GASEOUS EXCHANGE Ch # 01

DETAILED QUESTIONS

Q.1. Define the gaseous exchange. How does gaseous exchange take place in plants?

Gaseous Exchange:

The process in which carbon dioxide and oxygen are exchanged between the environment and living organism is called gaseous exchange.

Gaseous exchange in plants:

All living organisms must need to exchange oxygen and carbon dioxide gases with their environment to carry out their vital functions such as respiration. In addition to respiration, photoautotrophs like plants do carry out gaseous exchange for the process of photosynthesis. Aquatic organisms exchange gases with water while terrestrial ones with air.

Plants exchange gases for the processes of photosynthesis and respiration. During the process of photosynthesis, carbon dioxide is taken in while oxygen is given out whereas in respiration, oxygen is taken in and carbon dioxide is given out. During daytime, green parts of the plants carry out the process of Photosynthesis to prepare complex food molecules (organic molecules) by utilizing simple molecules such as carbon dioxide gas and water. During this process, carbon dioxide gas is taken in while oxygen gas released as by product is given out. Respiration takes place in all living cells. It is the process in which food is oxidized to release energy. In aerobic respiration, it involves taking in of oxygen and given out of carbon dioxide. The process of exchange of gases in plants takes place mainly through minute openings called stomata present in leaves. The roots and stem do exchange gases for respiration.

Q.2. What are stomata? Describe the structure and mechanism of stomata.

Stomata:

The minute pores (Microscopic) which are present in large number in the epidermis of leaves and stem of plants through gaseous exchange takes place are called stomata. A single pore is known as stoma.

Structure of stomata:

A stoma consists of small opening surrounded by two kidney shaped guard cells. Guard-cells contain chloroplast, which control the opening and closing of the stoma. Inner wall of guard cell is thick and inelastic whereas outer wall is thin, elastic and permeable**.**

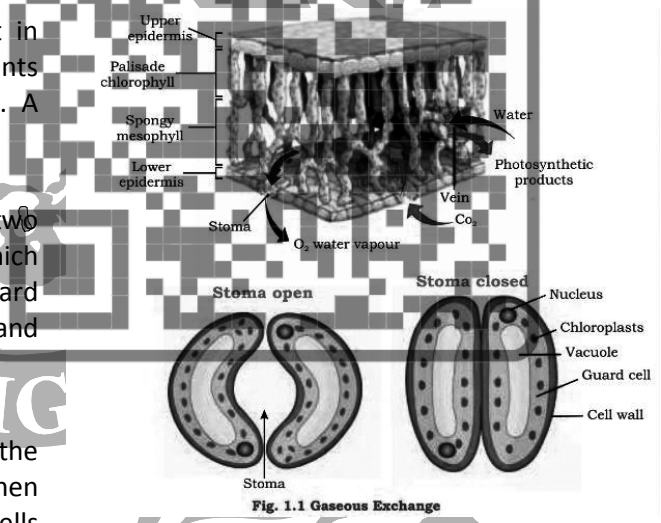


Fig. 1.1 Gaseous Exchange

Mechanism of stomata:

The opening and closing of stomata depends upon the change in the turgidity of their guard cells. Stomata open when the guard – cells are turgid and close when the guard cells flaccid. The turgidity of guard cells is regulated by the rate of photosynthesis in guard cells. Stomata open the guard cells are turgid. During daytime, as a result of ongoing process of photosynthesis, the accumulation of photosynthetic solutes causes increase in turgidity of the guard cells. Thus stomata are opened and the process of taking in of carbon dioxide and giving out of oxygen beings until it becomes dark.

Q.3. Define respiratory surface. Write its properties.

Respiratory Surface:

The area or place or organ in living organism through which exchange of gases take place is called respiratory surface.

Properties of respiratory surface:

The respiratory medium for aquatic animals is water whereas for terrestrial animals in air. The amount of molecular oxygen present in air is about 21% while in water it is about 5%. In order to exchange gases, animals have a respiratory surface. In unicellular organisms like protozoa, the plasma membrane serves as the respiratory surface. In multicellular animals, their body surface or some internal surface could serve as the respiratory surface.

- **Thin**
- **Wet**
- **Permeable**
- **Large in relation to the volume of the body.**

Proportion of Respiratory surface:

It must be sufficiently large enough to exchange gases for all the cells of the body. For example, the total surface area of the respiratory surface in human is about 20 times to the size of the body.

Q.4. Describe the respirator system of man in detail. "OR"
Discuss human respiratory system with the help of suitable illustrations.

Human Respiratory System:

The human respiratory system consists of following organs.

- **Nasal Cavity**
- **Pharynx**
- **Larynx**
- **Trachea**
- **Bronchi**
- **Lungs**

Nasal cavity:

Air from outside enters into the nasal sacs through external nostrils. This entire passage through which air passes is lined by mucous secreting ciliated cells. The internal surface has rich blood capillaries which turn the incoming air slightly hot. The hairs in nasal sacs as well as ciliated epithelial lining and mucous keep the air cleans by trapping and removing dust and germs. Then the air is pushed towards the pharynx.

Pharynx:

The part lies between mouth and oesophagus is called pharynx. Pharynx provides the muscular passage for air and food. Pharynx is common to both food and air.

Larynx:

The opening of trachea is called larynx. It is called sound box. It contains two pairs of fibrous bands called vocal cards. The opening of the larynx is called glottis having a cartilaginous flap like structure epiglottis which closes the glottis during swallowing of food and water.

Trachea:

The air then passes into a long wind pipe, the trachea about 12cm long. Trachea has C- shaped cartilaginous rings which prevent it from collapsing and it is opened all the time.

Bronchi:

Trachea in the center of the thorax bifurcates (divides) into two smaller ducts or bronchi (Singular bronchus). Each bronchus do have C-shaped cartilaginous rings. Bronchus of each side enters into the respective lung and it divides into many smaller branches or fine ducts called bronchioles.

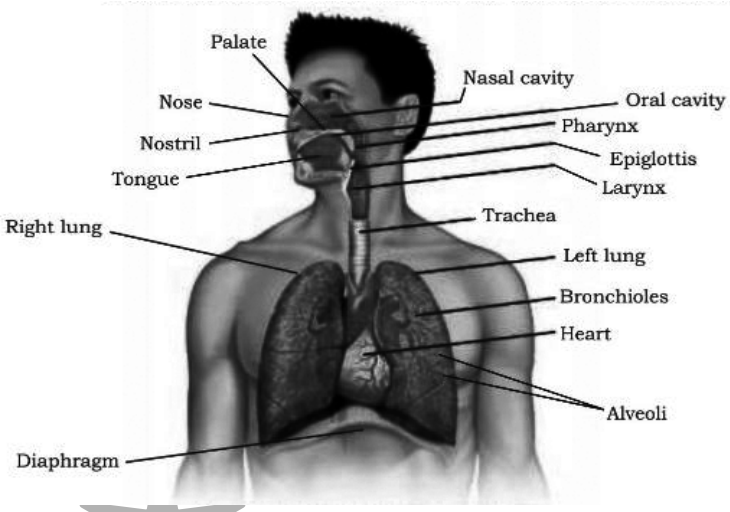
Alveoli:

At the end of each bronchiole is a bunch of tiny air sacs called alveoli. The alveoli make the respiratory surface. Each alveolus is a pouch like microscopic structure made up of only one layer of epithelial cells. It is enclosed by a dense capillary network. In each alveolus, exchange of gases takes place between air and blood.

Lungs:

Each lung is soft, spongy and pinkish in appearance. There are pair of lungs in the thorax cavity. Each lungs is wrapped in two pleural membranes. The space between pleural membranes is filled with fluid that acts like a lubricant. This makes the breathing movements easier. Lungs are enclosed in a bony cage made up of a flat sternum in front, 12 pairs of ribs from front to back where vertebral column is present. Ribs are attached with intercostals muscles. In the lower part of thorax, lies a sheet of muscles called Diaphragm which separates it from abdominal cavity. Each lung is made up of millions of alveoli. Palate

Q.5. Draw a neat and labeled diagram of the human gaseous exchange system OR respiratory system of man.



Q.6. Describe the process or mechanism of breathing in man "OR" Explain the process of ventilation in man.

Process of Breathing or Ventilation:

The respiratory surfaces are located deep inside the body in the lungs. So in order to perform exchange of gases, the air must first be brought into the lungs from the atmosphere. It is achieved through the process of breathing or ventilation. The movement of air in and out during breathing is called ventilation. The process of breathing consists of two phases.

Inspiration:

The process in which atmosphere air is taken into alveoli in the lungs is called inspiration. When breathing in or inspiration the muscles of the diaphragm contract, this pull the diaphragm downward making it flat. At the same time the intercostals muscles contract. This pulls the rib cage upwards and outwards. Together these movements increase the volume of the thorax. As a result, the pressure inside lungs decreases and the air rushes inside to fill and expands the lungs.

Expiration:

The process in which air moves out from the lungs is called expiration. When breathing out or expiration the muscles of the diaphragm relax, so that it springs back up into its dome shape. At the same time the intercostals muscles relax and the rip cage drops down again into its normal position. This decreases the volume of the thorax and increases the pressure upon lungs. This forces the air present in lungs to outside through the body.

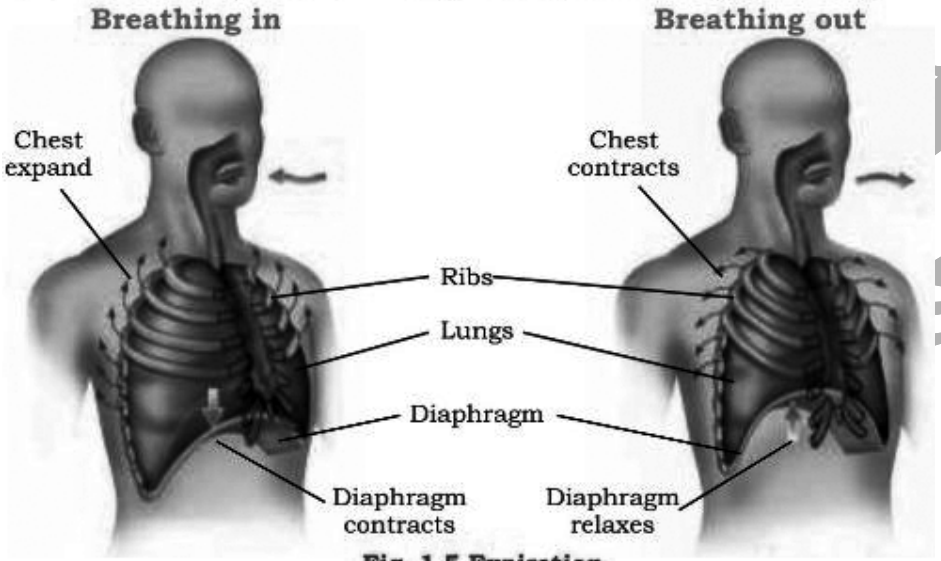


Fig. 1.5 Expiration

Q.7. Describe the process of gaseous exchange take place in lungs "OR" Drawing a chart the composition of exhaled air and inhaled air in human being.

Gaseous exchange in alveoli:

The gaseous exchange takes place at the level of alveoli. Oxygen brought in by air is taken up by the hemoglobin of RBCs of blood and vice versa the carbon dioxide brought by the blood is given out to the ai present in alveoli. This gaseous exchange involves diffusion which becomes possible at this level because both alveolus and blood capillaries are only one cell layered in thickness.

	Inhaled	Exhaled
Oxygen	About 21 %	16 %
Carbon dioxide	About 0.03 %	4 %
Nitrogen	78 %	78 %
Water vapours	Variable	Saturated
Temperature	Atmospheric Temperature	37 ^{o}C

Q.8. Write about the rate of breathing at rest and during exercise. "OR" Why and how lactic acid is a accumulated in muscles.

Rate of breathing at rest and during exercise:

Breathing is largely an involuntary process. It is regulated by hypothalamus of our brain. The rate of breathing changes automatically according to the changes in internal or external conditions. For instance, if a person is doing exercise, its rate of breathing would increase because of increased consumption of oxygen by his muscles. Thus gradually increase in concentration of carbon dioxide in his blood will cause an increase his breathing rate. If the exercise condition persists, the muscles cells will start breaking down glucose without oxygen. It is termed as "anaerobic respiration". As a result of this, lactic acid is formed in the muscles rather than carbon dioxide. It causes pain and cramp in normal muscles. The breaking down of lactic acid requires additional amount of oxygen which is termed as "oxygen debt". The extra amount of oxygen is obtained through deep breathes.

Artificial Ventilator:

A machine that works like lungs when patient's natural breathing becomes difficult. Through this machine, the oxygen rich air is directly supplied to the trachea through a tube inserted the mouth upto the wind pipe.

Q.9. Describe the respiratory disorders/defects of respiratory system.

Respiratory Disorders:

There are number of respiratory disorders which affect the people. Some important respiratory disorders are as under.

Bronchitis:

The inflammation of the air passage ways is termed as Bronchitis.

Causes of Bronchitis:

It is caused by smoking, bacteria, viruses etc.

Symptoms:

It is characterized by cough, mild wheezing, increased mucous secretion, shortness of breath and low fever.

Emphysema:

It is related to the destruction of the walls of alveoli. Lungs tissue breaks down in it, due to it air cannot be pushed out and is trapped in lungs.

Causes:

It is caused by industrial pollutants, chemical fume, and dust.

Symptoms:

It is characterized by laborious breathing, fatigue, cough with phlegm.

Pneumonia:

It is an infectious of lungs. If this infection affects both lungs is called is called double pneumonia. In pneumonia, the alveoli are infected so they may be filled with fluid or Pus. The breathing becomes difficult.

Causes:

It is usually caused by bacteria (streptococcus Pneumoniae), viruses (influenza virus) or fungi.

Symptoms:

The patient suffers from fever, cough with sputum, chill and chest pain.

Asthma:

It is form of allergy. It is an inflammatory condition of air ways of lungs, more mucous production and narrowing of the airway.

Causes:

Asthma is actually an allergic response to pollens, dust, smoke, fur, feathers and number of other substances. It may obstruct (Block) the air ways making it difficult to breath for its patient.

Symptoms:

It is characterized by shortness of breath, chest pain, fever, wheezing sound during expiration and couth.

Lung cancer:

Lung cancer is usually associated with smoking. Due to smoke or air pollution, abnormal cells appear in lungs which may spread to other tissues. The cells continue to divide without any control and form tumours.

Causes:

The main causes of lung cancer are smoking, radiation and viral infection.

Symptoms:

The major symptoms are cough with blood, shortness of breath, repeated lung infections, weight loss, bone ache, hoarseness (Dysphonia), weakness, fatigue, etc.

Q.10. What measures would you take to avoid respiratory disorders are as under.

Ans. The measures would we take to avoid respiratory disorders are as under.

- Avoid the Smoking.
- Reduce the air pollutants.
- Minimize exposure to outdoor and indoor air pollution.
- Prevent Infection.
- Get regular Check – ups.
- Eat healthy food and balance diet.
- Avoid exposure to people who have the flu or other viral infection.
- Exercise regularly.

Q.11. Prove with the help of experiment that CO_2 is released during respiration.

Apparatus:

- Test tube
- Delivery tube
- Double hole cork
- Lime water

Procedure:

- Take some lime water in test tube.
- Enclose the mouth of test tube by double hole cork.
- Pass the delivery tube through the cork.
- Breathe in and out through the delivery tube for 10 times.

Observation:

- Lime water turns milky due to the formation of in soluble calcium carbonate.

Result:

This experiment proves that CO_2 is released during respiration.

Q.12. Why smoking is dangerous? How it is related with respiratory disorders?

Ans. Smoking is harmful die to the chemicals in cigarette and smoke. It contains different chemicals which are dangerous and poisonous for us. It affects the whole body.

- It damages the air passage.
- It is also affected the circulatory system.
- It is also increased the chances of developing infections.
- Bronchitis, emphysema and lung cancer are caused by smoking.
- Smoking increases the risk of cancer of the nose, oral cavity, voice box, and throat.

SHORT QUESTIONS

Q.1. Why the stomata generally open during day-time?

Ans. Stomata are mouth-like cellular complexes at the epidermis that regulate gas transfer between plants and atmosphere. In leaves, they typically open during the day to favor CO_2 diffusion when light is available for photosynthesis, and close at night to limit transpiration and save water.

Q.2. Which parts of the plant intake CO_2 and give out O_2, take in oxygen and give out CO, during day-time?

Ans. The process of exchange of gases during day-time in plants takes place mainly through minute openings called stomata present in leaves.

Q.3. Why do we have to breathe through nostrils rather than oral cavity?

Ans. Nose breathing is more beneficial than mouth breathing. Breathing through your nose can help filter out dust, germs and allergens, boost your oxygen uptake, and humidify the air you breathe in. mouth breathing, on the other hand, can dry out your mouth. This may increase your risk of bad breath and gum inflammation.

Q.4. Differentiate between breathing, gaseous exchange and respiration.

Ans. For answer terminology and definition.

Q.5. Why do we deep breath during or immediately after exercise?

Ans. We deep breath during or immediately after exercise for the breaking of lactic acid which produces during the exercise. By deep breathing the additional amount of oxygen is entered into the lungs which break down the lactic acid.

Q.6. What is "oxygen debt"?

Ans. When insufficient oxygen is supplied by the lungs due to exercise or hard working, causing the muscle tissue to respire anaerobically with the production of lactic acid. The additional amount of oxygen which is required to remove the lactic acid, which is produced during exercise or hardworking is called the oxygen debt.

Q.7. Distinguish between inspiration and expiration.

Ans. For answer differences.

Q.8. What is lung cancer?

Ans. For Answer Q#9

Q.9. How the asthma is characterized?

Ans. It is characterized by shortness of breath, chest pain, fever wheezing sound during expiration and cough.

Q.10. Name five animals which use their body surface for gaseous exchange.

Ans. Earthworm, Hydra, tapeworms, sponge,

DIFFERENCES

#	PHOTOSYNTHESIS	RESPIRATION
1	It is an anabolic process.	It is a catabolic process
2	Synthesis of food from simple, inorganic substances.	Breaking down of food into inorganic substances.
3	It requires light energy.	It does not require light energy.
4	It occurs in plants.	It occurs in all living organisms.
5	Carbon dioxide gas is used in this process.	Carbon dioxide gas is released in this process.
6	Oxygen gas is released in this process.	Oxygen gas is used in this process.
7	It takes place during day-time.	It takes place all the times.
8	Chlorophyll is required.	Chlorophyll is not required.

#	Breathing	Cellular respiration
1	The exchange of gases which takes place through the respiratory surface is called breathing.	The oxidation of food which takes place within the cells by enzymes is called cellular respiration.
2	Enzymes are not required for the process of breathing.	Enzymes are required for the process of respiration.
3	It is carried out in two steps inspiration and expiration.	It is carried out in various steps inside the cell.
4	In this process energy is not released.	In this process energy is released.

#	Inspiration	Expiration
1	The process in which air is taken into the lungs is called inspiration.	The process in which air is taken forced out from the lungs is called expiration.
2	In this process rib cage move upwards and outwards.	In this process rib cage move downwards and inwards.
3	In this process thorax volume increases.	In this process thorax volume decreases.
4	Air pressure decrease in side thorax and lungs.	Air pressure increase in side thorax and lungs.
5	In this process muscles contract.	In this process muscles relax.

TERMINOLOGY AND DEFINITIONS

Photosynthesis:

The process by which plants make their food is called photosynthesis. In this process a plant can build sugar by taking carbon dioxide from air and water from the soil. Enzymes are needed for this purpose present in the cells and energy is trapped by chlorophyll from sunlight. Word photosynthesis composed of two words photo means light and synthesis means to prepare.

Equation: $6CO_2 + 6H_2O \xrightarrow[Chlorophyll]{Light} C_6H_{12}O_6 + 6O_2$

Stomata:

The minute pores which are present in large number in the epidermis of leaves and stem of plants through gaseous exchange takes place are called stomata. A single pore is known as stoma.

Aquatic Animal:

Those animals which live in water or different water forms are called aquatic animal.

Terrestrial Animal:

Those animals which live or spend their lives on land is called terrestrial animal.

Unicellular organism:

The organism that consists of a single cell is called unicellular organism.

Multicellular organism:

The organism that consists of multiple cells is called multicellular organism.

Respiratory surface:

The area or place or organ in living organism through which exchange of gases take place is called respiratory surface.

Bronchitis:

The inflammation of the bronchial tubes, which may be caused by smoking or by bacterial infection is called bronchitis.

Respiration:

The process in which exchange of gases takes place and energy is released by the chemical break down of food materials is called respiration.

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

Glucose + Oxygen $\rightarrow$ Carbon dioxide + Water + Energy

Breathing:

The breathing or gaseous exchange takes place through the respiratory surface by diffusion, either directly or through some transport medium like blood and does not involve any release of energy.

Cellular respiration:

The process in which oxidation of food takes place within the cells by the help of oxidative enzymes and energy is released is called cellular respiration.

Gaseous exchange:

The process in which carbon dioxide and oxygen are exchanged between the environment and living organism is called gaseous exchange.

Alveoli:

At the end of each bronchiole is a bunch of tiny air sacs called alveoli. Where gases are exchange takes place between blood and air.

Diaphragm:

It is dome-shaped, muscular and membranous structure that separates the thoracic (chest) and abdominal cavities in mammals; it is the principal muscle of respiration.

Ventilation:

The movement of air in and out during breathing is called ventilation.

Inspiration:

The process in which air is taken into the lungs is called inspiration.

Expiration:

The process in which air is taken forced out from the lungs is called expiration.

Anaerobic Respiration:

The primitive type of respiration which takes place in the absence of O_2 is called anaerobic respiration or fermentation. When the oxygen is not available organisms adapt this method to break down their food.

Aerobic Respiration:

This is the usual mode of respiration in plants and animals. It takes place in the presence of free oxygen the food is oxidized completely and releasing the maximum energy.

Oxygen debt:

When insufficient oxygen is supplied by the lungs due to exercise or hard working, causing the muscle tissue to respire anaerobically with the production of lactic acid. The additional amount of oxygen which is required to remove the lactic acid, which is produced during exercise or hardworking is called the oxygen debt.

Artificial Respiration:

The process in which patient is respired by a machine that works like lungs when patient's natural breathing becomes difficult. Through this machine, the oxygen is directly supplied to the trachea through a tube inserted the mouth upto the wind pipe.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. The biological functions which perform gaseous exchange:
   - Photosynthesis
   - Respiration
   - Both a & b
   - Growth
2. Plants do exchange of gases through:
   - Roots
   - Stomata
   - Stem
   - All of these
3. Each stoma is formed by:
   - One guard cell
   - Two guards cells
   - Three guard cells
   - Four guard cells
4. Respiratory surface possesses following property:
   - Thin and wet
   - Permeable
   - Very large
   - All of these
5. Inspiration involves:
   - Contraction of intercostals muscles
   - Contraction of diaphragm
   - Inward movement of ribs
   - Both a & b
6. Larynx is located on:
   - Lungs
   - Trachea
   - Bronchus
   - Bronchiole
7. The respiratory surface of human is:
   - Nostril
   - Bronchiole
   - Alveoli
   - Trachea
8. Increase in rate of breathing is due to the following:
   - Increase Co, in blood
   - Increase 0, in blood
   - Decrease CO, in blood
   - Decrease O, in blood
9. Which of the following disorder is associated with degeneration of alveoli?
   - Bronchitis
   - Lung cancer
   - Asthma
   - Emphysema
10. Which of the following disorder is associated with inflammation of air passage ways?
    - Bronchitis
    - Lungs cancer
    - Asthma
    - Emphysema

HOMEOSTASIS Ch # 02

DETAILED QUESTIONS

Q.1. Describe the adaption of plant for different internal conditions. "OR" Describe the three main aspects of homeostasis.

Adaptation of plant for different internal conditions:

There are three main aspects of homeostasis.

Osmoregulation:

It is the maintenance of internal water and salt conditions by osmosis.

Thermoregulation:

The maintenance of temperature within suitable limits where enzymes can work optimumly.

Excretion:

The process where metabolic toxic waste or excess metabolic substances from body i.e.NH3, Urea or uric acid, gums, latex etc.

Q.2. Describe the process of excretion or storage of CO_2.

Process of excretion or storage of CO_2:

At daytime plant perform photosynthesis in green cells and respiration in all living cells. The CO_2, produced in respiration utilized in photosynthesis. When rate of photosynthesis will be higher than respiration the plant gets extra CO_2, from air and release extra O_2, in air through stomata.

At night plant only perform respiration only CO_2, is produced which is removed by the process of diffusion through body surface. The green parts perform these gases exchange through stomata while non green parts perform this gaseous exchange through body surface.

Q.3. Describe the two ways / methods for removal of extra water in plants.

Removal of extra waters:

The plants removed extra water by two ways.

(a) Transpiration (b) Guttation

Transpiration::

Transpiration is the removal of water in the form of vapours from aerial part of plant. It occurs only at day time.

Guttation:

Guttation is the removal of water in the form of liquid from the margin of leaves through special pores, hydathodes. It only occurs at night when water pressure is high in leaves and low temperature environment is present.

Q.4. Which secondary products are produced by plant? Define them.
Write about the latex, resins and gums give examples.

Latex:

It is milky juice secreted by certain plants like Rubber plant which removes from scare like openings.

Resins:

They are chemically complex substances mostly found in stems of conifers (Pinus) which removes from scare like openings. They are yellowish solids.

Gums:

Some plants produce special types of gums for example Neem or Keeker etc. The extra amount of these are removed from special pores called lenticels.

Mucilaginous Material:

Some of these carnivorous plants and okra produce mucilaginous material to capture insects.

Q.5. Name the different types of plants on the basis of water and salt quantity. Define them and write their characteristics.

Types of plants on the basis of water and salt quantity:

The plants grow in different conditions of water and salts, on the basis of water and salt quantity there are four type of plants.

(a) Hydrophytes (b) Halophytes (c) Mesophytes (d) Xerophytes

Hydrophytes: (hydro = water; phyta = plants)

The plant which grow in fresh water; they live completely or partially in fresh water so called totally or partially submerged plants. They adapt the following characteristics for removal of excess water.

- These plants do not contain roots or have poorly developed roots.
- They have broad leaves if partially submerged and have stomata at upper epidermis e.g. water lilly.
- They may have thin and spongy tissues in leaves and stem in totally submerged plant e.g. Hydrilla.

