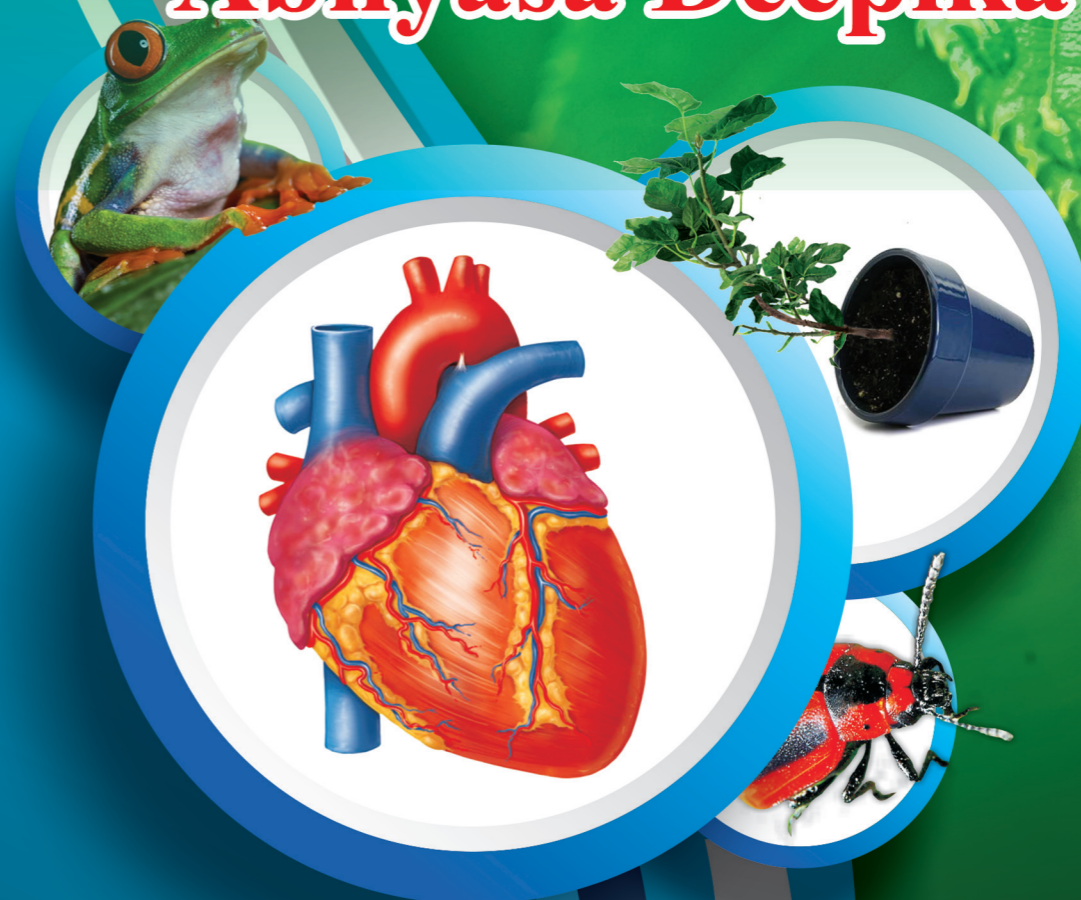


Government of Telangana

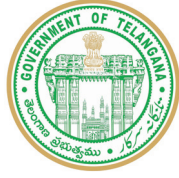
BIOLOGY

CLASS 10

Abhyasa Deepika



State Council of Educational Research and Training,
Hyderabad, Telangana



BIOLOGY

CLASS 10

ABHYASA DEEPIKA



STATE COUNCIL OF EDUCATIONAL RESEARCH & TRAINING
Telangana, Hyderabad.



EDUCATION MINISTER
GOVERNMENT OF TELANGANA



MESSAGE

Keeping in view of the special conditions prevailing in this academic year, worksheets and digital classes are made available with the objective to facilitate the transaction of lessons in different subjects through alternate modes. Now that the SSC Board Examinations are round the corner, to facilitate easy self learning for the students, SCERT, TS has designed Enrichment Material for Class X, compiling all the major concepts of non-language subjects.

During all critical times and crises, teachers are taking initiative and doing their best to make the learning happen. In similar lines, they may guide the students to understand the aspects of this learning material. This learning material is quite useful to those who need help in different subjects to enhance their performance. I hope students will achieve good results by using this material.

April, 2021
Hyderabad.

Ms. Patlolla Sabitha Indra Reddy
Education Minister,
Government of Telangana.



SPECIAL CHIEF SECRETARY
GOVERNMENT OF TELANGANA



MESSAGE

Along with all other fields, the field of education has been severely affected by COVID 19 situation. The whole system, top-down, is struggling to save the academic year by reaching out to students and impart quality education. Teachers are playing a key role connecting to students through various online, social media and electronic media in addition to holding face to face classes for as many days as possible. SCERT, TS has designed an Enrichment Material for Class X to equip teachers and students to face the approaching examinations. Students can enhance their understanding of key concepts in every unit in different subjects using this material. Practice questions are given here to facilitate self assessment with the help of teachers where needed. I hope the students will make use of this material to achieve success.

April, 2021
Hyderabad.

Ms. Chitra Ramachandran, IAS
Special Chief Secretary,
Education Department, Telangana.



DIRECTOR OF SCHOOL EDUCATION
GOVERNMENT OF TELANGANA



MESSAGE

State Council of Educational Research and Training, Telangana, has prepared Enrichment Material to support the teachers and students in facilitating an effective transaction of key concepts in non-language subjects. Due to the special conditions prevailing due to COVID 19 situation, the syllabus for the examinations has been reduced up to 30% for the current academic year. The Enrichment Material covers the remaining 70% syllabus and helps the learners easily understand all the key concepts through self learning. I expect the students will make use of this material and perform well in the examinations.

April, 2021
Hyderabad.

Ms. A. Sridevasena, IAS
Director of School Education
Telangana

FOREWORD

The prevailing situations of COVID-19 have paved way for the development of a comprehensive learning material for class 10th students with an objective to cater the needs of students appearing for Public Examinations.

Department of School Education started online transmission through T-SAT and Door Darshan channels from 1st September, 2020. Apart from this, The District Educational Officers in some districts also started online classes on YouTube involving the subject experts. The ultimate objective is to help the students achieve prescribed Academic Standards. From 1st February, 2021 onwards face to face class room interactive classes started, in view of paucity of time it is not possible to cover all the concepts. Hence, this learning material helps to fill all those gaps.

This material gives an understanding and helps them achieve good results in the examination. The biology syllabus of 10th class has 10 units out of which unit-7th Coordination in Life Processes, unit- 9th Our Environment and unit -10 Natural Resources (30% of the syllabus) are meant for activity/Project work. The remaining units (70% of the syllabus) are meant for public examinations. The key concepts of remaining 7 units are identified and made easy for the students to understand.

The self learning material is provided for further strengthening of the knowledge gained through classroom activities, worksheets and digital classes. The key concepts in each unit are dealt with using pictures, experiments, tables, real life applications etc., under their specific headings. A variety of practice questions are given to facilitate self assessment.

Teachers are expected to go through the material thoroughly once to understand the purpose of the material and in turn guide the students in making effective use of the material. Students may be encouraged to approach their teachers to clarify doubts. I appreciate the efforts of the material developers. Further, I wish all the students to benefit from the material and come up with flying colours in examinations.

M. Radha Reddy

Director

SCERT, Telangana.

ACKNOWLEDGEMENT

The State Council of Educational Research and Training, Telangana extends its special thanks to Smt. P.Sabitha Indra Reddy, Hon'ble Minister for Education, Smt. Chitra Ramachandran, Special Chief Secretary to Government, Education Department, Smt. A.Sridevasena, Director of School Education for their valuable guidance and support in developing the enrichment material to students.

We also express our heartfelt gratitude to all the Additional Directors Sri A. Satyanarayana Reddy, Sri Ch. Ramana Kumar, Sri P. V. Srihari, Sri Krishna Rao and Smt. Usha Rani for rendering their support and sharing their ideas in designing the enrichment material for SSC students and in preparing Activity / project based syllabus.

Further, SCERT expresses profound thanks to Sri Suresh Babu, Consultant, SLA, SCERT; Sri H.Narendra Rao Khatri, Consultant, SCERT; Faculty of Department of Curriculum & Textbooks; subject experts team; Computers Operators and other Technical team for their commendable work in designing and developing the material.

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INSTRUCTIONS TO TEACHERS

- Focus on 7 chapters meant for evaluation in public examination .
- This material is developed from the given 7 chapters meant for final examinations.
- Provide practice on variety of questions given in the material.
- Using pictures, experiments, tables, real life applications etc., under their specific headings.
- Correlate with text books to clarify doubts in the Abhyasa Deepika.
- Efforts should be made to make use of the Abhyasa Deepika to the maximum extent for better result.

INSTRUCTIONS TO STUDENTS

- Read Abhyasa Deepika thoroughly.
- Understand the concepts lesson wise to answer various types of questions in the public examinations.
- Correlate with text books to clarify doubts in the reading material and approach your teachers.
- Good practice of the Abhyasa Deepika helps you to achieve good grades.

CHAPTER

1

Nutrition

The process of providing or obtaining food by the living organisms for health and growth is known as nutrition. The mode of acquiring food varies from organism to organism. In single celled organisms, like amoeba the food may be taken in by the entire surface. In Paramoecium Food is taken in at a specific spot called cytostome.

Modes of Nutrition: Autotrophic nutrition, Heterotrophic nutrition, Saprophytic nutrition and Parasitic nutrition.

Autotrophic Nutrition:

Some living organisms make their own food using simple substances which they get from their environment. This type of nutrition is called autotrophic nutrition. The organisms that exhibit this type of nutrition are called autotrophs. Ex: Green Plants.

Heterotrophic Nutrition:

Some organisms depend upon other organisms for food. This type of nutrition is called Heterotrophic nutrition. The organisms that exhibit this type of nutrition are called heterotrophs. Ex: animals, fungi, some bacteria.

Saprophytic Nutrition:

Some organisms breakdown the dead and decaying organic matter out-side the body and then absorb it. This type of nutrition is called saprophytic nutrition. The organisms that exhibit this type of nutrition are called Saprophytes. Ex: bread moulds, yeast, mushrooms

Parasitic Nutrition:

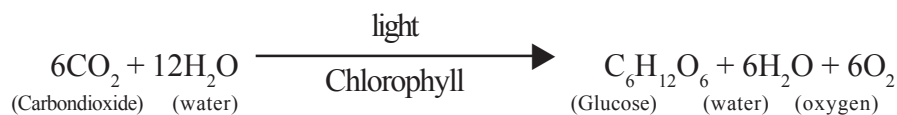
Some living organisms depend on other living organism. this type of nutrition is called parasitic nutrition. The organisms exhibit this type of nutrition is called parasites. Ex. Cuscuta, Leech.

Photosynthesis- Factors: Carbon dioxide, water, chlorophyll and sunlight

Photosynthesis- End products: Carbohydrates and oxygen are the end products of Photosynthesis.

Plants absorb carbon dioxide from atmosphere, water from roots and synthesize Carbohydrates in the presence of sunlight and chlorophyll and releases oxygen. This process is called Photosynthesis.

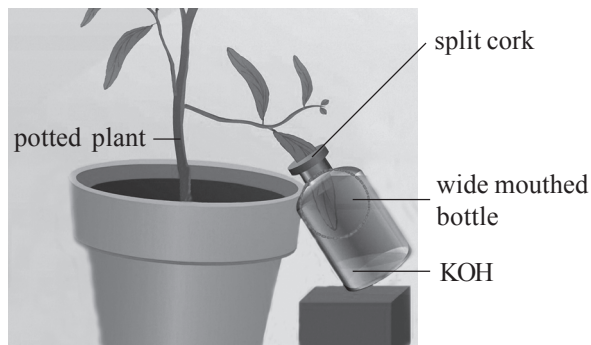
Chemical equation of Photosynthesis:



CO₂ is necessary for photosynthesis:

Aim: To prove that CO₂ is necessary for photosynthesis (Mohl's half leaf experiment).

Apparatus: wide mouthed transparent bottle, Potassium hydroxide solution, splitted cork, potted plant, Iodine solution and Vaseline.



Mohl's half leaf experiment

Procedure: Insert splitted cork in the

mouth of the bottle. Insert one of the leaf of destarched plant through a split cork into bottle containing potassium hydroxide solution. Apply Vaseline around the cork. Leave the plant in sunlight. After a few hours, detach and test this leaf with Iodine.

Observation: The leaf part which was exposed to the atmospheric air and light becomes Bluish-black and the leaf part inside the bottle remain colorless.

Result confirmation: Inside the bottle CO₂ is not available, because KOH absorbs the CO₂. This proves that carbon dioxide is necessary for photosynthesis.

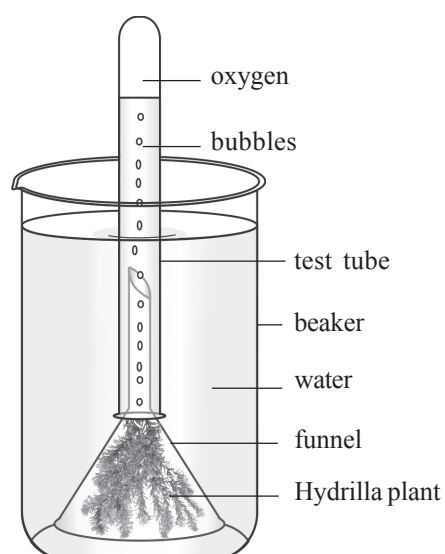
Precautions: Keep away the leaf from KOH. Don't allow air in to bottle.

Oxygen is produced during photosynthesis in the presence of light:

Aim: To prove that Oxygen is evolved in Photosynthesis (Hydrilla funnel Experiment).

Apparatus: Hydrilla plant, a short stemmed glass funnel, beaker, water, test tube, match stick or incense stick.

Procedure: Place a plant like. Hydrilla in a short stemmed glass funnel and keep in a beaker containing water. Invert a test tube filled with water over the stem of the funnel. Ensure that the level of the water in the beaker is above the level of stem of the inverted funnel (as shown in the experiment image). Keep the apparatus in the sunlight at least for 2- 4 hours.



Hydrilla experiment

Observation: After some time it is observed that gas bubbles released from the Hydrilla plant. These bubbles are collected at the end of the test tube pushing the water into the beaker. After sufficient gas is collected in the test tube, it is taken out of the beaker carefully by closing it with thumb

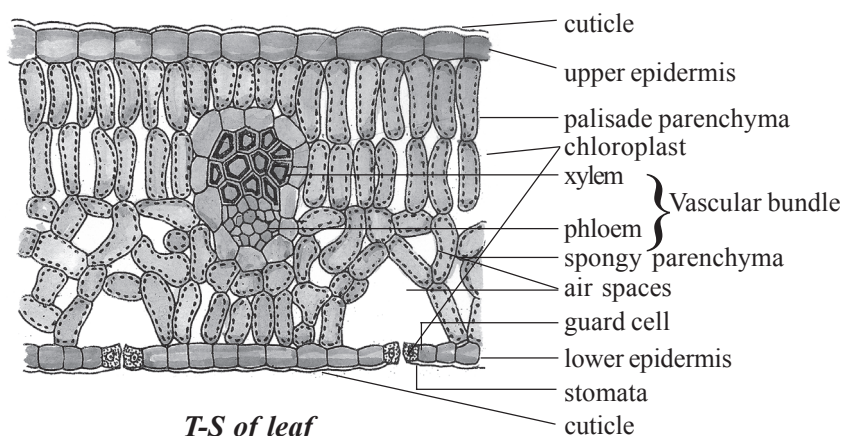
Result confirmation: Test the gas by inserting a glowing match stick or incense stick which would burst into flames. This proves that Oxygen is evolved in Photosynthesis.

Precautions: Collect the test tube and take out of the beaker carefully by closing it with thumb.

Internal structure of leaf:

Generally Photosynthesis is carried out in all the green parts (leaves) of the plant. Internal structure of leaf shows upper and lower epidermis. In between these epidermal layers mesophyll tissue is present. It is differentiated into palisade and spongy tissues. Palisade tissue is located below the upper epidermis. The cells of palisade tissue are pillar like contains more number of chloroplasts and perform the function of photosynthesis.

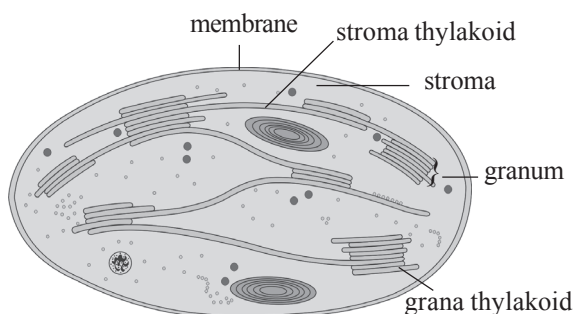
Spongy tissue is presented towards lower epidermis and is loosely packed with large intercellular spaces. Stomata are located in the lower epidermis. A large number of chloroplasts are present in guard cells of stomata and ground tissues of the leaf.



T-S of leaf

Structure of the Chloroplast:

Chloroplasts are an important cell organelles which carry photosynthesis found exclusively in plant cells. Chloroplast is a three membranous structure. Outer two layers form envelopes and the third layer forms stacked sack like structures called grana. Thylakoids are present in Grana. Chlorophyll pigments are present in thylakoid. Chlorophyll is site for trapping of solar energy. The intermediary



T-S of chloroplast

fluid filled portion is called stroma it is responsible for enzymatic reactions, leading to the synthesis of glucose. Chlorophyll contains one atom of magnesium.

