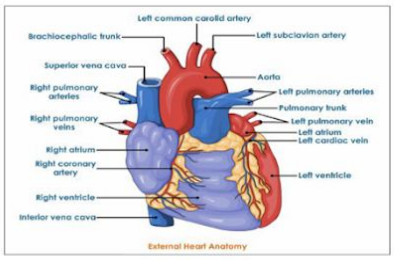
Heart



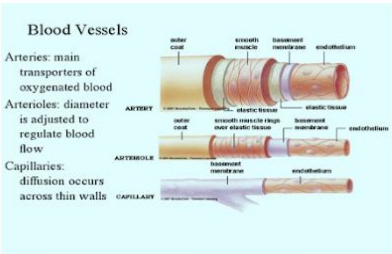
The heart is an important organ in our body. It is made up of cardiac muscles. The heart pumps blood from the heart to the different part of the body. The heart supplies oxygenated blood to the cells through blood vessels. The heart also helps to collect deoxygenated blood from different cells, send it to lungs for purification and then transport again to the cells.

The heart is a strong muscular organ. It is situated between two lungs in the thorax. It is enclosed in a membrane called pericardium. The space inside is filled with pericardial fluid which protects the heart from the mechanical jerk.

The heart has four chambers, they are:

1. Left ventricle
2. Right ventricle
3. Right auricle
4. Left auricle

There are two upper chambers and two lower chambers. The heart is internally divided into the right chamber and left chamber by a thick muscular wall called septum.



Blood vessels

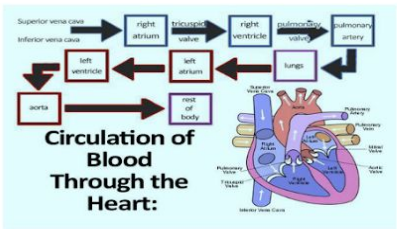
The heart pumps blood through vessels. These vessels carry blood to the different parts of the body. There are three types of blood vessels, they are:

1. Arteries
2. Veins
3. Capillaries

Arteries: The vessels which pump blood through parts of the body are called arteries. Arteries carry oxygenated blood to the body. The wall of arteries is made up of thick muscles and so, it can bear the great pressure of the blood. Arteries have no valves. Arteries divide into branches in different parts called arterioles. Arterioles also branch into smaller capillaries when they reach cells and tissues. These capillaries carry oxygenated blood and dissolved salts and sugar to the cells.

Veins: The vessels which carry blood to the heart are called veins. Veins carry deoxygenated blood to the heart. They have the thinner wall than that of arteries and have valves. Capillaries collect blood from tissues and carry to the heart.

Capillaries: The branched vessels which reach the different tissues of the body are called capillaries. They connect minute vessels like arterioles and venules in the form of network.



Blood circulation

The organs which take part in the circulation of blood are as follow:

1. Heart
2. Arteries
3. Veins
4. Capillaries

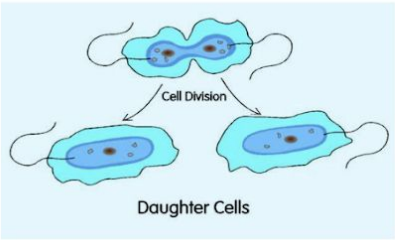
The deoxygenated blood collected from a different part of the body reaches the right auricle of the heart via superior and inferior venacava. The right auricle contracts and the blood flow to the right ventricle. When the right ventricle contracts the blood reaches lungs through the pulmonary artery. In lungs, the blood gets oxygen and leaves carbon dioxide. The oxygenated blood i.e. pure blood is carried by pulmonary vein to the left auricle. When the left auricle becomes full, it contracts and the blood flows to the left ventricle, which is pumped by the heart to the aorta. The aorta carries this oxygenated blood to all parts of the body and the veins carry deoxygenated blood from all over the body. The deoxygenated blood is carried by venules to the veins which carry back to the right auricle of the heart.

Asexual Reproduction

Reproduction is one of the important and essential characteristics of living organisms. Organisms reproduce in order to multiply their numbers and to maintain the continuity of their species. The process of production of new individuals by the organisms to continue their generation is the reproduction found in organisms.