Halophytes: (Halos = salt)

They grow in sea marshes or in saltish water. In salty condition water moves outside the cell which is not suitable for plants. To move water from outside to inside the plant develop following characters.

- Plants develop salt glands where plant store salts by taking it through active transport.
- Plants oppose salt to move outside from vacuole.
- Some salt accumulated at surface of leaf which attracts water from air.

Mesophytes:

The plants grow in moderate water containing soil they will develop following characters.

- They have developed root system which do not grow very deep.
- They have moderate (Medium/Average) sized leaves.

Xerophytes:

Plants grow in soil of low water quantity. They grow in desert or steep slopes or at high altitude. To conserve water and absorb proper amount of H_2O they develop following characters.

- They have vertically growing deep root system to absorb proper amount of water.
- They possess thick waxy cuticles over epidermis to conserve water.
- They have short sized leaves or leaves are modified into spines to reduce loss of water.
- Some xerophytes has special parenchyma cells in stem, where they store water, this makes the stem soft, wet and juicy called succulent (juicy) organs e.g. cacti.

Q.6. Describe the process of osmoregulation in aquatic animals and terrestrial animal.

Osmoregulation In Aquatic Animals:

The aquatic conditions are classified on the basis of the concentration of salt present in it.

Fresh Water:

The water which contains very low amount of salt called fresh water.

Marine water:

The water contains high salt called marine water.

Osmoregulation in Fresh water:

Fresh water animals have hypertonic (High salt) conditions inside their body or cells so they always facing the problem of flooding of H_2O and loss of salts. We can classify further these animals in two groups.

Unicellular:

These animals pump out excess water by contractile vacuole. e.g. Amoeba, paramecium etc.

Multicellular

- These animals pump out excess water by producing dilute urine.
- Loss of salt is compensated by active uptake of salt by gills and skin as well as use of salt containing food.

Osmoregulation in Marine Animals:

Usually marine animals have hypotonic conditions (Low salt) Inside the body but some marine animals develop hypertonic (high salt) or isotonic (same salt condition) by metabolism.

Osmoregulation in terrestrial condition:

Terrestrial conditions are harsh for living organism because the direct contact of heat to body causes loss of water which leads to dehydration which is the major problem for terrestrial life. Only arthropods, some mollusks reptiles, birds and mammals can survive in this habitat because. They have following characteristics.

- Their bodies are covered by exoskeleton or thick skin, which prevent loss of water.
- They conserve water by reabsorption in kidneys and rectum.
- Some of them can produce water from fats catabolism with the help of peroxysomes i.e. camel, kangaroos.
- Continuously drinking of water or using liquid food.

Bony Fish	Cartilaginous Fish	Osmoconformer
Have low salt inside the body.	Have high salt by storing urea inside.	Have equal amount of salt.
Actively get sea water and have salt glands to increase the salt and desalination.	Eat food which contain nitrogenous compound i.e. meat	These animals do not require any activity to adjust their internal osmotic condition i.e. unicellular.
Produces concentrated urine.		

Q.7. Define excretion. Why excretion is necessary? What is the importance of excretion in animal?

Excretion:

The removal of unwanted materials from cell and bodies of organisms is called excretion.

Importance of excretion in animal:

- Nitrogenous wastes (NH_3, Urea or uric acid) will low the PH of cells and are dangerous for life.
- Wastes materials are usually toxic and they can damage the cells.
- Balance of water in the body is maintained due to excretion.

Q.8. Define excretory organ. Name the write the excretory organ, excretory compound and source of the following. Planaria, earth worm, cockroach, vertebrate.

Excretory organ:

The animal cells produce their nitrogenous waste during metabolism and removed them either in tissue fluid or in blood. So the animals develop some organs to filter the tissue fluid or blood. These organs are called excretory organs.

Animal	Phylum	Excretory organ	Excretory compound	Source
Planaria	Platyhelminthes	Flame cells (Protonephridia)	Dilute urine	Excretory ducts
Earthworm	(Annelids)	Metanephridia	Dilute Urine	Coelomic fluid
Cockroach	(Arthropod)	Malphigian tubules	Uric acid pellets	Haemolymth (Hemolymph)
Vertebrate		Kidneys	Uric Acid	Blood

Q.9. Describe the homeostasis in man.

Homeostasis in man:

Human have well developed homeostasis system. The main organs which involved in homeostasis are.

(a) Skin (b) Lungs (c) Kidneys Skin

Skin:

The skin is considered as the largest organ of the body, basically functions as a protective organ as the first line of defense but it also works efficiently as a homeostatic organ by maintaining temperature, water and salt.

Lungs:

They maintain levels of O2, and CO2, in the blood, body fluid and cells Maintenance of O2, and CO2, Level, maintain rate of respiration and continuous flow of energy.

Kidneys:

Kidneys are called filters of the body fluids, they maintain internal water by removing excessive water, also maintain urea, uric acids, creatinine and other waste by excreting them through urine.

Q.10. Describe the structure of skin and function of each layer of skin.

Structure of Human Skin:

Human skin consists of three layers called epidermis, dermis and hypodermis.

Epidermis:

The outer layer of skin is epidermis, made up of flat, dead cells containing keratin protein. This layer does not contain blood vessels. It is impermeable to water and prevent water loss from the body as well as work as protective layer by preventing entry to microorganisms.

Dermis:

Dermis is the layer present between epidermis and hypodermis, it contains many different structures i.e. nerves ending receptors to detect temperature change, pain, pressure etc. the dermis also contains sweat glands which secrete sweat on the surface to maintain temperature and also secrete urea, water and salt.

A network of arterioles are also present in the form of network, which are involved in temperature regulation. The dermis also contains hair follicle and sebaceous glands which secrete oily sebum.

Hypodermis:

Hypodermis is the inner most layer of skin containing fats which act insulation against loss of heat, it also stores energy.

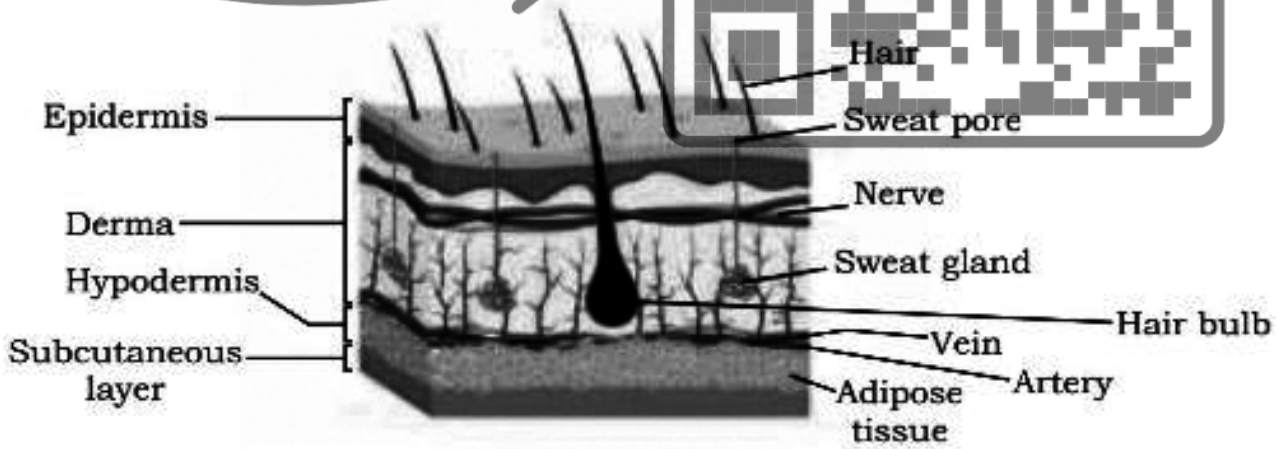


Fig. 2.7 LS of human skin

Q.11. Describe the role of skin in regulating the body temperature. "OR"
What happening when the temperature of the body starts to rise? "OR"
What happening when the temperature of the body starts to decrease?

Role of skin in regulating body temperature:

The skin is the organ which help in regulating body temperature when the receptor in skin detects change in body temperature from set point (set point of human is 37^{o}C) i.e. increase or decrease, and then Receptor send nerve impulse to the brain. It occurs by feedback mechanism to correct the temperature.

Body temperature starts to rise:

Production of sweat:

The sweat gland starts to produce and secrete sweat. The sweat accumulates at the surface of skin which evaporates with heat energy so the body feels cooling.

Laying down of hairs:

In hot condition, muscles which are attached with hair relax. It allows the hair to lie flat against surface of the skin.

Vasodilation:

Arterioles found in the form of network in dermis, dilate (become wide) which increase the flow of blood, as well as it brings the blood vessels near the surface of skin which allows more heat loss. This process of vessel dilation is called vasodilation.

Body temperature starts to decreasing:

Erection of Hairs:

The muscles contract pulling the hairs upright and trapping a player of insulation air next to skin. Now it is not very much effective in human.

Vasocontraction:

Narrowing of blood arterioles of dermis occurs which reduces the blood flow in capillaries of skin so less heat is lost.

Decrease in sweat production:

The sweat gland stops to produce and secrete sweat, so ir prevent from energy loss.

Increase in metabolic rate:

In cold conditions the rate of metabolism in the organs increases generating more heat which is distributed around the body in the blood stream. It prevents loss through the adipose tissue in hypodermis which work as an insulation layer.

Q.12. Describe the role of lungs to keep the CO_2, concentration low to certain level.

Role of lungs to maintain the concentration of CO_2:

Tissue or cells produce a large amount of co, during aerobic respiration. As blood passes through tissues via blood capillaries, this CO, diffuses into the blood. Where it reacts with water form carbonic acid. This reaction takes place by an enzyme called carbonic anhydrase present in R.B.C. The carbonic acid dissociate into H and bicarbonate HCO_3 ions. The level of H^+ in blood is continuously monitored by special detectors (receptor) carotid bodies and aortic bodies. Most of the bicarbonate ions diffuse out from RBC to blood plasma. A small amount of CO_2. The CO_2 diffuses out of the blood capillaries and into alveoli, where form it is expelled out when breathing out. If the CO_2, level increases in blood, pH of blood start increasing so that the receptor sends a message to the control centre which ultimately increases the breathing rate to expel out the CO_2, efficiently.

Q.13. Describe the role of kidney in controlling blood composition.

Role of Kidney in controlling blood composition:

Blood is the fluid having cells. In plasma, it contains a high amount of H_2O and some solutes like Na^+, Cl^-, Ca^{++}, K^+, etc. with nitrogenous waste. Liver continuously produces urea and NH_3, by breaking amino acid, we continuously take different solute ions in our food like Na^+, Ca^{++}, K^+ etc. the concentration of H_2O, solute and nitrogenous waste are maintained by kidney through process of filtration and reabsorption, which we will study in next topics.

Q.14. Describe the urinary system or excretory system in man.

Urinary System Or Excretory System In Man:

Urinary system in human is consisted of

- A pair of Kidney
- A pair of ureters
- A urinary bladder
- A urethra

Kidney:

Kidneys are reddish-brown bean shaped organs, situated at the dorsal side of the abdominal cavity on either side of the vertebral column. The kidneys lie above the waistline. Each kidney has an area in the center of concave surface which faces vertebral column; this area is called Pelvis hillus. The renal artery, renal vein, nerve and ureter are connected to each kidney at the hillus.

Ureter:

The ureter is a narrow tube which connect the kidney to urinary bladder. Urine passes through ureter to the urinary bladder.

Urinary bladder:

The urinary bladder is a thin walled muscular bag situated towards the bottoms of abdominal cavity in front of the rectum which stores urine.

Urethra:

The urethra is a tube which comes out from the urinary bladder, runs down and opens outside the body through urinary opening. It passes urine from bladder to outside the body.

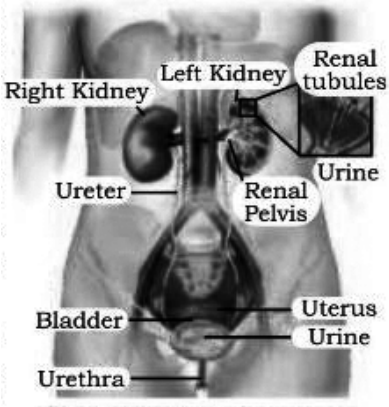


Fig. 2.10 Urinary System

Q.15. Describe the structure of human kidney:

Structure of Kidney:

Kidney is enclosed in a membrane called peritoneum. A fluid is filled in between peritoneum and kidney called peritoneal fluid which reduces the friction. A longitudinal section of kidney shows three main parts: the cortex, the medulla and the pelvis.

Cortex:

IT is the outer dark brown portion. It is covered and protected by a fibrous capsule.

Medulla:

The medulla is the inner lighter portion of the kidney.

Renal Pyramids:

Medulla contains the conical projection called renal pyramids; the human Kidneys contain 12-16 pyramids. The medulla contains nephrons.

Nephrons:

Nephrons are the basic, structural and functional units of the kidney. These are tiny kidney tubules where osmoregulation occurs to produces urine.

Pelvis:

The kidneys are connected to the ureter at pelvis. Pelvis is a funnel like space. It is the enlarged portion of ureter inside the kidney.

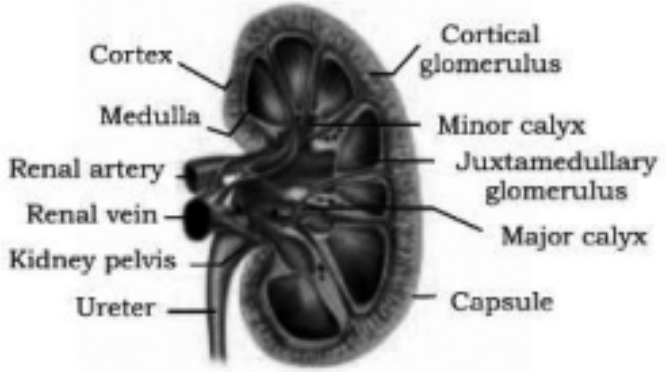


Fig. 2.11 LS of Human Kidney

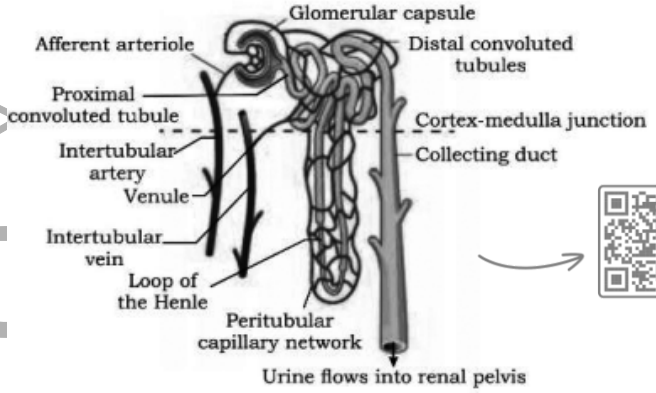


Fig. 2.12 Structure of Nephron with Blood Vessels

Q.16. Describe the structure of nephron in detail.

Structure of Nephron:

Nephrons are the functional unit of kidney. Each kidney contains more than one million nephrons, which are microscopic urinary tubules. Each nephron consists of four main parts. Nephrons are surrounded by different blood vessels that are connected tot eh renal artery and renal vein.

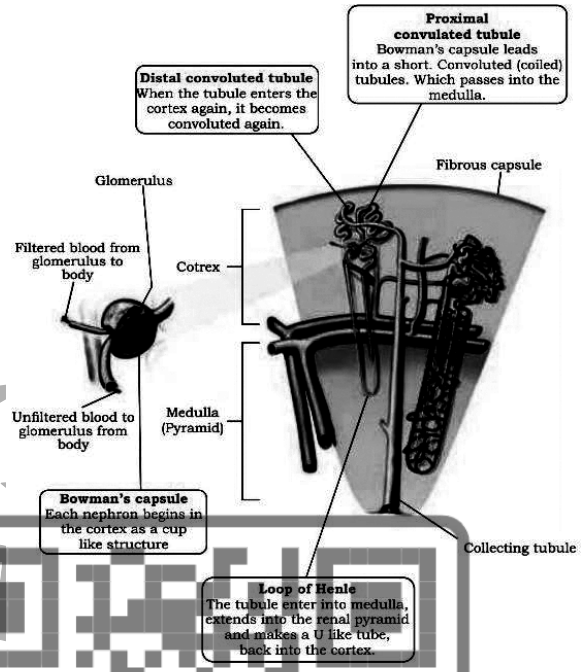


Fig. 2.13 Section of Kidney showing structure of two nephrons with blood supply

Section of Kidney showing structure of two Nephorns with blood supply

Bowman's Capsule:

Each nephron begins in the cortex as a cup like structure, which is a double walled is called bowman capsule.

Proximal convoluted tubule:

Bowman's capsule leads into a short, convoluted (coiled) tubules, which passes into the medulla is called proximal convoluted tubule.

Loop of Henle's:

The renal tubule enters into medulla, extends into the renal pyramid and makes a U like tube, which extends back into the cortex is called loop of Henle's.

Distal convoluted tubule:

It is third coiled part and connects the loop of Henle with the collecting duct which lies in the cortex.

Q.17. How does nephron perform function? Describe the function of nephron.

Function of Nephron:

- The renal artery when enters into kidney, it divides into millions of branches called afferent arteriole. The blood enters the kidney by renal artery goes into afferent arterioles.
- Each afferent arteriole further divides into numerous blood capillaries in Bowmann's capsule are collectively called glomerulus. Bowmann's capsule with glomerulus are collectively called Malpighian body or renal corpuscle.
- Blood leaving the glomerulus through efferent arteriole, enters blood capillaries surrounding the nephron.
- Blood capillaries surround a loop of Henle's unite to form venule, which ultimately joins to form a branch of renal vein.

Q.18. Describe the role of kidney in urine formation.

Formation of Urea:

The urea is formed within the liver cells. The liver stores surplus glucose of food by converting it into glycogen and other food substances but it cannot store the proteins. The excessive amino acid break and get some energy from it. The amino group (NH_3) is removed from amino acid called deamination. This NH_3, group is converted into ammonia (NH) which is very poisonous, it may kill the cell when stored in high concentration. So the liver cells quickly convert NH_3, into less toxic substance urea. This urea is carried by blood to kidneys and excrete out in the form of urine. A small amount of urea is also excreted in sweat as well.

Urine formation:

Excess mineral salt and nitrogenous waste products i.e. urea, creatinine and uric acid, which are poisonous if accumulated. These are removed from body with water and afferent this mixture is called urine.

Urine formation takes place in Kidneys. Two main processes are involved in the formation of urine within nephron.

(i) Filtration (ii) Reabsorption

(i) Filtration:

Filtration is the process of taking out material from blood. It is of two types.

(a) Ultrafiltration (b) Selective filtration.

(a) Ultrafiltration:

Ultrafiltration occurs at Malpighian body when the blood from afferent arteriole enters into glomerulus located in Bowman's capsule. Most of the blood plasma is forced out of the glomerulus blood capillaries into Bowman's capsule without any selection. Process of non-selective filtration is called ultrafiltration.

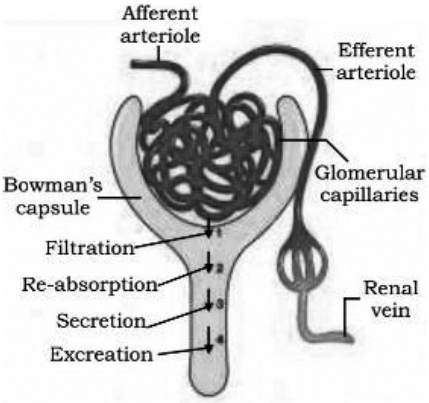


Fig. 2.14 Ultra Filtration in Glomerulus

(b) Selective filtration:

Selective filtration occurs at proximal and distal convoluted tubules when blood flows into peritubular capillaries, the remaining amount of urea filter out from blood by active transport. It requires some energy.

(ii) Reabsorption:

In a normal adult about 120 cm3 (ml) of filtrate is formed in the kidney every minute. If this large amount of filtrate allowed to pass out from the body as urine, the body will dehydrate and death may occur. To prevent this huge loss of water and useful salts, when the filtrate passes through the nephron useful substances and excessive water reabsorbed into the blood stream by two methods.

(a) Non-selective reabsorption (b) Selective reabsorption

(a) Non-Selective Reabsorption:

Non-selective reabsorption occurs at distal and proximal convoluted tubules without a selection.

(b) Selective Reabsorption:

Selective reabsorption occurs at loop of Henle's and collecting duct with the help of hormones. i.e. antidiuretic hormone (ADH), parathyroid hormones (PTH) and calcitonin.

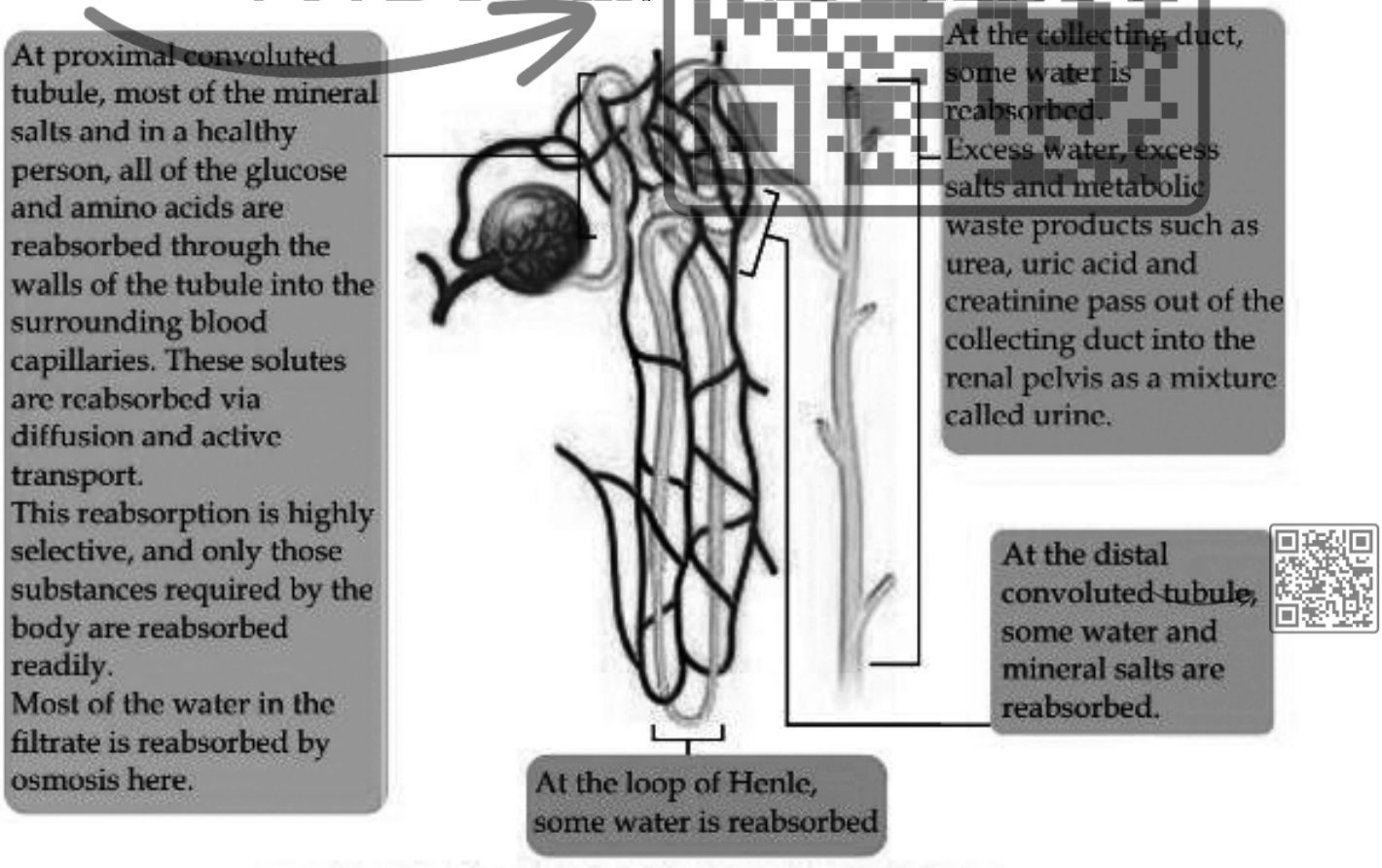


Fig. 2.15 Resorption of Material in Nephron

Q.19. Describe the role of kidney in osmoregulation.

Role of Kidneys in Osmoregulation:

The water potential (capacity to loose water) of blood in the body has to be kept constant because big and sudden change in the water potential of blood can lead to serious problems e.g. if plasma becomes very mi dilute water will enter the blood cells will swell and possibly burst.

On the other hand if the blood plasma becomes too concentrated water will move out of te cell by osmosis, as a result of it the blood cells, tissues will becomes dehydrated and shrink. This control of water and salt content of the body is known as osmoregulation. Kidney is not only an excretory organ, it also regulates water and salt balance in the blood. Kidneys makes sure that the concentration of blood stays more or less constant.