Mechanism of Photosynthesis:

Photosynthesis is an oxidation-reduction reaction. A series of chemical reactions occur in two stages in the chloroplast in a very quick succession initiated by light.

1. Light phase
2. Dark phase

Light phase (Light dependent reaction (Photochemical Phase):

In this phase light plays a key role. During this phase light energy is converted into chemical energy and it takes place in grana of the chloroplast. It occurs only in the presence sunlight. The chlorophyll on exposure to light energy becomes activated by absorbing photons.

Hill reaction:

Light energy, splits the water molecules into hydrogen (H⁺), hydroxyl (OH⁻) ions. This reaction is known as Photolysis of water. This was discovered by Robert Hill; hence it is called as Hill reaction. The highly reactive OH⁻ ions of water undergo quick change as H₂O and O₂ are produced in a series of steps. H⁺ ions undergo a series of changes to form energy like ATP and NADPH as an end products.

Dark phase (Light independent reaction (Biosynthetic phase):

Biosynthetic phase does not require the direct sunlight. This process takes place in stroma of chloroplast. ATP and NADPH are utilised in this process and the Glucose is the end product of the Dark reaction.

Digestion in Human beings:

We eat different types of food which will pass through the alimentary canal. In this digestive track food is broken up physically by the action of the teeth, and chemically, by the action of enzymes. Then the food is converted into a substance suitable for absorption and assimilation into the body. This process is called digestion.

Parts of alimentary canal:

The alimentary canal has different parts like mouth, oesophagus, stomach, small intestine, large intestines and anus.

Mouth:

Food is cut and crushed by our teeth in the mouth and mixed with saliva to make it wet and slippery called bolus.

Oesophagus:

Oesophagus shows peristaltic movement while food (bolus) moves through it. In this part no changes occurs in the food.

Stomach:

In stomach food gets churned with gastric juice and HCl. Now the food is in semisolid state and is called chyme. Here in the stomach the ring like muscles called pyloric sphincter relaxes to open the passage into the small intestine. Now the food material passes from the stomach into small intestine.

Small intestine:

The small intestine is the longest part of the alimentary canal. It is the site for further digestion. It receives the secretions of liver and pancreas for this purpose. Internally intestinal wall has number of finger like projections called microvilli. They increase the surface area for absorption. The passage of digested food through the walls of alimentary tract into circulatory system is called absorption. Undigested food passes into the large intestine.

Large intestine:

The undigested food materials move through the large intestine. Excess water present in the undigested food is absorbed as a result faeces is formed, and it is expelled out through anus.

Digestive glands - Enzymes:

Ptyalin (salivary amylase)	Salivary glands	Saliva	Carbohydrates
Pepsin	Gastric glands	Gastric juice	Proteins
Bile (No enzymes)	Liver	Bile juice	Fats
Amylase	Pancreas	Pancreatic juice	Carbohydrates
Trypsin	Pancreas	Pancreatic juice	Peptones
Lipase	Pancreas	Pancreatic juice	Fats
Peptidases	Intestinal glands	Intestinal juice	Peptides
Sucrase	Intestinal glands	Intestinal juice	Sucrose

Digestive glands play an important role in the digestion process. They break complex food into simple ones which are able to be absorbed. Glands such as Salivary, gastric, liver, pancreas and intestinal glands are present in humans. They secrete enzymes and digest carbohydrates, proteins and fats present in food later they are absorbed into blood. HCl changes the food in the stomach into acidic and kills bacteria.

Balanced food:

A diet which contains proper amount of carbohydrates, proteins, fats vitamins and mineral salts is called as balanced food.

Malnutrition:

Eating of food that does not have one or more than one nutrients in required amount is known as malnutrition. Poor health, will full starvation, lack of awareness of nutritional habits, socio-economic factors are the reasons for malnutrition in our country.

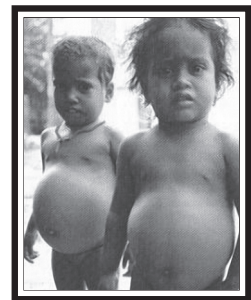
Malnutrition - types:

Malnutrition is of three types such as 1. Protein Malnutrition 2. Calorie Malnutrition 3. Protein-calorie Malnutrition.

Diseases due to malnutrition:

Kwashiorkor disease:

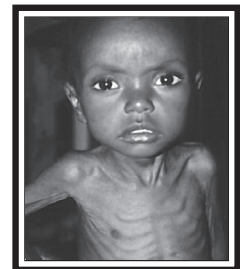
Kwashiorkor disease is caused due to protein deficiency in diet. Body parts become swollen due to accumulation of water in the intercellular spaces, very poor muscle development, swollen legs, fluffy face, difficult to eat, dry skin, diarrhoea are the symptoms of the disease.



Kwashiorkor

Marasmus disease:

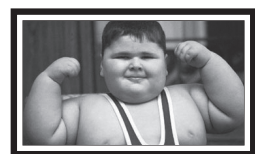
Marasmus is caused due to deficiency of both proteins and calories. Generally this disease occurs when there is an immediate second pregnancy or repeated child births. Lean and weak, less developed muscles, dry skin, diarrhoea, etc., are the symptoms of this disease



Marasmus

Obesity:

Obesity is due to over eating and excess of calories intake. It is a big health hazard. Obese children when grow, they will be target of many diseases like diabetes, cardiovascular, renal, gall bladder problems. Junk foods and unhealthy food habits lead to obesity.



Obesity

Vitamins- Types:

Vitamins are micronutrients required in small quantities. Vitamins are classified into two groups based on their solubility. They are

1. Water soluble vitamins (B-complex vitamins and Vitamin C)
2. Fat soluble vitamins (Vitamins A, D, E, and K).

Vitamin deficiency diseases:

Vitamin	Resources	Deficiency diseases	Symptoms
Thiamin (B ₁)	Cereals, oil seeds, vegetables, milk, meat, fish, eggs.	Beri beri	Vomitings, fits, loss of appetite, difficulty in breathing, paralysis.
Riboflavin (B ₂)	Milk, eggs, liver, kidney, green leafy vegetables.	Glossitis	Mouth cracks at corners, red and sore tongue, photophobia, scaly skin.
Niacin (B ₃)	Kidney, liver, meat, egg, fish, oil seeds.	Pellagra	Dermatitis, diarrhoea, loss of memory, scaly skin.
Pyridoxine (B ₆)	Cereals, oil seeds, vegetables, milk, meat, fish, eggs, liver.	Anaemia	Hyper irritability, nausea, vomiting, fits.
Cyanocobalamin (B ₁₂)	Synthesised by bacteria present in the intestine.	Pernicious anaemia	Lean and weak, less appetite.
Folic acid	Liver, meat, eggs, milk, fruits, cereals, leafy vegetables.	Anaemia	Diarrhoea, loss of leucocytes, problems related to mucus in the intestines.
Pantothenic acid	Sweet potatoes, ground nuts, vegetables, liver, kidney, egg.	Burning feet	Walking problems, sprain.
Biotin	Pulses, nuts, vegetables, liver, milk, kidney.	Nerves disorders	Fatigue, mental depression, muscle pains.
Ascorbic acid (C)	Green leafy vegetables, citrus fruits, sprouts.	Scurvy	Delay in healing of wounds, fractures in bones.
Retinol (A)	Leafy vegetables, carrot, Tomato, pumpkin, papaya, mango, meat, fish, egg, liver, milk, cod liver oil, shark liver oil.	Eye, skin diseases	Night blindness, xerophthalmia, cornea failure, scaly skin.
Calciferol (D) (sunshine vitamin)	Liver, egg, butter, cod liver oil, shark liver oil, sun rays stimulate the formation of vitamin D from the sub-cutaneous fat.	Rickets	Improper formation of bones, Knock-knees, swollen wrists, delayed dentition, weak bones.
Tocoferol (E)	Fruits, vegetables, sprouts, sunflower oil.	Fertility related disorders	Sterility in males, abortions in females.
Phylloquinone (K)	Green leafy vegetables, milk, meat, egg.	problems related to Blood clotting	Delay in blood clotting, over bleeding.

Practice Questions

* Very Short Questions:

1. Explain the autotrophic nutrition. Give examples of autotrophic nutrition.
2. What kind of changes takes place the food in mouth?
3. Compare the functions of Small intestine and Large intestine.
4. Explain the process of Photosynthesis with a chemical equation.
5. Mention the sites of Light dependent phase and Light independent phase in the chloroplast?
6. Write about the factors and End products of Photosynthesis.
7. What would happen, if photosynthesis does not takes place in plants?
8. What food do you suggest to your friend, who are suffering with Obesity?

* Short Questions:

1. Explain the structure of a chloroplast with the help of a diagram.
2. Write the differences between the autotrophs and heterotrophs with examples.
3. Narrate the role of digestive enzymes in the digestion of food.
4. Write the 4 questions do you pose to a Doctor to know more about the balanced food and Malnutritional diseases.
5. Write the reasons for malnutrition and explain about any 2 types of malnutritional diseases.

* Essay Type Questions:

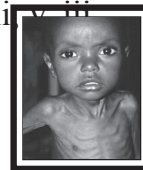
1. How do you prove that CO_2 is necessary for photosynthesis?
2. Explain about the experiment done in your school to prove that Oxygen is evolved in Photosynthesis. Mention the precautions you taken while conducting this experiment.
3. Explain the internal structure of leaf with the help of a diagram.
4. Draw a labelled diagram fo Human digestive system?

Calciferol	Rickets	butter, cod liver oil, shark liver oil, sun light
Retinol	Eye, Skin diseases	Leafy vegetables, carrot, Tomato, pumpkin, papaya, mango, meat, fish, egg, liver, milk, cod liver oil, shark liver oil
Ascorbic acid	Scurvy	Green leafy vegetables, citrus fruits, sprouts.
Tocopherol	Fertility related disorders	Fruits, vegetables, sprouts, sunflower oil.

5. Observe the following table and give the answers to the question given below.
1. Write the names of any two vitamins from the above table?
 2. Which food should we take to prevent from eye related diseases?
 3. Which diseases should we prevent by taking Fruits, vegetables, sprouts, sunflower oil?
 4. Which diseases caused by the deficiency of Calciferol and Ascorbic acid?

*** Multiple Choice questions:**

1. The digestive juice contain no enzymes ()
 A) Pancreatic juice B) Bile juice C) Gastric juice D) Intestinal juice
2. The vitamin related to Blood coagulation ()
 A) Retinol B) Calciferol C) phylloquinone D) Tocoferol
3. Choose the correct sentence related to CO₂ is necessary for photosynthesis Experiment ()
 A) Potassium hydroxide releases carbon dioxide
 B) Potassium hydroxide absorbs water
 C) Potassium hydroxide absorbs light
 D) Potassium hydroxide absorbs carbon dioxide
4. Sunlight splits the water molecule ()
 A) Hill reaction B) Electrolysis C) Photolysis D) A and C
5. Choose the incorrect pair ()
 A) Calciferol - Rickets B) Pyridoxine - Anaemia
 C) Thiamin - Beri beri D) Niacin - Glossitis
6. Choose the odd one regarding enzymes ()
 A) Gastric juice B) Bile C) Pancreatic juice D) Intestinal juice
7. Arrange the parts of human digestive system in the sequential order ()
 i buccal cavity ii duodenum iii Large intestine iv stomach
 v small intestine vi Pharynx vii oesophagus
 A) i, ii, iii, iv, v, vi, vii B) vii, vi, v, iv, iii, ii, i
 C) i, vi, vii, iv, ii, v, iii D) i, vii, vi, iv, ii, v, iii
8. identify the disease shown in the diagram ()
 A) Kwashiorkor B) Marasmus
 C) Obesity D) Pellagra



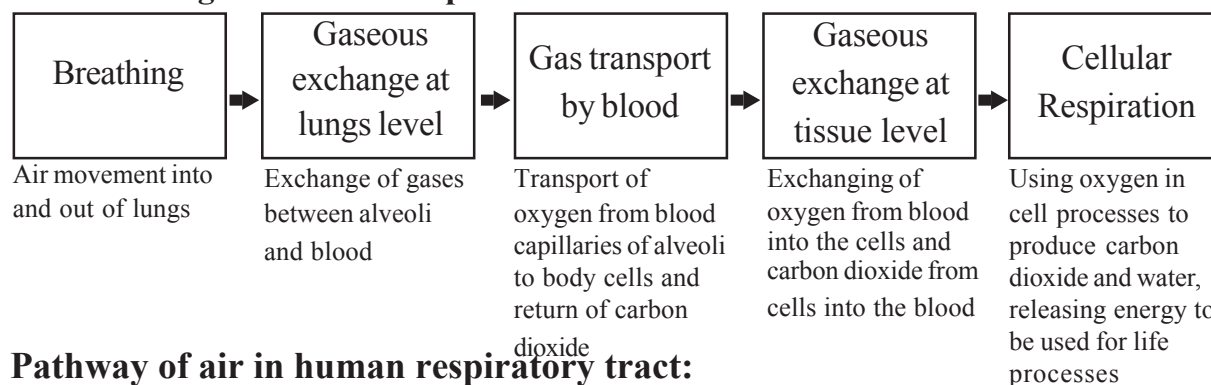
CHAPTER

2

Respiration

Food provides energy for all the biological activities only after breaking down through the process known as respiration. The term 'respiration' derived from Latin word 'respire' meaning 'to breathe', refers to the whole chain of processes from the inhalation of air to the use of oxygen in the cells. By the oxidation of food not only energy but also carbon dioxide, water and heat are released. These components are sent out of our body through exhaled air.

Different stages in human respiration :



Pathway of air in human respiratory tract:

Nostrils :

Usually air enters the body through the nostrils.

Nasal cavity :

Moist surface of the nasal cavity and hair present in it stops the dust particles in the air we breathe in. Nasal cavity controls the temperature of air we breathe in.

Pharynx :

Pharynx is the common passage for food and wind. Flap like valve which is below the pharynx is called epiglottis closes the glottis partially when we swallow food, so it deflects food down to the stomach and keeps it out of the trachea or windpipe which is the route to the lungs.

Larynx :

Larynx has vocal cords. When air passes out of the lungs over the vocal cords it causes their vibration due to this sounds are produced.

Windpipe :

Windpipe /Trachea Channelling air to lungs.

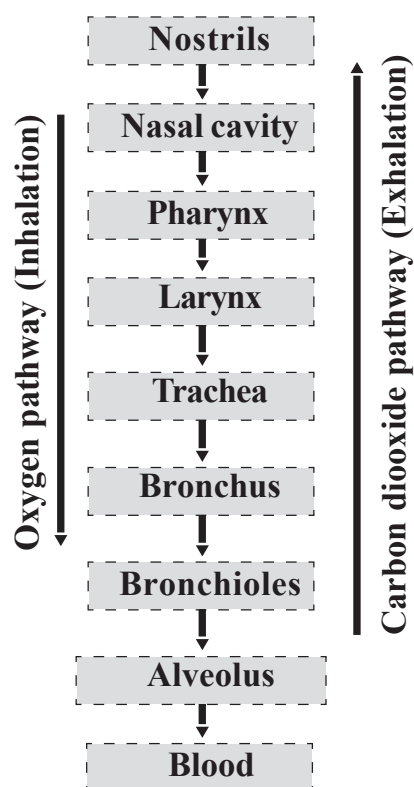
Bronchi

Trachea or the windpipe divides into two bronchi one leading to each lung.

Bronchioles :

Each bronchi is further divided into smaller and smaller branches called bronchioles. Bronchioles enters small chambers called alveoli.

Pathway of air in respiratory tract of human



Alveoli :

Alveoli are the structural and functional units of lungs. They are covered with blood capillaries. oxygen present in alveoli diffuses into blood. carbon dioxide present in blood diffuses into alveoli. Gaseous exchange take place in between blood and cells.

Blood :

Blood supplies oxygen to every cell in the body.

Mechanism of respiration in human beings:

The organs mainly involved in respiration are lungs. The lungs themselves can neither draw in air nor push it out. Instead, the chest wall muscles, and another flexible flattened muscle called diaphragm helps the lungs in moving air into and out of them. The diaphragm may be imagined as the floor of chest cavity. When diaphragm gets relaxed it is in dome shaped.

Inhalation: The chest wall moves upward and expands,

and the diaphragm flattens the volume of chest cavity increases, its internal pressure decreases and the air from the outside rushes into lungs.

Exhalation: The chest wall is lowered and moves inward, and the diaphragm assumes its dome shape. These changes increase the pressure on the lungs then they squeeze the air out to the external atmosphere.

Gaseous exchange between alveoli and blood capillaries:

Alveoli present in the lungs are surrounded by blood capillaries that are only one cell thick. Air, which is entered into lungs has oxygen, this oxygen diffuses into blood capillaries then the carbon dioxide in the blood diffuses into alveoli. when we breathe out this carbon dioxide sent out of our body.

The composition of inhaled and exhaled air is different .see the table given below.

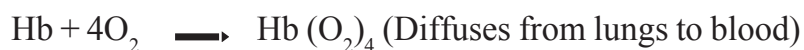
Gas	% in inhaled air	% in exhaled air
Oxygen	21	16
Carbondioxide	0.03	4.4
Nitrogen	78	78

Gaseous exchange between blood capillaries and cells:

The cells are continuously using oxygen; hence, the concentration of oxygen is quite low in them. As the concentration of oxygen is low in them oxyhaemoglobin in

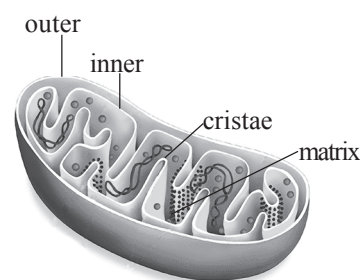
blood releases oxygen that enters the cells. oxygen oxidises the food, carbon dioxide released in cells that carbon dioxide diffuses from cells to blood capillaries.

