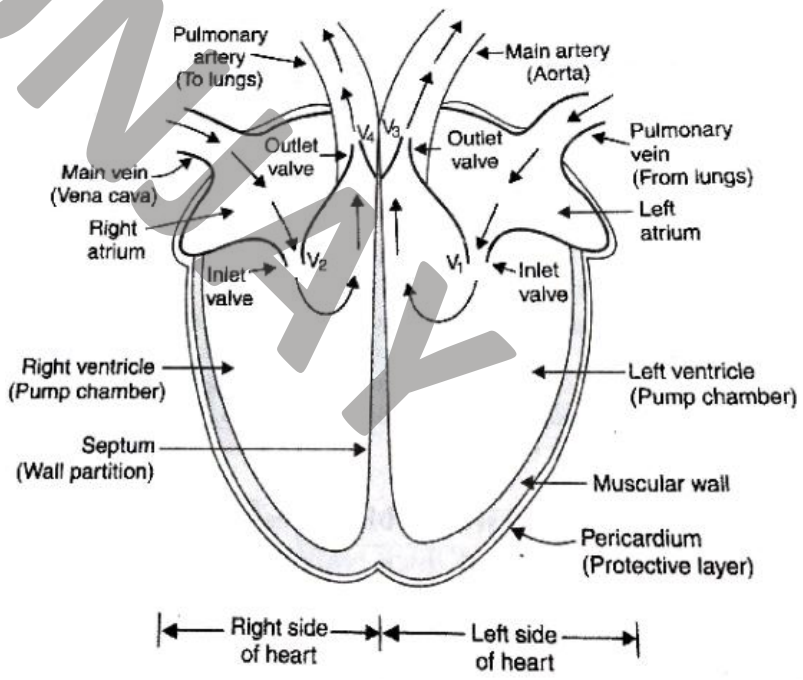
Phloem- Phloem is responsible for transportation of food. Phloem is composed of sieve tubes, companion cells, and phloem parenchyma and bast fibres. Sieve tubes are the conducting elements in phloem.
The food is made in the mesophyll cells of the leaf. The food then enters into the sieve tubes of the phloem. Interconnected tubes are present in all the parts of the plant. So the food is transported to all the other parts of the plant

Notes

Ascent of Sap: The upward movement of water and minerals from roots to different plant parts is called ascent of sap. Many factors are at play in ascent of sap and it takes place in many steps. They are explained as follows:
Adhesion-cohesion of Water Molecules: Water molecules make a continuous column in the xylem because of forces of adhesion and cohesion among the molecules.
Transpiration Pull: Loss of water vapours through stomata and lenticels; in plants: is called transpiration. Transpiration through stomata creates vacuum which creates section; called transpiration pull. The transpiration pull sucks the water column from the xylem tubes and thus water is able to rise to great heights in even the tallest plants.
Transport of Food-Transport of food in plants happens because of utilization of energy. Thus, unlike the transport through xylem; it is a form of active transport. Moreover, the flow of substances through phloem takes place in both directions, i.e. it is a two-way traffic in phloem.

Human Circulatory System

Circulatory system is responsible for transportation of various substances in human beings. It is composed of heart, arteries, veins and blood capillaries. Blood plays the role of the carrier for substances in the body.



Heart

• Heart is a muscular organ which is composed of cardiac muscles. The heart is a pumping organ which pumps the blood throughout the body.
• Heart is a triangular shaped structure. It is located in thoracic cavity inside ribcage between lungs above diaphragm and tilted towards left.

Anatomy of Heart -

The human heart is composed of four chambers, viz, right atrium, right ventricle, left atrium and left ventricle.
There are some terms related to blood circulation through the heart which are given below.

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Heart is surrounded by a thin layer called **Pericardium**. It protects the heart and maintains the shape of heart.

Septum is a partition which separates right and left heart.