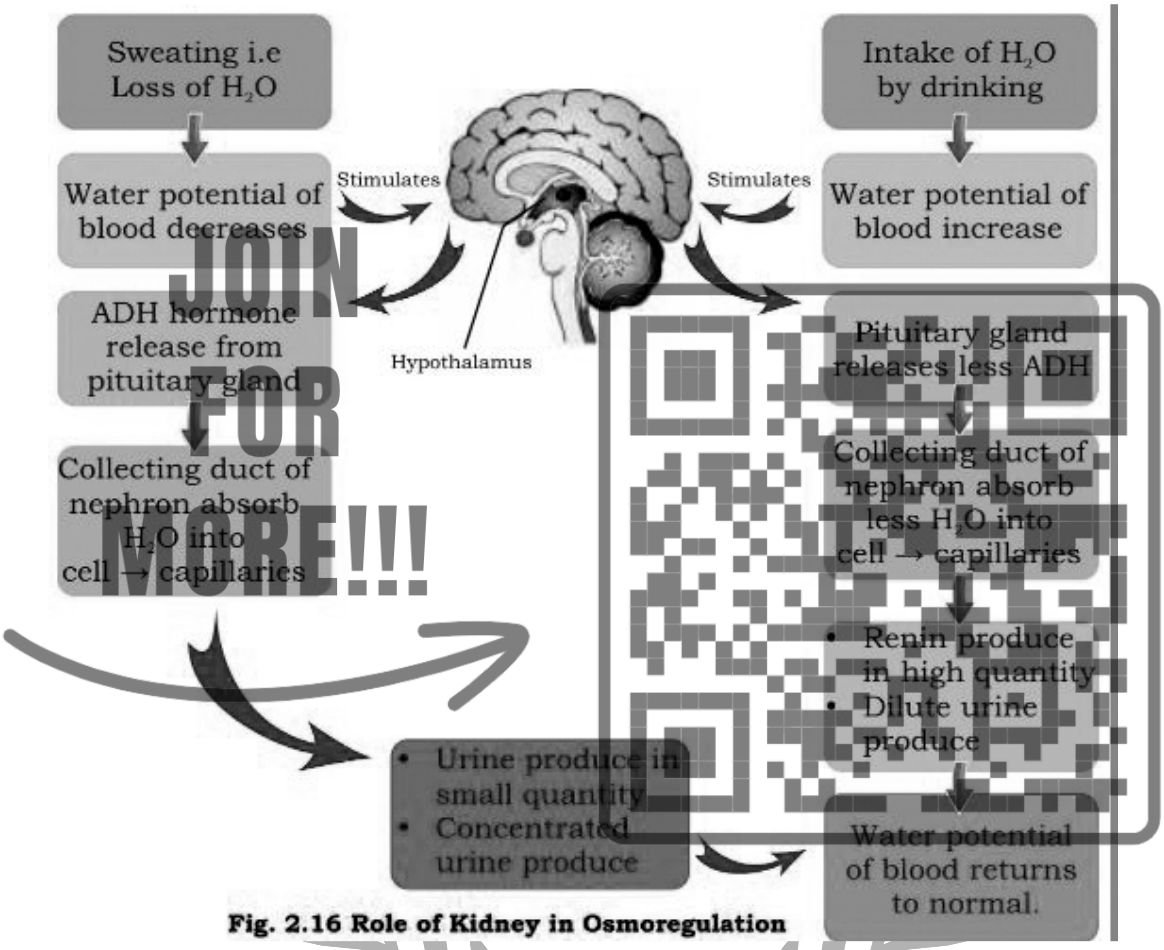


Fig. 2.16 Role of Kidney in Osmoregulation

Q.20. Describe the disorders of kidneys.

Kidney Stone:

A kidney stone is a solid mass that forms from the crystals of calcium oxalate or calcium carbonate. Sometimes uric acid and cysteine are also present in it. These molecules separate from urine, precipitate in kidney and deposit in the form of stone. Sometimes these stones are not hard therefore they break into sand like crystals which can pass out of the body with urine without pain. The little large size stone however damages the kidney tissues, it may stuck anywhere in urinary tract and cause renal failure with pain.

Treatment of Kidney Stone:

Lithotripsy:

It the size of stone is comparatively small we can use the technique of lithotripsy to break stone by ultrasonic waves (sound waves). The broken rudiments drain out from kidney with urine.

Renal surgery:

The large size stone cannot be broken by lithotripsy, so it is removed only by the process of renal surgery. The large intake of water is the only measure to minimize the chances of formation of stone in kidney.

Kidney failure:

Sometimes the nephrons of kidney stop working, it is called kidney failure. It is mainly due to solute disbalance in blood and kidneys. The failure of kidneys allows urea and other waste material to accumulate in blood. The amount of H2O is not regulated also. This disbalance of solutes cause death unless the patient is given treatment to filter out waste by machine.

Kidney dialysis:

Patient of kidney failure may get a kidney transplant. A person with two healthy kidneys may donate one kidney and survive with one kidney. If a donor is not available, the partient can be treated with dialysis using a dialysis machine. A dialysis machine performs the function of a kidney. It helps to clean the patient's blood from metabolic waste products and toxics.

For effective treatment the patient needs to undergo dialysis 2-3 times a week. Each session lasts about 3-5 hours depending on the patient's body size and medical condidtion.

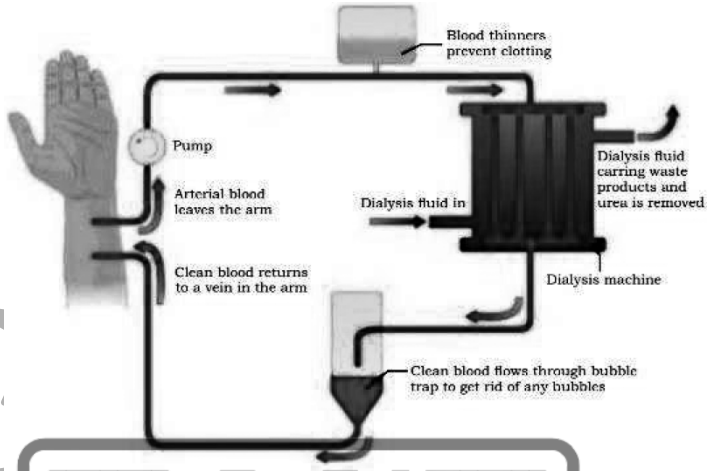


Fig. 2.18 Working of Dialysis Machine

SHORT QUESTIONS

Q.1. Why homeostasis is required? (For Answer Q#7)

Ans. Homeostasis is required because it is a set of metabolism which maintain internal environment of an organism within suitable limit.

Q.2. Why plants remove liquid water instead of water vapours?

Ans. Plants remove liquid water instead of water vapours from the margin of leaves through special pores, hydathodes. It only occurs at night when water pressure is high in leave and low temperature environment is present.

Q.3. How plants survive in saltish water? (For Answer Q#5 Heading Halophytes)

Q.4. Why skin is considered as excretory organ?

Ans. Skin functions as an excretory organ because it contains sweat glands which secrete sweat on the surface to maintain temperature and also secrete urea, water and salt.

Q.5. What type of structures are present in dermis to perform different functions?

Ans. Dermis is the layer present between epidermis and hypodermis, it contains many different structure i.e. nerves ending receptors to detect temperature change, pain, pressure etc.

Q.6. Draw a neat and labeled diagram of nephron. (For Answer Page # 17)

Q.7. What is kidney stone? (For answer Q#20)

Q.8. How human skin maintains temperature in cold conditions?

Ans. Human skin maintains temperature in cold conditions by increasing the rate of metabolism in the organ generating more heat which is distributed around the body the blood stream. It prevents loss the heat through the adipose tissue (fats) in hypodermis which work as an insulation layer.

Q.9. When dialysis is required?

Ans. For effective treatment the patient required to undergo dialysis 2-3 times a week. Each session lasts about 3-5 hours depending on the patient's body size and medical condition.

Q.10. Why filtration at peritubular capillaries called ultra-filtration?

Ans. Filtration at peritubular capillaries called ultra-filtration because when blood flows into peritubular capillaries selective filtration occurs and remaining amount of urea filter out from blood by active transport.

TERMINOLOGY AND DEFINITIONS

Homeostasis:

Homeostasis is defined as the maintenance of the internal conditions of the body at equilibrium, despite changes in the external environment "OR" Homeostasis is set of metabolism which maintain internal environment of an organism within suitable limit.

Hydathodes:

Hydathodes are modified pore, especially on a leaf, in a plant organ responsible for guttation in vascular plants. "OR" The removal of water take place in the from of liquid from the margin of leaves through special pores are called hydathodes.

Sebaceous Gland:

Sebaceous gland, small oil-producing gland present in the skin of mammals. Sebaceous glands are usually attached to hair follicles and release a fatty substance, sebum, into the follicular duct and thence to the surface of the skin.

Vasodilation:

Vasodilation is a response to being too hot. The process includes the widening of blood vessels at the skin surface to increase heat loss through the surface of the skin.

Vasoconstriction:

Vasoconstriction is a response to being too cold. The process involves the narrowing of blood vessels at the skin surface to reduce heat loss through the surface of the skin.

Carotid body:

The carotid body is a chemoreceptor located in the bifurcation of the common carotid artery. Carotid body monitors the blood's pH, CO_2, and O_2.

Aortic Body:

The aortic body is a chemoreceptor located along the aorta arch. Aortic body monitors the blood's pH, CO_2, and O_2.

Nephron:

Nephrons are the basic, structural and functional units of the kidney.

Peritubular Capillaries:

Peritubular capillaries are tiny blood vessels, supplied by the efferent arteriole, that travel alongside nephrons allowing reabsorption and secretion between blood and the inner lumen of the nephron.

Deamination:

The process by the amino group (NH2) is removed from amino acid or protein is called deamination. Amino group (NH2) converted into ammonia which is toxic, it may kill the cell. So, the liver quickly converted ammonia into less toxic substance urea.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. The internal condition of an organism is referred as:
   - Homeostasis
   - Internal environment
   - Internal metabolism
   - Feedback mechanism
2. A set of metabolism reaction which maintain internal environment is:
   - Positive feedback
   - Negative feedback
   - Osmoregulation
   - Homeostasis
3. Removal of extra liquid water is:
   - Exudation
   - Guttation
   - Respiration
   - Transpiration
4. Plant grow near coastal area called:
   - Xerophytes
   - Halophyte
   - Epiphyte
   - Hygrophyte
5. Organ of human body which is considered on the largest organ is:
   - Skin
   - Digestive tract
   - Liver
   - Brain
6. The maintenance of body temperature with in suitable limit is called:
   - Homeotherm
   - Thermoregulation
   - Osmoregulation
   - Heterotherm
7. The kidney is enclosed in a membrane called:
   - Pericardium
   - Peritoneum
   - Pleural membrane
   - Plumule
8. The network of blood capillaries present in the layer of skin.
   - Epidermis
   - Dermis
   - Hypodermis
   - Endodermis
9. Selective reabsorption in nephrons takes place at:
   - Glomerulus
   - Malpighian body
   - Convulated tubules
   - Loop of Henle's
10. The hormone ADH release from
    - Pituitary gland
    - Kidneys
    - Liver
    - Lungs

COORDINATION AND CONTROL Ch # 03

DETAILED QUESTIONS

Q.1. Define different types of co-ordination.

Types of co-ordination:

There are two types of co-ordination. Both are inter-related and interact with each other to develop proper response.

(a) Chemical coordination (b) Nervous coordination

Chemical Coordination:

It takes place by releasing specific, signaling molecules such as hormones by special cells or glands. These molecules are released to stimulate or inhibit other cells or tissues of the body. The target cells must have receptor molecules (special receiving molecules) for signaling molecules. This kind of coordination is helpful in lower animals as well as plants because of their simple body plans and small size.

Nervous coordination:

It is an advance type of coordination exhibited by most of the animals, which is a consequence of specially designed cell, neurons. The neurons upon stimulation generate electrochemical signals. Since the signaling is in electric form so it is very rapid.

Q.2. Write differences between nerves co-ordination and chemical co-ordination.

#	Nervous Co-Ordination	Chemical Co-Ordination
1	It is activity of neurons.	It is activity of special secretory cells.
2	It is signal type is electro-chemical.	It is signal type but purely chemical.
3	It is rapid in action.	It is slower in action.
4	Response is shorter duration.	Response is longer duration.
5	It is advance type of coordination.	It is primitive type of coordination.
6	It is exclusively related to animals.	It is related to all organisms.
7	Involves neurotransmitters.	Involves other signaling molecules such as hormones.

Q.3. Describe the process of coordination in lower organisms and plants.

Coordination in lower organisms and plants:

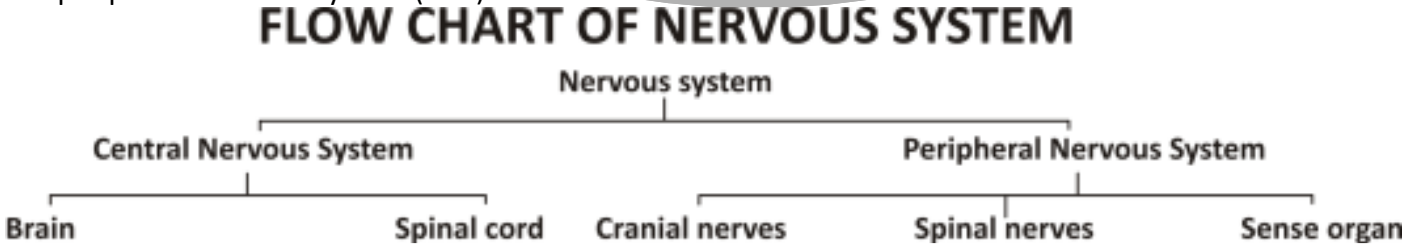
Lower organisms like prokaryotes, protozoa, algae, fungi and plants have chemical coordination through signaling molecules released usually in the form of hormones to regulate their movements, growth, metabolism, reproduction, etc. for example, leaves of the "touch me not" are closed when touched. After a short while, they restore their original open position. The pressure or touch serves as stimulus while closing down of leaves is the response.

Other responses like growth, reproduction are due to the secretion of hormones by secretory cells and carried via the transport media to their respective target organs. Another fascinating movement is the turning towards the direction of sun in "sun flower" plants. It's a bit slower movement which is believed to be caused by phytohormones called auxins. It causes rapid cell growth in shaded regions of the plant.

Q.4. Draw the flow chart of nerves system.

Human nervous system:

Human nervous system like other vertebrates is "centralized-type nervous system" (CNS). It is the most complicated type. Nervous system consists of two major divisions, viz. central Nervous system (CNS) and peripheral Nervous system (PNS).



Q.6. What is CNS? Describe its main components and their important function. (OR)
Write the functions of different parts of brain. (OR)
What is spinal cord? Write its functions.

Central Nervous system:

It is the major command and control center to which stimuli are reported and decisions are made and conveyed to effector organs. It consists of two main components brain and spinal cord.

Brain:

It is the major command and control center of our body. It is wrapped in there protective membranes called meninges. Inside the brain, there are empty cavities or ventricles filled with a cerebrospinal fluid (CSF). It also provides a cushion-like protection to the brain. Bones of the skull provide another protection to brain. Human brain consists of following important part. Cerebrum, hippocampus, amygdale, thalamus, hypothalamus, mid-brain, cerebellum, and medulla oblongata.

Cerebrum:

It is the largest part of the brain where important decisions are made. It is considered to be the seat of intelligence, all conscious activities and memory. Its outer part, cortex or gray matter is grayish in color and consists of cell bodies of neurons while inner part white matter is whitish and consists of cell processes which are hair like outgrowths. Cerebrum consists of two hemispheres, i.e. Right and left cerebral hemispheres. The right cerebral hemisphere regulates the left side of the body while the left cerebral hemisphere to the right side of the body. The cortex is associated with thoughts, plans, actions and determination. It can be divided into four sections or lobes, viz., Frontal lobe, Parietal lobe, Temporal lobe and Occipital Lobe. Frontal lobe is associated with thoughts, emotions, etc. Parietal lobe is associated with different sensations like pressure, temperature, language processing, etc. the temporal lobe is involved in hearing and speech. The occipital lobe is associated with vision.

Thalamus:

Thalamus lies inside in the brain just above the hypothalamus. It guides the stimuli towards appropriate part of the cortex.

Hypothalamus:

Hypothalamus regulates life maintaining functions like blood pressure, body temperature, hunger, thirst, etc. it plays vital role in maintaining homeostasis of the body.

Hippocampus:

It is related with long-term memory. Amygdale: It's a deep seated small area involved in emotions (pain, pleasure, etc.)

Mid brain:

In human it is relatively smaller and involved in integration of visual and olfactory (smell) stimuli. It is also collaborator of spinal cord with fore-brain.

Cerebellum:

It is highly convoluted structure located on the dorsal side just below the cerebrum. It control the precision in movement of the muscles for balance and maintains the position of the body in relation to gravity. Activities like writing, drawing, painting, dancing, crafting have become possible due to its elaborate structure in human.

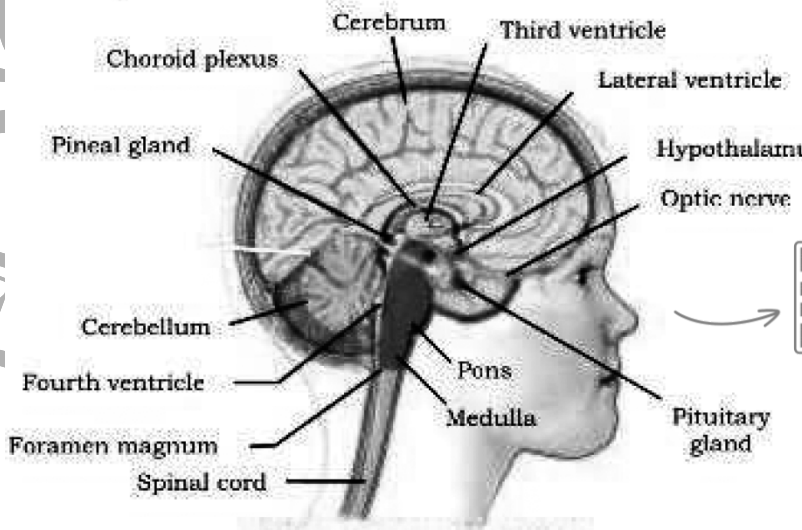


Fig. 3.5 Human brain

Medulla oblongata:

It lies just above the spinal cord. It is the control center for automatic activities like breathing, heart-beat, blood pressure, coughing, swallowing, hiecupping, digesting food, etc. such activities are termed as Reflexes.

Pons:

It lies on the ventral side of medulla oblongata. It helps in controlling the facial muscles as well as helps in sleep and wakening.

Spinal cord:

It's a butterfly shaped, thick, whitish, long tube like structure which arises from medulla oblongata and extends down through the vertebral column. Unlike brain, in cross section, its outer portion is whitish called white matter while inner is grayish or gray matter. Like brain, it is also wrapped in meninges and bathed in cerebrospinal fluid.

Function of spinal cord:

- It acts as a mini control center for few reflexes.
- It also acts as express way for flow of information from brain to the different parts of the body and vice versa.

Q.7. Describe the peripheral nervous system.

Peripheral nervous system:

It consists of cables which arises from the central nervous system and connect it to different organs of the body. Each cable is termed as a Nerve. Each nerve consists of bundles of axons of both sensory and motor neurons. The PNS consists of somatic nervous system and autonomic nervous systems.

Somatic nervous system:

It is associated with skeletal muscles and glands.

Autonomic nervous:

It is associated with involuntary functions like digestion, breathing, etc. these functions are vital for maintaining life processes.

Q.8. Define neuron. Describe the structure of neuron.

Neuron:

For answer definition.

Structure of neuron:

The cells of the nervous system are termed as neurons. Each neuron is specialized to generate and conduct neuronal signal or nerve impulse. Neuron consists of following parts.

Cell body or soma:

Cell body or soma comprised of plasma membrane, cytoplasm and nucleus.

Cell processes:

The cell processes are hair-like projections given out from soma. They are of two types dendrites and axon.

Dendrites:

Dendrites receive stimulus.

Axon:

Axon transmits the command either to some other neuron or some effector cells.

Myelin sheath:

Like an electric cable, cell processes usually have insulate coverings, termed as myelin sheath to ensure the uninterrupted transmission of nerve impulse.

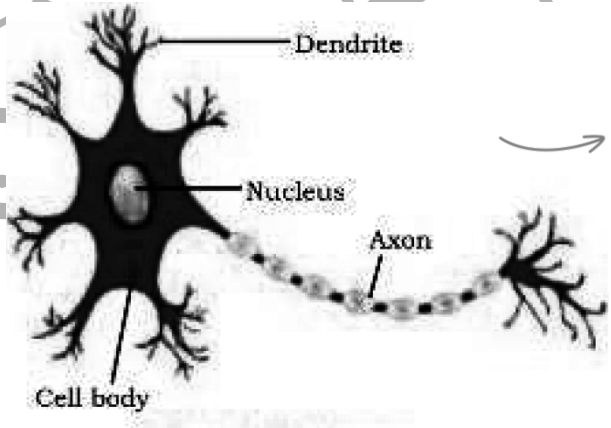


Fig. 3.8 Neuron

Q.9. What is reflex arc? Explain it with example.

Reflex are:

Pre-programmed responses regulated by CNS are termed as reflex actions. Some of them are directly regulated by brain while others by spinal cord.

Example:

The simple reflex action is knee jerk. It occurs when the tendon of muscle below knee joint is hit by some object. As a result, the leg is extended forward sharply. The knee jerk reflex arc involves only two neuron, a sensory and other motor neuron whose soma lie in the spinal cord. In complicated reflexes, the reflex arc may involve one or numerous inter-neurons in between sensory and motor neuron.

Q.10. Explain an experiment which show contraction of shin muscle (leg muscle) of Frog.

Apparatus:

- Dissecting box
- Frog
- Dissecting tray
- Wires
- Petri-dish
- 12 volt D.C.
- Charged battery

Procedure:

The simple reflex action is knee jerk. It occurs when the tendon of muscle below knee joint is hit by some object. As a result, the leg is extended forward sharply. The knee jerk reflex arc involves only two neuron, a sensory and other motor neuron whose soma lie in the spinal cord. In complicated reflexes, the reflex arc may involve one or numerous inter-neurons in between sensory and motor neuron.

Observation:

Muscles contract when provided signal through neurons by nervous system. In this experiment, we observe that a shin muscle removed from dissected frog is placed in methylene blue solution in a petri dish. When artificially stimulated by power supplied i.e. 12 volts D.C. battery, it contracts.

Result:

This experiment show the contraction of shin muscle/leg muscle.

Q.11. What are receptors? Name receptors organ of sight, sound, odour and taste. (OR) Name the sense organs and write one function of each.

Receptors:

Receptors are the sensory tissues or organs which receive stimuli.

Sense organs of man:

In man there are five major sense organs. Eyes, Ear, Nose, Tongue, Skin

Function of Eyes:

Ears are the organs of hearing and balance.

Function of Nose:

Nose is the organ of smell by which we differentiate the good and bad smell.

Function of Tongue:

Tongue is the organ of taste, which can detect to sweet, salt, sour and bitter tastes.

Function of Skin:

Skin response to external stimuli such as touch, heat, cold and pressure.

Q.12. Describe the structure of eye also draw the labeled diagram of human eye.

Eye of Man:

It is an organ of sight. Each eye is about 2.5 cm in diameter, spherical in shape and closed in a bony case the orbit for protection. The front expose part has two eye lids for closing or opening the eyes.

Internal structure of eye:

Internally the eye ball is made up of three main layers. Sclera, choroid and Retina

Sclera:

It is the outer most layer or tough coat of the eye. It is white part of eye. The front part of sclera becomes transparent is called cornea. It provides shape and protection to the eye.

Choroid:

It is the middle or second layer of the eye. It is pigmented and vascular. It has a rich supply of blood capillaries. It supplies the blood and nutrition to the cells of the eye.

Aqueous chamber:

Behind the sclera, lies a small chamber filled with watery fluid this fluid is called aqueous humor.

Iris:

Behind the aqueous chamber, lies a coloured part is called iris. It can contract which reduce or enlarge the size of the pupil.

Pupil:

Iris having a circular opening or hole in the middle is called pupil. The pupil appears blackish.

Convex lens:

Behind the iris lies a convex lens suspended by a ring of circular muscles known as ciliary body. The contraction of ciliary muscles causes change in the shape of the lens to adjust focus.

Vitreous chamber:

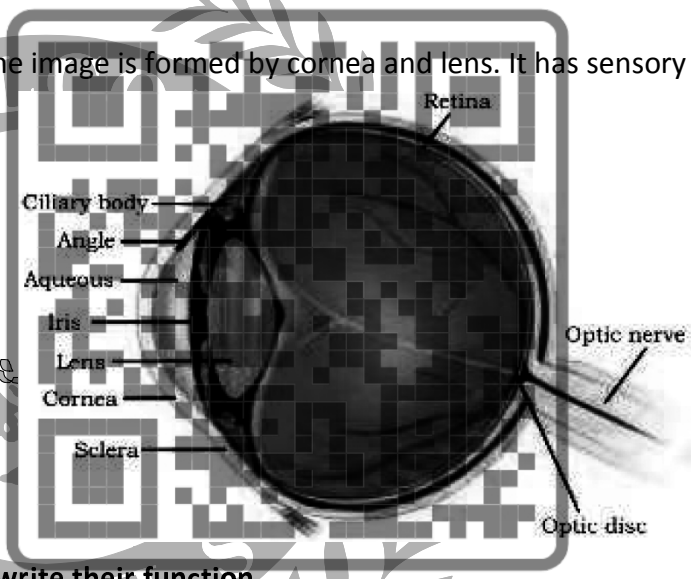
Behind the lens, there is a main cavity of eye ball filled with a clear gel like fluid the vitreous humour.

Retina:

The innermost layer of eye is retina on which the image is formed by cornea and lens. It has sensory cells, rods and cones which upon stimulation convert light signals into nerve impulses and report tham to the brain.

Process of image formation and vision:

When light rays reach the eyes, most of the focusing is done by the cornea. However, focusing is also done by the changing the curvature of the lens with the help of ciliary muscles. By the combined action of cornea and lens, the image is formed on retina. The sensory cells of retina, rods and cones convert the image into nerve impulses that are transmitted to brain through optic nerve.



Q.13. Name and the three layers of human eye and write their function.

Main layers of human Eye:

The three main layers of human eye are the following.

Sclera:

It is the outer most layer or tough coat of the eye. It is white part of eye. The front part of sclera becomes transparent is called cornea. It provides shape and protection to the eye.

Choroid:

It is middle or second layer of eye. It is pigmented and vascular. It supplies blood to the eye.

Retina:

The innermost layer of eye is retina on which the image is formed by cornea and lens. It has sensory cells, rods and cones which upon stimulation convert light signals into nerve impulses and report them to the brain.

Q.14. Write short note on the following.

Pupil Reflex:

The pupil adjusts itself depending upon the intensity of light. In case of bright light, it protects the retina by constricting itself so less amount of light falls on retina. Vice versa, in dim light condition, the pupil dilates to allow more light to fall on retina.

Accommodation:

It is an automatic process of altering focus to get sharper image of the near objects. To do this, the ciliary muscles contract allowing the elastic lens to become thicker and more convex. With age, the lens loses its elasticity and as a result, accommodation becomes increasingly difficult.

Role of vitamin A with Vision:

Vitamin a or retina is required for proper vision and needed for sensory cells of retina. It also helps the cornea to be well lubricated. Deficiency of vitamin A could lead to corneal ulcers and blindness.