Haemoglobin present in blood has iron (Fe). when oxygen enters blood haemoglobin immediately binds the oxygen and forms oxyhaemoglobin. This oxyhaemoglobin divides and releases oxygen in the cells when blood reaches cells. Carbon dioxide transported in the form of bicarbonates through blood and plasma.



Cellular Respiration:

The term cellular respiration refers to the pathway by which cells release energy by breaking the chemical bonds of glucose molecules. Cellular respiration in prokaryotic cells like that of bacteria occurs within the cytoplasm. In eukaryotic cells cytoplasm and mitochondria are the sites of cellular respiration. The produced energy is stored in mitochondria in the form of ATP. That is why mitochondria are called "power houses of the cell". ATP is called energy currency. Each ATP molecule gives 7200 Calories of energy.



Mitochondria

Differences between aerobic and anaerobic respiration

Aerobic respiration	Anaerobic respiration
Occurs in presence of oxygen	Occurs in absence of oxygen
Carbon dioxide, water and energy are released	Alcohol/Acid and carbon dioxide are released
Glycolysis, Krebs cycle and other chemical reactions occurs in this respiration	Glycolysis and fermentation occurs in this respiration
Energy released in high amounts	One tenth of energy released when compared to aerobic respiration (very less energy)
Occurs in cytoplasm and mitochondria of the cell.	Occurs in cytoplasm of the cell
Almost all multicellular plants and animals perform this respiration	Bacteria, fungi and muscles of human perform this respiration

After undergoing strenuous exercise, we feel pain in muscles why?

When Oxygen debt in muscles they undergo anaerobic respiration then muscles convert glucose into lactic acid. accumulation of lactic acid in muscles leads to pain. when

our blood is replenished with oxygen, that oxygen oxidizes lactic acid into water and carbon dioxide.

Anaerobic respiration in yeast:

Aim: To show that carbon dioxide and heat are produced in anaerobic respiration

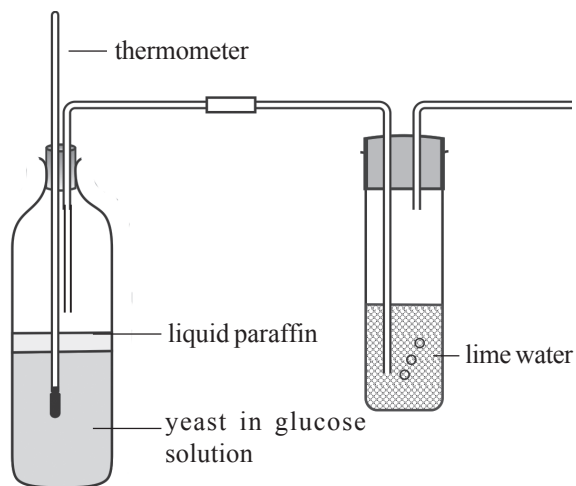
Apparatus: Glucose solution, Yeast, liquid paraffin, Janus green B/Diazine green, thermometer, thermos flask, beaker, lime water, U- shaped glass tube, Corks etc.

Procedure: Take glucose solution in beaker. Heat the glucose solution to remove the oxygen present in it. Cool the sugar solution without stirring it. To test the presence of

oxygen present in glucose solution add a few drops of diazine green. The colour of sugar solution Changes from Blue to pink when oxygen is in short supply around it. Now mix yeast powder in glucose solution and pour this glucose solution in the thermos flask add paraffin liquid over the glucose solution to cut the contact of air. Close the mouth of the thermos flask with two holed rubber cork. Arrange the thermometer and U- shaped glass tube for any gas produced by the yeast to escape through the thermos flask. Keep other end of this glass tube in lime water which is in the test tube shown in the figure. close the mouth of the test tube with cork. Do not disturb this entire setup. The readings on the thermometer should be recorded. It should be observed after one day.

Observation: After a day it was observed that lime water in the test tube turned into milky white. Temperature was increased in the thermometer and alcohol smell given off from the thermos flask.

Result: These observations indicate that yeast cells respire anaerobically converting glucose solution into carbon dioxide, alcohol and heat energy.



Testing for production of heat and CO₂ under anaerobic respiration

Differences Between respiration and combustion:

Respiration	Combustion
Glucose is oxidised to carbon dioxide water energy and heat in cells is called respiration.	Glucose first Chars and later burns produces carbon dioxide, water and energy released as heat.
It is a controlled process	It is uncontrolled process
It occurs in the presence of water in cells.	It does not occur in presence of water
It occurs at our body temperature	We have to apply heat energy to start the process.

Respiration in plants:

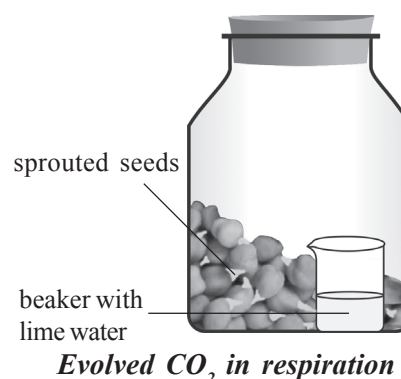
Plants also respire like animals. In plants gaseous exchange takes place through stomata and lenticels. Mangrove plants have special structures for gaseous exchange called aerial/Respiratory roots.

To show that carbon dioxide is released during aerobic respiration in plants:

Aim: To prove that carbon dioxide is released during respiration in plants.

Apparatus: Glass jar or plastic bottle, Germinated seeds, beaker, lime water etc.

Procedure: Before conducting an experiment soak groundnuts or green gram in water for a day. The next day shift these soaked seeds into a wet cloth and tie cloth with a string to make it as a pouch. Keep this cloth pouch at the corner of the class for two days. Seeds germinate within 2 days. We can use those germinated seeds for our experiment. Fill half of the glass jar with germinated seeds. Take lime water in the beaker. Keep the beaker in the glass jar in between the germinated seeds. Close the mouth of the glass jar with a lid. Do not disturb this bottle for a day.



Observation: After a day it was observed that lime water in the beaker changed to milky white.

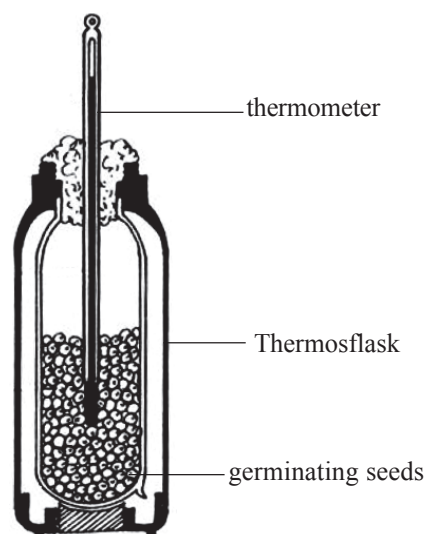
Result: It indicates that germinated seeds produced carbon dioxide which turns lime water into milky white

To Prove that heat is liberated during respiration in plants:

Aim: To prove that heat is released during respiration in plants.

Apparatus: Thermos flask, thermometer, rubber cork, Germinated seeds etc.

Procedure: Before conducting an experiment soak groundnuts or green gram in water for a day. The next day shift these soaked seeds into a wet cloth and tie cloth with a string to make it as a pouch. Keep this cloth pouch at the corner of the class for two days. Seeds germinate within 2 days. We can use those germinated seeds for our experiment. Fill half of the thermos flask with germinated seeds. Close the mouth of the thermos flask with a one holed rubber cork. Insert the bulb of the thermometer in the middle of the germinated seeds through hole of the rubber cork. Do not disturb this



Heat evolved during respiration

thermos flask for a day. Observe the temperature of the thermometer for every two hours up to 24 hours.

Observation: After two hours I observed that temperature in the thermometer increased.

Result: It indicates that germinated seeds performed respiration, so heat is released by seeds.

Differences Between photosynthesis and respiration:

Photosynthesis	Respiration
It is a anabolic process	It is a catabolic process
Occurs only in plants and photosynthetic bacteria	Occurs in all living organisms
Light energy converted to chemical energy	Chemical energy converted to potential energy
It occurs in Chloroplasts	It occurs in mitochondria
Takes place in the presence of Sunlight	Takes place throughout the day
Light energy is fixed here	Energy is released here
Carbon dioxide is utilised here	Carbon dioxide is released here
Oxygen is liberated	Oxygen is utilised
Carbon dioxide and oxygen is combined to form glucose in presence of sunlight in chloroplast buy plants is called photosynthesis	Oxidation of glucose to carbon dioxide water energy and heat is called respiration
$6\text{CO}_2 + 12\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O} + 6\text{CO}_2$	$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + 686\text{k.cal.} + \text{heat}$

Practice Questions

* Very Short Questions:

1. What are the structural and functional units of lungs?
2. What would happen if diaphragm does not work?
3. What would happen if vocal cords do not vibrate in the larynx?
4. What are the materials required to do the experiment that heat is liberated during respiration in plants?
5. Write any two sentences by appreciating the role of haemoglobin in respiration.
6. Why do we feel pain in muscles while doing physical hard work?
7. In which form energy is stored in cells?

*** Short Questions :**

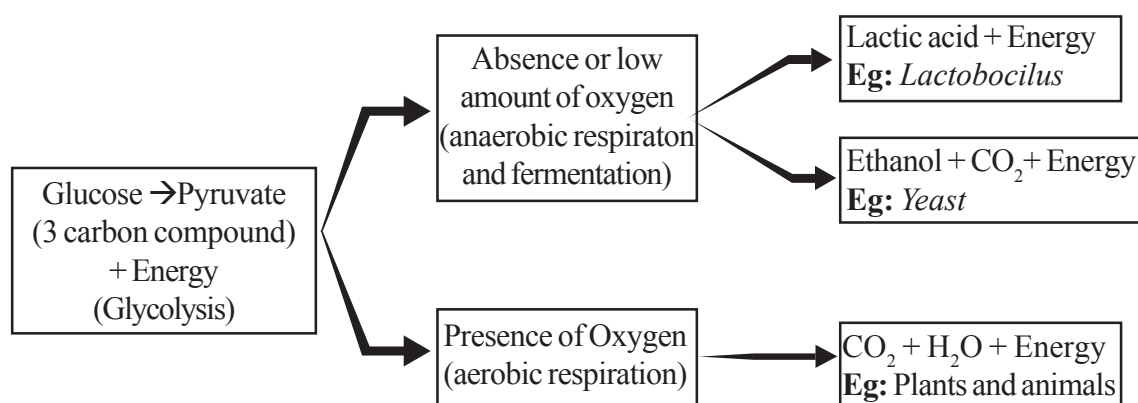
1. Observe the table and answer the following questions.

Gas	% in inhaled air	% in exhaled air
Oxygen	21	16
Carbondioxide	0.03	4.4
Nitrogen	78	78

- Which gas composition is same in both inhalation and exhalation?
 - In which phase carbon dioxide gas percentage is high?
- Draw the neat, labelled diagram of alveoli which shows gaseous exchange in it.
 - Write any four differences between Respiration and combustion

*** Essay Type Questions:**

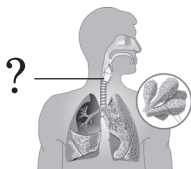
- Write the materials used and the procedure followed by you to observe the anaerobic respiration?
- Write the differences between photosynthesis and respiration
- Draw the diagram of organelle in which cellular respiration occurs and explain the process of cellular respiration.
- Describe the pathway of air in respiration of humans with the help of flowchart.
- Observe the given flowchart and answer the following questions



- What is the common process in both the respirations?
- Which living organisms perform respiration without oxygen?
- What type of respiration performed by muscles while doing strenuous exercise?
- What type of respiration observed in plants?

*** Multiple Choice questions:**

1. Identify the incorrect statement about gaseous exchange in human. ()
- A) Air enters into alveoli from lungs. Lungs are surrounded by blood capillaries
 - B) Oxygen diffuses from alveoli to blood
 - C) Carbon dioxide diffuses from Blood to alveoli
 - D) Oxygen diffuses from blood to alveoli

2. ?  Identified part in the picture is... ()

- A) Larynx
- B) Trachea
- C) Pharynx
- D) Bronchi

3. Identify the correct sentence about exhalation. ()

- A) Diaphragm flattens and moves downward by the contraction of muscles in it
- B) When Chest walls move upward, and diaphragm moves downward then chest cavity size increases.
- C) When chest walls inward and diaphragm gets dome shaped then chest cavity size decreases
- D) When diaphragm moves downward, and chest wall moves inward then the chest cavity moves upward.

4. Which Of the following useful for gaseous exchange in plants? ()

- A) stomata
- B) chloroplasts
- C) nostrils
- D) mitochondria

5. What is the role of diazine green solution in anaerobic respiration in yeast is?()

- A) Activates anaerobic respiration in yeast
- B) Helps in checking the presence of oxygen in yeast solution
- C) Helps in identifying carbondioxide release
- D) Accelerate the work of paraffin solution

6. What is the common passage for food and wind? ()

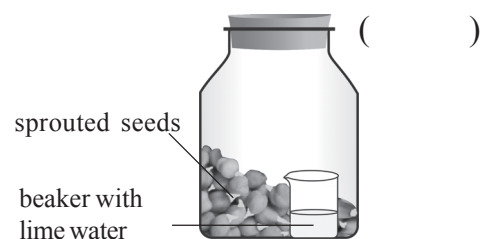
Sentence 1: Oxygen is released from oxyhaemoglobin and diffuses from blood into cells.

Sentence 2: Carbon dioxide present in cells diffuses into blood stream

- A) Both the sentences are incorrect
- B) sentence one is correct and sentence two is incorrect
- C) sentence one is incorrect and sentence two is correct
- D) Both the sentences are correct

7. Identify the lab activity ()

- A) Heat is released during respiration
- B) Heat is released during photosynthesis
- C) carbon dioxide is released during respiration
- D) Oxygen is released during respiration



CHAPTER

3

Transportation

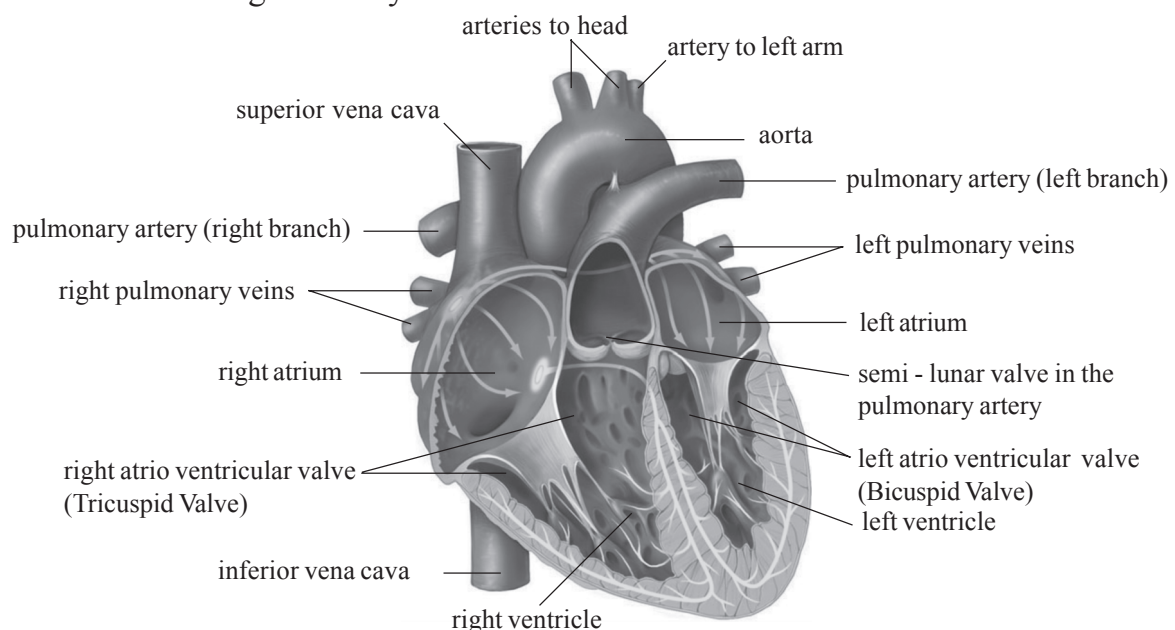
All the living organisms need nutrients, gases, liquids etc., for growth and maintenance of the body. All the organisms would need to send these materials to all parts of their body. For this specialized system that is developed by organisms is called 'the circulatory system'. Heart and blood vessels are main parts of the human circulatory system.

Structure of the Heart

Heart is located in between the lungs and protected by rib cage. The size of your heart is approximately the size of your fist. The heart is pear shaped structure triangle in outline, wider at the anterior end and narrower at the posterior end. The heart is covered by two layers of membrane. The membranes are called pericardial membranes. The space between these two layers is filled with pericardial fluid, which protects the heart from shocks.

Internal Structure of Heart :

The Heart is divided into four parts externally by grooves. The two upper parts are called atria (auricles), and the lower ones are called ventricles. The walls of the ventricles are relatively thicker than atrial walls. The left atrium and ventricle are smaller when compared to that of right - atrium and ventricle. The two atria and the two ventricles are separated from each other by muscular partitions called septa. The openings between atria and ventricles are guarded by valves.



Internal structure of heart

Heart - Blood Vessels

The blood vessels found in the walls of the heart are coronary vessels which supply blood to the muscles of heart. The vein which is at the anterior end of the right side of the heart is superior venacava, which collects blood from anterior parts (head and neck) of the body. The vein which is coming from posterior part of the heart is inferior venacava, collecting blood from posterior part (hand and legs etc) of the body. These open into the right atrium of the heart the pulmonary artery departs from the right ventricle and reaches the lungs. Whereas blood from the lungs enters the left atrium through the pulmonary veins. A large blood vessel called the aorta exists from the left ventricle and carries blood to all parts of the body.