Valve- It allows one way flow of liquid

Oxygenated Blood: Blood in which oxygen is mixed is called Oxygenated Blood.

Deoxygenated Blood: Blood in which carbon dioxide is mixed is called Oxygenated Blood.

Left atrium: It collects blood from lungs and passes to left ventricle.

Left ventricle: It pumps blood so that it can reach to all body parts.

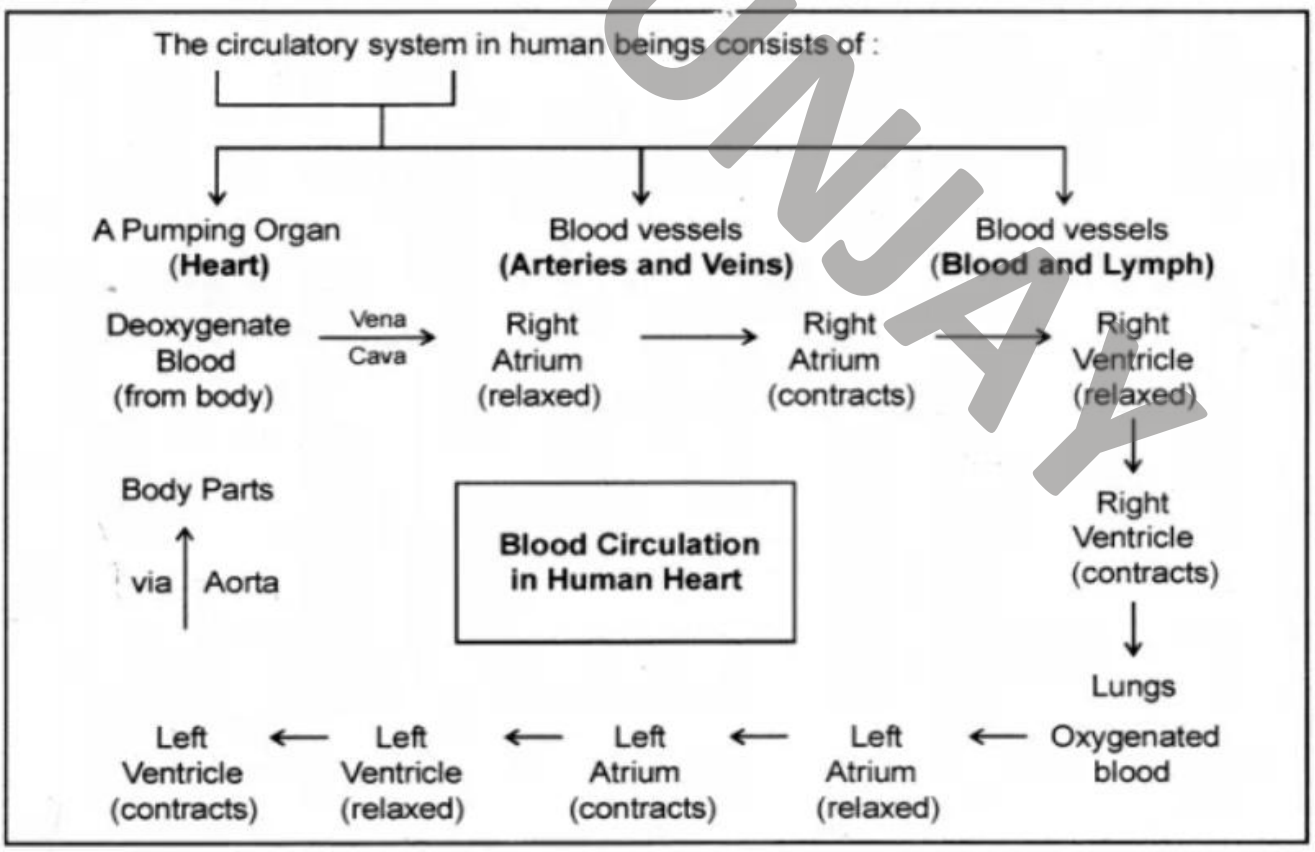
Right atrium: Collects blood from body organs and passes to right ventricle.