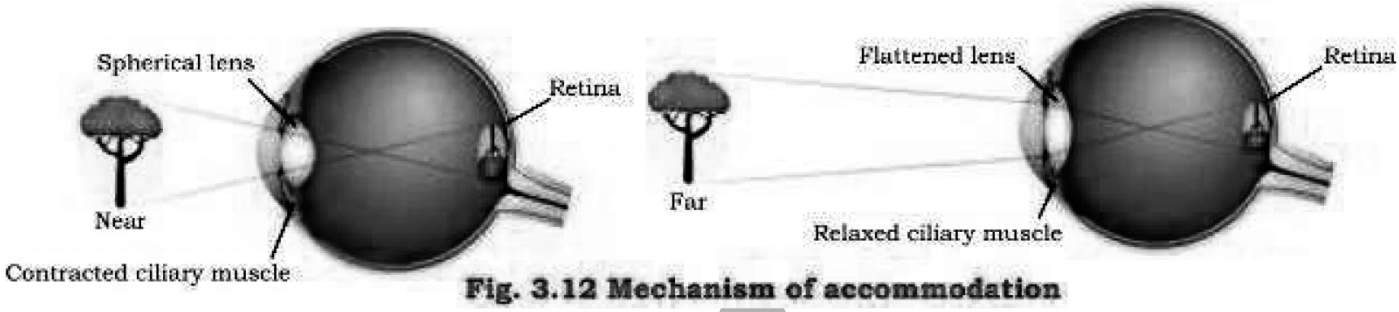


Fig. 3.12 Mechanism of accommodation

Q.15. Describe the disorders or disease of eye. Write short note on the following.

Short-Sightedness or Myopia:

Short- sightedness or myopia refers to the difficulty in focusing distant object while the near objects are focused normally. It can be diagnosed and corrected by using appropriate glasses or contact lenses.

Long-Sightedness or Hyperopia:

Long-sightedness (Hyperopia) is the difficulty in focusing closer objects while distant vision is clear. It can be diagnosed and corrected by using appropriate glasses or contact lenses.

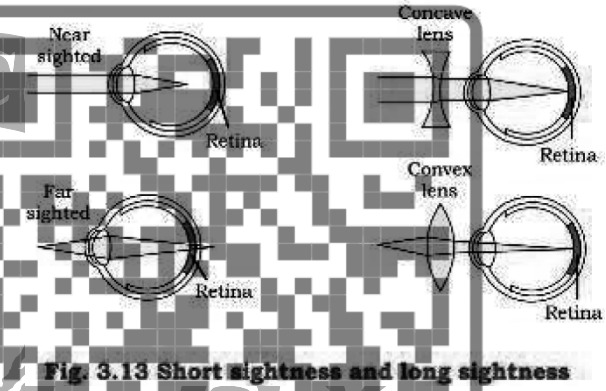


Fig. 3.13 Short sightness and long sightness

Colour Blindness:

It's a deficiency of vision in which one cannot distinguish certain colours such as blue and yellow or red and green. It is due to the defect in cones of retina. Tough, the vision may be normal in a colour blind person, yet the most common problem is driving because of their inability to distinguish red and green traffic lights.

Q.16. Write the contribution of two opticians. "OR" Write the contribution of Ibn-al-Haitham and Ali-Ibn-Isa about the structure of eye and treatment of ophthalmic diseases.

Ibn-Al-Haitham:

He was a great Muslim mathematician, philosopher, astronomer and physicist of 11th century. He was considered as "father of modern optics".

Contribution:

- He has great contribution in principles of optics and visual perception.
- He was the first person to consider vision as a result of bouncing back of light from an object and then enters our eyes.
- His most important book on optics was "Kitab-ul-Manazir"

Ali Ibn-Isa:

He was one of the most important Muslim ophthalmologists of medieval times.

Contribution:

In his famous book "Memorandum of the oculists" on ophthalmology, he described more than hundred different eye disease and their treatment.

Q.17. Describe the internal structure and function of ear. "OR"
Name the three parts of ear and write their function.

Structure of Ear:

The ear is the organ of hearing and balancing body. The ear of man consists of three parts.

Outer ear:

The outer ear consists of pinna, ear canal and tympanic membrane or ear drum. The pinna composed of folds of skin and cartilage. The pinna leads into the ear canal which is closed at the inner end by tympanic membrane or ear drum.

Function:

Ear canal has hair and produces wax to trap dust and small foreign bodies. The outer ear collects and transmits sound waves.

Middle ear:

It is small air filled cavity behind ear drum. Internally it has three small soft bones, malleus or hammer, incus or anvil and stapes or stirrup.

Function:

The middle ear consists of a small cavity containing three small moveable bones malleus, incus and stapes. The middle ear is connected to inner nasal cavity through a small tube, the Eustachian tube.

Function:

The middle ear receives sound waves from air outside and transmits it into the fluid in the inner ear.

Inner ear:

The inner ear consists of a front membranous cochlea and a rear, three semicircular canals deep inside the skull bones. Both cochlea and semicircular canals are fluid filled and contain sensory hair cells. These cells transform sound waves into nerve impulse.

Function:

The cochlea is associated with hearing while semicircular canals are associated with balance.

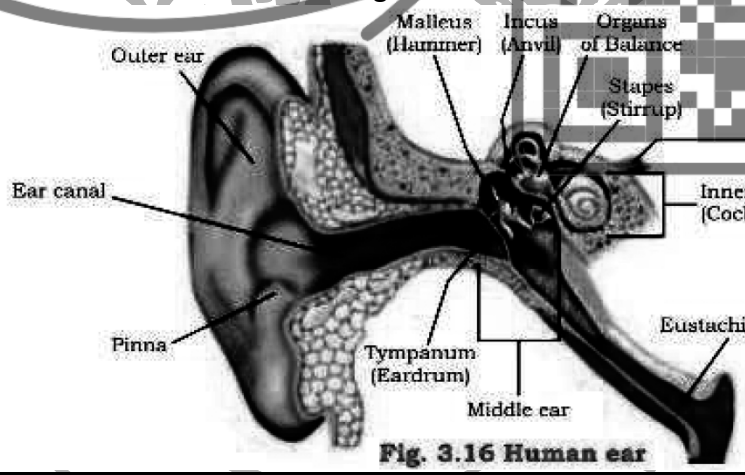


Fig. 3.16 Human ear

Role of ear in balance:

Semi-circular canals are sensitive to gravity, position and movements of head. Any of such changes are detected and reported to the brain through nerve fibers. The three semicircular canals are inter connected and lie right angle to each other. They are connected to a swollen part, the vestibule. Semicircular canals and vestibule are involved in maintaining balance of the body in relation to gravity.

Q.18. What is endocrine system? Describe the different types of endocrine gland with function.
"OR" Name different endocrine glands. Also write one hormone secreted y each.

Endocrine Gland:

The ductless glands are called endocrine glands because they have no duct or tube and their secretions are released directly into the blood. They carry hormones to their target tissues or organ. Important endocrine glands present in man are as under.

Pituitary Gland Thyroid Gland Pancreas
Adrenal Gland Gonads

Pituitary Gland:

It is located in brain and considered to be very important. It secretes number of hormones which influence upon other endocrine glands also besides other organs. Pituitary gland consists of two lobes in human, an anterior lobe or anterior pituitary gland and a posterior lobe or posterior pituitary gland.

Anterior Pituitary Gland:

It has number of hormone secreting cells. Its important hormones and their effect with target organs are as under.

Hormones	Target Organs	Important effects
Follicle Stimulating Hormone (FSH)	Gonads (Teste and ovaries)	Stimulate gonads to develop gametes
Luteinizing Hormone (LH)	Gonads	Development and release of gametes.
Thyroid Stimulating Hormone (TSH)	Thyroid gland	Stimulate thyroid gland
Somatotropin (Growth Hormone = GH)	Bones, Cartilages, muscles, etc	Growth in children and normal body structure and metabolism in adults
Adeno cortico tropin Hormone (ACTH)	Adrenal cortex	Stimulates adrenal cortex
Melanocyte Stimulating hormone	Skin	Pigmentation Stimulating (melanin) in skin

Posterior Pituitary Gland:

It is actually stores and releases SOME hormones of hypothalamus. Few Neurons of hypothalamus store and secrete their hormones from posterior pituitary and.

Hormones	Functions
Antidiuretic Hormone (ADH)	ADH maintains the blood pressure, blood volume and tissue water.
Oxytocin	Oxytocin stimulates greater contraction of smooth muscles as well as social behavior.

Thyroid Gland:

It's a butterfly shaped gland located on trachea in the base of neack.

Hormones:

It secretes thyroxine and calcitonin.

Thyroxine:

It has iodine as its important constituent. It regulates the rate of the metabolic activities of cells. It regulates the physical growth and mental development in children. In case of its deficiency, physical and mental retardation occur in children. If the intake of iodine in diet is low in adult, the thyroid gradually enlarges in size. This abnormal condition is termed as "goiter".

Calcitonin:

It released in response to high level of calcium in blood lowers the blood calcium.

Pancreas:

Pancreas is about 6 inches long, leaf-like in structure located in the abdominal cavity in between stomach and small intestine. It is both exocrine as well as endocrine gland in nature. The endocrine part consists of patches of cells called "Islets of Langerhan's". It is involved in regulating glucose metabolism.

Hormones:

It secretes insulin and glucagon.

Insulin:

In response to high level of glucose, it secretes insulin which helps in decreasing the blood glucose levels.

Glucagon:

In response to low level of blood glucose, it secretes glucagon which increase the glucose level up to normal.

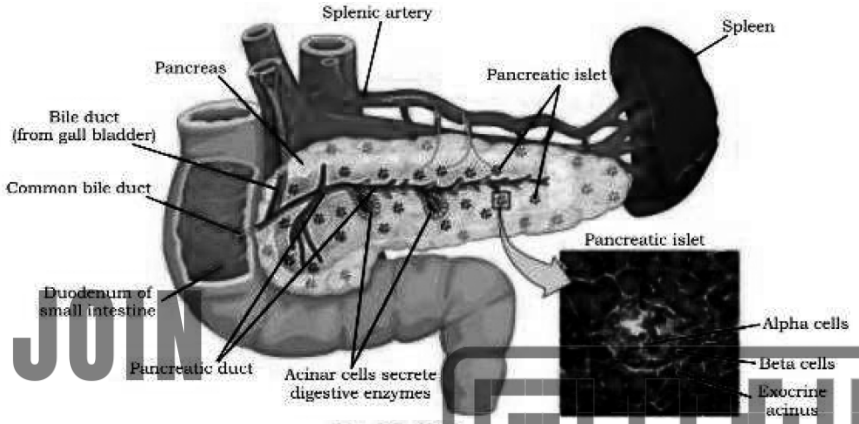


Fig. 12.22 Pancreas

Adrenal Gland:

Adrenal gland is located on the top of each kidney. It is triangular shape and consists of two glands; the outer part is called Adrenal Cortex while the inner one is Adrenal Medulla. Adrenal Cortex secretes number of steroid (lipid) hormones necessary for regulation of body metabolism maintenance of water and salts.

Hormones:

It secretes cortisol and adrenaline.

Cortisol:

It is one of the important hormones secreted by adrenal cortex in response to illness or inflammation of any tissue. It stimulates glucose production.

Adrenaline:

Adrenaline medulla responds to emergency conditions to produce so called "fight or flight response". It secretes adrenaline or emergency hormone resulting in an increase in blood glucose level by breaking down of glycogen. As a result, the body responds to the emergency situation quickly. It dilates (larger/wider) the blood vessels of muscles, heart and brain and constricts those of kidneys and skin so that more blood is supplied to the muscles, heart and brain.

Gonads:

Gonads are the reproductive organs, viz., testes in male while ovaries in female. They are involved in gametes formation and hormones secretion.

Testis:

Each testis is oval shaped structure located in a pouch of skin, scrotum. It secretes hormone known as testosterone, a type of androgen hormone. Testosterone is responsible for the development of secondary characteristics in boys like appearance of moustache and beard deepening of voice, etc.

Ocaries:

Each ovary is about the size of a grape located in the lower abdominal cavity on either side of uterus. Ovary secretes estrogen and progesterone hormones. Estrogen is responsible for the development of secondary characteristics in girls like development of breasts, sharpening of voice, etc. progesterone maintains and prepares uterus for pregnancy.

Q.19. Write short note on Diabetes mellitus.

Diabetes Mellitus:

It's a disorder in which pancreas produces insufficient or n o insulin. As a result, the level of glucose in blood becomes very high. The excess amount of glucose is excreted in urine so the frequency of passing urine increases many times. Moreover, the patient feels very thirsty and hungry. In the absence of using or storing glucose by the cells, the patient losses weight and get tired.

In case of low blood insulin, it can be administered through injecting insulin derived from animals. Some patients may show allergic reactions to this animal-insulin. It has been overcome by using pure human insulin made by genetically altered bacteria.

Mg/DL	Fasting	After Eating	2-3 Hours After Eating
Normal	80 – 100	170 – 200	120 – 140
Impaired Glucose	101 – 125	190 – 230	140 – 160
Diabetic	126+	220 – 300	200+

Q.20. Write about the feed-back control mechanism of hormonal secretion.

Feed-Back Control mechanism of Hormonal Secretion:

Hormone secretion is regulated through feed – back control so that they are secreted whenever required. There are two types of feed-back systems working in the body, negative and positive feed-back controls.

Negative feed-back control:

It refers to the opposite effect in relation to the stimulus. For example, if there is an increase in blood glucose level (effect), the pancreas would secrete insulin (response) which will bring down the blood glucose to its set point.

Positive Feed-Back Control:

It refers to enhancement of the effect in relation to stimulus. For example, when an infant sucks the nipple of his mother's breast, she secretes hormone to secrete milk. Further continuous sucking increase the hormonal secretion several folds.

Q.21. Describe the disorders of the nervous system.

Disorders Of The Nervous System:

The disorders of nervous system are as under.

Paralysis:

It is characterized by partial or complete loss of controlled movement caused by the inability to contract one or more muscles. It may be accompanied by loss of sensation. The most common cause is either bleeding (hemorrhage) or blood clot in the specific part of brain. However, it could be a result of injury to brain, spinal cord or nerves. It can be treated if diagnosed the exact cause. Physiotherapy of the affected muscles is required otherwise muscles may degenerate.

Epilepsy:

It is a brain disorder in which there is temporary alteration in one or more function or recurrent seizures. It is due to the abnormal electrical activity in brain. Stimulus like sudden flash light on eyes is also associated cause of the epilepsy. As a result, the victim may become unconscious with stiffness of the body and then twitches or jerks uncontrollably. The frequency of seizures can be reduced by using proper medication.

SHORT QUESTIONS

Q.1. What do you mean by feed back system?

Ans. A feedback mechanism is a physiological regulation system in a living body that works to return the body to its normal internal state or homeostasis.

Q.2. Why the nervous coordination is faster than chemical coordination?

Ans. The nervous coordination is faster than chemical coordination because. It is an advance type of coordination, which is a consequence of specially designed cell, Neurons. The neurons upon stimulation generate electrochemical signals. Since the signaling is in electric from so it is very faster.

Q.3. Which of the two coordination types is better and why?

Ans. Nerves co-ordination is better that chemical co-ordination because in nervous co-ordination signaling form is in electric form so it is rapid in action and response.

Q.4. How reflex action works by a reflex-are?

Ans. A reflex action often involves a very simple nervous pathway called a reflex arc. A reflex arc starts off with receptors being excited. They then send signals along a sensory neuron to your spinal cord, where the signals are passed on the motor neuron. As a result, one of your muscles or glands is stimulated.

Q.5. Why driving license is not issued to a color blind person?

Ans. Driving license is not issued to a color blind person because it is a deficiency of vision in which one cannot distinguish certain colours such as blue and yellow or red and green.

Q.6. Why does thyroid gland swell up and give the name of the disease?

Ans. Thyroid gland swells up or gradually enlarge in size due to deficiency of iodine and this disease is called goiter.

Q.7. What is the role of Islet's of Langerhans cells?

Ans. It is involved in regulating glucose metabolism. In response to high level of glucose, it secretes Insulin which helps in decreasing the blood glucose levels. In response to low level of blood glucose, it secretes glucagon which increases the glucose level up to normal.

Q.8. What is "emergency hormone" and why it is named so?

Ans. Adrenaline is called emergency hormone. It is named so because it increases the blood glucose level by breaking down of glycogen. As a result, the body responds to the emergency situation quickly.

Q.9. What are the possible reasons of paralysis?

Ans. The possible reasons of paralysis are bleeding (hemorrhage) or blood clot in the specific part of brain. However, it could be a result of injury to brain, spinal cord or nerves.

Q.10. What is Epilepsy?

Ans. It is brain disorder in which there is temporary alteration in one or more function or recurrent seizures.

Q.11. Differentiate between chemical and nervous coordination.

Ans. For answer Q#2.

TERMINOLOGY AND DEFINITIONS

Co-ordination:

The working together of different parts of the body with each other to develop efficient responses is called co-ordination. "OR" The process where different units of a system work together to perform a meaningful function is called co-ordination.

There two system are involved in co-ordination.

- Nervous system
- Endocrine system

Stimulus:

The factors which cause change either in internal or external environment of the organism.

Receptors:

The changes are detected by special cells or organs termed as receptors.

Response:

The activity or action which is performed by some living organism after analyzing stimulus or stimuli is called response.

Effectors:

They are the organs that respond on receiving the orders from the central nervous system e.g muscles and glands etc.

Hormones:

Chemical coordination takes place by means of special secretion called hormones. These are chemicals which are secreted by endocrine gland.

Reflex Action:

The body functions which are not under the control of the will of the organism and take place automatically are called reflex actions.

Neuron:

The structural and functional unit of nervous system is called neuron.

Hormones:

Chemical coordination takes place by means of special secretion called hormones. These are chemicals which are secreted by endocrine gland.

Central nervous system:

The system which consists of brain and spinal cord is called CNS.

Nervous System:

The set of organ, which control and co-ordinate all the activities of the body is called nervous system. Nerves system composed of two system central nervous system and peripheral Nerves system.

Reflex Are:

The pathway of a reflex action is termed as reflex are.

Cerebrospinal fluid:

Cerebrospinal fluid (CSF) is a clear, colorless body fluid found within the tissue that surrounds the brain and spinal cord of all vertebrates.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. The activity in relation to changes in environment is:
   - Stimulus
   - Response
   - Both a & b
   - None of these
2. Stimulus is detected by:
   - Receptor
   - Effector
   - Nerve
   - All of these
3. The type of coordination through electrochemical signals is:
   - Nervous
   - Chemical
   - Mechanical
   - All of these
4. The chemicals released from one cell and carried to signal some distant cell through blood are:
   - Neurotransmitters
   - Enzymes
   - Hormones
   - All of these
5. The type of coordination exhibited by plants:
   - Nervous coordination
   - Chemical coordination
   - Mechanical coordination
   - Both a & b
6. The part of brain involve in reasoning is:
   - Fore brain
   - Cerebrum
   - Cortex
   - Frontal lobe
7. The part of brain involved in balance and precision in movements is:
   - Cerebrum
   - Cerebellum
   - Thalamus
   - Medulla oblongata
8. Vital functions for survival of animals are regulated by:
   - CNS
   - PNS
   - Somatic sub division
   - Automic sub-division
9. The shortest path of reflex action consists of:
   - 1 neuron
   - 2 neurons
   - 3 neurons
   - Many neurons
10. The type of lens in our eye is:
    - Convex
    - Concave
    - Both A & B
    - None of these
11. The automatic process of altering focus to get sharper image of near object is:
    - Vision
    - Accommodation
    - Focus
    - All of these
12. The vitamin necessary for proper vision is:
    - Vitamin A
    - Vitamin B
    - Vitamin C
    - Vitamin D
13. A colour blind person cannot see:
    - Anything
    - Red
    - White
    - Black
14. The book “Kitab-ul-manazir” was written by:
    - Jabir bin Hayan
    - Ibn-al-Haitham
    - Ali Ibn –Isa
    - Bu – Ali sina
15. Sensory hair – cells are present in:
    - Retina
    - Cochlea
    - Skin
    - Nose
16. The gonads are the target organ for:
    - FSH
    - LH
    - Both a & b
    - None of these

SUPPORT AND MOVEMENT Ch # 04

DETAILED QUESTIONS

Q.1. Define the types of movement on the basis of stimuli.

Types of movement on the basis of stimuli:

On the basis of stimuli there are two types of movement.

Autonomic or spontaneous movement:

The type of movement takes place due to internal stimuli.

Example: cramps due to involuntarily release of Ca" ions.

Paratonic or induced movement:

The type of movement takes place due to external stimuli.

Example: Reflex action.

Q.2. Define the types of movement on the basis of response.

Types of movement on the basis of responses:

Locomotory Movement or taxis or tactic Movement:

The type of movement where organism change its place either towards or away from stimulus.

Example: Usually found in animals, bacteria and protozoa.

Trophic Movement:

Type of growth movement, organism move toward or away by growing their organs.

Example: Usually found plant, fungi or in bacterial colony. Growth of root towards water or growth of stem towards light.

Nastic Movement:

Type of movement where change in osmotic water occur due to stimuli.

Example: Purely found in plants like touch me not plant, which close leave when touch.

Q.3. What is skeleton? Write its important functions.

Skeleton:

In animal and man the hard from work of bones which gives shape and responsible for support and movement is known as skeleton.

Functions of skeleton:

- It provides shape to organism (organs)
- It provides support to organism (organs) during movement.
- Provide protection to soft and vital organs such as brain, heart, lungs etc.
- It provides surface for the attachment of muscles.
- It helps in locomotion.

Q.4. Define different types of skeleton.

Types of skeleton:

There are following types of skeleton found in animals.

Exoskeleton:

If the skeleton lies outside the body of animals is called exoskeleton.

Examples:

Shell of molluses and cuticle of arthropods etc.

Endoskeleton:

IT the skeleton lies inside the body of animals is called endoskeleton.

Examples:

Sponges, echinodermata and vertebrates etc.

Hydrostatic skeleton:

The skeleton is formed of fluids is called hydrostatic skeleton. It helps to maintain the body structure and locomotion of animals.

Examples:

Cnidarians, annelids and caterpillars etc.

Q.5. Prove that the skeletal system is a dynamic system "OR"
Define the term 'Skeletal System is a Dynamic System'

Skeletal system is a dynamic system:

The dynamic property of skeletal system means that it is made of living tissues, it is capable of quick growth. It can adapt to stress can repair itself after damage (injury). 5% to 10% of our bones dissolve away annually and are replaced by a new one this process is called remodeling while in the growing age our bones enlarge with the growth of the body. The remodeling system allows a skeleton to alter the shape size of skeleton in response to demand. e.g the bones carry heavy load subjected to extreme stress become thicker to provide more strength support. Normal stresses are major factors in maintaining bone strength. There are three types of cells associated with bones i.e. bone forming cells (osteoblast), mature bone cell (osteocyte) and bone dissolving cells (osteoclast).
Bone remodeling is the result of coordinated activity of osteocyte and osteoblast. This coordination can be seen clearly at the time of repair of broken bone.

Q.6. Explain the process of bone healing occurs during 6 weeks.
When the bone is broken, the following steps occur during 6 weeks for bone healing.

Step 1:

Bone blood from ruptured blood vessels form a large clot around the fracture. Phagocytic cells and osteoclast in the blood ingest, dissolved the Cellular debris and bone fragments.

Step 2:

A fracture ruptures the periosteum and stimulates the production and release of numerous osteoblasts, which secrete a porous mass of bone and cartilage called callus, around break. Callus replaces the original blood clot and holds the end of the bones together, the remodeling process re-form the original shape of the bone.

Step 3:

Osteoclast, osteoblast and capillaries invade the callus. Blood nourished the cells, osteoclast breakdown the cartilage while osteoblast replaces it with bone.

Step 4:

The healing of bone completed.

Q.7. Explain the types or groups of skeleton in human.

Human skeleton:

In humans 206 bones are present which can be categorized into two groups or types.

The axial skeleton:

The skeleton consists of all the bones which lies on the central axis of the body and form the main frame-work or main axis of the body. It is composed of 80 bones.

- Head (skull 22 bones)
- Vertebral column (26 vertebrae)
- Rib cage (ribs 12 pairs, 24 single)
- Chest bone or sternum (1 bone)

Appendicular Skeleton:

The bones which are attached with axial skeleton form the appendicular skeleton. It includes pectoral (shoulder) and pelvis (hip) girdles. It is composed of 126 bones.

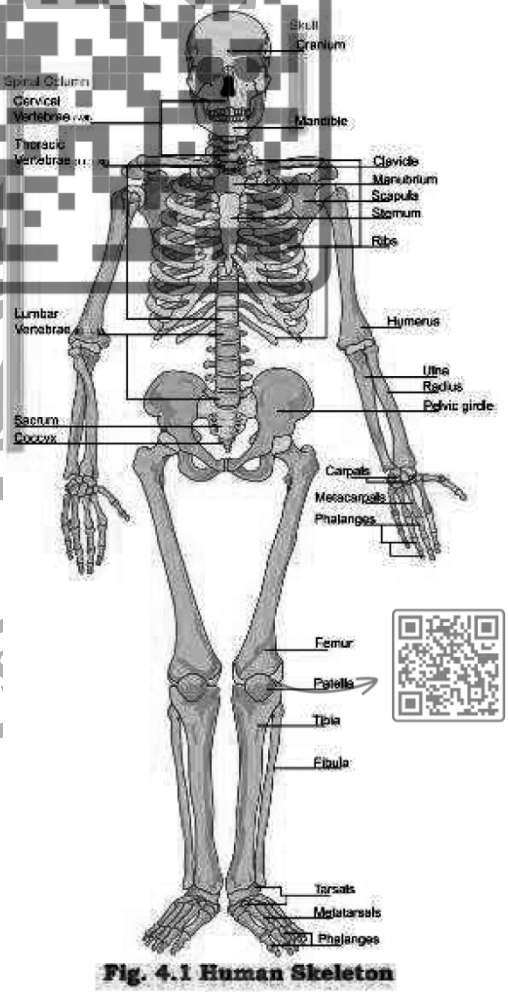


Fig. 4.1 Human Skeleton

Pectoral girdle:

It consists of two bones i.e. scapula and clavicle. The forelimb consist of humerus, radius and ulna, carpal (8), metacarpal (5), and phalanges (14).

Pelvic girdle:

It consist of three bones ileum, ischium and pubis. Hind limb consists of femur, patella, tibia, fibula, tarsals, (7), metatarsals (5) and phalanges (14).

Q.8. Define joints. Write about its different types.

Joints:

The junction of two bones is called a joint.

Types of joints:

There are two types of joints.