Heart - Valves

There are one-way valves in the heart and blood vessels that connect to the heart.

Tricuspid Valve: The valve present on the Right Auriculo - ventricular septum between Right atrium and Right ventricle is referred to as "Tricuspid Valve". It allow deoxygenated blood flow from right atrium to right ventricle only.

Bicuspid Valve or Mitral Valve: The valve present on the left Auriculo Ventricular septum between left atrium and left ventricle is referred as Bicuspid valve or Mitral valve. It allows oxygenated blood from left atrium to left ventricle only.

Pulmonary Valves: A major blood vessel that originate from right ventricle is pulmonary aorta. The valves present at the region of pulmonary aorta are called "Pulmonary valves". It allows the de oxygenated blood from right ventricle to lungs only.

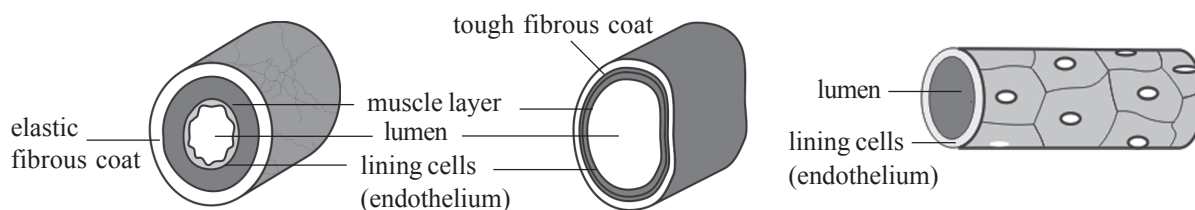
Systemic Valves: A major blood vessel, originates from left ventricle is systemic aorta. The valves present at the region of systemic aorta are called systemic valves. It allows the oxygenated blood from left ventricle to aorta only.

Blood Vessels: The arteries, veins and blood capillaries are main blood vessels of human circulatory system.

Arteries: Arteries carry blood from the heart to body parts. Since the blood flow is rapid and at a high pressure, the arteries have thick elastic walls. There are no valves in arteries. Usually oxygenated blood flows in the arteries. But deoxygenated blood flows in the pulmonary artery.

Veins: Veins are the vessels which carry carbon from all parts of the body back to the heart. The veins have thin walls and valves are also present which allow blood to flow towards the heart only. Usually deoxygenated blood flows in the veins. But oxygenated blood flows in the pulmonary veins.

Blood Capillaries: Blood capillaries are the microscopic vessels made of single layer cells. They allow diffusion of various substances and establish continuity between arteries and veins. Blood reaches the cells via capillaries. They establish continuity between arteries and veins.



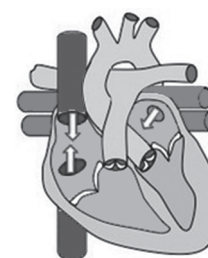
Fill in the following table.

Structure / Function of blood vessel		Artery	Vein
1.	Thickness of walls(thick / thin)		
2.	Valves (present / absent)		
3.	Capacity to retain shape when blood is absent (can retain/can't retain)		
4.	Direction of blood flow (heart to organs / body organs to heart)		
5.	Pressure in the vessel(low /high)		
6.	Type of blood transported (oxygenated / de-oxygenated)		

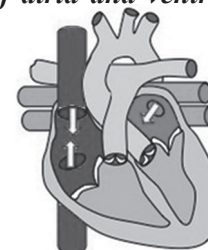
The cardiac cycle

The human heart starts beating around 21st day during the embryonic development. If it stops beating, it results in the death of a person. One contraction and one relaxation of atria and ventricles is called one cardiac cycle. Let us understand cardiac cycle with the help of following steps.

1. We start with the imagination that all the four chambers the heart are in relaxed state (diastole).
2. Blood from venacava and pulmonary veins enters the right and left atria respectively.
3. Now the atria contract, forcing the blood to enter into the ventricles.



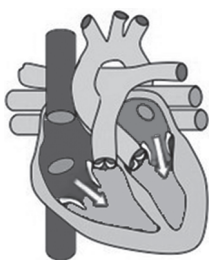
1. Imaginary relaxation of atria and ventricles.



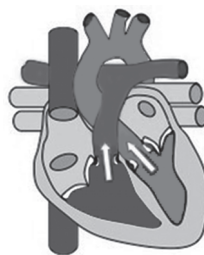
2. Blood flows into atria.

Fig-10(1-2)

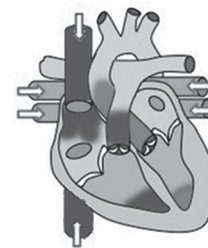
4. When the ventricles are filled with blood they start contracting and atria start relaxing. The aperture between the atria and ventricles is closed by valves. On ventricular contraction due to pressure the blood moves into the aorta and pulmonary artery. When the valves are closed forcibly, we can listen to the first sharp sound of the heart 'lub'.
5. When the ventricles start relaxing the pressure in the ventricles is reduced. The blood which has entered the arteries tries to come back into the ventricles. The valves which are present in the blood vessels are closed to prevent backward flow of blood into the ventricles. Now we can listen to a dull sound of the heart 'dub'. The atria are filled up with blood and are ready to pump the blood into the ventricles.



3. Contraction of atria and flow of blood into ventricles.



4. Contraction of ventricles. A.V. Valves closed (Lub) blood flows into arteries.



5. Relaxation of ventricles. The closing of arterial valves (Dub).

Cardiac cycle

Single and double blood circulation

The blood flows in the blood vessels. To keep the blood moving the heart pumps it continuously. There are two types blood circulation modes in animals. They are single circulation and double circulation.

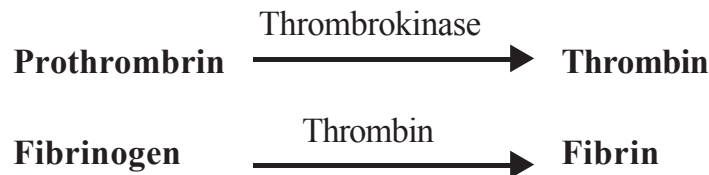
Single Circulation: If blood flows through heart only once for completing one circulation it is called single circulation. Ex: Fishes

Double Circulation : If the blood flows through the heart twice for completing one circulation it is called double circulation. Ex: Amphibia to Mammals.

Blood pressure (B.P.): When heart contracts blood flows rapidly into the artery, causing pressure on the walls of the arteries it is called blood pressure. This pressure helps the flow of blood in blood vessels of our body. Doctor measure the blood pressure (B.P.) with a device called sphygmomanometer. For a healthy young adult B.P. is 120/80 (120 is systolic pressure and 80 is diastolic pressure). People who have high B.P. during resting period are said to have hypertension.

Coagulation of blood : When you cut yourself, the blood flows out of the wound for only a short time. Then the cut is filled with a reddish solid material. This solid is called a blood clot.

- When the blood flows out, the platelets release an enzyme called thrombokinase.
- Thrombokinase acts on pro-thrombin converting it into thrombin.
- Thrombin acts on another substance called fibrinogen, converting into insoluble fibrin.
- The blood cells entangle in the fibrin fibres forming the clot.



Materials transport with in the plant

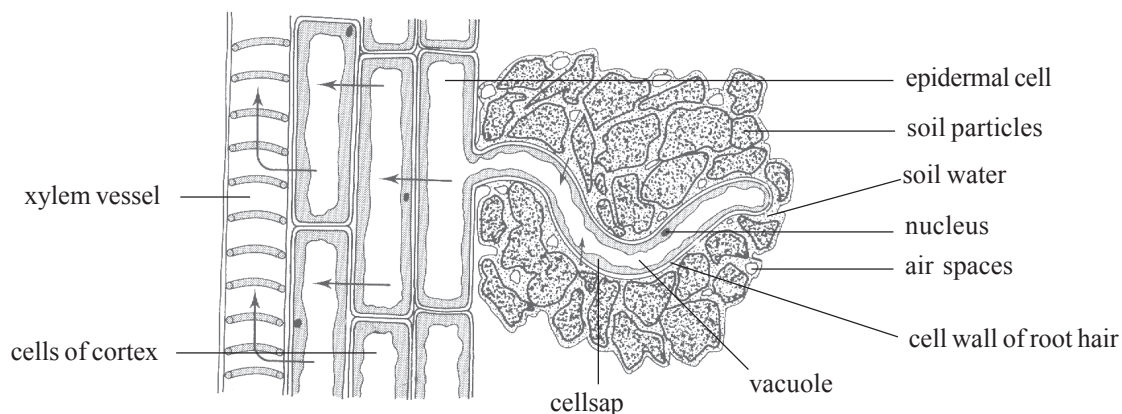
The plants also transport the material with in their bloody like animals. The water absorbed by roots and supplied by xylem, food prepared by leaves are supplied to the remaining parts of the plant by phloem.

Water Transport in Plant :

The Osmosis, Root pressure and transpiration etc., like factors help the plants to absorb water. Where as food prepared by leaves are supplied through phloem.

Osmosis - Root hairs

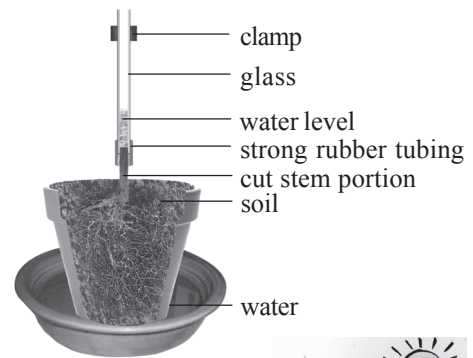
The Osmosis plays major role in the root hairs and passes inward from cell to cell until it gets into the xylem vessels. The cytoplasm lining of the cell wall acts as the semipermeable membrane. The root hairs grow out into the spaces between the soil particles and that the hairs are surrounded by moisture. The soil water is an extremely dilute solution of salts. Soil water concentration is more dilute than that of the cell sap in the root hair; therefore water will pass into the vacuole of the root hair by Osmosis. The entry of water dilutes the contents of the root hair vacuole so that it becomes more dilute than it's neighbouring cell. So, water passes into the neighbouring cell which in turn becomes diluted, finally water enters the xylem vessels.



L.S of root showing relationship of root hair and soil water

Root Pressure

The vast number of root hairs and root cells involved, a pressure in the xylem vessels develops which forces the water upwards, This total pressure is known as root pressure.



Root pressure

Transpiration

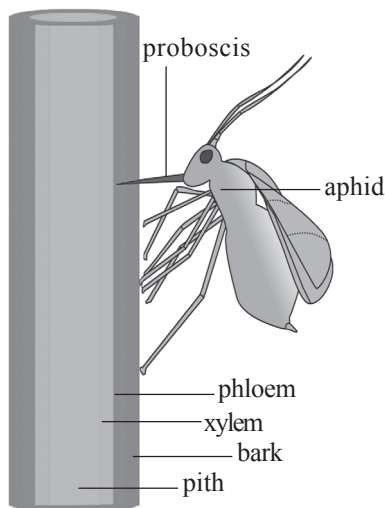
The evaporation of water through leaves is called transpiration. Water evaporates through stomata of leaves and lenticles of stem. When the leaves transpire, there is a pulling effect on the continuous columns of water in the xylem vessels.



Transpiration

Transport of manufactured food

Food such as sugar is synthesised in the green parts of plants, mainly the leaves, this food has to be transported to all the living cells through phloem.



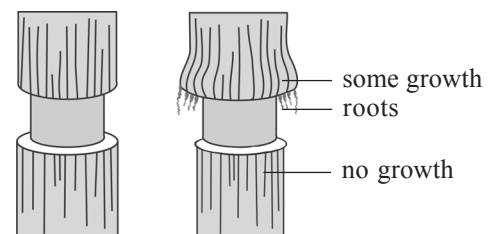
Aphid extracting food material from plant

Biologists studies about food transportation in plants with the help of aphids.

To obtain juice an aphid pierces the plant tissues with its long needle like organ 'proboscis'. An aphid is killed while in the act of feeding and the body is then carefully cut away, leaving the hollow proboscis still inserted into the phloem. It is found that because the fluid slowly exudes from the cut end of the proboscis in the form of drops; these drops are then collected and analysed. The components (sugar and amine acids) of proboscis drops matched with phloem components.

Removing ring of bark to illustrates the conduction of sugar by the phloem

Removing a ring of bark from a shoot to expose the wood. Remove all tissues from the centre outwards, including the phloem. After a few days, food had accumulated above the ring, but was not present below it. If it is left for some more time, the stem increases in thickness immediately above the right. but no growth occurred below. Because absence of phloem.



Removing ring of bark

Practice Questions

* Very Short Questions:

1. What are the differences between xylem and phloem?
2. What would happen if valves of heart are not function properly?
3. Write about hypertension.
4. Write two questions, which you are going to ask doctor to know about function of the sphygmo mano meter?
5. Which factors help the plants to absorb water?
6. How can you appreciate the protection of heart with pericardial membranes and pericardial fluid?

* Short Questions:

1. Illustrate the process of coagulation.
2. What are differences between single circulation and double circulation?
3. Draw the well labeled diagraph of “Removing ring of brak” and write about it.
4. Explain the valves of heart.
5. What is the study of biologists on aphids?

* Essay Type Questions:

1. Draw the well labeled diagraph of heart and write about blood vessels, which connected to heart.
2. Write about the experiments of root pressure and transpiration
3. How do structures of arteries, veins and blood capillaries are help in circulation of blood?
4. Explain the sequential events in the cardiac cycle.
5. Observe the following table

Arteries	Veins
Walls are thick	Walls are thin
Absent of valves	Present of valves
Transport the blood to body parts	Bring the blood from body parts to heart
Pressure in this vessels high	Pressure in this vessels low

write the answers to following questions.

1. What is the use of thickness present in arteries?
2. How can you support the valves present in veins?
3. Direction of blood flow not same in all arteries and veins? comment on it.
4. Write the two characteristics of arteries and veins each.

*** Multiple Choice questions:**

1. Identify the right sequence ()
 - A) Pulmonary vein → left ventricle → left atrium → lungs
 - B) Pulmonary vein → lungs → left atrium → left ventricle
 - C) Lungs → pulmonary vein → left atrium → left ventricle
 - D) Lungs → left atrium → left ventricle → pulmonary vein
2. Identify the correct sentence ()
 - A) Veins are the blood vessels that carry blood from parts of the body
 - B) Arteries are not strong as veins
 - C) Pulmonary vein carries blood from heart to lungs
 - D) Inferior vena cava collects deoxygenated blood from upper parts of the body like head and neck
3. What is the reason for heart beat ()
 - A) Closing of valves
 - B) Blood pressure in arteries and veins
 - C) Blood flows rapidly through valves
 - D) Flow of blood into ventricles
4. What part is pressed by doctor to examine B.P. with sphygmomanometer? ()

A) vein B) Artery C) Capillary D) Lymph vessels
5. Identify the wrong sentence ()
 - A) Root pressure helps the small plants to absorb water
 - B) Water transport through xylem
 - C) Plants absorb the water rapidly with the help of transpiration
 - D) Osmotic pressure helps the phloem to transport food material
6. Identify the right pair ()
 - A) Root hair - present on shoot B) Xylem - Transport food material
 - C) Stomata - Transpiration D) Phloem - Transport water

CHAPTER

4

Excretion

In living organisms different kinds of material are produced out of various metabolic activities, In addition to the substances needed for metabolism, waste products are also produced. Excretion is also one of the metabolic activities in living organisms. In the process of excretion. Waste products produced in the body of an organism are separated and removed.

Waste products generated in human body

The waste products generated in human body include carbon dioxide, water, nitrogenous compounds like urea, ammonia, uric acid, bile pigments, excess salts etc.

Excretory Systems in Human being

Human excretory system mainly consists of a pair of kidneys, a pair ureters, urinary bladder and urethra.

Kidneys : In human beings Kidneys are a pair of bean shaped, reddish brown structures in the abdominal Cavity attached to dorsal body wall, one on either side of the back bone.

Ureters : Each Ureter arises from hilus of the kidney. These are a pair of whitish, narrow distensible and muscular tubes measuring 30 cm in length. Ureters open into the urinary bladder.

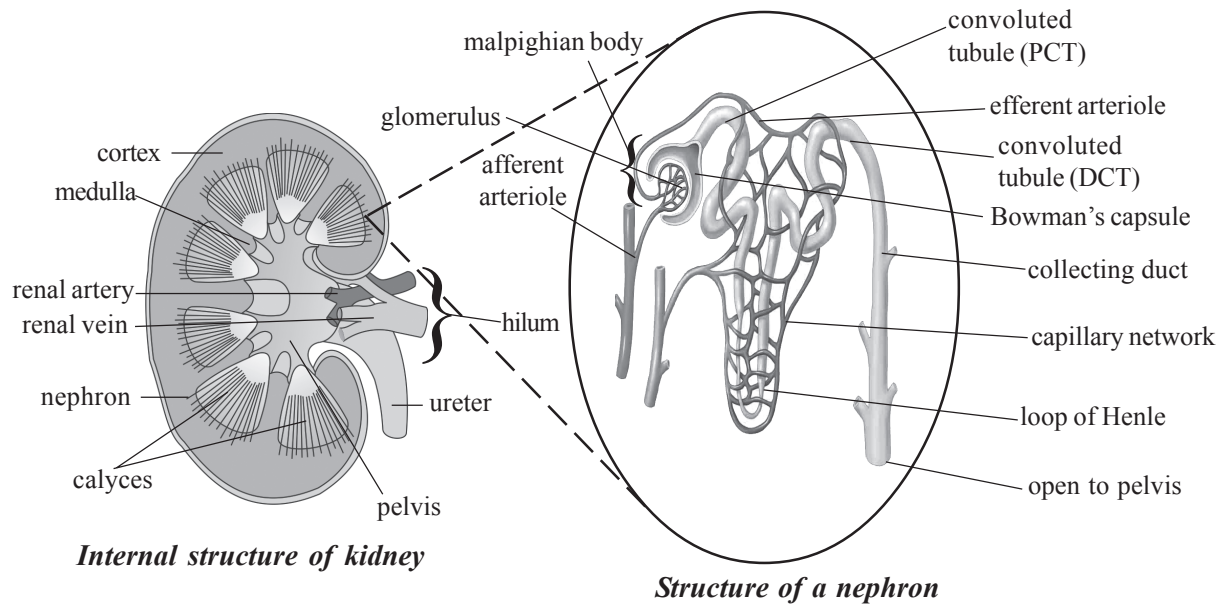
Urinary bladder : It is a median, pear shaped and distensible sac. It stores approximately 300-800 ml of Urine temporarily.