Right ventricle: It pumps deoxygenated blood to lungs.

Pulmonary Circulation: Deoxygenated blood moves from heart to lungs and converts into oxygenated blood and then this oxygenated blood moves back to heart. This one circulation of blood is called Pulmonary Circulation.

Systemic Circulation: In another cycle of blood circulation, oxygenated blood moves from heart to other organs and converts into deoxygenated blood and then this deoxygenated blood moves back to heart. This circulation of blood is called Systemic Circulation. Thus in the human body, blood passes through the heart twice. This type of circulation is called double circulation.

Double circulation ensures complete segregation of oxygenated and deoxygenated blood which is necessary for optimum energy production in warm blooded animals.



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Mechanism:

1. When the muscles of all the four chambers of the heart are relaxed, the pulmonary vein brings the oxygenated blood from the lungs in to the left atrium of the heart.
2. When the left atrium contracts, the oxygenated blood is pushed into the left ventricle through the valve V_1.
3. When the left ventricle contracts the oxygenated blood is forced into the main artery called aorta. This artery sends blood into different body organs with the help of capillaries (the smaller arteries)
4. When the oxygenated blood passes through the capillaries of the body organ, then it gives oxygen to the body cells. The blood is then called as deoxygenated blood.
5. At the same time, $co_{2\ is}$ produced in the body cells which enter into the blood. This deoxygenate blood enters the heart through vena cava.
6. When the right atrium contracts, deoxygenated blood pushed into the right ventricle.
7. When right ventricle contracts, the deoxygenated blood is pumped into the lungs through the pulmonary artery. In lungs, deoxygenated blood releases its co2 and absorbs fresh oxygen form air. Thus blood becomes oxygenated again.

BLOOD VESSELS

Blood vessels are of three types:
(i). Arteries (ii). Veins (iii). Capillaries

Arteries: These are thick-walled blood vessels which carry oxygenated blood from the heart to different organs. Pulmonary arteries are exceptions because they carry deoxygenated blood from the heart to lungs: where oxygenation of blood takes place.

Veins. These are thin-walled blood vessels which carry deoxygenated blood from different organs to the heart. Pulmonary veins are exceptions because they carry oxygenated blood from lungs to the heart. Valves are present in veins to prevent backflow of blood.

Arteries	Veins
Arteries carry blood from heart to different organs.	Veins carry blood from different organs to heart.
In arteries, blood flows with high pressure.	In veins, blood flows with low pressure.
No valves are present in arteries.	Valves are present in arteries to prevent back flow of blood.
These are thick-walled blood vessels.	These are thin-walled blood vessels.
Walls of arteries are elastic in nature.	Walls of veins are non-elastic in nature.
Arteries are present generally deep in body.	Veins are present deep as well as near the surface of body.

Capillaries: Capillaries are narrow, thin walled blood vessels between arteries and veins through which small molecules/gases can easily diffuse and thus they are responsible for exchange of gases, food etc. between blood and body parts.

Functions of Circulatory System or Blood

• Blood transports oxygen from lungs to body and carbon dioxide from body to lungs.
• Blood transports food from simple intestine to body.
• Blood transports hormones from glands to organs.
• Blood transports waste substances from body to kidney.
• Blood protects us from many diseases.
• Blood maintains body temperature to 37°C.

Relaxation and Contraction of Heart-
Cardiac Cycle: It is a periodic relaxation and contraction of muscles of heart.
Heart Beat: It is produced due to contraction and relaxation of heart.
• One complete cardiac cycle is equal to one heartbeat.
• The heart beats about 70 - 72 times per minute in a normal adult. In one cardiac cycle, the heart pumps out 70 mL blood and thus about 4900 mL blood in a minute.
Pulse: Pulse is the periodic movement of artery due to periodic forceful movement of blood through it. the pulse rate of an adult person while resting is 70 to 72 per minute.