Immovable or fixed joint:

Joint where bones are fixed like puzzle pieces and do not allow to move, like 8 bones skull or 3 bones of pelvic girdles.

Moveable joints:

Joints where bones are allowed to move freely or partially. So there are types of moveable joints i.e freely moveable and partially moveable.

Hinge Joints:

The joint allow movement in one plane only e.g knee joint.

Ball and socket:

The joint allow movement in many plans such as forward, backward and sideways. Both hinge joints and ball socket joints have the same basic structure. e.g shoulder joint.

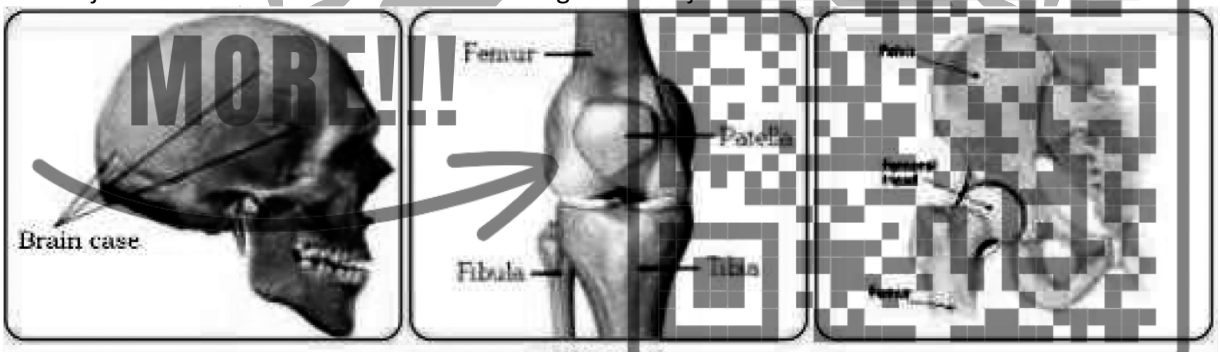


Fig. 4.3

Immovable joints Skull | Knee as Hinge Joint | Hip Joint as Ball & Socket Joint

Location and Movement of Hinge Joint:

Hinge joints move back and forth like the hinge on a door and allow movements in one plane only. The knee and elbow are hinge joints.

Location and Movement of ball and socket Joints:

This joint allows movement in all directions. The ball of humerus and femur fit into the socket of pectoral and pelvic girdle respectively. The hip and shoulder joints are ball and socket joints.

Q.9. Describe the role of ligament and tendon in Movement.

Role of ligament in Movement:

The band of fibrous connective tissues by which bones are joined to one another at joints called ligament. It works as strong firmly attached ropes, it stabilizes the joint or hold the ends of two bones together. The strong connective tissue in the ligaments protects these structures and prevents them from bending twisting or earing.

Role of tendons in Movement:

Skeletal muscles are attached to bones on either side of the joint by bands of tough, fibrous connective tissues called tendons. They are tougher and less elastic than ligaments. Tendon transfers the mechanical force of muscle contraction to the bones. It is strongly connected to muscles fiber at one end and to components of the bones at its other end. They are very strong, highly tensile.

Q.10. Draw the flow chart of the joints.

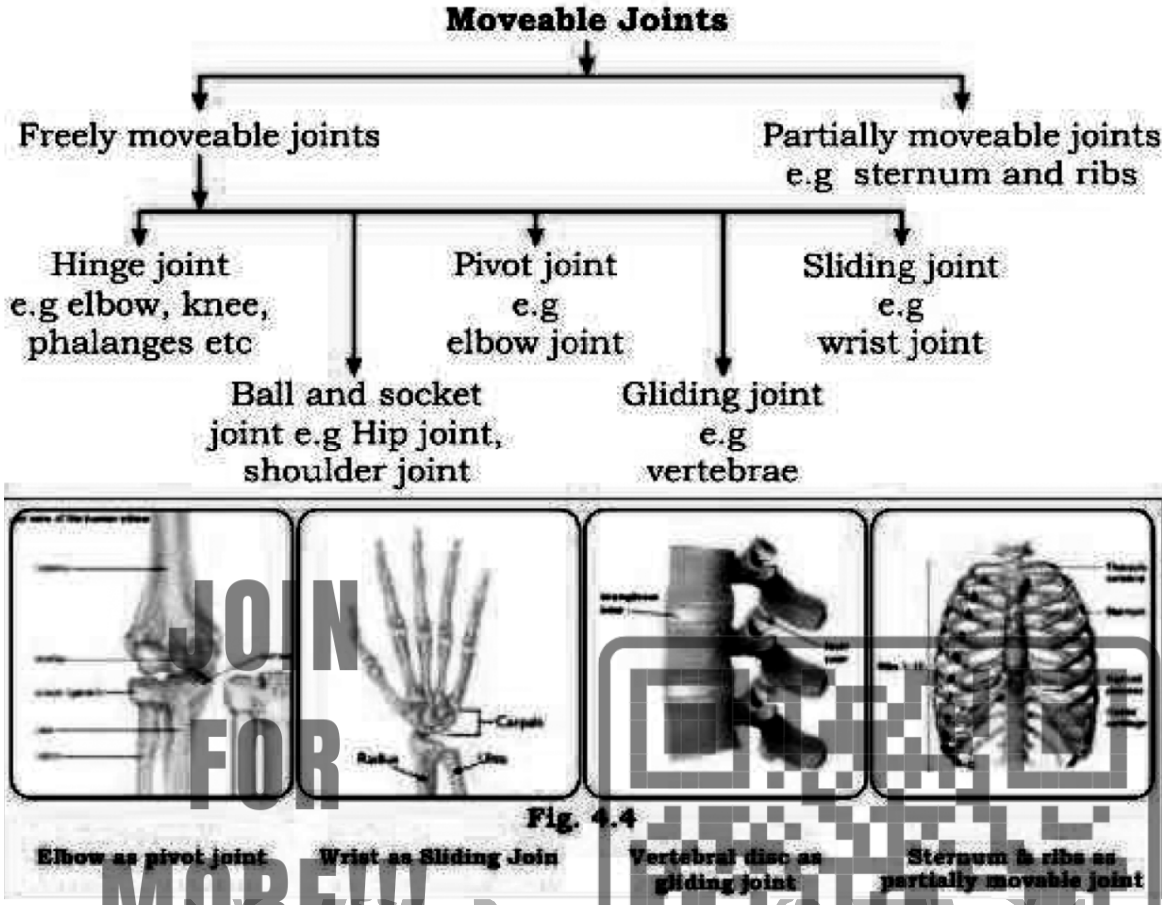


Fig. 4.4

Q.11. Define muscle. Define its types with examples.

Muscles:

Muscles are connective tissues consist of fibrous cells. These tissues have ability to contract and relax. Muscles cause movement of the body and body parts.

Type of muscles:

The vertebrate possess following three kind of muscles.

Skeletal muscles:

The muscles which are attached to the skeleton called skeletal muscles. They are associated with the movement of bones. These muscles are voluntary in nature. They are also called striped or stride muscles because they have alternate thick and thin means dark and light bonds.

Cardiac Muscles:

These are the muscles which build the walls of heart. They are also striated muscles but unlike skeletal muscles they are branched in nature and arranging mash work. they are involuntary in nature.

Smooth Muscles:

They are made up of long and spindle shaped cells, each cell contain single nucleus. They have no striations or stripes. They are involuntary in nature. These muscles are found in blood vessels, digestive tract and many other internal organs.

Q.12. Describe the flexion and extension in human arm. "OR"
Describe the action of flexors and extensors as a pair of apposing muscles. "OR"
What are antagonistic muscles? Describe with an example. "OR"
How are muscles attached with the bones?

Attachment of muscles:

Each skeletal muscle is attached to the bones at two points. One end is usually attached to an immoveable rigid bone called origin of muscle, while the other end is attached to a moveable bone called insertion of muscle. Muscles can be attached to the bone by means of strong, whitish cords of inelastic fibres called tendons. When a muscle contract it exerts tension between origin and insertion points and thus the organ moves.

Antagonistic Muscles:

Muscles acting in pairs in such a manner that one provide extension and other provide flexion. The one muscle of this pair when contracted other muscles will relax. This type of working of two muscles against each other called antagonism. The pair of skeletal muscles which work against each other called an antagonistic pair or antagonistic muscles.

Mechanism of Movement:

Skeletal muscles work in sets. The contraction and relaxation of skeletal muscles allows the bones to move. Usually the members of a set work opposite to each other to bring about movement or locomotion. When the biceps muscle contracts it pulls upon the radius bone of lower arm, which bend the arm at elbow, this bending process is called flexon. When triceps muscle contracts it pull on the ulna which straightens or extends the arm. It shows that when the biceps contracts the triceps relaxes and vice versa. It means that in arm the biceps is the flexor muscle and triceps is the extensor muscle.

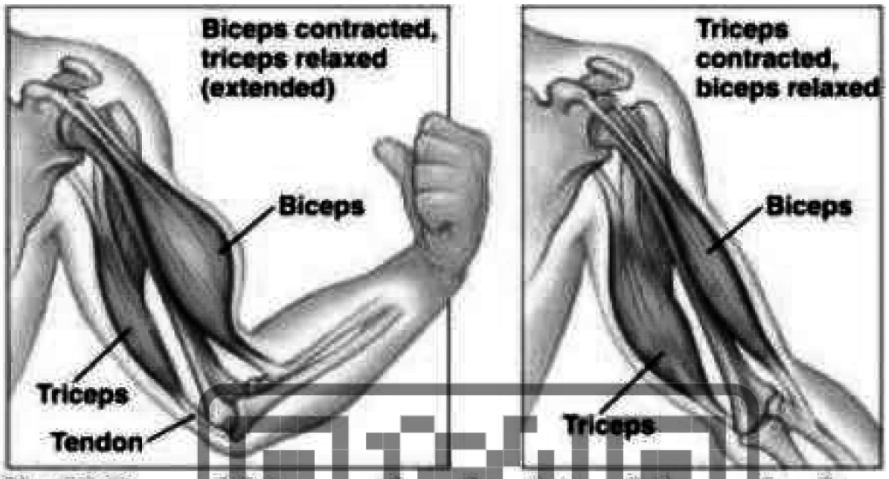


Fig. 4.9 Bicep and Tricep muscle work as Antagonistic muscles of arm

Q.13. Describe the disorder of skeleton system. "OR"
Explain disorders of bones and their causes.

Effect of Calcium Deficiency on Bone:

The hardening of bones occurs due to deposition of calcium phosphate, this process is called calcification. If ca deficiency occurs in body or blood, ultimately it occurs in bones. This deficiency of Ca" in bone is called hypocalcemia known as calcium deficiency disease. A long term calcium deficiency can lead to dental weakness, osteoporosis, in childhood rickets.

Osteoporosis:

It is a disorder related to the aging process. In this condition the bones become porous or more spongy, thinner and weaker so that they become fragile, in this condition a slight injury break the bone. Osteoporosis is more common in female than male.

Rickets:

Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency. Vitamin D plays vital role in the absorption of Ca', deficiency of vitamin D leads to deficiency of Ca" in bone.

Arthritis:

It is the painful condition of joints due to swelling and tenderness of joint. The main symptom of arthritis are as under.

- Joint pain
- Inflammation in and around the joint
- Warm red skin over the affected joint
- Trouble dressing, combing, gripping, bending over squatty or climbing stair.
- Tenderness and stiffness
- restricted movement of joint

Common types of Arthritis:

Osteoarthritis:

It is caused by overuse of joints, age, joint injury, obesity, joints that bear weight, like knees, hips, feet and spine.

Rheumatoid Arthritis:

It is due to immune system i.e. autoimmune disorder. In this disorder immune system attacks on joints.

Psoriatic Arthritis:

In this disorder joints and skin affects.

Causes of Arthritis:

The following factors are the causes of arthritis.

- Injury
- Infection
- Genetic makeup
- Abnormal metabolism
- Auto immune system
- Reduction in the normal amount of cartilage or synovial fluid

Q.14. Describe the role of obesity in arthritis.

Role of Obesity in Arthritis:

Obesity puts stress on joints, especially on knee, causing pain and develop worse condition in arthritis damage. The rheumatologist states that just 10 pound overweight increases force of 20 to 40 pound on knees at each step during walk.

The excessive fats tissues release high levels of cytokines proteins that can cause inflammation throughout body. The same protein produced by joints during rheumatoid arthritis. It makes existing joint inflammation more worse.

SHORT QUESTIONS

Q.1. What are the main function of skeleton?

Ans. For answer Q # 3.

Q.2. Distinguish between bone and cartilage.

Ans. For answer Differences

Q.3. Located the cartilages in different organs.

Ans.
- **Ends of the ribs.**
- **Between the vertebrae in the spine**
- **Ears and nose**
- **Bronchial tubes**
- **Trachea**

Q.4. Enlist the name and number of bones present in hind limb.

Ans. There are 30 bones present in hind limb. Each hind limb contains femur in thigh, patella in knee, tibia and fibula in shank, 7 tarsals in ankle, 5 metatarsals in sole and 14 phalanges in toes.

Q.5. Locate the immovable joints in the human body.

Ans. 8 bones of Skull and 3 bones of pelvic girdle are immoveable joint in human body.

Q.6. Draw neat and labeled diagram of hinge joint and ball and socket joint.

Ans. For answer Q # 8.

Q.7. What is rickets? Give its causes.

Ans. For answer Q # 13.

Q.8. Distinguish between ligament and tendon.

Ans. For answer differences

Q.9. Locate hinge joint in the body of human.

Ans. There are hinge joints in the fingers, toes knees, elbows, and ankles in the human.

Q.10. What do you mean by bicep and triceps muscles?

Ans. For answer definitions and terminology.

DIFFERENCES

#	Cartilage	Bones
1	Type of skeleton which is flexible.	Type of skeleton which is harder.
2	It is made up of cells called chondrocytes embedded in a matrix of protein called collagen.	It is made up of cell called osteocytes embedded in a matrix of protein called collagen.
3	It is much softer than bones as well as flexible.	It is harder due to the deposition of calcium phosphate, process is called calcification.
4	Calcification does not takes place.	Calcification takes place.
5	It covers ends of the bones and joints.	It support the organ consists of an outer shell of compact bone.
6	No blood vessel penetrate into cartilage.	Blood vessels can penetrate into bone especially in spongy bones.

Hydrostatic Skeleton	Exoskeleton	Endoskeleton
Skeleton made up of fluid.	Skeleton deposit outside the body or organ.	Skeleton develop inside the body.
Found in soft bodied animals.	Found in Arthropod, Mollusca and higher animals.	Found in high animal.
Simplest type of skeleton.	It provides support and protection.	It provides shape, support and protection.
It helps in extension or with drawl of body or its organs.	Nonliving in nature, in arthropods made up of chitin, in mollusca made up of $CaCO_3$.	Living in nature made up of cells.
In jelly fish, help in propulsion by water.	In high animals made up of proteins.	Two types of endo skeleton cartilage made up of chondreocyte bone made up of osteocytes.
In earthworm coelomic fluid work as hydrostatic skeleton.		

#	Tendon	Ligament
1	Tendons join skeletal muscle to bone.	Ligaments join the one bone to another bone.
2	Tendons are tough and inelastic.	Ligaments are strong and elastic.
3	In tendons fibroblast present in a rows.	In ligaments fibroblast present in scattered form.

TERMINOLOGY AND DEFINITIONS

Protoplasm:

It is the living part (material) of a cell that is surrounded by a plasma membrane.

Irritability:

The organisms are sensitive to its nature due to possess special property. This property is called irritability.

Movement:

Due to this irritability the living organism take some action to reduce its irritation these actions called movement. "OR" Movement is the response shown by the living organism towards or away from the stimulus.

Stimulus:

The change in environment takes place due to some factors these factors are called stimulus. (stimuli:p)

Response:

The reaction of organism due to the stimulus is called response.

Positive response:

The response away from towards the stimulus is called negative response.

Negative response:

The response away from towards the stimulus is called negative response.

Locomotion:

Movement of an organism as whole from one place to another is called locomotion.

Motile:

Those organisms which have ability of moving from one place to another place are called motile.

Sessile:

The organisms which remain fixed to the substratum and cannot shift from one place to another are called sessile.

Cartilage:

Cartilage is a flexible connective tissue that makes part of the human skeleton.

Chondrocyte:

The cells which are present in the cartilage bone are called chondrocyte.

Osteocytes:

The mature bone cells are called osteocytes.

Calcification:

Calcification is a process in which calcium builds up in body tissue, causing the tissue to harden.

"OR" The hardening of bones occurs due to deposition of calcium phosphate, this process is called calcification.

Bipedal Animal

Bipedal means two feed. The organism moves by means of two feet (limb) are called bipedal animal.

Remodeling:

The bones of human body dissolve away annually 5% to 10% of the bones and are replaced by a new one this process is called remodeling.

Osteoblast:

The cells which are formed bones are called osteoblast.

Osteoclast:

The bone dissolving cells are called osteoclast.

Ruptured blood Vessels:

When a blood vessel bursts, a small amount of blood escapes from the vessel into the body. This blood may show up just beneath the surface of the skin. Blood vessels can burst for many reasons, but it usually happens as a result of an injury.

Phagocyte cells:

The cell that has the ability to ingest, and sometimes digest, foreign particles, such as bacteria, carbon, dust.

Periosteum:

A dense membrane composed of fibrous connective tissue that closely wraps all bone except that of the articulating surfaces in joints, which is covered by a synovial membrane. Striations or stripes:

SAN (Sino Auricular Node):

The sinoatrial node (SA node) is a specialized myocardial structure that initiates the electrical impulses to stimulate contraction, and is found in the atrial wall at the junction of superior caval vein and the right atrium.

Tendon:

Tough, whitish cords of fibrous material by which muscles attached with bone is called tendon.

Ligament:

Strong fiexible bones of connective tissues are called ligaments. The revelent bones of joints are held together by ligaments.

Flexor Muscle:

Member of antagonistic muscle which bends of a limb is called flexor muscle.

Extensor Muscles:

Member of antagonistic muscle which straightens of a limb is called extensor muscle.

Bicep Muscles:

The bicep muscle is a large muscle that lies on the front of the upper arm between the shoulder and elbow. It has two heads or origin.

Tricep Muscles:

The tricep is also a large muscle on the back of arm. It is three headed or origin.

Hypocalcemia:

If Ca deficiency occurs in body or blood, ultimately it occurs in bones. This deficiency of Ca" in bone is called hypocalcemia known as calcium deficiency disease.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. Irritation caused by stimulus is the main cause of:
   - Tropism
   - Movement
   - Locomotion
   - Arthritis
2. The framework which gives shape to any structure called:
   - Architecture
   - Bone
   - Cartilage
   - Skeleton
3. The cartilage are made up of cells called:
   - Osteoclast
   - Osteocytes
   - Chondrocytes
   - Chondrocytes
4. The head of femur attached with:
   - Pelvic girdles
   - Pectoral girdle
   - Scapula
   - Acetabulum of pelvic gridles
5. The large muscles of arm is:
   - Bicep
   - Tricep
   - Tetracep
   - Pentacep
6. The band of tough, fibrous, connective tissue which are attached to bone at joints called:
   - Ligament
   - Tendon
   - Bicep
   - Tricep
7. Softening and weakening of bone in children due to deficiency of vitamin D called:
   - Osteoporosis
   - Osteoarthritis
   - Rickets
   - Rheumatic fever
8. The muscle which is responsible to straighten the limb is:
   - Ligament
   - Skeleton muscle
   - Flexor
   - Extensor
9. The pair of muscle where both work in opposite direction:
   - Antagonist
   - Cardiac
   - Smooth
   - Abductor

REPRODUCTION Ch # 05

DETAILED QUESTION

Q.1. What is reproduction? Define its different types.

Reproduction:

The process by which the living organisms produce offspring of their own kinds is called reproduction. There are two types of reproduction.

Asexual reproduction:

It is the production of off spring without fusion of sex cells (gametes). This types of reproduction takes place from a single parent and off spring is exactly alike to its parents.

Sexual reproduction:

It is the production of off spring by the fusion of male and female sex cells (gametes). These off spring are not exactly alike to its parents.

Q.2. Write difference between asexual and sexual reproduction.

#	Asexual reproduction	Sexual reproduction
1	Type of reproduction which takes place without fusion of male and female gametes (Sex cells).	Type of reproduction which takes place by the fusion of male and female gametes (sex cells)
2	In this type of reproduction only on parent is required.	In this type of reproduction usually two parents of opposite sexes are involved.
3	No fertilization.	Fertilization occurs.
4	The offspring are exactly similar to their parents.	The offspring are not exactly similar to their parents.
5	Organisms are genetically similar to each other as well as to their parent.	Organisms are genetically dissimilar to each other as well as to their parent.
6	Ne new combination of genes occurs.	Genetic recombination occurs which causes variation and leads to evolution.

Q.3. Describe different types of asexual reproduction in plants.

Types / Methods of asexual reproduction:

There are following types of asexual reproduction.

By fission (splitting):

It is the type of asexual reproduction during which there is replication of genetic material or division of the nucleus followed by the division of the parent body into independent daughter cells. Each daughter cell receiving equal amount of nucleus or genetic material. There are two types of fission binary fission and multiple fission.

(a) Binary Fission:

The types of fission where a mother cell divides into two daughter cells. It occurs during favorable conditions. It takes place in bacteria under favorable conditions of temperature, nutrition and moisture, single bacterium divides into two bacteria within 20 minutes and numerous bacteria are produced within very short interval of time.

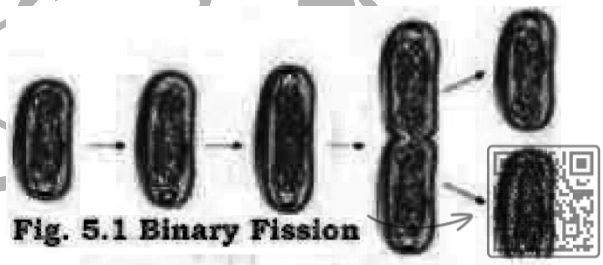


Fig. 5.1 Binary Fission

(b) Multiple Fission:

The type of fission where a mother cell divide into more than two daughter cells.

Budding:

In this type of reproduction parent cell forms a small out growth or a bud. This bud grows into a new cell which breaks off from the parent cell. Yeats and fungus reproduce by budding.

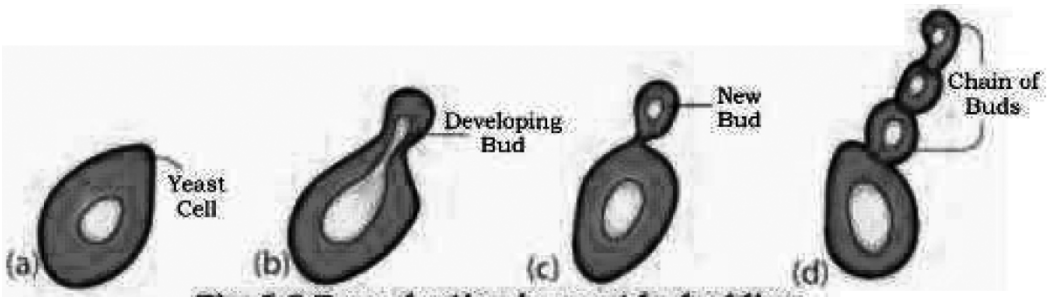


Fig. 5.2 Reproduction in yeast by budding

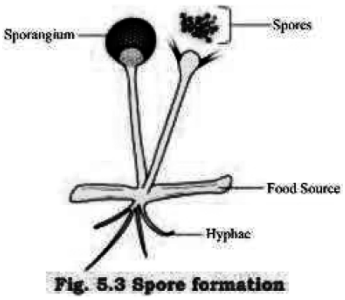


Fig. 5.3 Spore formation

Spore formation:

In most of the fungi asexual reproductive structure sporangium is formed on their body. These sporangia have unicellular spores. They are very small and light and are dispersed by wind, water and animals. These spores can survive in unfavorable condition due to thick and resistant wall. When these spores drop on proper substratum, they develop into new organism I favorable conditions.

Q.4. Define vegetative propagation. Define the different types of vegetative propagation in plants.

Vegetative propagation:

Vegetative means non-reproductive part of plan like, thallus, root, stem and leaf. If any of this part develop into new plant called vegetative propagation.

Vegetative Propagation in Plants: (Through stem, suckers and leaves)

New plants can be produced from vegetative structures such as the roots, stems, suckers and leaves. The process can be natural or artificial.

By Stem:

In many plants, the stem has buds as in onions, daffodils and strawberries etc. have stems that can start new offspring. These type of stem that can reproduce recognized as runners, bulbs, rhizome, tubers, and suckers.

Leaves:

Some leaves have bud on their margin e.g. Bryophyllum. These buds give rise adventitious root when fall on ground or come in contact with soil. After some time these parts of leaves develop into an independent plant.

Suckers:

Suckers are known as root sprouts, basically these are plants stem that arise from buds on the base of stem or root of parent plant that use suckers, are apple, elm and banana tree. Suckers grow and form a dense compost mats that is attached to parent plant. Too many suckers can lead to a small crop.

Q.5. Define artificial propagation. Define the different types of artificial vegetative propagation in plants.

Artificial Vegetative Propagation:

If the plants are artificially propagated by using the vegetative parts this method is called artificial vegetative propagation.

Methods of Artificial regetative propagation:

The methods of artificial vegetative propagation are as under. It takes place by cutting, grafting and cloning.

Cutting:

Cuttings are the short pieces of stems that have 2 to 3 nodes and buds. It cuts obliquely below a node from a plant. The cutting embedded in soil with at least one node above the soil. The adventitious roots and shoots grow from buds of the portion below the soil and above the soil respectively forming a new plant e.g. sugar cane, sweet potato and rose.

Grafting:

This is a teachnique where a branch of desired variety of plant is joined to another plant with well-established root system. The plant from which the branch is taken is called scion and the plant to which it is joined is called stock. The two plants involved are normally belongs to different varieties of same species e.g. oranges, lime and mango.