Urethra : Urethra is a tube that take urine from urinary bladder to outside The opening of urinary bladder into urethra is guarded by a ring of muscles or sphincter. Urethra is 4cm long in females and in males it is 20 cm long.

Internal Structure of the kidney:

When observing internal structure of kidney, It shows two distinct regions. Dark coloured outer zone is called cortex and pale inner zone is called medulla. Each kidney consists approximately 1.3 to 1.8 million microscopic thin tubules called nephrons.

Observe the pictures below.



Structure of nephron:

Each nephron has two parts 1) Malpighian body 2) Renal tubules

Malpighian body: Consists of blind cup shaped broader end of nephron called Bowman's capsule and bunch of fine blood capillaries called glomerulus. Afferent arteriole enters the bowman's capsule forms a bunch of blood capillaries and leaves the bowman's capsule as efferent arteriole which has a lesser diameter than afferent arteriole.

Bowman's capsule is lined by a single layer of squamous epithelial cells called podocytes cells. There are fine pores between podocyte cells.

Renal tubule: Renal tubule consists of proximal convoluted tubule (PCT), loop of Henle, Distal convoluted tubule (DCT). Distal Convoluted tubule opens into a collecting tube. All the parts of the renal tubule are surrounded by a network of peritubular capillaries formed from efferent arteriole.

Different Stages in Urine formation :

Formation of urine involves four stages. (i) Glomerular filtration (ii) Tubular Re-absorption (iii) Tubular secretion (iv) Formation of hypertonic urine

1. Glomerular filtration: Blood flows from renal artery to glomerulus through afferent arteriole, as a result pressure filtration takes place. Due to this waste molecules and some Water along with useful substances are filtered and enter into the Bowman's capsule. This pressured filtration is called glomerular filtration. The filtrate formed in Bowman's capsule is called primary urine.

2. Tubular Re-absorption: Filtrate formed after glomerular filtration is almost equal to blood in chemical composition except the presence of blood cells. The peritubular capillaries present around the Henle's loop reabsorb all the useful components and excess water from primary urine.

3. Tubular secretion: Waste products left unfiltered in the blood are secreted by the peritubular capillaries into the loop of Henle.

4. Formation of concentrated Urine: Urine passes from loop of Henle to Distal convoluted tubule. Where it gets further concentrated by the action of hormone called Vasopressin. Deficiency of vasopressin causes excessive, repeated, dilute urination. The condition is called diabetes insipidus.

Composition of Urine

Urine is a pale yellow coloured fluid. Urine has amber color due to the presence urochrome, which is formed by the denaturation of Haemoglobin.

Urine contains 96% of water, 2.5% of organic substances (urea, uric acid, creatine, creatinine, B, C, vitamins, hormones, oxalates), 1.5% of inorganic substances (sodium, chloride, phosphate, sulphate, magnesium, calcium, iodine).

What happens if both kidneys fail completely?

Kidney failure is called End Stage Renal Disease (ESRD). If kidneys stop working completely, our body is filled with extra water and waste products as a result you feel tired and weak. This condition is called uremia.

Dialysis or kidney transplantation is done for the people whose kidney's fail to work.

Process of Dialysis:

In the process of dialysis, blood is filtered artificially in a machine called dialyzer. This process of artificial filtration is called haemodialysis. In this process blood is taken out from the main artery, mixed with an anticoagulant, such as heparin and then send into the apparatus called dialyzer. In this apparatus blood flows through tubes which are madeup of cellophane. These tubes are embedded in the dialyzing fluid. The membrane separates the blood flowing inside the tube and dialyzing fluid. As nitrogenous wastes are absent in dialyzing fluids, these substances from the blood move out freely, there by filtering the blood of its wastes. The filtered blood is pumped back on to the body through a vein after adding anti-coagulant. Each dialysis session lasts for 3 to 6 hours.

Kidney transplantation

The best long term solution for kidney failure is kidney transplantation. A functioning kidney from a donor preferably a close relative is transplanted. Now a days kidney from

the donor or from brain dead patients are collected and transplanted. This is called organ donation.

Accessory Excretory Organs in Human body

Kidneys are the most important excretory organs. In addition to kidneys there are certain organs which have their own specific functions but carry out excretion as a secondary function. These are lungs, skin, liver and large intestine. Small amount of nitrogenous wastes are also eliminated through saliva and tears.

Lungs: Lungs excrete carbon dioxide and water vapour formed in the process of respiration.

Skin: Sweat glands in skin excrete excess water and salts from the body in the form of sweat. Sebaceous glands in skin eliminate sebum.

Liver: The life span of RBC is 120 days, later RBC are destroyed in the liver. As a result of haemoglobin destruction, bile pigments like biliverdin, bilirubin and urochrome are produced. The urochrome is excreted through urine.

Large intestine: Excess salts of calcium, magnesium and iron are separated by epithelial cells of colon and are eliminated along with the faeces.

Excretion in Plants

The biochemical substances produced in plants are of two types, they are 1. Primary metabolites 2. Secondary metabolites. The materials required for the normal growth and development of the plant are called Primary metabolites Eg. Carbohydrates, fats and proteins. The materials which are not required for normal growth and development of plant but help in self defence, pollination, seed dispersal, and help the plant to recover from an injury are called secondary metabolites. They are Tannins, Resins, Gums, Latex, Alkaloids.

Tannins: Tannins are carbon compounds. These are used in tanning of leather and in medicines e.g. Cassia, Acacia.

Resins: Resins are stored in resin passages. These are used in varnishes- e.g. Pinus.

Gums: Some plants ooze out a sticky substance when branches are cut these are called gums. The gum swells by absorbing water and helps in the healing of damaged parts of a plant. Gums are used as adhesives and binding agents in the preparation of the medicines, food, etc. Eg: Neem, Acacia.

Latex: Latex is a sticky, milky white substance. Latex is stored in latex cells or latex vessels of a plant. Eg: Rubber Plant.

Alkaloids: Alkaloids are nitrogenous by-products and poisonous substances produced by the plants. These are stored in different parts of the plants.

ALKALOID	PLANT	PART	USES
Quinine	Cinchona	Bark	Antimalarial drug
Nicotine	Tobacco	Leaves	Insecticide, stimulant
Morphine, Cocaine	Opium	Fruit	Pain killer
Reserpine	Snake root	Root	Medicine for High BP
Caffeine	Coffee	Seed	Central nervous system Stimulant
Nimbin	neem	Seeds, Barks, Leaves.	Antiseptic
Scopolamine	Datura	Fruit, flower	Sedative
Pyrethroids	Chrysanthemum	Flower	Insecticides

Differences between Excretion and Secretion

Excretion	Secretion
<ul style="list-style-type: none"> ● Removal of waste materials from a organism ● passive process ● Tears, Sweat, Urine, Carbon dioxide 	<ul style="list-style-type: none"> ● Movement of materials from one point to other point ● Active process ● Enzymes, Hormones, Saliva

Practice Questions

* Very Short Questions:

1. Differentiate between Excretion, Secretion?
2. Write about any two accessory excretory organs.
3. Write two slogans needed for campaigning organ donation.
4. What would happen if the kidneys fail to function.
5. What are the waste products generated in the human body?

* Short Questions:

1. Explain the human excretory system with a neat labelled diagram?
2. Describe the process of dialysis?
3. Write about the alkaloid that are useful in every day life?
4. Write the differences between primary and secondary metabolites.
5. Explain the composition urine?

* Essay Type Questions:

1. Describe the structure of nephron with a neat labelled diagram?
2. Explain the procedure followed in the lab to observe the Internal structure of a kidney.
3. Write about Secondary metabolites of plants, plants in which they are found and their uses?
4. Explain the different stages of urine formation?

5. Observe the table below.

Quanine	Bark	Antimalarial drug
Caffeine	seeds	Central nervous system stimulant
Nimbin	Seeds, bark, leaves	Antiseptic
Reserpine	Root	Medicine for High Blood pressure

Answers the following questions.

- i) Write the names of any two alkaloids from the above table
- ii) Which parts of plants are used as alkaloids?
- iii) From the above table name the alkaloids obtained from Neem, Coffee?
- iv) Quinine, reserpine are used to prevent which diseases?

*** Multiple Choice questions:**

1. Identify the correct pair of the following ()
A) Tannin - Pinus B) Resin - Cassia C) Gum - Neem D) Latex - Acacia
2. Which the following is not an accessory excretory organ ()
A) Skin B) Large Intestine C) Lungs D) Small intestine
3. Identify the Correct Sequence ()
A) Glomerular filtration → Tubular Secretion → Tubular re-absorption → Formation of hypertonic urine
B) Glomerular filtration → Tubular secretion → Formation of hypertonic urine → Tubular reabsorption.
C) Tubular Secretion → Tubular reabsorption → Glomerular filtration → Formation of hypertonic urine
D) Glomerular filtration → Tubular reabsorption → Tubular secretion → Formation of hypertonic urine.
4. Identify the components in the composition of urine. ()
A) 95% water, 2.5% organic substances, 1.5% inorganic substances
B) 96% water, 1.5% organic substances, 2.5% inorganic substances
C) 96 % water, 2.5% organic substances, 1.5% inorganic substances
D) 96% organic substances, 1.5% inorganic substances, 2.5% water
5. Which of the following is not a part of renal tubule ()
A) Bowman's capsule B) Proximal convoluted tubule
C) Distal convoluted tubule D) Loop of Henle
6. Diabetes Insipidus means ()
A) Concentrated urine, less urination
B) Dilute urine, excessive urination
C) Concentrated urine, excessive urination
D) Dilute urine, less urination

CHAPTER

5

Control and Coordination

In our body the nervous system and endocrine system work together to control and coordinate all our activities such as physical actions, our thinking process and emotional behaviour. In plants nervous system is absent. But phytohormones control the life process.

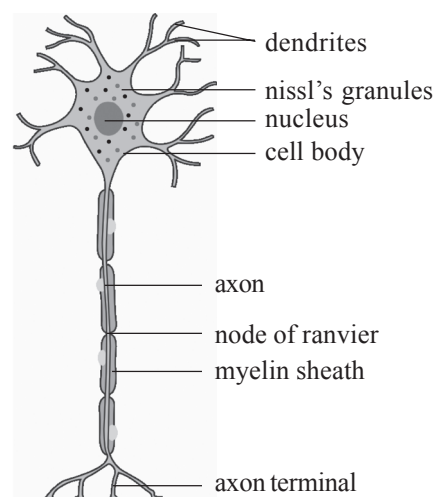
Nervous system

The nervous system includes the brain, spinal cord, sense organs and nerves. The sense organs receive the stimulus and this stimulus with the help of sensory nerves reaches brain and spinal cord. This information will be sent to different organs by motor nerves for action.

Structure of Nerve cell

The nerve cell is the structural and functional unit of nervous system. The nerve cell carries impulses. The nerve cell consists of three parts (i) Cyton (ii) Axon (iii) Dendrites

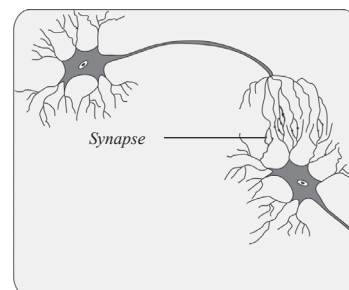
Cyton is the cell body having large nucleus. Nissil granules are present in the cyton. Dendrites arise from the cyton. They are much branched the axon is the long and cylindrical process that arises from the cyton. It is surrounded by a layer of fatty material knowns as myelin sheath. It is broken at regular intervals and these broken spots are called as nodes of Ranavier.



Nerve cell

Synapse

Dendrites of nerve cell connect to the other or to the axons of other nerve cell through connection called synapse. Synapse is the functional region between two neurons where information from one neuron is transmitted or relayed to another neuron.

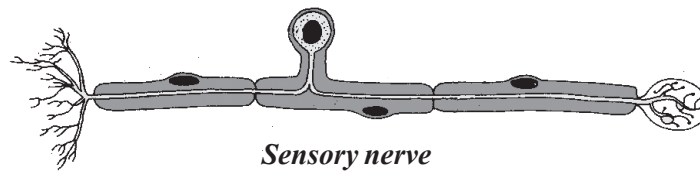


Synapse

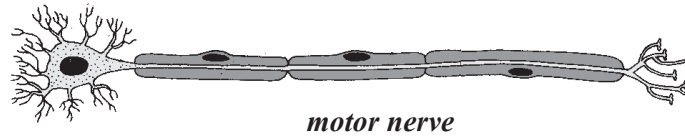
Types of Nerves

Based on the function, nerves are divided into three types 1) Sensory nerves (Afferent nerves) (2) Motor nerves (Efferent nerves) (3) Mixed nerves

Sensory nerves: Sensory nerves are also called as afferent nerves. They carry the impulse from receptors (sense organs) to the central nervous system (Brain and Spinal cord)



Motor nerves: Motor nerves are also called as efferent nerve. They carry impulse from central nervous system to different body parts.

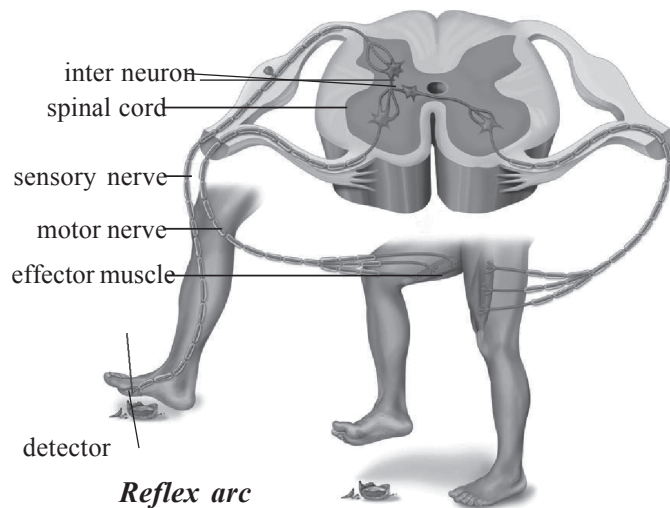


Associated Nerves: The nerves which afferent and efferent nerves are called associated nerves.

Reflex arc

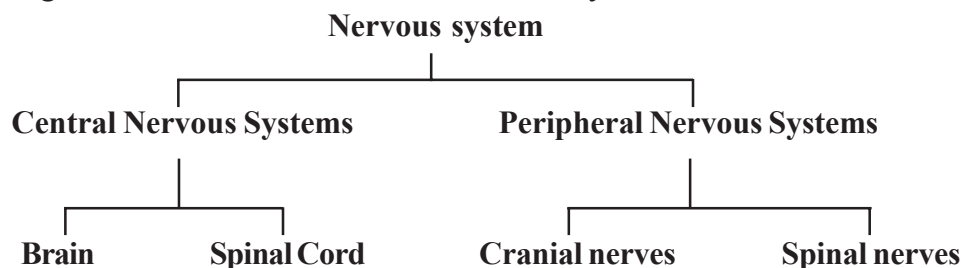
The single pathway that goes upto the spinal cord from detectors and returns to the effector muscle is a reflex arc. components of Reflex arc are (1) Receptor (2) Sensory nerve (3) Association nerve (4) motor nerve (5) effector organ.

Reflexarc can be shown as stimulus → Receptors of sense organs → sensory nerve fibres → Brain → Spinal cord → Motor nerve fibres → muscles/glands.



Divisions of Nervous System

Following are the different division of nervous system found in Human beings.



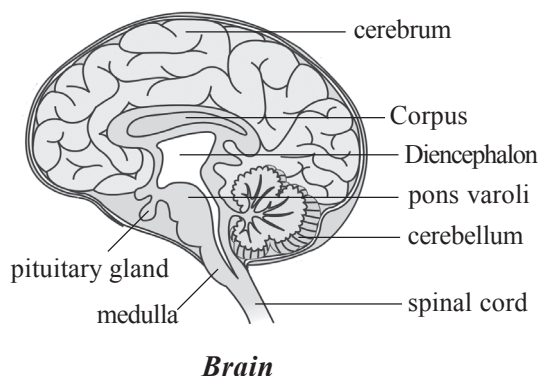
Central Nervous System

The Central Nervous System consists of brain and spinal cord.

Structure of Brain: Brain is a soft structure present inside the cranium of skull. It is protected by three layers. The fluid present in between these layers is called cerebrospinal

fluid. This fluid protects the brain from the shocks.

The outer portion of the brain contains cell bodies of the nerve cell these and are grey coloured. This portion is called grey matter. the inner portion of the brain contains axons of the nerve cell. As these axons contain white myelin sheath this portion of the brain is called white matter.