Blood

Blood is a connective tissue which plays the role of the carrier for various substances in the body. Blood is composed of plasma, blood cells and platelets.
Blood Plasma: Blood plasma is a pale coloured liquid which is mostly composed of water. Blood plasma forms the matrix of blood.
Blood Cells: There are two types of blood cells, viz. Red Blood Cells (RBCs) and White Blood Cells (WBCs).

Red Blood Corpuscles (RBCs): These are of red colour because of the presence of haemoglobin which is a pigment. Haemoglobin readily combines with oxygen and carbon dioxide. The transport of oxygen happens through haemoglobin. Some part of carbon dioxide is also transported through haemoglobin. RBC does not have the nuclei. Each RBC lives for about four months.
White Blood Corpuscles (WBCs): These are of pale white colour. They play important role in the immunity. They protect us from infection and diseases. Therefore they are called soldiers of the body.
Platelets: Platelets are responsible for blood coagulation. Blood coagulation is a defense mechanism which prevents excess loss of blood; in case of an injury.

Blood pressure:

1. The pressure at which blood is pumped around the body by the heart is called blood pressure. blood pressure of a person is always expressed in the form of two values called 'systolic pressure' an 'diastolic pressure'
2. The phase of the heart heat when the heart contracts and pumps the blood into arteries is called systole. The maximum pressure, at which the blood leaves the heart through the main artery (aorta) during contraction phase, is called the systolic pressure.

3. The phase of heart heat when the heart relaxes (or expands) and allows the chambers to fill with blood is called 'diastole". The minimum pressure in the arteries during the relaxation phase of heart is called the diastolic pressure. The value of diastolic pressure is always low', than that of the systolic pressure.

This high pressure in the main artery maintains a steady flow of blood in all the arteries towards the capillaries.

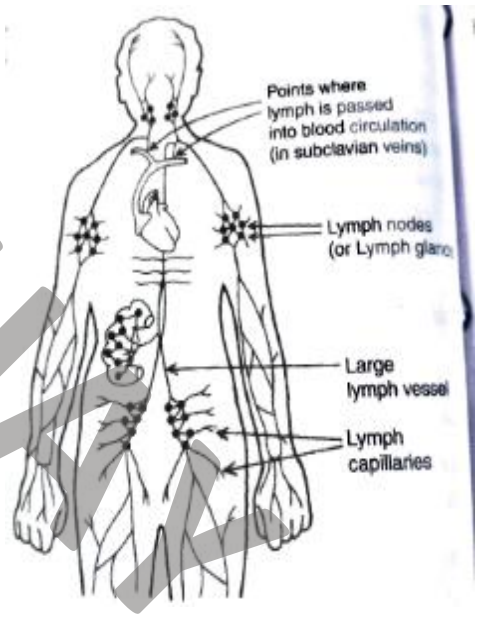
The blood pressure of a person is expressed in terms of millimetres of mercury (which is written as mm Hg). The normal blood pressure values are:
Systolic pressure : 120 mm Hg
Diastolic pressure: 80 mm Hg

Lymphatic System

A system of tiny tubes called lymph vessels and lymph nodes in the human body which transports the liquid called lymph from the body tissues to the blood circulatory system is called lymphatic system. The lymphatic system consists of the

(i) Lymph capillaries
(ii) Larger lymph vessels,
(iii) Lymph nodes
(iv) Lymph.

The lymph capillaries join to form larger lymph vessels. The lymph vessels have lymph nodes (or lymph glands) at intervals. The lymph nodes contain special type of cells called lymphocytes. It helps in protecting the body from disease. The lymph vessels are connected to large veins of the blood circulatory system



Lymph is not red like blood because it does not contain red blood cells. Lymph contains large protein molecules and digested food (which come into it from the tissue fluid between the cells). But lymph flows in only one direction - from body tissues to the heart. Since lymph is derived from the tissue fluid which remains outside the cells of the body, so it is also called extracellular fluid. Lymph contains a special type of white blood cells called lymphocytes which help in fighting infection and disease.