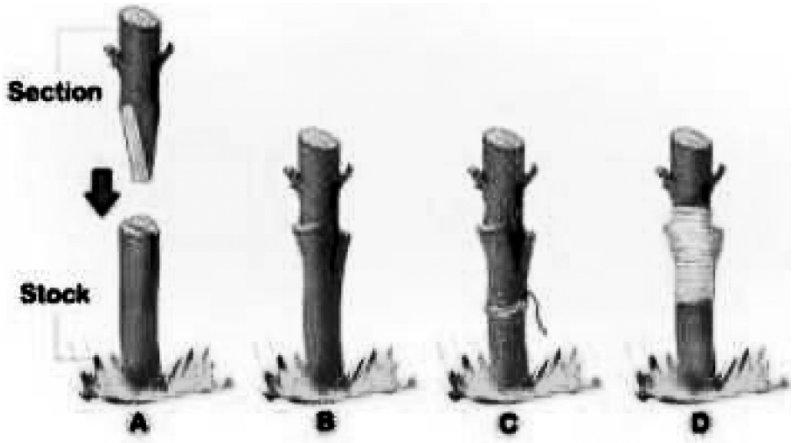


Fig. 5.9 Grafting of plant

Cloning: (Tissue Culture Technology)

It is one of the recent techniques. In this method tissues of selected plants are cultured using their ability of asexual reproduction in test tube or dishes. To speed up the growth, hormones are added in the growth medium. After some time the baby plant is transferred to field for large commercial scale production of desired yield.

Q.6. Writ differences between vegetative propagation & vegetative propagation.

#	Vegetative Propagation	Artificial Propagation
1	It is natural development of new plant without human efforts.	It is the method of development of new plant with the help of efforts.
2	Natural vegetative propagation usually occurs by root, stem, or leaves.	Artificial propagation can occur from cells, tissues, cutting of stem etc.
3	Stem, runners grow horizontally above the ground.	The method are Tissue culture, cutting, grafting, Layering, Budding.
4	Roots; new plant emerges out of swollen modified root known as tuber.	Root may be used for artificial propagation.
5	Leaves; of a few plants detached from parent plant and develop into new plant e.g. Bryophyllum	Any leave tissue may also use and develop into new plant.

Q.7. Describe the process of apomixes (Parthenogenesis).

Apomixes /Parthenogenesis:

It is the type of asexual reproduction. In this process the egg without being fertilized, becomes a complete individual. Such individuals are sexually sterile. It is commonly observed in some insects and rotifers.

Apomixes is the type of seed production without fusion of male and female gametes. It is the type of Parthenogenesis which is the form of asexual reproduction. Where an egg develops into a complete individual with out being fertilized. The resulting offspring can be either haploid or diploid depending on the process and the species. It is a natural form of asexual reproduction in which embryo develops in the absence of fertilization. Most commonly found in plants and invertebrates. The question arises here when gamete is involved so why it is considered as asexual reproduction? Because this process does not require fusion of male and female gametes to produce offspring and new genetic combination does not occur.

Q.8. Describe the sexual Reproduction in flowering plants.

Sexual Reproduction in Flowering Plants.

The angiosperm is the group of plants which gives rise traditional flower therefore these plants are called flowering plant. In these plants sexual reproduction takes place through flower.

Flower:

Flower is highly modified shoot which is responsible for the reproduction by producing seeds within fruits. Flower consists on the following wheels.

Calyx:

It is the external wheel leave called calyx which consist of sepal.

Corolla:

It is the external wheel of leave called corolla which consist of petals.

Androecium:

It is the inner wheel of leaves which consist of stamens. It is directly responsible for sexual reproduction of plants. Stamens produce pollen grains which take part in reproduction.

Gynoecium:

It is the inner wheel of leaves which consist of carpals. It is directly responsible for sexual reproduction of plants. Carpals produce ovule in ovary which take part in reproduction.

Fig. 5.10 Parts of a flower

Q.9. Describe the structure of ovule. ---OR--- draw a neat and labeled diagram of ovule.

Structure of ovule:

Ovule consists on the following parts.

Nucellus:

Ovary contains the ovule. Each ovule has main cellular body is called nucellus.

Integuments:

Necellus surrounded by two coats, inner and outer known as integuments.

Micropyle:

A small opening present at the apex of the integuments is called micropyle.

Funicle:

The ovule has a stalk by which it is attached to the ovary wall known as funicle.

Chalza:

Chalza is a tissue between nucleolus and funicle.

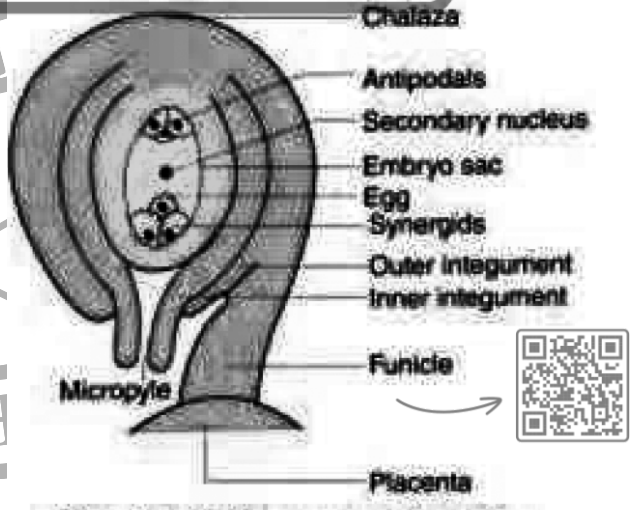


Fig. 5.11 Structure of ovule

Embryosae:

There is a large oval cell embedded (lying) in the nucellus which form embryo sac (female gametophyte). The mature embryo sac consists of 7 cells i.e. one three antipodal cells and one secondary nucleus in number while diploid cell is a fusion nucleus in the centre.

Q.10. Describe the structure of pollen grains.

Structure of pollen grains:

The pollen grains are developed in the pollen sac of the anthers of the stamens and form a loose, dusty powder. Each pollen grain is a single cell bounded by a wall which consists of two coats. The inner coat is intine and an outer coat is the axine. Each pollen grain is a single cell consisting of granular protoplasm with the nucleus in the middle.

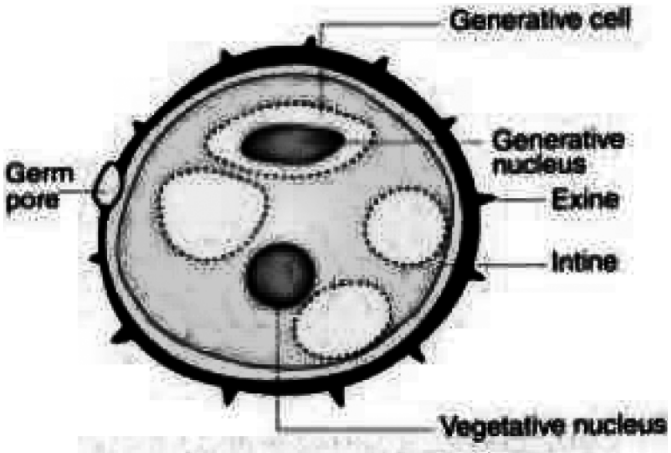


Fig. 5.12 Structure of pollen grain

Q.11. Define pollination with its types.

Pollination:

Pollination is a biological process in which there pollen grains are transferred from the anther of a stamen to the stigma of carpel.

Types of pollination:

There are two kinds of pollination. 1. Self pollination 2. Cross pollination.

Self pollination:

It is transfer of pollen grains from the anther of the stamen to the stigma of a carpel of the same flower.

Cross pollination:

It is transfer of pollen grains form the anther of one flower to the stigma of another flower, present on two different plants belonging to same species.

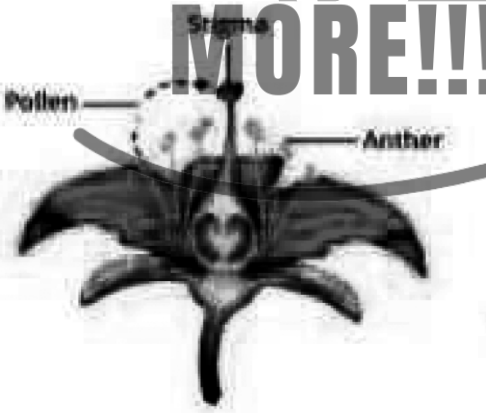


Fig. 5.13 Self pollination


Fig. 5.14 Cross pollination

Q.12. How pollen grains are transferred in cross pollination. "OR"
Which flowering agents help in cross pollination.

Ans. Cross pollination is more common than self pollination, the pollen grains are carried from one flower to another flower through following agents.

- Wind
- Water
- Insects
- Animals

Q.13. Define fertilization. Describe the process of double fertilization in flowering plant.
Describe the process of embryo formation. "OR" Describe the life cycle of flower.

Double Fertilization:

It is the process of the fusion of male and female gametes to form a single diploid zygote. When pollen grain drops at stigma, it starts its development into pollen tube (male gametophyte), which consists of 6 haploid cells, among them two are prothallial cells, two are male gametes, one stalk nucleus and one tube nucleus. The pollen tube grows from stigma to ovule through style and transfers two male gametes in ovule through micropyle which ultimately reach to embryo sac. One sperm nucleus fuses with ovum to produce diploid (2N) zygote while other gamete fuses with secondary nucleus to form 3N (triploid) cell which later develop into endosperm of seed. This type of fertilization is called double fertilization which is the characteristic feature of angiospermic plant.

The 2N zygote after successive mitotic divisions develops into an embryo within the embryo sac, whereas triploid (3N) secondary nucleus develops into endosperm. The endosperm provides nourishment to the developing embryo.

During this development the ovule develops into seed the integument develop into seed coat whereas zygote form small embryo and cotyledon during this the ovary outside ovule become swollen due to mitotic cell division and become fruit. The fruit is eaten by animal or decay, the seeds come out, disperse or dropped in soil. In favorable conditions, it germinates and grows into new baby plant.

Fig. 5.16 Life cycle of flower

Q.14. Describe the process of formation of fruits.

Fruit Formation:

The ovary enlarges to form a fruit, containing seed or seeds. The stigma and style disappear. The stamens and petals are usually lost after pollination. In some case, sepals remain attached with fruit e.g. brinjal. The endosperm provides nourishment to develop embryo. It also stores energy in grains like wheat, rice, gram etc. which can be utilized by us or other animals.

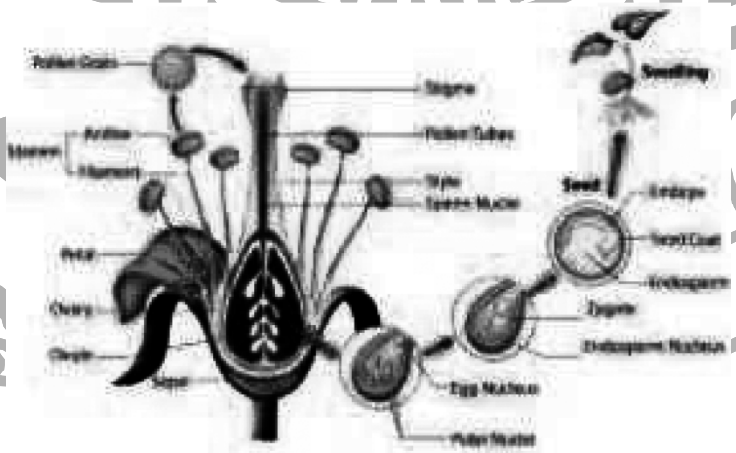


Fig. 5.16 Fruit formation

Formation of fruit without fertilization:

Fruit and seed formation usually occur after fertilization but some fruit may formed without fertilization. This mechanism is called parthenocarpy i.e. formation of seedless fruit, like banana.

Q.15. Write the adaptive characteristics wind pollinated and insect pollinated flower.

Adaptation in the structure of wind pollinated and insect pollinated flower:

Some plants spread their pollen grains by wind and H_2O while the other spread by insects and animals. The plants which spread their pollen grain by wing and H_2O have some adaptive characters.

Adaptive characters of wind pollinated and water pollinated plants:

- The flower of these plants are non-attractive, small in size and do not bear any odour.
- They produce pollen grains in high quantity.
- The pollen grains are very light in weight, some of them bear wings and some have parachute like structure.
- They do not produce high quantity of nectar.

Adaptive character in insect pollinated plants:

- The flowers are large in size.
- They have bright coloured petals or sepals or bracts.
- The pollen grains have sticky substance or hooks.
- They produce special odour.
- They produce high quantity of nectar.

Q.16. Define seed. Describe the structure of sed. "OR"
Describe the structure of mono cot / maize seed.

Seed:

Seed may be defined as ripened ovule or it is fertilized, developed ovule which contains dormant embryo.

Structure of seed:

The seed consists of following parts.

Seed Coat Embryo Cotyledon Sometime endosperm

Seed Coat:

The outer wall of seed which develops from integument of ovule called seed coat. The seed coat consists of an outer thick layer called testa and inner thin wall called tegmen. The hilum is a scare, present at seed coat. At lower end of seed there is small pore present is called micropyle. The water inter into the seed through micropyle.

Embryo:

The embryo develops from diploid zygote. It is a small axis, lying between two cotyledons, the upper end called plumule and the other lower end is called radical, during germination plumule develops into shoot while radical develops into root.

Cotyledons:

The seed also contains leaf-like structure called cotyledon. These are either one or two on the basis of these numbers the seeds are classified into monocot or dicot seed, respectively. In endospermic seed these cotyledons are thin and paper like. In many of the seeds endosperm is not present than food is stored in cotyledons therefore they become swollen and thick e.g. pea.

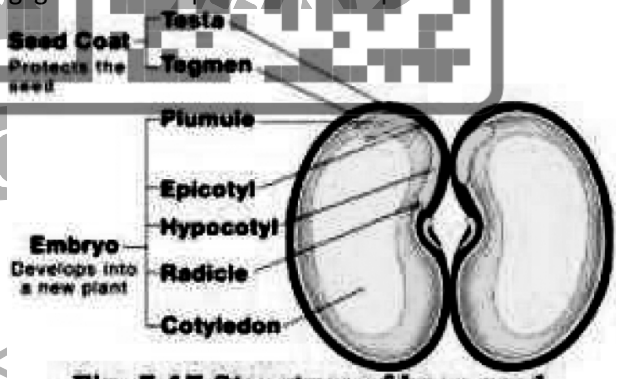


Fig. 5.17 Structure of bean seed

Endosperm:

The food for the embryo is stored in a structure called endosperm or albumen. In many of the seeds endosperm is not present then food is stored in cotyledons.

Monocot seed / maize seed:

In some monocot seeds, ripened ovary walls called pericarp get fused permanently with seed coat as found in maize grains. Internally maize grain is divided into two unequal parts by a thin layer of cells called epithelium. The larger portion is endosperm and the smaller is embryo in the embryonic part, a shield shaped cotyledon is present called scutellum. Moreover the plumule and radicle are enclosed in protective sheath called coleoptile and coleorhizae, respectively.

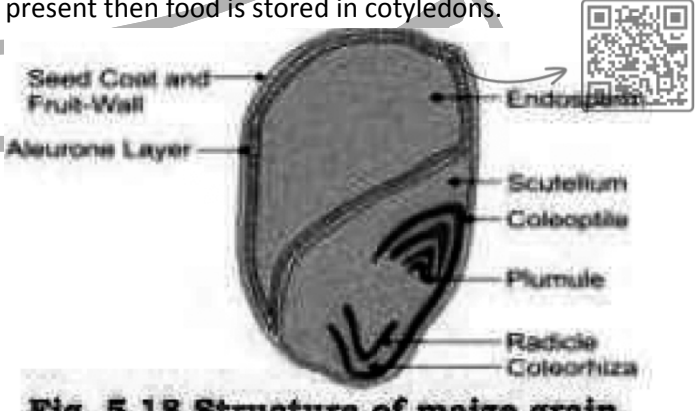


Fig. 5.18 Structure of maize grain

Q.17. What is seed germination? Define its different types with example.

Seed Germination:

It is a process during which dormant embryo wakes up and begins to grow to form seeding. "OR" Breaking of seed dormancy is called seed germination. As a result of germination seed develops into seeding.

Kinds of Germination:

There are two types of germination.

Hypogeal Germination:

It is kind of germination in which cotyledons remain under the soil due to rapid growth of epicotyle. E.g. gram, pea etc.

Epigeal Germination:

It is kind of germination in which cotyledons came above the soil due to rapid growth of hypocotyle. E.g. castor oil seed, tomato etc.

Q.18. Write difference between epigeal germination and Hypgeal germination.

#	Epigeal Germination	Hypgeal Germination
1	The type of germination where seeds come above the soil during germination.	The type of germination where seeds remain in the soil during germination.
2	The growth rate of hypocotyl is higher than epicotyl.	The growth rate of epicotyl higher than hypocotyl.
3	The hypocotyl grows in the form of arch.	The hypocotyl does not grow in the form of arch.
4	The cotyledons become green when come above the soil and work as 1st foliage leaves.	The cotyledons do not turn green.

Q.19. Describe the different conditions necessary for seed germination.

Conditions necessary for seed germination:

Only living seeds can germinate, require optimum condition of moisture, oxygen and temperature.

Role of water (Moisture):

Water is essential for life because metabolic activities depend on water. Seed coat become soft by water. Cotyledons and endosperm absorb water by imbibition become swollen and exert pressure on seed coat to break. So the embryo comes out grow, enzymes become activated by water and solid reserve food change into solution.

Role of oxygen:

The metabolic activities require energy. Energy is produced during respiration which requires oxygen.

Temperature:

Enzymes activity require certain range of temperature. Most of the seeds require the temperature range between 25 to 37°C. Seeds do not germinate at temperature below 0°C or above 45°C.

Q.20. Describe the different types/methods of asexual reproduction in animal.

Methods of asexual reproduction in animals:

Animals reproduce asexually by different methods, some of them are as follows.

Fission (Splitting):

Splitting (Division) of cell into two or many cells or organisms called fission.

(a) Binary Fission:

The type of fission where an organism divides into two organisms is called bianary fission. It is commonly observed in unicellular organisms like protozoa. During this process the nucleus of the parent organism divides into two nuclei, both of them move in opposite directions in the cytoplasm. Mean white, a constriction appears in cytoplasm which deepens from outside to inside final organism divides into two organisms.

(b) Multiple Fission:

Multiple fission involves the division of an organism into many small sized daughter organisms as found in plasmodium.

Budding:

In this method one or more out growth develop on the body surface of organism which are called buds. When buds separates from the parent body starts living independently and develop into new organism e.g. Hydra.

Fraymentation:

It is found in lower, multicellular animals like liver fluk 102 nematodes. When a living organism divides into fragments, each fra recovers its lost part by regeneration and develops into new organism.

Q.21. Describe the process of sexual reproduction in animal.

Sexual reproduction in Animal:

The process of sexual reproduction involves fusion of specialized haploid sex-cells or gametes to form a single diploid cell, zygote. The fusion of these gametes is called fertilization. In sexual reproduction involves.

Gametogenesis:

Formation of gametes

Mating:

Union of male and female organisms to collect their gametes at same place.

Fertilization:

Fusion of male and female gametes to form zygote.

Q.22. Describe the process of gametogenesis in rabbit:

Gametogenesis in Rabbit:

Gametogenesis is the process of gametes formation by meiosis in gonads. These are to types.

Spermatogenesis:

Formation of sperm in male gonads (Testis) from germ cells.

0ogenesis:

Formation of ovum in female gonads (ovary). The process of gametes formation or gametogenesis involves meiosis, which reduces number of chromosomes to half in gametes. It also results variation in genes by process called crossing over. These gametes mostly do not have identical genetic makeup.

Q.23. Campare the male and female reproductive organs in rabbit.

Comparison of male and female reproductive organs in Rabbit:

	Male	Female
Gonads **Gametes producing organs**	➢ **Testes two in numbers.** ➢ **Hanging outside, in a sec called scrotal sac.** ➢ **Contain seminiferous tubules.** ➢ **Epididymis to collect sperm.**	➢ **Ovaries two in numbers.** ➢ **Located in abdominal cavity.** ➢ **Produce ovum**
Duct **Gametes collecting tubes.**	➢ **Vas deferens, two in number.**	➢ **Oviduct or fallopian tube collect ovum from ovary.** ➢ **Two in number**
Genitals **Gametes depositing or receiving organs**	**Penis, a muscular organ to transfer semen into female genitals.**	**Vagina, a tube which receive semen containing many sperms.**
Glands	**Prostate gland Cowper's gland Seminal vesicle**	**Ovary works as gland glands**

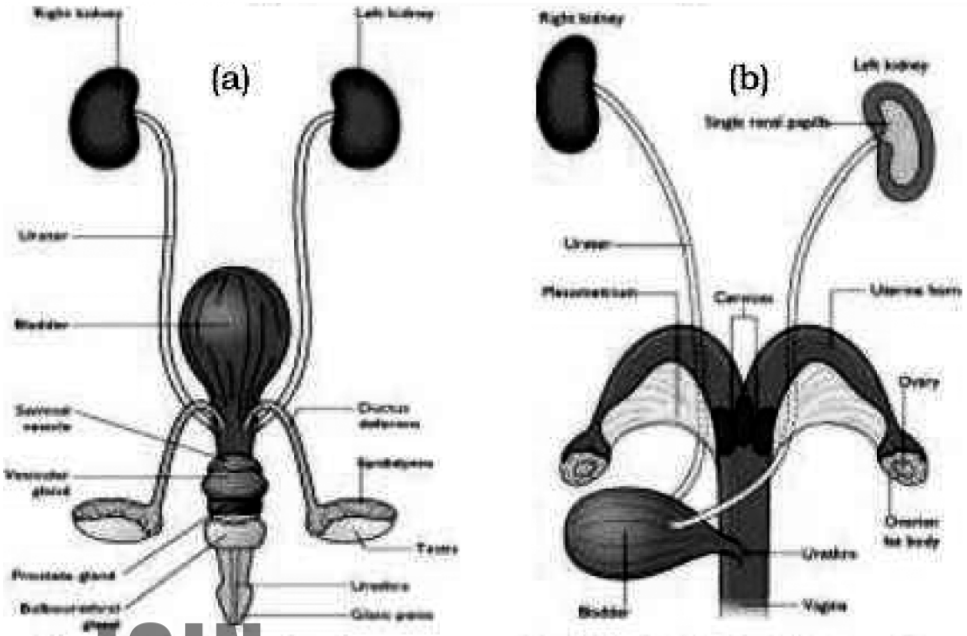


Fig. 5.19 Reproductive organs of rabbit (a) Male (b) Female

Q.24. Describe the sexually transmitted diseases. Name some sexually transmitted diseases.

Sexually Transmitted Diseases:

"The diseases or infections which are passed from one person to another person through genital organs and genital fluids during sexual contacts called sexually transmitted diseases."

Name sexually transmitted diseases:

Some of the sexually transmitted diseases are Gonorrhea, AIDS, Syphilis, Genital herpes etc.

Sometimes they can spread through intimate physical contact as well like herpes, spread by skin to skin contact. Sexually transmitted infections have been known since ancient time, they remain world wide a major public health problem. AIDS is one of the serious threat came into light around 1980.

AIDS (Acquired Immuno Deficiency Syndrome) is caused by virus known as HIV (Human Immuno-Deficiency Virus). The HIV is transmitted through contaminated surgical instruments, transfusion of infected blood, sexual contacts, placenta and mother's milk.

Role of national AIDS Control Program and different NGOs in educating about AIDs:

The first role was the study of AIDS patients, frequency in different social group of population. The next goal was the study of reasons of AIDS in different populations. Another aim was to educate people about prevention. The next role is the proper diagnosis of HIV in different private and government sector Hospitals.

Q.25. Write the differences between external fertilization and internal fertilization.

External fertilization	Internal fertilization
It takes place outside the body.	Ti takes place inside the body.
It takes place in water.	It takes place inside female body.
Both gametes mature at same time.	Gametes may mature after each other.
Gametes are produced in large numbers.	Gametes are produced in limited numbers.
It takes place in fishes and amphibians.	Ti takes place in reptiles, Aves and mammals.

SHORT QUESTIONS

1. Distinguish between the following.

Ans. (a) Asexual and sexual reproduction (For Answer Q#2)
(b) Epigial and Hypogial Germination (For Answer Q#18)

2. Draw neat and labeled diagram of T.S of angiospermic flower.

Ans. For Answer Q#8

3. How a new plant develops with an already growing plant?

Ans. A new plant develops with an already growing plant from vegetative structure such as roots, stem, suckers and leaves.

4. How leaves develop into new plants?

Ans. Some leaves have bud on their margin e.g. Bryophyllum. These buds give rise adventitious root when fall on ground or come in contact with soil. After some time these parts of leaves develop into an independent plant.

5. Draw neat and labeled diagram of ovule.

Ans. For Answer Q#9.

6. **Draw neat and labeled diagram of male gametophyte of angiospermic plant.**

Ans. For Answer Q#

7. **List out the male reproductive organs of rabbit with glands.**

Ans. For Answer Q#23.

8. **What are STD's?**

Ans. "The diseases or infections which are passed from one person to another person through genital organs and genital fluids during sexual contacts called sexually transmitted disease or STD's."

9. **Why population control is considered important for prosperous society?**

Ans. Population control is considered important for prosperous society due to limited resources like food, houses, health, electricity, transport, drinking water, garbage disposal etc.

10. **Draw life cycle of angiospermic plant.**

Ans. For Answer Q#13.

TERMINOLOGY AND DEFINITIONS

Angiosperm:

The angiosperm is the group of plants which gives rise traditional flower therefore these plants are called flowering plant.

Spores:

Spores are single celled, thick walled and are produced in sporangium without sexual reproduction.

Seeds:

The seed is a dormant embryo. It has the ability to with stand in unfavourable condition.

Parthenocarpy:

In this process the egg without being fertilized, becomes a complete individual. Such individuals are sexually sterile. It is commonly observed in some insects and rotifers.

Parthenocarpy:

The process in which ovary develops into a fruit without fertilization is called fertilization.

Fertilization:

The process of fusion of male and female gametes form diploid zygote is called fertilization.

Population:

Population means the total number of beings living in a particular area.

MULTIPLE CHOICE QUESTIONS

1. The process which is essential for continuing and survival of species is:
   - Digestion
   - Respiration
   - Reproduction
   - Excretion
2. The type of reproduction which is necessary for evolution is:
   - Vegetative propagation
   - Fragmentation
   - Sexual reproduction
   - Clonning
3. The unicellular structure, responsible for asexual reproduction without fusion is:
   - Pores
   - Spores
   - Gametes
   - Pollen grains
4. The example of stem which run horizontally on surface of soil to produce vegetatively:
   - Mint
   - Ginger
   - Onion
   - Bryophyllum
5. Plant stem that aries from buds on the base of parent plants are:
   - Bulb
   - Rbizome
   - Sucker
   - Runner
6. The type of seed production without fusion of male and female gametes is:
   - Parthenoearpy
   - Apormixes
   - Grafting
   - Scion
7. The female gametophyte of angiosparmic plant is:
   - Embryo sec
   - Ovule
   - Ovary
   - Carpel
8. The 3N zygote is angiosperm develop into:
   - Seed coat
   - Cotyledon
   - Embryo
   - Endosperm
9. The male gonads is rabbit are:
   - Testis
   - Ovaries
   - Scrotal sec
   - Vasdeferens
10. The female gametes are fertilized in the rear end of:
    - Oviduct
    - Follopin tube
    - Ovaries
    - Both a and b

INHERITANCE Ch # 06

DETAILED QUESTION

Q.1. Describe the chemical composition of chromosomes.