Brain contains following parts

1. Fore brain: It contains cerebrum and diencephalon
2. Mid brain: It contains optic lobes
3. Hind brain: It contains cerebellum and medulla oblongata

Functions of the parts of the brain

Brain	Parts	Structure	Functions
Fore brain	Olfactory lobes	Clubshaped	Sense of smell
	Cerebrum	It contains two lobes called cerebral hemispheres. The surface of the cerbrum has folds. The elevations of the folds are called Gyri and depressions are called Sulci.	<ul style="list-style-type: none"> ● seat of mental abilities ● controls thinking, memory, reasoning perceptions and speech
	Diencephalon	It is in Rhomboidal shape. It is divided into thalamus and hypothalamus	Controls emotions such as anger, Reflex centre for muscular activities, centre for water balance, blood pressure, body temperature, sleep and hunger. The hypothalamus controls the pituitary gland.
Mid brain	Mid brain	Small stalk like structure	It relays motor impulse from the cerebral cortex to the spinal cord and relays sensory impulses from spinal cord to thalamus. Reflexes for sight and hearing
Hind brain	Cerebellum	It contains two large cerebral hemispheres.	Maintains posture, equilibrium and musule tone.
	Medulla oblongata	It is in traingular in shape.	Controls cardiac, respiratory, vasomotor activities, coordinates reflexes like swallowing, coughing, sneezing and vomiting

Structure of Spinal cord

Spinal cord extends from the back of the hind brain to the back of the stomach through the neural canal of vertebral column. It is almost cylindrical in shape. In spinal cord the white matter is towards periphery while grey matter is towards the centre of spinal cord. The myelinated axons leave the spinal cord from both the sides of the vertebral column. The spinal cord is not only a road for passing instructions from the brain but it also acts as controlling centre.

Peripheral Nervous system

The peripheral nervous system is formed by 12 pairs of cranial nerves that arise from the brain and 31 pairs of spinal nerve arise from the spinal cord. The peripheral nervous system is a vast system of the dorsal and ventral root spinal and cranial nerves that are linked to the brain and spinal cord on one end and sense organs on the other.

Autonomous nervous system

The peripheral nervous system involuntarily controls the several functions of regions like our internal organs (for example blood vessels smooth and cardiac muscles) so it is called autonomous nervous system. It has voluntary control on muscles of some areas of skin and the skeletal muscles also. Normally such involuntary activities take place by the coordinating effort of the medulla oblongata and autonomous nervous system.

Sympathetic Nervous System: It is formed by the chain of ganglia on either side of the vertebral column and the associated nerves.

Para Sympathetic Nervous System: It is formed by the nerves arising from the ganglia of the brain and the posterior part of the spinal cord.

The sympathetic and para sympathetic nervous system together constitute autonomous nervous system. These are considered as a part of peripheral nervous system only.

Endocrine System:

Endocrine system works with the chemical substance known as hormone. These hormones are secreted directly into the blood by the endocrine glands.

Duct and Ductless glands:

The secretion of some glands flows in the vessels they are called duct glands whereas the secretion of some glands does not flow in the vessels their secretion directly mixes in the blood these glands are called ductless glands. The system formed by the ductless glands is endocrine system. Liver secretes its secretions in the vessels so it is called duct gland. Pancreas is the example for mixed gland. It acts as both duct and ductless glands. 'Islets of Langerhans' present in the Pancreas, secretes insulin. Insulin regulates the glucose level in the blood. The person suffering from diabetes will be given insulin injection.

The endocrine glands their secreted hormones and its response on Human body:

Name of the endo-	Location	Hormone secreted	Response of body to Hormone
Pituitary gland (Master gland)	Floor of brain	Growth Hormone (or) Somatotrophin	Growth of bones
		Thyroid stimulating hormone (TSH)	Stimulates the secretion of Thyroxine
		Adreno cartico Trophic hormone (ACTH)a	Stimulates the secretion of adrenal cortex
		Follical Stimulating hormone (FSH)	In female growth of graffian follicles, stimulates the secretion of progesteron.
		Gonadotropin hormone	Activity of ovary and testies
		Lutenising Hormone (LH)	In females ovulation, development of corpus luteum;
		Prolactine	In females development of mammary glands, promotes milk production.
		Oxytocine	Controls the contraction of uterus muscles.
		Vasopressin	Regulates the reabsorption of water
Thyroid gland	Neck	Thyroxine	Effects in general growth rate and metabolic activity
Ovary	Below the abdomen	Progesteron Estrogen	Growth of the uterus development of mammary glands control of menstrual cycle
Testies	Scrotal sacs	Testosterone	Development of secondary sexual characters in males.
Adrenal gland	above the kidney	Adrenalin	Increase in heart beat, Rise in blood Sugar, Dialation of coronary artery
Pancreas	Near deuodenum	Insulin	Decrease of sugar levels in blood.
		Glucagon	Increase of Sugar levels in blood.

Feedback Mechanism:

Feedback mechanism is the mechanism of self-controlling. The mechanism which exists in our body to regulate the production and release of hormone in the body is feedback mechanism. This feedback mechanism plays an important role in bringing back

the increased metabolic rate by the secretion of hormone to normal rate. For example, Insulin releases more in blood when the sugar level is more than the normal value. When the sugar level in the blood comes to normal position the secretion of insulin decreases.

Control and coordination in plants

In plants nervous system and endocrine system are absent but there is a controlling mechanism by hormones. These hormones are called phytohormones. Plants can sense the presence of stimuli like light, hot water, touch pressure, chemical gravity etc. The hormones present in plants are called phytohormones. Phytohormones coordinate the activities of the plant usually by controlling one or other aspect of the growth of the plant hormones are called as growth substances. The first plant hormone Auxin was discovered by Went.

Phytohormones	Uses
Auxins	Cell elongation and differentiation of shoots and roots
Cytokinins	Promote cell division, development of sprouting of lateral buds, opening of stomata
Gibberellins	Germination of seed, sprouting of buds, elongation of stem development of seedless fruits. Breaking the dormancy in seeds and buds...
Abscicic acid	Closing of stomata, promoting seed dormancy promoting the aging of leaves
Ethylene	Ripening of fruits

Tropic and Nastic movements in plants:

The movement of individual parts of plants is possible when they are subjected to an external stimulus.

In plants there are two types of movements, they are tropic movement and nastic movement. In tropic movement the direction of stimuli determines the direction of the movements but where as in nastic movement the direction of movement may not be determined by direction of stimuli.

When we touch the leaflets of 'touch me not' plant they shrink. This type of movement is nastic movement.

The response of plant to light and showing movement towards light is called 'phototropism'.

Tendrils are thin thread like growth. They grow towards the support and wind around them. This type of response to make contact (or) touch is called ‘thigmotropism’.

Roots always grow towards the earth which is called ‘geotropism’.

The plants which grow near a rock or wall side, they grow towards region containing water. Such type of movement is called ‘hydrotropism’.

The chemical substance stimulates the pollen grain which falls on the stigma. This type of response to chemicals is called ‘chemotropism’.

Practice Questions

* Very Short Questions:

1. What is the function of cerebrospinal fluid?
2. Which part of the brain controls the body equilibrium?
3. Why endocrine glands are called ductless glands?
4. Give the examples for sex hormones in human beings?
5. What happens if more amount of adrenalin is secreted in the blood?
6. Give the example for mixed gland
7. Draw the well labelled diagram of synapse and explain its function
8. What happens if potted plant is kept near the window? Which side it grows?
9. Write the difference between Nastic movement and trophic movement.

* Short Questions:

1. What is the difference between sensory nerve and motor nerve?
2. Explain the autonomous nervous system with the help of an example.
3. Explain the Reflex arc with the help of diagram.
4. Explain the different types of trophic movements in plants with suitable examples.
5. Write any four questions which you would like to ask your teacher to know about ‘feedback mechanism’.
6. Prepare a table showing the different types of phyto hormones and their uses in plants.
7. Explain the structure of Nerve cell with the help of a diagram.

* Essay Type Questions:

1. Explain the structure of Human Brain with the help of a diagram.
2. Explain the functions of various parts of the brain.

3. Observe the following table of endocrine glands and answer the questions given below

Name of the endocrine gland	Location	Hormones secreted	Response of body to hormones
Pituitary gland	Floor of the brain	Somatotrophin Gonadotrophin	Growth of the bones Activities of ovaries and testis
Thyroid gland	Neck	Thyroxin	General growth rate and metabolic activities
Ovaries	Lower abdomen	Estrogen	Controls menstrual cycle
Testis	Scrotal sacs	Testosterone	Development of secondary sexual characters
Adrenal gland	Attached to kidneys	Adrenalin	Increase of heart-beat rise in blood sugar

- Identify the sex hormone which is found in females?
 - Which hormone plays an important role in the development of secondary sexual characters in male?
 - Where the pituitary gland is located?
 - Name the endocrine glands which secrete Thyroxin and Adrenalin hormones.
4. Observe the following table and answer the following questions.

Phytohormones	Uses
Auxins	Cell elongation and differentiation of shoots and roots
Cytokinins	Promote cell division, development of sprouting of lateral buds, opening of stomata
Gibberellins	Germination of seed, sprouting of buds, elongation of stem development of seedless fruits. Breaking the dormancy
Absciscic acid	Closing of stomata, seed dormancy
Ethylene	Ripening of fruits

- Which phytohormones help in the growth of the plant?
- Which hormone ripens the nuts?
- What are the uses of cytokinins?
- Which hormone enhances seed dormancy? Which hormone works against it?

*** Multiple Choice questions:**

- The total no. of Cranial nerves present in human being is ()
 A) 12 pairs B) 43 pairs C) 33 pairs D) 10 pairs
- Identify the correct pair ()
 A) Pituitary-Thyroxine B) Adrenalin-Testosterone
 C) Ovary-Estrogen D) Pancreas-Gonadotrophin

3. Identify the nerve cell type ()



A) Motor nerve B) sensory nerve C) mixed nerve D) Association nerve

4. Match the following ()

- | | | |
|-----------------|-----|----------------|
| a) Phototropism | () | i) Gravity |
| b) Geotropism | () | ii) Light |
| c) Hydrotropism | () | iii) Chemicals |
| d) Chemotropism | () | iv) Water |

A) a-ii, b-iii, c-i, d-iv B) a-ii, b-i, c-iv, d-iii C) a-i, b-ii, c-iii, d-iv D) a-iii, b-iv, c-ii, d-i

5. Mixed gland is ()

A) Pituitary B) Adrenalin C) Pancreas D) Thyroid

6. Identify the incorrect pair ()

- | | |
|---------------------------|----------------------------------|
| A) Mid brain - cerebrum | B) Forebrain - diencephalon |
| C) Hindbrain - cerebellum | D) Hind brain - Medullaoblongata |

7. Auxins were discovered by ()

A) Charles Darwin B) Francis Darwin C) FW went D) Mendal

8. Islets of Langerhans are present in ()

A) kidney B) liver C) Pancreas D) Trachea

9. Growth hormone is secreted by ()

A) Pitutary gland B) Andrenal gland C) Pancreas D) Testis

10. Parts of the central nervous system ()

- | | |
|--------------------------|----------------------------------|
| A) Brain, Cranial nerves | B) Spinal cord, Spinal nerves |
| C) Brain, Spinal cord | D) Cranial nerves, Spinal nerves |

CHAPTER

6

Reproduction

Reproduction is a necessary life process for continuation of life by producing offspring.

Modes of reproduction:

There are two forms of reproduction: They are asexual and sexual.

Asexual reproduction involves one parent and produces offspring that are genetically identical to each other and to the parent without involving male and female gametes. It includes different types, they are Fission, Budding, Fragmentation, Parthenogenesis, Regeneration, Vegetative Propagation and Sporogenesis.

Fission:

In this process, an organism divides into two or more parts and each part develops into a that new organism resembles the parent organism. In binary fission parent cell divides into two and in multiple fission it splits into many daughter cells. Ex: Single celled organisms like Bacteria, Paramecium etc.

Budding:

A new organism develops as an outgrowth or bud due to cell division from one particular site of the parent cell or body. At maturity, the bud detaches from the parent body and becomes an independent individual Ex:- Yeast, Hydra.

Fragmentation:

When a filamentous organism splits into pieces, each fragment develops into a mature organism Ex:- Spirogyra, lichens and flatworms.

Parthenogenesis:

The process of development of young ones from unfertilized gametes is called parthenogenesis. In these organisms the fertilized ovum (zygote) develops into female and unfertilized ovum develops into male. In this process the sperms develop by mitotic division in male, whereas ova develop by meiotic division in females Ex:- Spirogyra, honeybee, ants.

Regeneration:

The ability of an organism to give rise to a new individual from their body parts is called regeneration. These body parts can regenerate into a complete organism Ex:- Planaria .

Vegetative propagation:

Plants propagate by their vegetative parts like roots, leaves and stem structures. They may propagate naturally or artificially.

A. Natural propagation:

It occurs through specialized structures of a mature plant roots, leaves and stem structures like rhizomes, corms, bulbs, tubers, runners, stolons show such propagation.

Root buds: Sweet potato, Guava, Millingtonia, Murraya (Curry leaves) give rise to a new plant from root buds.

Leaf buds: In Bryophyllum leaves develop small buds with adventitious roots at the margins, which later give rise to a new plants.

Stem structures: The stem structures like Rhizome in Ginger, Corm in Colocasia, Bulb in Onion, Stem tubers in Potato, Runners in grasses, stolons in Jasmin and Strawberry help in vegetative propagation.

B. Artificial Propagation:

Cuttings: A piece of the stem or branch having bud is cut off from the parent plant. When the lower part of such cutting is buried in moist soil, it grows as an individual plant after developing roots. Ex. Rose, Hibiscus.

Layering: A weak lateral branch of the plant with at least one node is bent towards the ground and covered with moist soil. After few days adventitious roots develop from that branch, then it is cut off from the parent and grown as a new plant. Ex: Nerium, Jasmine.

Grafting: It is a technique where two plants with desirable characters are joined to continue their growth as a single plant. The grafted upper part is called the scion and the lower part- which forms the roots is called stock. Plants with desirable characters can be produced. Grafting is commonly used in cultivation of flower and fruit yielding plants.

Sporogenesis (Spore formation):

The spores are formed from sporangium, released after bursting the spongia and germinate on reaching suitable substratum in favourable conditions and develop to form a new individual. Ex: Fungi like Rhizopus, Mucor, few Bacteria, Moss and fern plants reproduce by asexual spores.

Observing spores in fungus (Rhizopus).

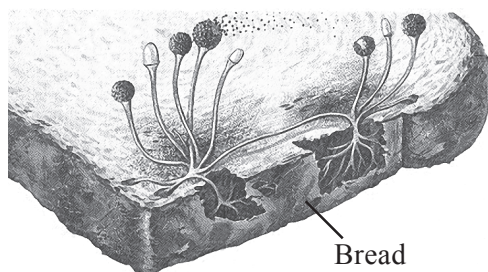
Aim: To examine mycelial hyphae, sporangia, spores of Rhizopus.

Material required: Soft rotten bread or fruit or vegetable, polythene bag, Plain glass slide, coverslip, water, disposable gloves.

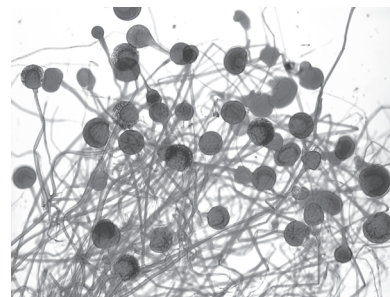
Procedure:

- Leave the bread in the open air for an hour. Place the bread in a plastic bag, sprinkle water over it to have dampness, then seal the bag, Place the bag in a dark, warm place. Mold would start growing in 2-3 days.
- Using a toothpick, scrap very little of the mold and place it on the slide and add a drop of water.
- Place a cover slip on the specimen without trapping air bubbles underneath.
- Use a tissue paper to remove excess water at the edges of the cover slip and view the slide under a compound microscope.

Observations: Fine thread like structures called mycelial hyphae and on a small erect hyphae knob like structures called Sporangia are seen. Each sporangium contains hundreds of minute spores.



Rhizopus growing on bread

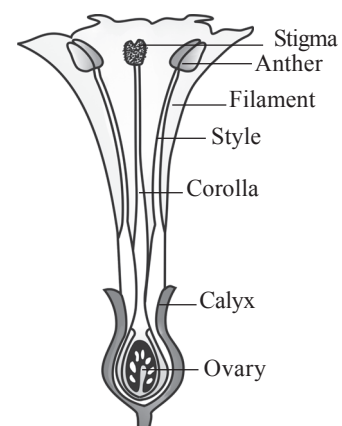


Rhizopus mycelium seen under microscope

Sexual reproduction in flowering plants:

Flower - The reproductive part.

The typical bisexual flower has sepals, petals, stamens and carpels. Sepals and petals are non-essential parts. Stamens are male parts and are called androecium, produce male gametes in the form of pollen grains. Carpel is the female portion called Gynoecium. It has three main parts called ovary, style and stigma, produces ovules inside the ovary.



Parts of a flower

Pollination:

Transfer of pollen grains from anther to stigma of the flower is called pollination. It is of two types. They are;

Self-pollination: In this pollen grains are transferred to stigma of the same flower

Cross pollination: In this Pollen grains are transferred to the stigma of another flower of the same plant or different plant of the same species.