There are two different methods by which different organisms reproduce.

1. Asexual reproduction
2. Sexual reproduction



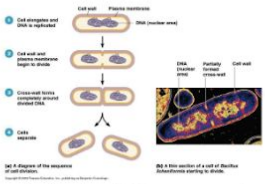
Asexual reproduction

The reproduction that takes place without the fusion of male and female gametes is called asexual reproduction. In this types of reproduction, similar types of new organisms develop from a single organism. Such reproduction takes place in simple unicellular organisms like amoeba, paramecium, etc. These organisms multiply their number by simple division method from a single parent by a process of fission. Organisms like Yeast, hydra also reproduce asexually.

Types of asexual reproduction:

1. Fission: The type of reproduction in which one individual divide itself into two or more daughter individual by some mechanism is called fission. It is of two types:

Binary fission:

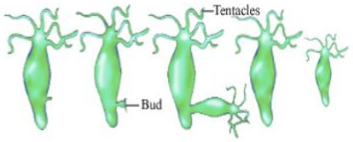


The asexual reproduction in which one organism divides into two daughter organisms is called binary fission. This type of reproduction generally occurs in Amoeba, Euglena, Paramecium etc.

Multiple fission:

The asexual reproduction in which one organism divides into many daughter organisms is called multiple fission. This type of reproduction generally occurs in Plasmodium (malaria parasite) and Chlamydomonas.

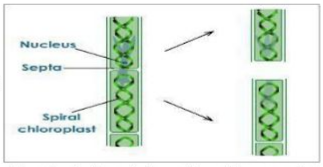
2. Budding:



During budding, a small end produced on the body of the organism grows fully and is detached from the main body part after maturity and starts living on its own, is called budding.

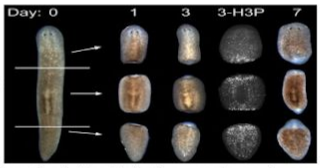
3. Fragmentation and regeneration

Fragmentation:



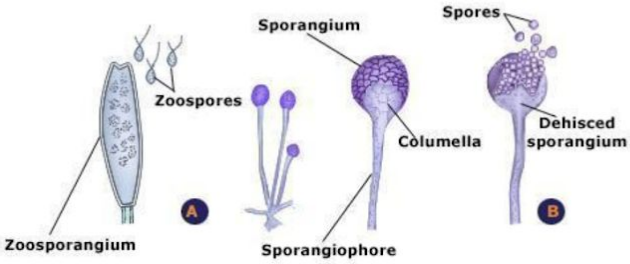
When a long plant body divides into various fragments because of different effects, they start to spread independent life. This is called fragmentation. E.g. Spirogyra

Regeneration:



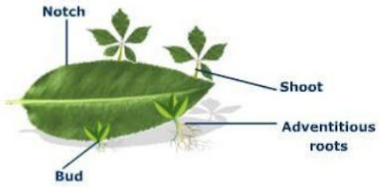
When an organism is divided into two, each part can regenerate into a new individual this process is called regeneration. It is very common in animals like hydra, tapeworm, Planeria etc.

4. Sporulation:



Most of the non-flowering plants like mucor, mushroom, bacteria produce spores inside their sporangia. The spores are small, light unicellular reproductive structures formed by meiosis. The spores are released out by bursting. Such spores germinate under favorable conditions.

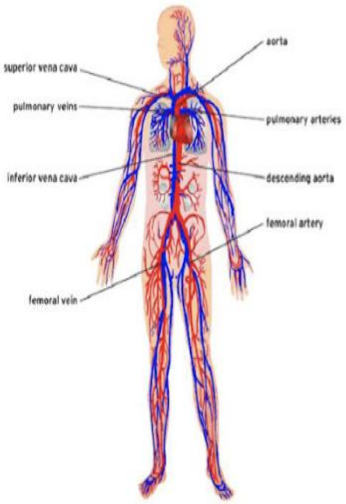
5. Vegetative propagation:



The reproduction, which generally occurs only in plants from various vegetative organs like root, stem, leaves etc. through the process of cutting, grafting, layering etc., is called vegetative propagation. E.g. through root: sweet potato, mint etc., through leaves: poryophylum begania etc., through stem: sugarcane, ginger etc.