Chemical composition of chromosome:

The chemical material of chromosome is called chromatin, which is basically a nucleoprotein (Deoxyribo Nucleoprotien). It is composed of DNA (40%) and special protein i.e. Histone (60%). DNA (Deosyribo Nucleie Acid) is made up of billions of units called Deoxyribo nucleotides. Each nucleotide is made up deoxyribose sugar ($C_5H_{10}O_4$), phosphoric acid (H_3PO_4) and Nitrogenous bases.

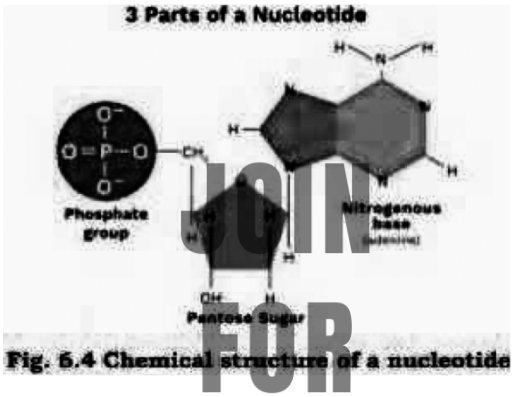


Fig. 6.4 Chemical structure of a nucleotide

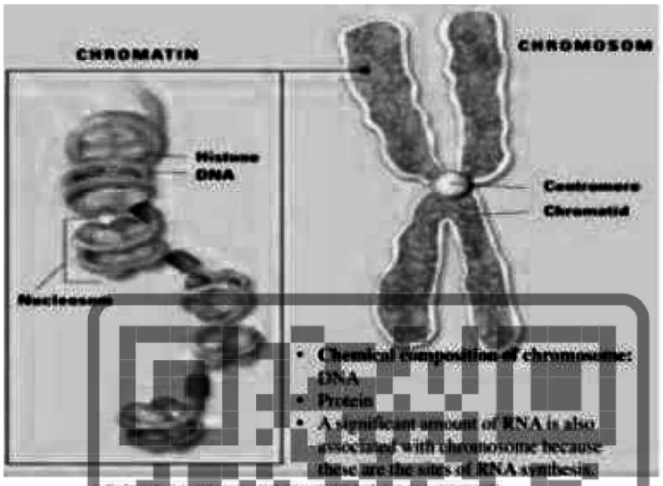


Fig. 6.5 Chemical Composition of

The DNA of a chromosome exists as one very long double stranded fiber, a duplex, which extends unbroken through the entire length of the chromosome. This long DNA is coiled to fit into a much smaller spaces.

Q.2. Describe the structure of DNA.

Structure of DNA:

The model of DNA was suggested by Watson and crick in 1953. This model is based on X-Rays photographs and chemical analysis of DNA. According to this model.

- DNA is a double helical structure.
- Each helix is a polynucleotide chain which are twisted around each other.
- The outer part is called Upright, which are made up of deoxyribose sugar and phosphate. The inner part called rungs, made up of paired nitrogenous bases.
- Both helixes are complementary to each other which are held together by hydrogen bonds.
- The complementary helix has complementary base pairs i.e. Adenine pairs with Thymine and Cytosine always pairs with Guanine.

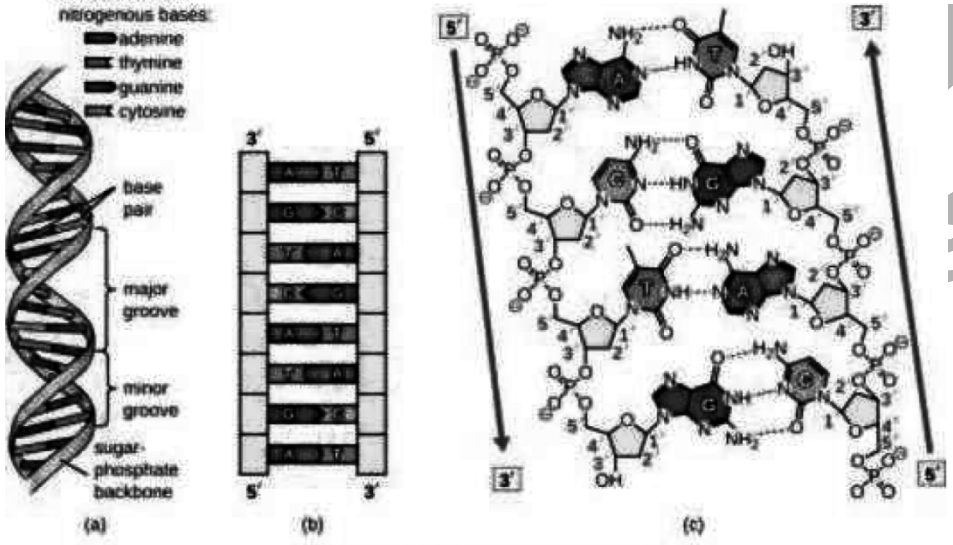


Fig. 6.6 Structure of DNA

Q.3. Describe the replication process of replication of DNA. "OR"
Discuss gene is a Unit of inheritance which is copied and inherited to the next Generation.
"OR" How does the gene copy itself and inherited to the next generation?

Ans. The complementary arrangement of nucleotide is of great importance in DNA molecule. If the sequence of bases in one strand is known, the sequence of bases in the other strand will be automatically known due to specific base-pairing. This property of the two strands of double helix makes DNA a unique molecule best suited to store, copy and transfer genetic information from generation to generation.

DNA is able to make its exact copy itself in nucleus of cell before cell division. This process of duplication of DNA is called replication of DNA. Gametes are haploid cells, carry one copy of replicated DNA. This copy carries genes from parents to offspring through these gametes.

The Watson and Crick model of DNA ideally proposed the mechanism of self-replication. The hydrogen bonds that hold together the double helix of DNA are broken up from one end to another end like a zip. The double helix gradually "unzip" along its length and each new nucleotide of the complementary nucleotide would be added to separate chains sequentially.

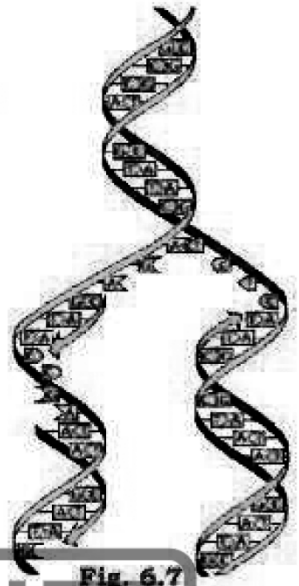


Fig. 6.7
Replication of DNA

Q.4. Describe the central dogma of protein synthesis by Gene.

The central dogma of protein synthesis by Gene:

The term central dogma means a set of beliefs where a gene expresses by synthesizing a protein. This protein work as an enzyme, which carry down a chemical reaction to produce a metabolic product. This metabolic product either develops a character or lead to develop a character.

DNA is located in the nucleus of eukaryotic cell while most of the synthesis and metabolic reactions occur in cytoplasm under the instructions of DNA (genes). Therefore DNA requires some other molecules to carry its genetic information from nucleus to cytoplasm. These molecule are different types of Ribo Nucleic Acids or RNAs. Genetic information flows in a cell from DNA to mRNA than to ribosome in cytoplasm, which is two step process for protein (enzyme) synthesis.

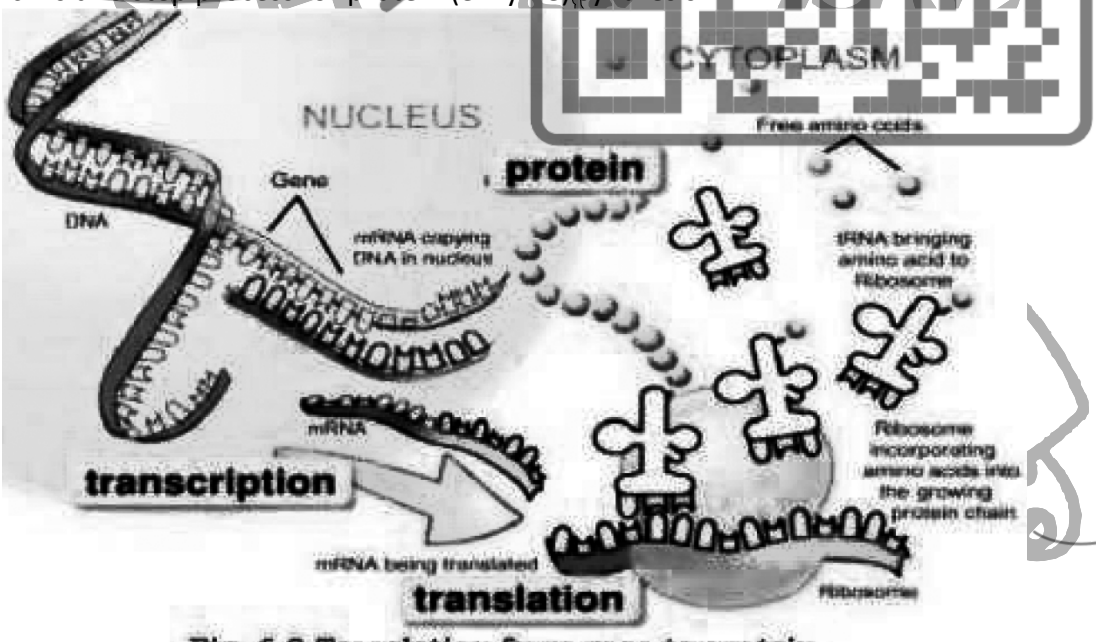


Fig. 6.8 Translation from gene to protein

Transcription:

The step of protein synthesis where information which contained in a specific segment of DNA (gene) is copied in complimentary from (genetic codes) i.e. RNA. This RNA carry information of DNA sequences to ribosome from nucleus to cytoplasm called messenger RNA or mRNA. The process of copying DNA information to mRNA is called Transcription.

Translation:

In the second step two other types RNA: transfer RNA (tRNA) and ribosomal RNA (rRNA) translate the information of messenger RNA into the specific sequence of amino acids which help to synthesize the protein.

Q.5. State the Mendel's law of complete dominance. -OR-

Define the Mendel's laws of inheritance and explain any one of them.

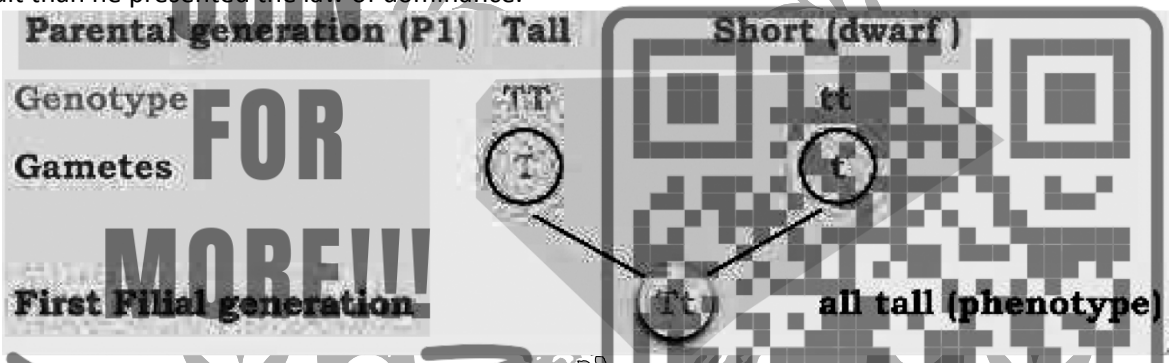
Mendel's law of complete dominance:

"when a pair of contrasting characters (heterozygous) is brought together in a cross, only one factor will express in the offspring while other will be masked. It means that in heterozygous condition one factor is completely dominant over other."

Explanation:

Mendel took gene as factor; he told that both parents donate one factor of a trait. If both the parents donate some factor of the trait, the organism is pure or homozygous for this trait like pure Tall i.e. TT, same as the pure short (dwarf) i.e. tt is also homozygous. On the other hand if both parents donate different factors (allele) of a trait, the organism is bybrid or heterozygous for the trait i.e. Tt for tall.

He took pure tall stem and short stem varieties and crossed them. All the seeds were collected and allowed to grow. He founded that all the plants were of tall stem, no plant with intermediate stem were found to grow in this generation. He repeated his experiment on pea plants with different traits having contrasting characters, found same result than he presented the law of dominance.



Q.6. State the Mendel's law of segregation or law of purity of gametes.

Mendel's law of segregation or law of purity of gametes:

"This law states that in an organism, the factors (genes) exist in pairs but during gametes formation these factors segregate cleanly from each other, so each gamete has only one factor of a trait,"

Explanation:

Mendel when crossed pure tall and dwarf plant and got all tall plant. Alleles separate during gamete formation in F1 generation but unlike the P! tall, these plants of F1 generation segregation were heterozygous. Mendel did not stop his experiments here. He planted all the seeds of F1 generation and allowed them to self-pollinate. He observed that in the next generation (F2), both the parental types, i.e. tall and dwarf stem varieties were produced. When he counted these, he found that in F2 generation, the two types of the individuals were present in a ratio of 3:1 tall and dwarf respectively.

Mendel perceived from these result that when the plants of F1 generation form their gametes, the factors (allele) separate or segregate again in such a way that only one of the two alleles enters each gamete. On the basis of these observation he presented the "Law of segregation" this is also called law of purity of gametes.

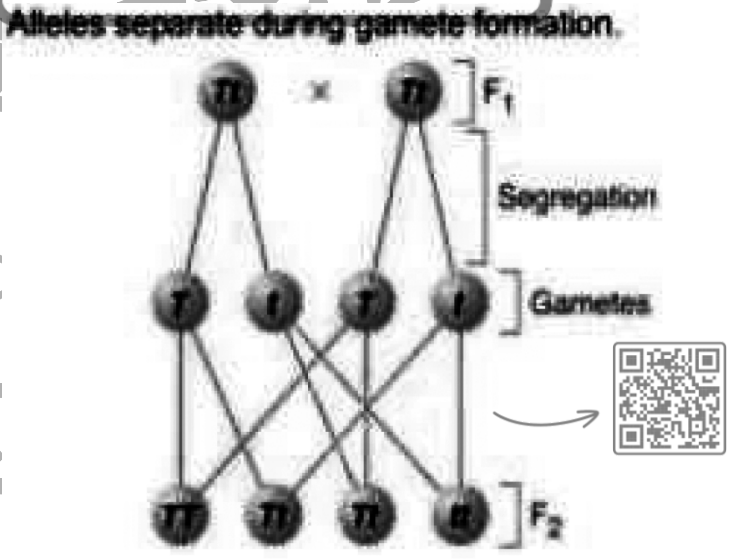


Fig. 6.12 Alleles separation during gamete formation

Result:

Phenotype ratio: 3 : 1

Genotype ratio: 1 : 2 : 1

Q.7. State the Mendel's law of independent assortment.

Mendel's Law of independent assortment:

The genes of assorted traits are independent in their inheritance. "OR"
"Members of one pair of genes separate from each other during gametes formation".

Explanation:

In the next cross, Mendel's studied two contrasting traits at a time. He crossed between two individuals (pea plant) differing in two traits which he called Dihybrid – Cross and the ratio obtained in F2 generation called Dihybrid ratio. The results achieved as a consequence of dihybrid-cross is known as inheritance of two traits.

When Mendel crossed yellow cotyledon and rounded seed containing plant with green cotyledon and wrinkled seed containing plant. The F1 generation had all plants with yellow cotyledon and round seeds. This proved Mendel previous findings that allele for round seed is dominant over wrinkled while yellow cotyledon over green. Mendel self – fertilized the F1 generation, expecting either of the two following possibilities.

(a) If the genes for round seed and yellow colour are inseparable (dependent on each other), as well as those for wrinkled shape and green colour, then in F2 generation ¾ of the seeds will be round and yellow and ¼ will be wrinkled seed and green.

(b) If the genes for seed shape and cotyledon colour are separable (independent) and distributed to the gametes independent to each other, then in F2 generation some plants produce round seeds with green cotyledon and some have wrinkled seeds with yellow cotyledon will also be expected along with parental combinations.

Observation:

Mendel actually obtained four different kinds of phenotype in F2 generation. Out of a total 556 seeds, he obtained four different phenotypes which are as under.

Phenotype:

Round and Yellow seeds = 315
Wrinkled and Yellow seeds = 101
Round and Green seeds = 108
Wrinkled and green seeds = 32

Genotype:

Genotypes for round and yellow seeds RRYY, RRYy, RrYY, RrYy
Genotypes for round and Green seeds RRyy, Rryy.
Genotypes for wrinkled and yellow seeds rrYY, rrYy.
Genotypes for wrinkled and Green seeds rryy.

Result:

These numbers are in a ratio of about 9:3:3:1 for the four phenotype it showed that genes for seed colour and shape are independent in their inheritance. They do not necessarily stay together in the combination in which they occurred in parents.

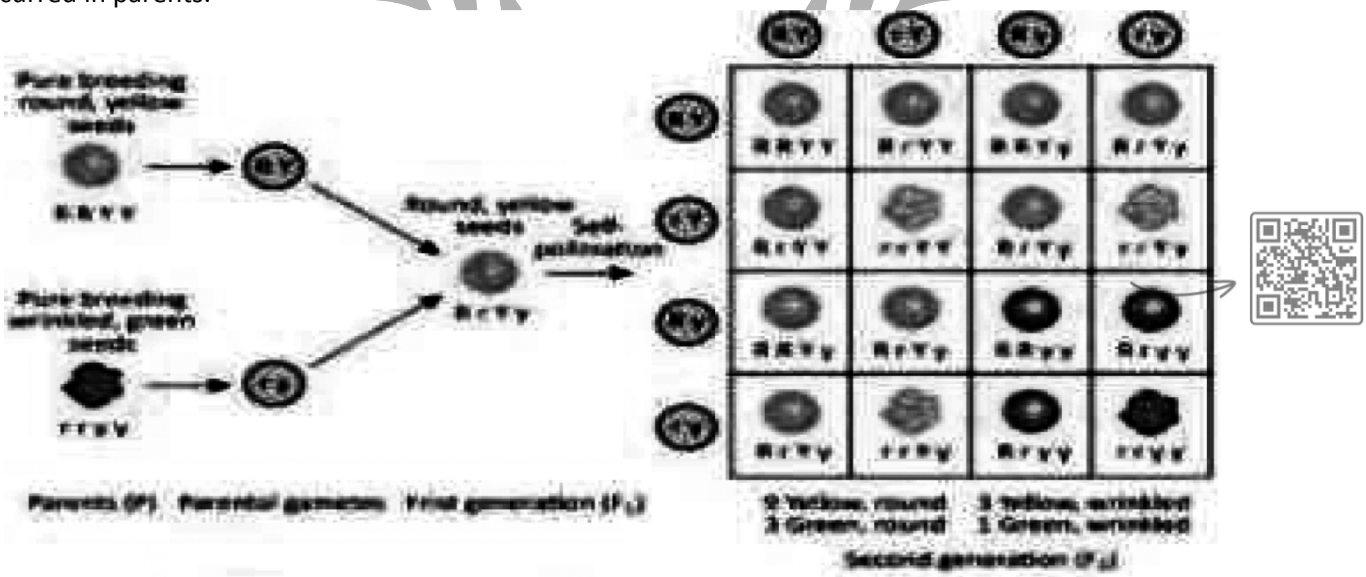


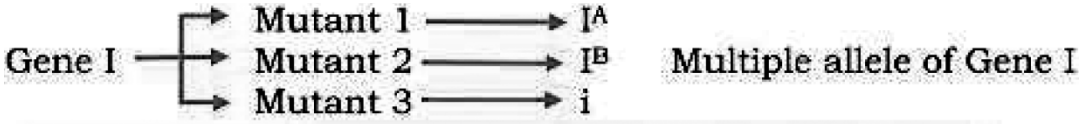
Fig. 6.13 Expected ratio in dihybrid cross.

Q.8. Describe the Multiple allele with and example blood groups of human.

Multiple Allele (Blood Groups inhuman as example):

According to Mendel's finding that each trait has two alternative forms (allele). Later it was found that some trait has more than two and more alternative forms. These traits are called Multiple allelic Traitor or Multiple Alleles. ABO blood group system in human population was the first discovered multiple allelic trait. Karl Landsteiner in 1901 discovered ABO blood group system. There are four phenotypes due to presence or absence of two specific antigen on the surface of RBC.

The genetic basis of ABO system was explained by Bernstein in 1925. This system is controlled by a polymeric gene I on chromosome 9, contain three alleles i.e. I^A, I^B and i.



Blood Group	Genotype	Phenotype & Antigen
Group A	$I^A I^A$ I^A i	A-Homozygous A A-Heterozygous
Group B	$I^B I^B$ I^B i	B-Homozygous B B-Hetrozygous
Group AB	$I^A I^B$	AB-Heterozygous AB
Group O	i i	O-homozygous NO

Q.9. Write about the R^h type blood.

Rh type blood:

This protein ws first time observed in rhesus monkey the another mendalian gene found in human. This gene produce a protein which is found on the surface of RBC as well.

This trait has 2 allele a dominant R^h and r^h recessive. The R^h protein produce Rh protein therefore person called R^h+ve where as r^h gene is unable to produce R^h protein so the person called R^h –ve person wil be r^h r^h.

Q.10. Describe the role of antibodies for AB and R^h in blood transfusion.

Blood transfusion:

Whenever, any one is need blood due to a lot of blood loss he is given a compatible dose of blood from a healthy person. This process is called blood transfusion.

Antibodies:

The chemicals cells or organs of an organism can work as antigen to other organ ism. When these antigens enter in the body of other organism. This organism produce defense protein against this antigens to protect itself. These proteins are called antibodies. Blood group and antibodies.

- The blood group alleles (I^A, I^B, i) start their expression at embryonic stage and keep expressing till death.
- The person also produce anti-A, anti-B antibodies during first few months after birth.
- The person of A-blood group produce anti-B antibodies.
- Person of B-blood group produce both anti-A and anti-B antibody.
- Person with AB blood group do not produce any antibody.
- Person with AB blood serum containing antibodies called antibody.
- The blood serum containing antibodies called antiserum.

Role of antibodies AB in blood transfusion:

The person of a blood group which contain anti-B antibodies if given blood of B-group. The R.B.C of this b-blood group will work as antigen in the person of A-blood group it anti-B antibodies will work against the donor R.B.Cs of B-blood group and clumped cells called agglutination. Which lead to serious problem, this clumped cells cannot pass through fine capillaries. Therefore during transfusion of blood the people must be careful about blood group.

Blood group	Blood group recipient	reasons
A	A and AB	Recipient do not have antibodies A.
B	B and AB	Recipient do not have antibodies B.
AB	AB only	B recipient neither have antibody A or antibody B.
O	O,A,B,AB	✚ Blood group have antibody A and antibody so if can receive only O blood group. ✚ Blood can be donated to A, B and AB because donor's antibodies are quickly absorbed by other. Tissue or diluted in recipient blood. Therefore O blood is called universal donor.

Role of Rh in blood transfusion:

On the other hand side the R^h factor has different phenomena: unlike the naturally occurring anti-A and anti-B antibodies of ABO system, anti-R^h antibodies do not produce automatically. The production of anti-R^h antibodies require stimulus which is R^h human protein itself. It works as antigen. If an R^h-ve person receive R^h protein (antigen) through wrong R^h+ve blood transfusion, he will begin to produce anti R^h antibodies against R^h antigens. R^h-ve blood person does not contain any R^h protein (antigen) can be transferred to R^h+ve person (recipient).

Q.11. Write about the co-dominance and incomplete dominance:

Co-Dominance:

The phenomenon of inheritance where both alleles are dominant and expressed equally called Co-Dominant e.g. AB blood group, where both alleles I^A and I^B express and produce antigen A and B both.

Incomplete Dominance:

"The phenomenon of inheritance where both alleles of a trait express in heterozygous condition and their expression get blended to produce new phenotype called incomplete dominance or partial dominance."

Q.12. What is variation? Define two groups of variation. "OR"
Define continuous variation and discontinuous variation.

Variation:

The differences in characters such as height, colour etc among individual of the same species are called variation.

Types of Variation:

Variations may be caused either by the effect of environment or by the changes in the genetic material.

Environmental variation:

The changes or variations are caused by the environmental factors and they cannot be inherited to the offspring are called environment variations.

Examples:

- Development of muscles in athlete.
- Lose of body part due to accident or disease.
- The boring pf pinna or nose for putting on jewellery.

Heritable variations:

The changes in genetic materials are called heritable variations and they can be inherited to the offspring. They are considered raw material for evolution.

Example:

Eye colour, hair colour. Tongue rolling.

Continuous variations:

Continuous variation are small differences in characters among members of the same species are called continuous variation. Such variations are neither purely genetical nor purely environmental. They appear to be the combination of both factors.

Examples:

Height, skin, colour, intelligence, eye colour etc.

Discontinuous variations:

Discontinuous variations are sudden and sharp differences in character among the members of the same species are called discontinuous variation. They are heritable and they are purely caused by the genetic material.

Examples:

Blood groups, six fingers in hands or foot, tongue rolling etc.

Q.2. Describe the causes of variation. (OR) what is variation? Write wo causes of variation.

Causes of variation:

Following are important causes of variations.

Mutation:

Mutation is the sudden change in the genetic material (genome) of an organism. It is the major source of heritable variation among the organisms which is considered as the starting point of new species. For example, six fingers in hand or feet.

Crossing over:

It is the process of mutual exchange of equal segments of chromatids of non-sister chromatids of a pair of homologous chromosomes during prophase-I of first meiotic division. Due to crossing over maternal and paternal alleles are mixed and segregated. So the indefinite combinations of alleles are made. Due to this crossing over and segregation, offspring of same parents become variable.