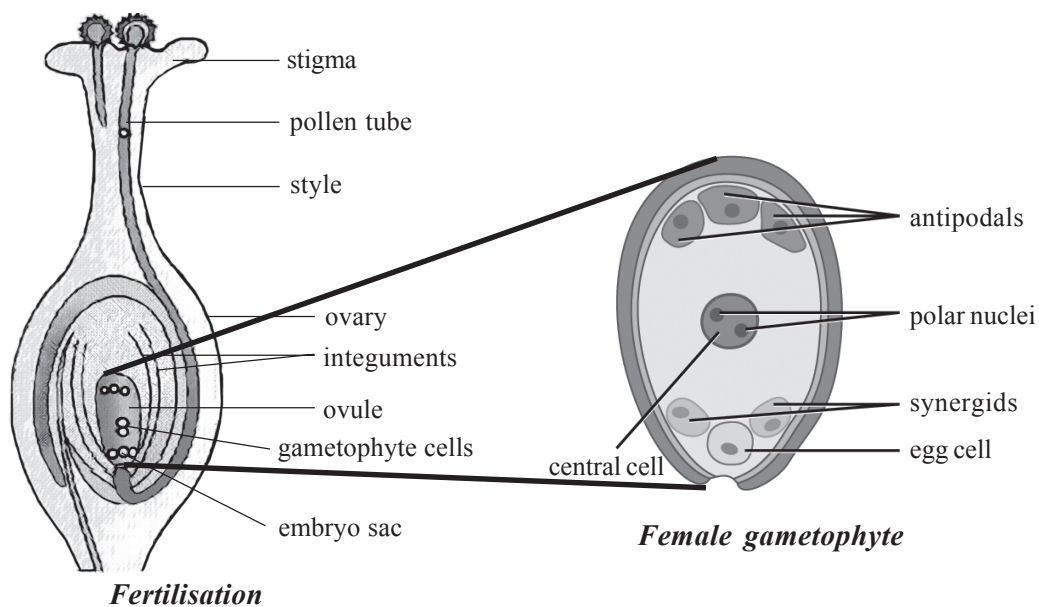
Double fertilization - Triple fusion:

After pollination, pollen grains germinate on stigma to produce pollen tube and grow through the style to reach the ovule. The pollen grains are with two male nuclei. The ovule is attached by a stalk to the inner side of the ovary. Each ovule has microscopic embryo sac. It has 7 cells, 8 nuclei.

Pollen tube carries 2 male nuclei. One fertilizes the egg cell, forming a diploid zygote, it develops into an embryo. The other male nucleus fuses with the two polar nuclei (secondary nucleus), forming a triploid cell that develops into the endosperm. Because of two fertilizations, it is known as double fertilization.

1st male nucleus + Egg Cell → Zygote → Embryo (contained in a Seed) → New plant

2nd male nucleus + Secondary nucleus → Endosperm



Post-fertilization changes:

After fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and converts into a seed. The ovary grows rapidly and ripens to form the fruit. Meanwhile the other floral parts may shrivel and fall off.

Reproduction in Human beings:

Male reproductive system:

Male reproductive system has (1) a pair of testes, (2) vasa Efferentia, (3) a pair of Epididymis, (4) a pair of vasa Deferentia, (5) a pair of Seminal vesicles, (6) Ejaculatory duct, (7) Prostate gland, (8) a pair of Cowper's glands, (9) Urethra.

Testis are located in the scrotum, hangs outside the body and maintains temperature suitable for sperms. Each testis has highly coiled seminiferous tubules, in which millions of sperms are formed by meiosis.

Epididymis stores sperms temporarily.

Vasa Efferentia; Vasa Deferentia- Are long, thin tubules that serve as a passage for sperm.

Cowper's Gland, Prostate Gland, Seminal vesicles: Secrete fluids that stimulates, nourishes, neutralize the acidity and enables the sperm to move.

Ejaculator duct and Urethra: Two ejaculatory ducts join at the center of urethra.

Urethra transports not only urine but also sperms. It is also called as urino-genital duct.

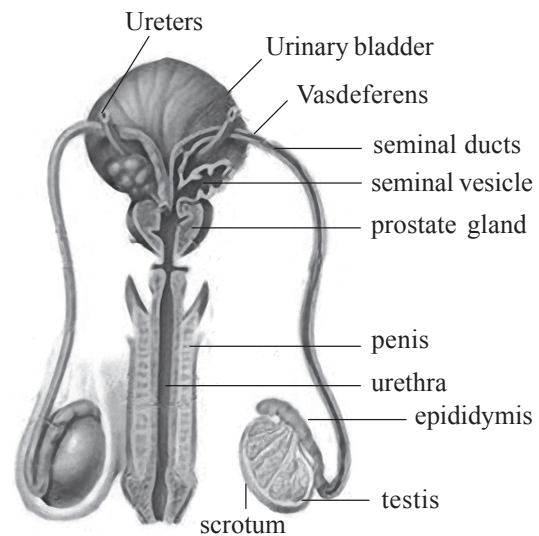
The passage of spermatozoa: Seminiferous tubules → vasa Efferentia → epididymis → vasa deferentia → ejaculatory duct → urethra.

The sperm: The sperm has a head which bears acrosome. It helps the sperm to penetrate into the ovum. The head has male nucleus. It fuses with the female nucleus. Head and middle piece are attached by neck. Mitochondria of middle piece produce energy for the movement of the sperm. The tail helps the sperm to propel.

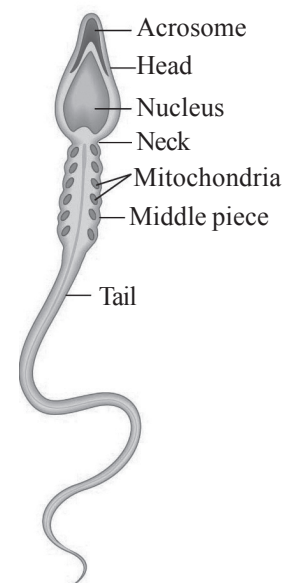
Female reproductive system: The parts of the female reproductive system are (1) a pair of ovaries, (2) a pair of fallopian tubes, (3) uterus, (4) vagina and the functional mammary glands.

Ovaries: The ovaries are located in the abdominal cavity. The ova develop in tiny cellular structures called graafian follicles. Each follicle contains a single ovum formed after meiosis. When ovum mature, the follicle ruptures and releases the ovum. It is called ovulation.

Fallopian tubes: Generally, the ovum enters the widened funnel of an oviduct (fallopian tube), a tube that carries ovum to the uterus. Fertilization occurs as the ovum passes through the fallopian tubes, thus forming zygote. The zygote undergoes mitotic division while travelling down in the fallopian tubes and reaches the uterus and transforms into a solid ball of cells.

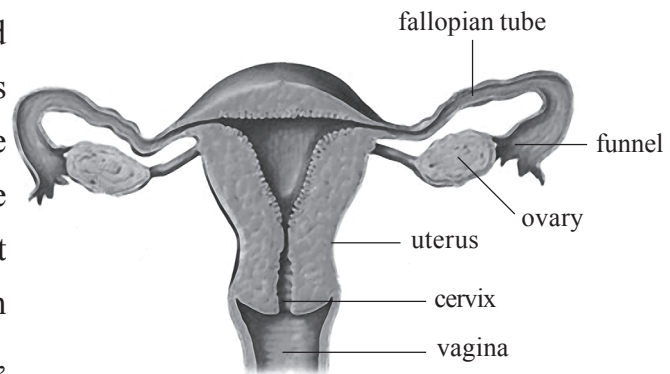


Male reproductive system



Sperm cell

Uterus: It is inverted pear-shaped structure. The inner layer of uterus is called endometrium. It receives the embryo. If there is no fertilization the endometrium disintegrates and flows out as menstrual fluid. If there is fertilization the thickness of endometrium continues, it provides nourishment to the developing embryo.



Female reproductive system

Pregnancy [Gestation period]: it is the period in which a foetus develops inside a woman's womb or uterus. The embryo attaches to the soft tissues of the uterus, This is called as implantation of an embryo. Certain cells of the embryo develop into membranous structures called chorion, amnion, allantois, yolk sac. These layers nourish, protect, and support the developing embryo. Placenta is a tissue formed by the cells of foetus and the mother. Amnion join at the cord of allantois to form long tube called umbilical cord. Pregnancy lasts, on an average 9 months [40 weeks or 280 days]. This period is called gestation period.

Vagina: It is the outer canal of the female reproductive tract. During the delivery the baby is pushed out of the body through the vagina.

Mammary Glands: During the end of pregnancy, a watery yellowish lymph like fluid called 'colostrum' accumulates in the mammary glands. For the first few days after the baby is born, the mammary glands secrete only colostrum. It is very important to feed colostrum to the new born baby. It helps in developing the immune system of the child. After this milk is secreted. In mother when production of milk stops menstrual cycle will resume.

Birth control methods:

They are used to prevent unwanted pregnancy. Surgical methods of birth control are available for males as well as females. In males a small portion of sperm ducts is removed called vasectomy. In females a small portion of oviducts are removed called tubectomy.

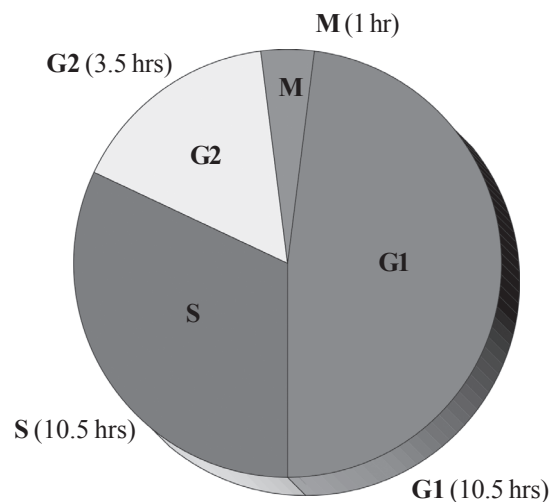
Reproductive health:

Physical devices such as condoms and diaphragm (cap) prevent fertilisation and also STD like Gonorrhoea, Syphilis and HIV-AIDS. Every year 1st December is considered as AIDS Awareness Day.

Cell division

According to cell theory cells arise from pre-existing cells, indicates the importance of cell division in the creation of new cells. It is the process by which a cell divides into two or more daughter cells.

Cell cycle: Cell cycle is a series of events that takes place in a cell as it grows and divides. It has two stages. They are 1. Interphase 2. Division phase. A cell spends most of its time in interphase, it replicates its chromosomes, and prepares for cell division. The cell cycle has the following phases



Cell cycle

Types of cell divisions: It is 2 types; they are Mitosis and Meiosis.

MITOSIS: It is somatic division. 2 daughter cells are produced. Both are genetically identical to the parent cell.

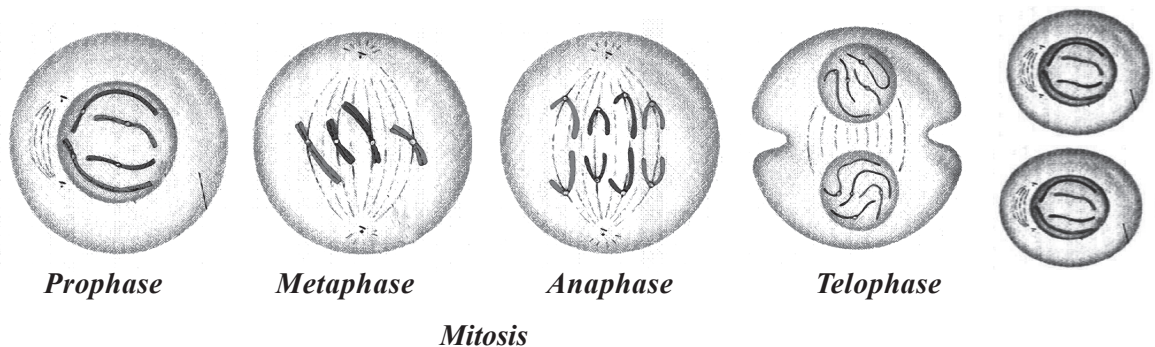
Interphase: It's a longest phase. All the materials required for division are prepared in this phase. cell shows large nucleus and dense cytoplasm, It has 3 stages, they are;

- i) G1 Stage- cytoplasm and organelles are synthesized, the cell size increases during this phase.
- ii) S Stage- DNA Synthesis stage, leads to duplication of chromosomes.
- iii) G2 Stage- all the proteins necessary for division are synthesised.

Mitotic phase: It has two divisions. They are Karyokinesis and Cytokinesis.

Karyokinesis: Division of the nucleus is called as 'karyokinesis'. It has four phases. They are; prophase, metaphase, anaphase and telophase.

1. Prophase: Chromatin condenses to form visible chromosomes. Centrosome divides into centrioles and forms the ends of spindle fibers. Chromosomes split length-wise to form chromatids.



2. Metaphase: Chromosomes are now lined up at the equator. Spindle apparatus is clearly seen between the opposite poles and spindle fibres attached to Centromeres.

3. Anaphase: It occurs rapidly. Centromeres split, separating chromatids as a result Daughter chromosome are formed. Spindle fibres pull daughter chromosomes (sister chromatids) to opposite poles of the cell.

4. Telophase: The daughter chromosomes arrive at both the poles, of the cell. Nuclear membrane is resynthesized around each set of daughter chromosomes. Nucleoli re-appear in each daughter nuclei. As a result, two nuclei are formed at both poles of a cell. Daughter chromosomes elongate, become invisible due to decondensation, forming chromatin.

Cytokinesis: Division of the cytoplasm is called as cytokinesis. As soon as the telophase completed, the remnants of spindle fibres and Golgi complex reach the cell plate and produce cell wall materials where the parent cell divides into two daughter cells. In plant cells cell plate, in animal cells, cleavage furrow forms at the equator to divide cell during cytokinesis.

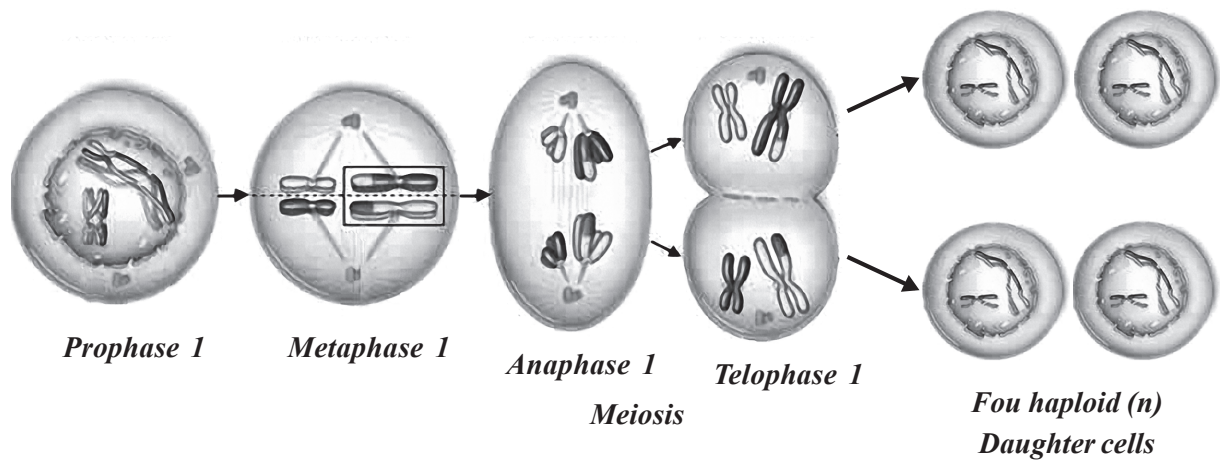
Meiosis

It is a reproductive division, by the process of meiosis 4 daughter cells are produced. Chromosomes in the daughter cells are reduced to half. Haploid gametes or spores are formed from a diploid parent cell.

It has two nuclear divisions. 1st nuclear division is Meiosis-I and 2nd is Meiosis-II.

Meiosis-I is a reductional division in which '2n' parent cell divides into 2 haploid (n) daughter cells.

Meiosis-II is like mitosis, in this division 2 haploid (n) daughter cells of Meiosis-I undergoes one mitosis. As a result FOUR haploid (n) daughter cells are formed at the end of meiosis.



Comparison of Cell Divisions

	Mitosis	Meiosis
Number of divisions	1	2
Number of daughter cells	2	4
Genetically identical	Yes	No
Chromosome Number	Same as parent	Half of the parent
Where	Body cells	Germ cells
When	Throughout life	At sexual maturity
Role / Significance	Growth, Repair	Maintains constant number of chromosomes

Practice Questions

* Very Short Questions:

1. What would happen if, organisms do not reproduce?
2. When does parthenogenesis occur. Give examples.
3. What would happen if meiosis fails to occur in sexually reproducing organisms?
4. What precautions will you suggest to prevent sexually transmitted diseases?
5. How does the repair of worn-out parts take place in multicellular organisms?
6. What are the different artificial vegetative propagation methods used in plants?

* Short Questions:

1. Write the differences between grafting and layering.
2. What are the advantages of grafting?
3. Name the plants which propagate vegetatively by stem structures?
4. Name some important crop plants of daily life, which can be cultivated by using their vegetative parts?
5. Write the differences between regeneration and fragmentation.
6. Write the differences between mitosis and meiosis.
7. Explain the structure of human sperm.

* Essay Type Questions:

1. Draw a neat labelled diagram of human female reproductive system and explain.
2. Write the apparatus used and procedure followed to observe the sporangia of *Rhizopus* in the laboratory.
3. Draw the labelled diagram of a bisexual flower and explain briefly about each part.
4. Explain the double fertilization and triple fusion in angiosperms.