Blood

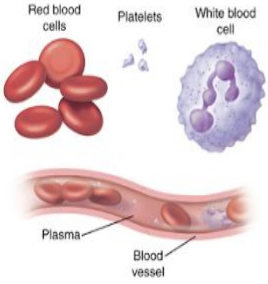
Circulatory system



Blood circulatory system plays an important role in the body of organisms. Essential nutrient and useful materials need to be transported from one part of the body to the other part of the body. The blood transport these essential nutrients, oxygen and hormones to the different tissues of the body and also transport unwanted and harmful substances produced in the body to the excretory organs. This process continues in the body and is called transportation or circulatory system. In unicellular and simple organisms, the transport system is simple while, in complex organisms, the transport system is well developed. In developed organisms, blood is flowing all the time in blood vessels. So, essential nutrients are carried by the blood to different part of the body and unwanted substances are carried by the blood from tissue to the excretory organs.

Blood

Blood is a red fluid which circulates around the body through blood vessels. Blood is red due to the iron-containing pigments called hemoglobin.Hemoglobin is made up of two parts; heme- iron containing part and glopin- protein part. Blood is composed of plasma and blood cells. Plasma is a yellowish transparent liquid. It contains 90% water and 10%nutritive substances dissolved in water. It also carries the carbon dioxide gas produced during respiration by the lungs. It helps to carry urea from the liver to the kidneys and hormones secreted by the endocrine glands to the tissues.



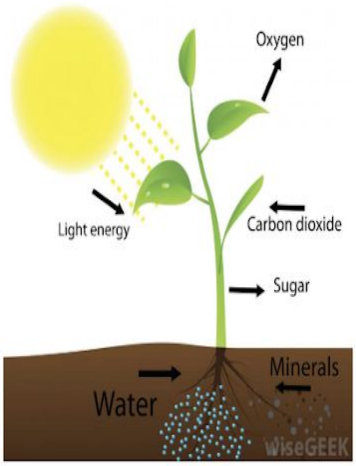
Blood Cell

There are three types of blood cells in the blood i.e. red blood cells, white blood cells, and platelets. Red blood cells are many in number in the blood. These blood cells are very small and have no nucleus. They are made in bone marrow and destroyed in the spleen. Hemoglobin present in cells absorbs oxygen from the lungs and helps to transport to the different cells of the body. The decrease in the number of red blood cells in the blood causes anemia.

White blood cells are bigger than red blood cells and are less in number in the blood. These cells are of various types and colorless. They have the distinct nucleus but have no fixed shape. They are also made in bone marrow. These cells fight against germs in an infected area and protect the body from disease. Some of them destroy the disease-causing microbes while some of them remove the destroyed cells or microbes from the infected area and help to heal the wounds.

Platelets are very tiny cells. These are smaller than both red blood cells and white blood cells. They are also of various kinds. They are less in number in the blood. They are spherical in shape and have no nucleus. They are also made in bone marrow, they help in clotting of blood at wounds and damaged skin or cut. Thus, platelets play an important role to clot the blood in wounds or cuts.

Photosynthesis



Photosynthesis is the necessary process for the life process of animals and plants. Green plants prepare their food by themselves. Green plants make their food in the presence of CO_2, water, and sunlight. The food prepared by the green plant is called carbohydrate and process of making food are called photosynthesis. Green plants take carbon dioxide from the atmosphere absorbs water from the soil through roots and trap solar energy to manufacture their food carbohydrate.

The whole process can be summarized as

Carbon dioxide + Water → Glucose + Oxygen

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

During photosynthesis, oxygen is given out. Since green plant makes their food by themselves, they are also called autotrophs.