Functions

1. Lymph (or lymphatic system) takes part in the nutritive process of the body. For example, it puts into circulation large protein molecules by carrying them from the tissues into the blood stream (which could not he absorbed by blood capillaries due to their large size). Lymph also carries digested fat for the nutritive process.
   2. Lymph (or lymphatic system) protects the body by killing the germs drained out of the body tissues with the help of lymphocytes contained in the lymph nodes, and by making antibodies.
   lymph (or lymphatic system) helps in removing the waste products like fragments of dead cells, etc.

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Excretion

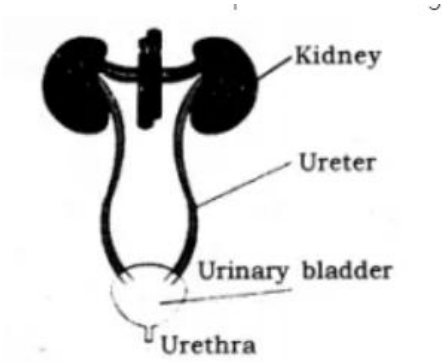
Removal of harmful waste from the body is called excretion. Many wastes are produced during various metabolic activities. These need to be removed in time because their accumulation in the body can be harmful and even lethal for an organism.

Human Excretory System

The human excretory system is composed of a pair of kidneys. A tube called ureters; comes out of each kidney and goes to the urinary bladder. Urine is collected in the urinary bladder, from where it is expelled out through urethra as and when required.

EXCRETORY SYSTEM

Kidney: Kidney is a bean-shaped organ which lies near the vertebral column in the abdominal cavity. The kidney is composed of many filtering units called nephrons. Nephron is called the functional unit of kidney. The function of the kidney is to remove the poisonous substance urea, other waste salts and excess water from the blood and extrete them in the form of a yellowish liquid called urine.

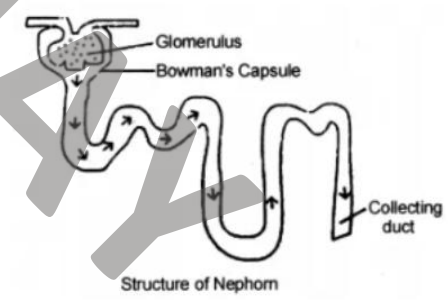


Human Excretory System

Nephron: It is composed of a tangled mess of tubes and a filtering part; called Ureter glomerulus. Glomerulus is a network of blood capillaries to which renal artery is attached. Glomerulus is enclosed in a capsule like portion; called Bowman's capsule. The Bowman's capsule extends into a fine tube which is highly coiled. Tubes from various nephrons converge into collecting duct; which finally goes to the ureter.

Function

The dirty blood containing waste like urea enters the glomerulus . The glomeruhis filters this blood. During filtration, the substances like glucose, amino acids, salts, water and urea, etc., present in the blood pass into Bowman's capsule and then enter the tubule of nephron.



Structure of Nephorn

When the filtrate containing useful substances as well as the waste substances passes through the tubule, then the useful substances like all glucose, all amino acids, most salts, and most water, etc., are reabsorbed into the blood through blood capillaries surrounding the tubule. Only the waste substances urea, some unwanted salts and excess water remain behind in the tubule.

The liquid left behind in the tubule of nephron is urine. The nephron carries this urine into the collecting duct of the kidney from where it is carried to ureter. From the ureter, urine passes into urinary bladder.

Urine is stored in the bladder for some time and ultimately passed out of the body through urethra

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understand the working of the excretory system of ... nephron shown in Figure 109. The dirty blood containing waste like urea (b...