* Multiple Choice questions:

1. Identify the plant which propagates by root. ()
A) Potato B) Sweet potato C) Ginger D) Onion
2. Identify the method of asexual reproduction in yeast from the following ()
A) Binary fission B) Parthenogenesis C) Budding D) Spore formation
3. Identify the stage of cell cycle in which DNA replicates? ()
A) Interphase B) Prophase C) Metaphase D) Anaphase

4. Match the following ()
- | | | |
|--------------|-----|------------------------------------|
| 1. Prophase | () | a) Nuclear membrane synthesized |
| 2. Metaphase | () | b) Daughter chromosomes are formed |
| 3. Anaphase | () | c) Nuclear membrane disintegrate |
| 4. Telophase | () | d) Alignment of chromosomes |
- A) 1-c; 2- a; 3- d; 4- b C) 1-d; 2- a; 3- b; 4- c
 B) 1-b; 2- d; 3- a; 4- c D) 1-c; 2- d; 3- b; 4- a
5. The number of cells and nuclei in the embryo sac ()
 A) 7cells, 8 nuclei B) 8cells, 7 nuclei C) 1cell, 3 nuclei D) 3cells, 8 nuclei
6. Which part of the male reproductive system stores the sperm cells? ()
 A) Vasa Efferentia B) Epididymis C) Seminiferous tubules D) Seminal vesicles
7. Identify the diploid structure of flowering plants from the following ()
 A) Pollen grain B) Embryo C) Endosperm D) Embryo sac
8. One of the following organism does not reproduce by binary fission. ()
 A) Amoeba B) Spirogyra C) Euglena D) Paramecium
9. Which of the following is a parthenocarpic fruit? ()
 A) Dates B) Almonds C) Banana D) Coconut
10. Identify the surgical method of contraception in females ()
 A) Hysterectomy B) Copper - T C) Vasectomy D) Tubectomy

CHAPTER



Heredity and Evolution

We find different living organisms in the world around us. We see variation and similarities among them. Differences in characters within very closely related groups of organisms are referred to as variations. Passing of characters or traits from parent to offspring is called heredity. The process in which traits or characters are passed from one generation to another generation is called inheritance.

Gregor Johann Mendel did many experiments on pea plants to explain how characters and variations are passed from one generation to another.

Mendel reasons to choose pea plant for his experiments

Mendel chose the pea plant for his experiments. Because of the following advantages.

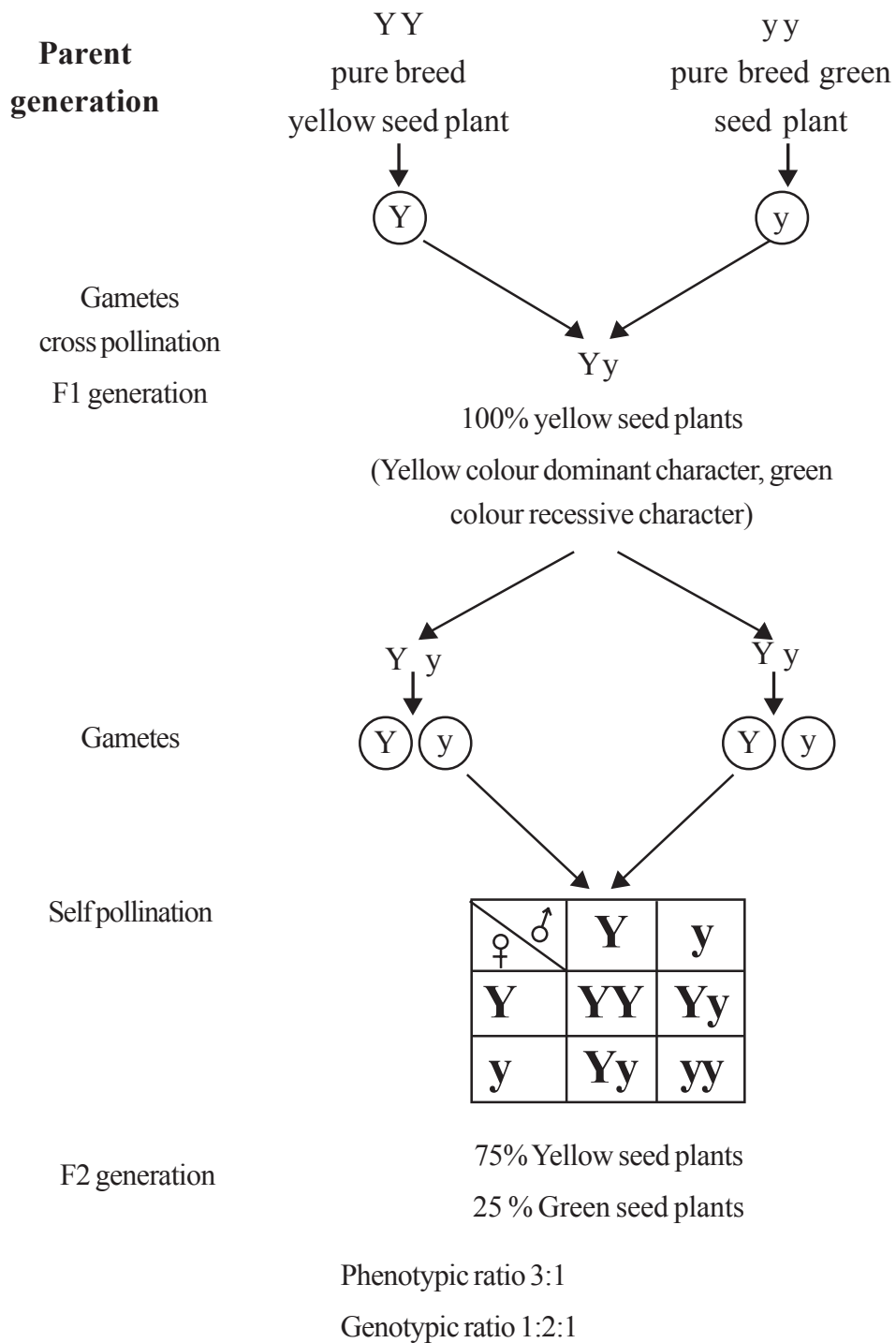
- having well defined characters
- Predominantly self pollinating plant
- It is an annual plant
- having Bisexual flowers
- Suitable for cross pollination

Mendel chose 7 pairs of contrasting characters in pea plants for his study. They are color of the flower, position of the flower, color of the seed, shape of the seed, shape of the pod, color of the pod, length of the stem.

Mono hybrid cross

- Mendel selected one character of pea plant and examined how that character is passed to next generation.
- When a pure breed yellow seed pea plant is cross pollinated with pure breed green seed pea plant (parent generation) in the first generation (F₁) all the pea plants were with yellow seeds.
- When these plants are self pollinated in F₂ generation. 75% yellow seed pea plants and 25% green seed pea plants were found it is in the ratio of 3:1.
- Based on these results Mendel hypothesized some factors. Every character has factors, which are called alleles.
- If these factors are of same type, they are homozygous or if the factors are of different type then they are referred to as heterozygous.

- In F1 generation all pea plants are with yellow seeds, this character is called dominant character and the green seed character which did not express is called recessive character.
- In F2 generation 75% are yellow seed producing pea plants and 25% are green ones. This is known as phenotype and this ratio is called phenotype ratio, It is 3:1. Based on the factors genetic constitution it is 1:2:1 ratio. It is known as genotypic ratio.



YY, yy are homozygous; Yy are heterozygous

Mendel's Laws of Inheritance

Mendel proposed laws of inheritance which include law of dominance, law of segregation, Law of Independent Assortment.

Law of Dominance: Out of two factors which are responsible for a character, only one factor is expressed in F1 generation and other factor remains recessive (or) suppressed, this is the law of dominance.

Law of Segregation: The alleles received from the parents get separated and each one enters into a separate gamete (sperm, ovum) randomly is called law of segregation.

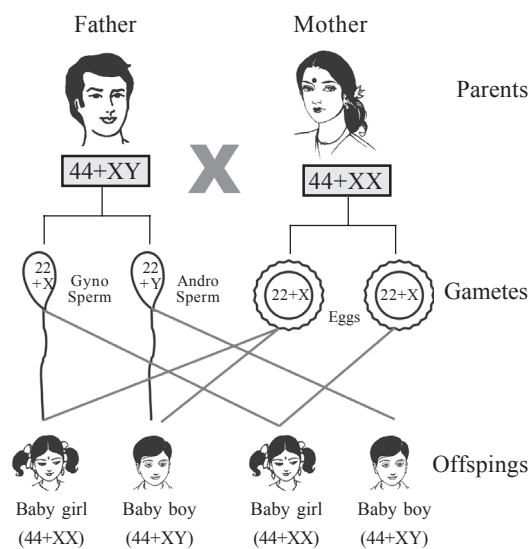
Law of Independent Assortment: When two different characters pass from parent generation to next generation one character of it except the opposite character does not show influence on any other characters. This is law of independent assortment.

Sex Determination in Human Beings:

- Each human cell contains 23 pairs of chromosomes. Out of 23 pairs 22 pairs of chromosomes are autosomes and one pair are Allosomes (or) sex chromosomes. Sex chromosomes are two types one is 'X' and other is 'Y'.
- Females have XX chromosomes, where as males have XY chromosomes. Female gamete (ova) have only one X chromosome. Male gamete (sperm) have two types of chromosomes, one with X chromosome and other with Y chromosome.
- If a sperm carries X chromosome fertilizes the ovum with X chromosome results in a baby girl. If a sperm carries Y chromosome fertilizes the ovum with X chromosome results in a baby boy.

Who determines the sex of the baby - mother or father?

Observe the flowchart below



We can observe from the above flowchart that chromosomes in the sperm of the father plays an important role in the sex determination of the baby. So, father is responsible for the birth of a baby girl or a baby boy.

EVOLUTION:

From ancient times it is believed that living things do not change and remain the same forever. But some scientists, after much research have proposed theories of evolution.

Inheritance of acquired characters proposed by Jean Baptist Lamarck (Lamarckism):

According to lamarcks theory, at some point of time in the history the size of giraffe was equal to that of deer. He thought that due to the shortage of food materials on the ground and to reach the lower branches of trees giraffes started stretching their necks. Because of continuous stretching of neck, after several generations giraffes developed long necks. Such characters that are developed during the lifetime of an organism for its need and survival are called acquired characters and passing of acquired characters to its offsprings (next generation) is the "Inheritance of acquired characters", proposed by lamarck.

August Weismann Experimental Results on Rats Tail:

August weismann removed tails of parental rats and observed that their offsprings are normal with tails. He has done it again and again for 22 generations but still offsprings are normal with tails. He disproved lamarck's theory "Inheritance of acquired characters" saying that the bodily changes caused due to the surroundings are not inherited to their offsprings.

Theory of Natural selection proposed by Charles Darwin (Darwinism)

Charles Darwin proposed 'Natural Selection' theory:

- It states that the nature itself decides which organism should survive or perish from it.
- The organisms with useful traits will survive. Nature selects the one who survives. The organisms with unfavourable traits will perish from its environment.
- Each species tend to produce large number of offsprings. They compete with each other for food, space, mating and other needs. Sometimes they have to compete with other species for survival. In this struggle for existence, only the fittest can survive. This is called 'struggle for existence'.
- In a population when there is a struggle for the existence the fittest will be survived. Nature favours only useful variations. Surviving in the struggle for life is called 'survival of the fittest'.

- The offsprings of survivors inherit the useful variations, and the same process happens with every new generation until the variations becomes a common feature.
- Above a long period of time this leads to the formation of new species. This new species, is distinctly different from the original species.
- All species on the earth have evolved in the same way.
- Small changes within the species is known as "Micro evolution". Formation of new species is known as "Speciation" or "Macro evolution".

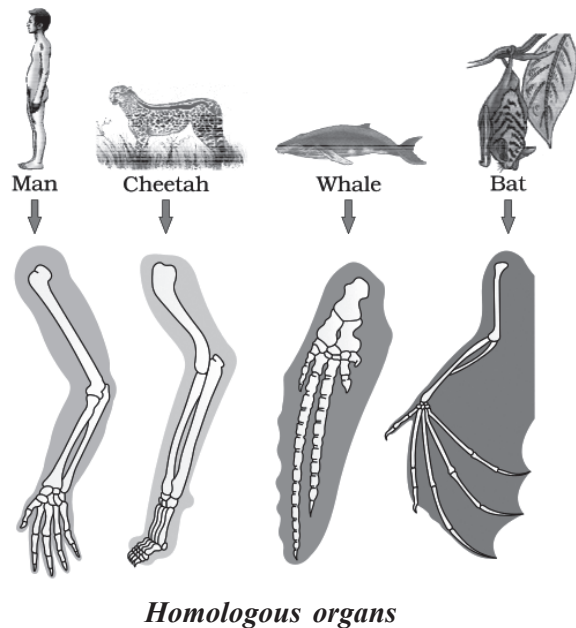
Evidences of Evolution:

Some evidences for evolution are currently available. Some of the examples are:

- Homologous organs
- Analogous organs
- Evidences from Embryology
- Fossils
- Vestigial organs

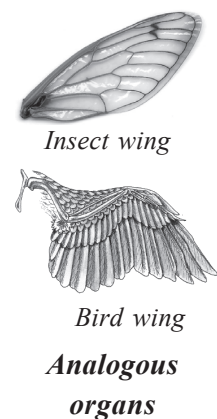
Homologous Organs:

Similar arrangement of bones in the forelimbs of organisms though their functions are different, these organs are called homologous organs, for example, flippers of whale (swimmer) wings of a bat (flyer) leg of a cheetah (runner) claw of a mole(digger) and hand of a man(grasping). Organs which are structurally similar and functionally different are called homologous organs. It indicates that all vertebrates have evolved from a common ancestor. This type of evolution is called divergent evolution.



Analogous Organs:

Organs which has structurally different but functionally similar are called analogous organs. For example, wings of insects and wings of birds are structurally different but both are used for flying, functionally similar, their origin is not common. This type of evolution is called convergent evolution.



Evidences from Embryology:

There are remarkable similarities in the embryos of different animals from fish to man. The resemblance is so close that at an early stage it is difficult to distinguish one embryo from the other. Even a tadpole larva of a frog resembles fish more than the frog. When we observe the life cycle, every organism exhibits the structural features of their ancestors. This indicates that all organisms have a common ancestor, from which all organisms have evolved.

Fossils:

If a dead organism as a whole or its body parts get caught in mud, they do not decompose quickly and the mud will eventually harden and retain the impression of the body parts of the organism. All such preserved traces of extinct organisms are called fossils.

Age and period of fossils is determined by radioactive isotopes of certain elements such as Carbon, Uranium, and Potassium. By calculating the half life of radioactive isotopes the age of fossils can be estimated.

Vestigial organs:

During the course of evolution some organs which are not useful, gradually disappear. Some organs which do not have any function, but still remain in the body of organism are called vestigial organs. Sometimes vestigial organs abruptly appear even in human beings. This phenomenon is called 'ATAVISM'. Ex: baby with tail. In human beings appendix has no role to play in the process of digestion. But in herbivores (rabbit, goat, horse) appendix plays an important role in digestion. There are nearly 180 such vestigial organs in human beings. Human being is said to be a moving museum of vestigial organs.

Practice Questions

*** Very Short Questions:**

1. Why Mendel chose garden pea plant as material for his experiments?
2. Write the Phenotypic, Genotypic ratio of Monohybrid cross
3. Write the questions you would ask your teacher to know about evolution
4. What would happen if evolution does not take place?

*** Short Questions:**

1. Who decides sex of the baby - mother or father explain?
2. Explain the inheritance of acquired characters proposed by Lamarck with examples.

3. Observe the table below and answer the following questions

$\frac{\text{♀}}{\text{♂}}$	Y	y
Y	YY	Yy
y	Yy	yy

i) YY, yy - Indicates which characters?

ii) Write phenotypic ratio of the above

4. Write the results of experiment conducted by August Weismann.

5. Explain the laws proposed by Mendel.

*** Essay Type Questions:**

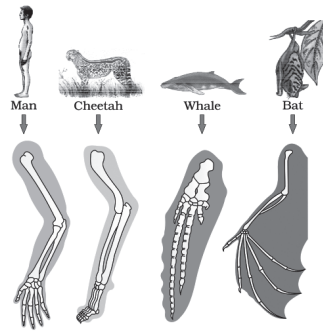
1. Explain monohybrid cross based on any one character.
2. Explain the evolutionary evidence with examples.
3. Explain the key points in the "theory of natural selection" proposed by Darwin.

*** Multiple Choice questions:**

1. Genotypic ratio of monohybrid cross ()
 A) 1:2:1 B) 3:1 C) 1:3 D) 2:1:1
2. Homozygous state of the following ()
 A) yy B) Yy C) yY D) Yr
3. The number of chromosomes in women is indicated as ()
 A) 44 + XY B) 22 + XY C) 44 + XX D) 23 + XX
4. Identify the incorrect statement ()
 A) Homologous, analogous organs both show convergent evolution
 B) Homologous organs show convergent evolution
 C) Analogous organs show divergent evolution
 D) Homologous organs show divergent evolution
5. Identify the correct pair ()
 A) Inheritance of acquired characters - August weismann
 B) Natural selection - lamarck
 C) Struggle for existence - Charles Darwin
 D) Speciation - Mendel

6. Identify the following picture ()

- A) Vestigial organs
- B) Analogous organs
- C) Fossils
- D) Homologous organs



7. Natural selection means ()

- A) Nature favours only fittest organisms
- B) Nature's reaction in living organisms
- C) Organisms produce more offsprings
- D) Ensuring that there are more trees in nature

Question Paper Pattern

Part - A :	Total Questions	Choice of Questions	Marks
Section - I	6	3	3 X 2 = 6
Section - II	4	2	2 X 4 = 8
Section - III	4	2	2 X 8 = 16
Total			30 Marks

Part - B :

10 Questions - 1 Mark Each : 10 X 1 = 10

TOTAL : 40 Marks