Essential raw materials for photosynthesis

1. **Carbon dioxide (CO_2)**
   The main source of this gas is the atmosphere, which consists 0.03% of 0.04% of the atmosphere. Water plants take CO_2 dissolved in water. During respiration, CO_2 is released by animals and plants. Plants are capable of utilizing this CO_2, in addition to atmospheric CO_2 for the purpose of making their food. During daytime, when light is available, plants fix the CO_2 in photosynthesis.
2. **Water (H_2O)**
   Plants absorb water from the soil by their root hairs. This water is then transported up to the stem and leaves through the xylem. Along with water, many minerals dissolved in water are also absorbed by the plants. Water plants absorb water through their general surface.
3. **Chlorophyll**
   Chlorophyll is the photosynthetic apparatus in which photosynthesis occurs. They are located in green parts of a plant particularly in the chloroplast of a leaf. This chlorophyll is present in small bodies called chloroplasts which help to trap solar energy and converts into chemical energy. The green leaves of plants are photosynthetic organs of plants. Only those cells are able to carry out photosynthesis which has chloroplasts.
4. **Light**
   Light is very important for photosynthesis. In photosynthesis, the light energy changed into potential chemical energy. Sun is the only main natural source of light energy. Artificial light is also effective in photosynthesis, but this light should be intensive. Only green plants are capable of utilizing this light energy.

   The rate of photosynthesis is affected both by quality as well as the quantity of light. In red color of light, the rate of photosynthesis is maximum and in light of green color, there is no photosynthesis

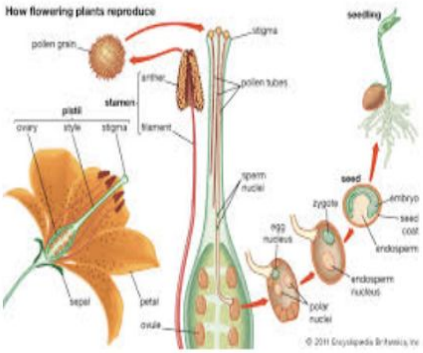
Significance of Photosynthesis

1. It is the important source of energy for all living organisms, both producers and consumers. It is essential for sustaining life.
2. It helps in the growth and development of plants.
3. It is necessary for the synthesis of many organic compounds used by man and other animals.
4. It converts atmospheric CO_2 back to oxygen.

Sexual Reproduction

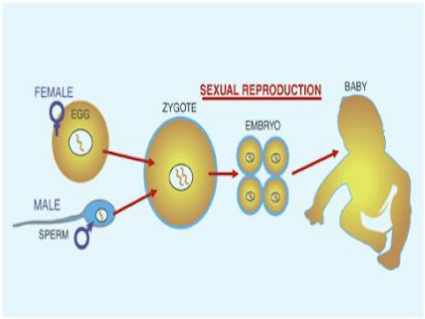
Sexual reproduction

The reproduction that takes place with the fusion of male gamete and the female gamete is called sexual reproduction. Such reproduction usually occurs in animals and higher plant. Two parents male and female are involved in this process of sexual reproduction. In most of the animals, male and female are separate. Such animals are called uni-sexual. Man, birds, etc. in animals and papaya, pumpkin, etc. in plants are the examples of unisexual. In some animals, male reproductive organ and female reproductive organ are present in one animal. Such animals are called bisexual organisms. These organisms are also called hermaphrodite. Hydra, Earthworm. The mustard plant, etc. are the examples of bisexual organisms.



Sexual reproduction in plants

Reproduction takes place in the flowers of the plant. The male organ of flower is androecium and female organ of flower is gynoecium. Androecium produces pollen grains whereas gynoecium produces ova. Fusion of pollen grains and ova leads to fertilization. The zygote starts to form after fertilization.



Sexual reproduction in animals

There is no asexual reproduction in animals. After the sexual intercourse between male and female, the female is able to conceive the baby. After meiosis, the male reproductive system produces sperm (male gamete) and the female reproductive system produces an egg (female gamete). Then male releases its gamete that fuses with female gamete. The fusion may be internal (in higher organisms) or external (in lower organisms). If it is external then a medium, that carries male gamete, is required and mostly it is water. After fertilization, the egg becomes zygote and undergoes mitosis to become an embryo. Embryo again with the help of mitosis becomes a new individual.

In animals, there are two types of fertilization. They are:

1. External fertilization: Fertilization that takes place outside of the body is called external fertilization. Frogs and fishes do external fertilization.
2. Internal fertilization: Fertilization that takes place inside of the body is called internal fertilization. Most of the animals does internal fertilization. Example: Humans