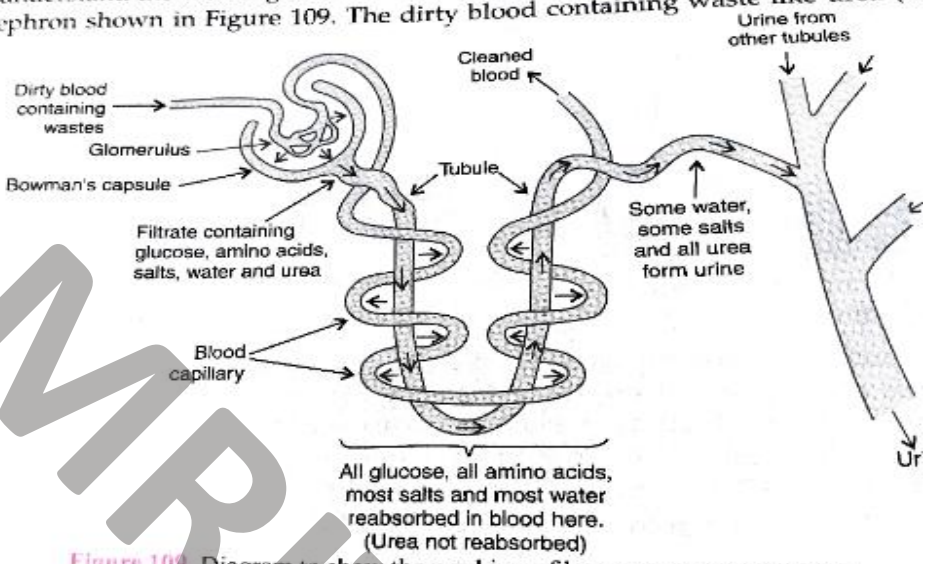

Figure 109. Diagram to show the working of human excretory system.

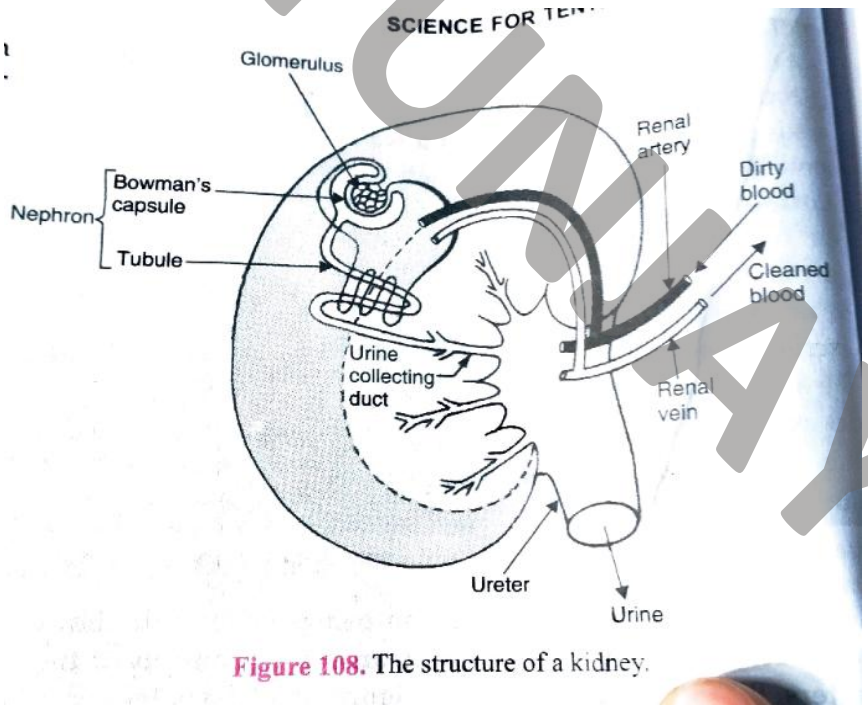

Figure 108. The structure of a kidney.