Environment:

Number of environmental factors affect the body cells to cause variations. For example, the change in pigmentation of skin upon the extent of exposure to sun light or the development of muscles duet to exercise etc. However, such variations are non-heritable.

Independent assortment of chromosome:

During metaphase of first meiotic division homologous chromosomes come together in the form of pairs and subsequently segregate during anaphase-I into the daughter cells independently. This produces a wide variety of different gametes.

Fertilization:

The set of alleles carried by chromosomes of each gamete is unique and always differs to each other. Since a number of male gametes are available to fertilize female gametes. Thus different combination of characters in individual are possible as a result of fertilization.

Q.4. Writ the important point of Darwinism or Darwin's theory of evolution.

Darwinism or darwin's theory of evolution:

In 1859 Charles Darwin published a book "Origin of species by means of natural selection" in which he presented simple evidences in favour of evolution and proposed the mechanism of origin species. The main points of darwin's theory are as under.

i. Over production:

Living organism reproduces rapidly so that number of their off spring could increase rapidly.

ii. Struggle for existence:

Due to limited resources of food, shelter etc the offspring of species complete not only with each other but also with the members of different species to share these sources. In this struggle a large number of individuals of each species are eliminated and population remains stable.

iii. Heritable variation:

According to Darwin survival in struggle for existence is not randam but depends upon in part on the heredity constitution of the surviving individuals. Those individuals whose inherited characteristics fit them best to their environment would survive and produce more offspring than less fit individuals who will die or vanish.

iv. Natural selection:

Nature selects the fittest individuals to survive and reproduce. As a consequence, the favourable variations are preserved through their inheritance to new young ones.

SHORT QUESTIONS

Q.1. What is gene and how it works?

Ans. Genes contain biological information in the coded form which are passed through gametes from parents to offspring. These inherited characters are determined by genes which are transmitted from generation to generation.

Q.2. Which of the phenomena of inheritance is there where both factors express in heterozygous condition.

Ans. The phenomena of inheritance in which both factor are express in heterozygous condition is called incomplete or partial.

Q.3. List out the factors which are involved in theory of natural selection.

Ans. The factors which are involved in theory of natural selection are as under.

- **Overproduction**
- **Struggle for existence**
- **Heritable variation**
- **Natural selection**

Q.4. Relate artificial selection with natural selection.

Ans. Artificial selection could produce so many changes in a species in relatively short period of time, then natural selection should be capable of considerable modification of species over thousands of generations.

Q.5. Define following terms.

Ans. Define following terms: (For answer definition and terminology)

(a) Homologons Chromosome (b) Heterologous Chromosome (c) Dominant allele
(d) Allele (e) Recessive allele (f) Homozygous
(g) Heterozygons

TERMINOLOGY AND DEFINITIONS

Dominant:

The factor (gene) which express and masks the expression of other factor in heterozygous condition is said to be Dominant factor. Mendel represent it with capital letter like T for tall.

Recessive:

The factor which is unable to express or masked in heterozygous condition is said to tbe recessive. It represents by small letter of same alphabet like t of small (dwarf).

Phenotype:

It is the physical appearance of the trait on the basis of inherited genes like tall, dwarf, round seed, wrinkled seed etc.

Reproduction:

The genetic makeup or genic constitution of a trait like TT, tt, tt etc.

Homozygous:

An individual having same factors (allele) of a trait called homozygous.
For example, TT (factor for tallness).

Heterozygous:

An individual having different factors of a trait called heterozygous.
For example, Tt (factors of tallness and dwarfness both)

Parental generation (P1):

The offspring of true breeding organism were called first filial generation or F1.

Second filial generation or F2:

The offspring of filial one generation produced by crossing self fertilization were called second filial generation or F2.

Heredity:

The characteristics of the offspring's to resemble their parents is called heredity.

Genetics:

The branch of biology which deals with the study of heredity and Variations is called genetics.

Gene:

Gene is the small segment of DNA which has genetic information in the form of code to synthesize a protein. It is the basic unit of biological information.

Hybrid:

Hybrid is an organism that arises from mating between two genetically different parents.

Replication of DNA:

DNA is able to duplicate itself in the chromosome. Such duplication of DNA is called replication. During this process it makes an exact copy of itself.

Chromosomes:

Chromosomes are chemically made up of DNA and basic protein called histone. It means chromosomes behave as vectors of genes form one generation to next generation.

Homologous Chromosome:

The chromosomes which are similar in their shape, size and position of centromeres are called homologous chromosome.

Allele or Allomorph:

The alternative form of a gene is called alleles or allomorph.

Gene Locus (Loci):

Each gene is located at specific position on chromosome, this position of gene on chromosome is called gene locus (loci)

Multiple Allelic Traitor or Multiple Alleles:

The trait has more than two and more alternative forms. These traits are called multiple allele (Allelic)

Trait:

Inheritance means the transmission of characteristics from parents to their offspring these characteristics are called traits.

Transcription:

The process of copying DNA information to mRNA is called Transcription.

Messenger RNA:

A type of RNA found in cells. mRNA molecules carry the genetic information needed to make proteins. They carry the information from the DNA in the nucleus of the cell to the cytoplasm where the proteins are made. Also called messenger RNA.

Transfer RNA (tRNA):

tRNA carries and transfers an amino acid to the polypeptide chain being assembled during translation. Translation – the process in which a cell converts genetic information carried in an mRNA molecule into a protein.

(rRNA):

(rRNA) translate the information of messenger RNA into the specific sequence of amino acids which help to synthesize the protein.

Evolution:

The biological process of gradual change in living organism with the passage of time is called evolution.

Homologous Organs:

The organs that are anatomically similar but perform different functions are called homologous organs. For example the arms of man and wings of birds have similar bones and muscles but they perform different function.

Analogous Organs:

The organs that are anatomically different but perform similar functions are called homologous organs. For example the legs of insects and mammals.

Vestigial Organs:

The body part in an organism which are present in reduced, non functional form are called vestigial organs. For example appendix in man, pelvic hones in whale and some snakes.

Artificial Selection:

Artificial selection is the cross breeding of domestic animals and plants to produce specific desirable features.

Antigens:

Substances which are present on the R.B.Cs and produce antibodies are called antigen.

Antibody:

A protein, which acts against antigen and provides defence for the body is called antibody.

Serum:

It is watery fluid which separates from clotted blood and is free from blood cells and fibrin.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. Branch of biology deals with the study of heredity and variation is called:
   - Inheritance
   - Heredity
   - Genetics
   - Evolution
2. The way by which gene transmits characters from parents to offspring is:
   - Genetics
   - Inheritance
   - Heredity
   - Allele
3. Two similar chromosomes in a cell which are similar in shape, size and position of centromore called:
   - Chromatids
   - Arms
   - Homologous
   - Homology
4. The chemical material of a chromosome is called:
   - Chromatin
   - Chromeres
   - Chromonema
   - Chromatid
5. the outer part of DNA helix made up of sugar and phosphate is called:
   - Nucleoprotein
   - Upright
   - Rungs
   - Phosphoester
6. the small segment of DNA which has information to code one protein is called:
   - Nucleotide
   - Polynucleotide
   - Gene
   - Exon
7. The exact duplication of DNA is called:
   - Duplication
   - Replication
   - Transcription
   - Translation
8. If both the parents donate same factors of a character is called:
   - Homologous
   - Heterologous
   - Homozygous
   - Heterozygous
9. The genetic constitution of a trait is called:
   - Genotype
   - Phenotype
   - Genome
   - Phenyl

MAN AND HIS ENVIRONMENT Ch # 07

DETAILED QUESTION

Q.1. Define the level of ecological organization.

Levels of ecological organization:

In ecology, the level of organization ranged from organism to biosphere.

Habitat:

The area where an organism lives is called its habitat. It may be on land, in water or in the air.

Population:

The group of organism belong to the same species lives in a particular area is called population.

Community:

The group of population that lives in a particular area or habitat and interact with each other is called community.

Ecosystem:

During the interaction energy is also transferred from one to another level. So the area where these all interactions occur called Ecosystem. "Eco" means the environment (house) and 'System' implies an interacting area.

Biosphere:

The largest possible major community comprised of all living organisms on the earth is called biosphere.

"OR"

The life sustaining envelope of earth is called biosphere.

Q.2. Define ecosystem. Write the name of its biotic and abiotic components.

Ecosystem:

The interaction of all the living organism of a community with each other and with their nonliving environment is called ecosystem or ecological system.

Components of ecosystem:

There are two types of components of ecosystem.

- Biotic components of an ecosystem.
- Abiotic components of an ecosystem.

Biotic Components of an ecosystem:

The living organisms which interact in an ecosystem are called biotic component. These may be autotrophic and heterotrophic. They are.

- Produces
- Consumers
- Decomposers

Abiotic components of an ecosystem:

All the nonliving things of an ecosystem are called abiotic components. They are

- Light
- Water
- Temperature
- Soil
- Air

Q.3. Describe the abiotic components of an ecosystem.

Abiotic components of an ecosystem:

Abiotic components of an ecosystem are as under.

Light:

It is the most vital factor, without it life cannot exist. The sun is the source of energy for every ecosystem. Plants by the process of photosynthesis change this light energy into chemical energy which needed by every living thing. Distribution of plants and animals is affected by the amount of light. A small amount of this light is utilized in photosynthesis whereas the rest of it maintains the temperature of earth and atmosphere. Light is necessary for vision and making vitamin D in human being and migration of many animal.

Temperature:

Temperature is also an important factor for an ecosystem. It is low at high altitudes and high latitudes, the flora and fauna changes according to it. Temperature changes during the day and night and also varies from season to season. Enzymes activities of metabolic reaction are also altered with the changes in temperature. Most forms of life cannot survive in extreme temperature.

Water:

All the living things need water. It is the major part of protoplasm and maintains the turgidity of the cell. It acts as a solvent for the most of the metabolites. Inorganic substances enter the plants with water in dissolved form. The amount of water on land is controlled by rainfall and snowfall. The vegetation on earth is depended on the rate of rainfall. It is the raw material for photosynthesis. It controls the distribution of plants and animals.

Soil:

The upper layer of earth crust consists of particles of varying size and decomposed organic material by microorganism called soil the decomposed dead animals and plants called humus. Humus enriches the soil and increases its water and air holding capacity. Plants are anchored in soil and depend on it for their growth by absorbing water in organic substances.

Air:

Air is the gaseous envelope which surrounds the earth. It plays an important role in smooth running of the ecosystem. Air is the mixture of N_2, O_2, CO_2 and H_2O vapours mainly. Nitrogen is essential for protein, oxygen is vital for respiration and CO_2 is must for photosynthesis to produce carbohydrates. The composition of air and its velocity control other abiotic factors of environment which indirectly affect the plant, animal life and ecosystem.

Q.4. Describe the biotic components of an ecosystem.

Biotic components of an ecosystem:

Biotic components of an ecosystem are as under.

Producers:

All living organisms which can trap and convert energy into food molecules called producers because they produce food for themselves and other organisms of ecosystem. They are primary source of energy for other organisms. All members of community depend, directly or indirectly on the producers for their food and energy. These are photosynthetic bacteria, algae and plants.

Consumers:

Animal and all other organisms that cannot make their own food are called consumers. They get energy and food from producers directly or indirectly. On the basis of feeding level consumers are three types. Primary consumers, secondary consumers, tertiary consumers.

Decomposers:

Microorganisms which break down complex food molecules of dead organisms called Decomposers. They are generally bacteria and fungi. They recycle the nutrients by decomposing and converting complex organic molecules into simple inorganic molecules which are returned to the environment.

Q.5. What are consumer? Define its different types.

Consumers:

Animals and all other organisms that cannot make their own food are called consumers. They get energy and food from producers directly or indirectly.

Types of consumers:

On the basis of feeding level consumers are three types.

Primary consumers:

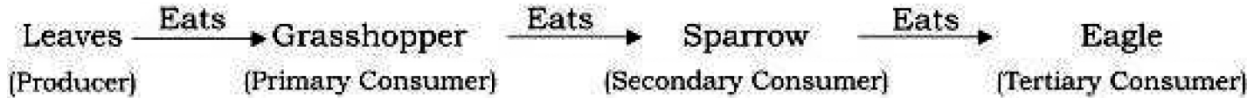
The herbivorous consume green plants to get energy and food are called primary consumers. They eat directly producers e.g cows, goat, sheep etc.

Secondary consumers:

The carnivore which feeds on primary consumers to get energy and food is secondary consumers e.g. lion. Hawks etc.

Tertiary Consumer:

The organism which eat secondary consumers to get energy and food are called tertiary consumers. They are carnivores e.g an eagle which eat the small bird, which has already eaten grasshopper.



Q.6. Write short note on food chain and food web. Construct and three food chains.

Food chain:

Food chain is series of organisms in which energy transfers from one trophic level to another, by eating or being eaten up, is called a food chain. It is +represented by using arrows.

Structure of food chain:

All food chains start from producers which are usually plants in land ecosystem and continue to herbivores at next trophic level, followed by one or more levels of carnivores. The carnivores are consumed by decomposers. A food chain represents only one possible route for transfer of food materials and energy. A simple food chain is shown below.

Producers → Primary consumers → secondary consumers → tertiary consumers → decomposers.

Grass → Cow → Man

Plant → Rat → Snake → Owl

Plant → Small fishes → Large fishes → Birds

Periwinkle Plant → Moth → Frog → Snake → Hawk

Food web:

Food web is a network of food chains representing the feeding relationship among different organisms in an ecosystem.

Structure of food web:

In nature simple food chain occurs rarely. An organism derives its food from more than one source. Even the same organism may be eaten by several organisms of high trophic levels or an organism may feed upon several different kinds of organism of a lower trophic level. Thus in a given ecosystem various food chains are linked together and interact with each other to form a complete network called food web.

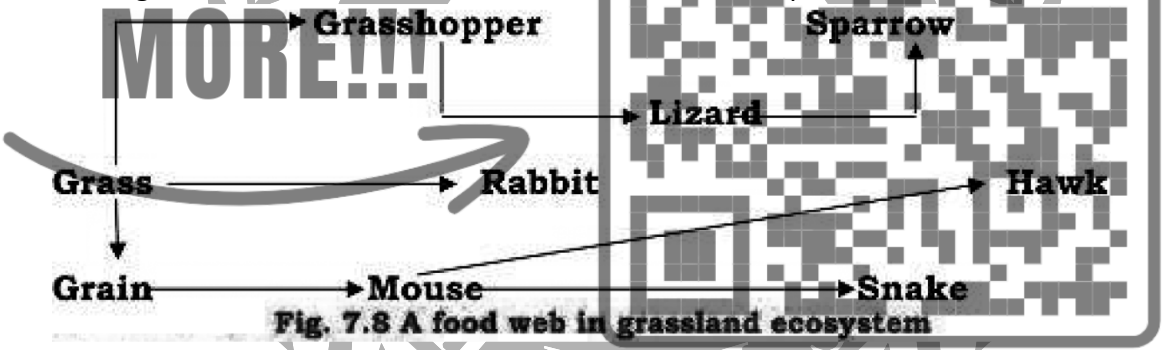


Fig. 7.8 A food web in grassland ecosystem

Q.7. What is ecological pyramid? Define its different types.

Ecological pyramid:

An English ecologist Charles Elton develops the concept of ecological pyramids in 1927. The trophic relationship of producers, consumers and decomposers expressed in the pyramid forms is called ecological pyramid.

"OR"

Ecological Pyramid is defined as "Presentation of number of individuals or amount of biomass or energy in various trophic levels from lower to higher level". Two of them are given here.

Types of ecological pyramid:

There are different types of Ecological pyramid. Two of them are given here.

Pyramid of numbers:

"Pyramid that shows the number of organisms at each trophic level in a given ecosystem is called pyramid of numbers."

When number of organisms is counted at each level, it is observed that previous one e.g there are more mice than snakes which feed on mice, subsequently the number of eagles are much lesser than snakes. This relationship is also expressed in the form of pyramid known as pyramid of number.

Pyramid of biomass:

"The pyramid that represent the total biomass at each trophic level such a pyramid is called pyramid of biomass."

The pyramid of biomass shows that each higher feeding level contains less biomass than the previous trophic level. It results from energy loss in a food chain at each trophic level.

Fig. 7.9
Pyramid of Numbers in an Ecosystem

Fig. 7.10
Pyramid of Biomass in an Ecosystem

Q.8. What is biochemical cycle? Write the characteristics of biochemical cycle. Name the some important biochemical cycle.

Biochemical cycle:

The living organisms require about 40 elements for growth and life processes, among them six are needed in large quantities i.e. carbon, oxygen, hydrogen, nitrogen, phosphorous and sulphur. These elements are taken up form environment by producers, made a part of protoplasm and finally returned back to environment. So the elements cycle continuously through organism and environment. These cycles are called biogeochemical Cycles.

Characteristics of biogeochemical cycle:

- Movement of the nutrient elements from environment to organism and back to environment.
- Involvement of biological process.
- Chemical changes.

Some important biochemical cycle:

- Carbon – oxygen cycle.
- Nitrogen cycle

Q.9. Describe in detail Carbon – oxygen cycle.

Carbon – oxygen cycle:

All the life in the earth is based on carbon. It is needed for the formation of proteins, carbohydrates, fats and many other substances that make up living things. The major sources of carbon is CO_2 which is found in atmosphere. Plants take this CO_2 from air and convert into carbohydrates by the process of photosynthesis. Carbon in this form passes into a food chain.

Animals get carbon by eating plants and animals. The amount of CO_2 in the air stays the same because it is recycled in the air. From living organism (plants and animals) carbon is returned to atmosphere by respiration and photosynthesis. It also returned in air by combustion and by decomposers when they decompose they are decomposed the dead organism. From atmosphere CO_2 is again returned to the plants which use it in photosynthesis. In this way the carbon cycle continues.

Q.10. Write short note on carbon cycle. How it is completed in nature?

Nitrogen cycle:

Nitrogen is important for organism because it is essential part of proteins and DNA. It is an essential element in the structures of all living things Nitrogen cycle is completed in the following steps.

Nitrogen Fixation:

It is the first step of nitrogen fixation in which atmospheric gaseous nitrogen is converted into ammonia. It is carried out by nitrogen fixing bacteria. The atmospheric. Nitrogen combines with oxygen during lightning to make certain compound which ultimately form nitrates and reach to soil by rain water. The atmospheric Nitrogen also fix by three types of bacteria. One group live in water, second group lives in the soil and third group lives in the roots of certain leguminous plants.

Nitrification:

In this step ammonia is converted into nitrates, for use of the plants by another group of bacteria called nitrifying bacteria is called nitrification. These bacteria (microorganisms) live in soil. These nitrates are reabsorbed by plants and the Nitrogen cycle starts again.

Assimilation:

In this step plants absorbs nitrates through roots and use it in the formation of protein.

Denitrification:

The process of converted nitrogenous compounds into free or gaseous nitrogen is called denitrification. It takes place by special bacterial which lives in soil. These bacteria called denitrifying bacteria. These bacteria break ammonia or nitrates into free nitrogen, which is released in the air so as to complete the cycle and to keep the nitrogen balance in nature.

Q.11. Describe the different types of interaction or relationship in the ecosystem.

Interaction or relationship in the ecosystem:

It has been observed that in an ecosystem living organisms develop number of relationship according to their needs. The herbivores develop their relation with producers, in the same manner carnivores depend o herbivores for their food. Some types of these relationships are competition, predation and symbiosis.

Competition:

This type of a relationship is actually a cold war between the organisms of a community occupying the same habitat. This competition may be interaspecific i.e. between the members of same species or interspecific i.e. between the members of different species. Intraspecific competition is mainly for mate, better shelter, better and high amount of food, while the interspecific competition is for food. This competition becomes a limiting factor ends in the survival of the fittest, to keep the size population and community in balance.

Predation:

A predator is an organism which captures and kill the alive animal for its food. The animal being killed is called prey. Predator in an ecosystem are either secondary or tertiary consumers usually. Some plants are also predators, these plants are called carnivore plants i.e. pitcher plant, venus fly trap etc. predator relationship is an important factor in which one population continually determine the population of the other predator –prey relationship is an effective tools for biological control of the population of various organisms.

Sumbiosis:

It is an association between the two organisms of different species which live together. In this association either one is benefited while the other is harmed or at least one is benefited while other is neither benefited nor harmed or both mutually benefited. So this symbiotic association is of three type the Parasitism, commensalism and Mutualism respectively.

Q.12. What is symbiosis? Define its different types in detail.

Symbiosis:

For Answer Q # 11.

Parasitism:

This is a relationship between two organisms in which one organism gets benefit while other harm. The organism that is harmed is called a host, while other organism that benefited is called parasite. Parasite lives in or on the body of host and gets food from host. Sometimes the parasite gets place to live also thus benefited whereas its host is harmed. Parasites cause diseases, these disease causing parasites are viruses, bacteria, fungi, protozoa, insects, worms etc.

Commensalism:

It is a type of symbiotic relationship in which one of the organism commensal, gets the benefit whereas the other is neither benefited not harmed.

Examples:

- Spirochaetae, a kind of spiral shaped bacteria, living between our teeth to obtain food but causes no harm to us.

Mutualism:

In mutualism two different kind of organisms get benefit from living together. Usually they cannot live without each other.

Example:

- Termites
- Nitrogen fixing bacteria
- Relationship between flower and insects

Q.13. Define greenhouse gases and greenhouse effect (global warming). Write the effect of greenhouse effect (global warming).

Greenhouse gases:

The gases like CO_2 and methane produce by the burning of fossil and fuels which are generally called greenhouse gases.

Greenhouse effect (global warming):

The greenhouse gases like CO2 and methane are produced in high quantity in atmosphere will accumulate below the ozone layer, which do not allow heat energy of sun to reflect back in space. As a result, heat remains with in the earth's atmosphere and increases the temperature. This is called global warming or greenhouse effect.

Effect of greenhouse effect (global warming):

Due to global warming more evaporation of H2O which ultimately reach to high rainfall, melting of polar ice and glaciers at high rate, rise of sea levels and ultimately reach to flood.

Q.14. Define acid rain. What is the effect of acid rain?

Acid Rain:

The rain falls through the polluted air which contains CO2, Soc and NO2. These gases react readily with rain water to form carbonic acid, dilute sulphuric acid and nitric acid respectively. Rain containing these acids is known as acid rain.

Effect of acid rain:

The acids like carbonic acid, dilute sulphuric acid and nitric acid remain as vapours and condense into liquid when temperature falls. The acid destroy soil, micro-organisms of soil, skin of animals, building material.

Q.15. Define deforestation. What is the effect of deforestation on earth?

Deforestation:

The destroying or cutting own trees for the conversion of forest into non-forest land in known as deforestation.

Causes of deforestation:

Deforestation is done deliberately due to the mining, paper making, urbanization, timber, for making roads and agriculture expansion livestock breeding.

Effects of deforestation:

Deforestation result in recurrent floods, soil erosion, lowering of ground level, declination of annual rain fall, loss of fertility of the soil, reduction in wild life and greater incidence of diseases because of loss of organism which helped in controlling the vectors. Deforestation also increase in the concentration of greenhouse gases (Methane and CO_2) which leads to global warming and temperature will be high that causes glaciers melting.

Q.16. Define pollution and pollutants? Write the common pollutants. Name the different types of Pollution.

Pollution:

Pollution is defined as the undesirable changes in the physical, chemical or biological characteristics of air, land and water that will harmfully affect human life and other organisms.

Pollutants:

All those substances that cause pollution called pollutants.

Common pollutants:

- Deposited matter such as soot, smoke, tar, dust and grit.
- Gases like SO_2, CO,CO_2, NO_2,Cl_2, O_3 etc.
- Chemical compounds like aldehyde, arsines, hydrogen fluoride, chloro flouro methane, phosgene, detergents etc.
- Heavy metals like lead, mercury, iron, zinc etc.
- Economic poison like herbicide, fungicide, insecticide etc.
- Fertilizers.
- Sewages.
- Radioactive substances.
- Noise and heat.

Classification/types of pollution:

Generally pollution is classified as:

Material pollution:

Where some material or substance becomes excessive in environment; like

- Air pollution
- Water pollution
- Soil pollution

Non-material pollution:

Where material does not increase but environment disturb or become unbearable to live.

- Noise pollution
- Heat or radiation pollution.

Q.17. What is air pollution? Write the causes and control of air pollution.

Air pollution:

When amount of solid waste or concentration of gases other than oxygen increases in atmosphere called air or atmospheric pollution.

Main causes of air pollution:

Automobile, electrical power plant use coal, gas, diesel or petrol, industrial processes, heating and cooking plants, transport industry etc. these machines produce smoke, carbon mono-oxide (DO), carbon dioxide (CO_2), sulphur oxide (SO_2), nitrogen oxide (NO_2), chloro flouro carbon (CFC) etc, due to which photochemical haze produces, acid rain occurs, greenhouse effect take place as well as ozone depletion occurs.

Control of air pollution:

Air pollution can be controlled by following ways.

Use of proper filters:

Industrial air pollutants should be passed through filters and other devices. So in this way particulates matter is removed before they release in air.

Use of solar cooker:

Industry should use solar cooker or bio-gas producing units.

Environment friendly fuels:

Use lead free fuels, Sulphur free fuels, use of CNG gases.

Afforetation:

Development of new forest or plantation. Forest use excessive CO_2, plants also absorb other air pollutants.

Q.18. Define ozone and ozone depletion. Write causes of ozone depletion in atmosphere.

Ozone:

Ozone is an allotrope of oxygen which has molecular formula O_3. In between 12 to 50 km above the ground there is a layer of gas is called ozone.

Ozone depletion:

Removal of ozone layer up in the atmosphere is known as ozone depletion.

Role of Ozone in atmosphere:

In upper atmosphere a protective layer of ozone (O_3) is present which is very important for us because it checks and protects us from the ultraviolet radiations from sun which are lethal (Fatal/Deadly) for living organisms.

Causes of ozone depletion in atmosphere:

Scientists have found this protective layer is gradually depleting (getting thin) due to chloro flouro carbon, as they react with ozone and convert it into O_2. The CFC used as propellant in pressurized aerosol, foaming agent, refrigerators etc. each one atom of chlorine converts more than 100000 molecules of ozone.

Q.19. What is water pollution? Writ the causes and control of water pollution.

Water pollution:

The harmful substances like chemicals, microorganisms and other harmful substances are added in the water sources like stream, canals, river, lake, ocean etc which make the water contaminated, degrading water quality and make it toxic for humans and other living organisms is called water pollution.

Main causes of water pollution:

Main sources of water pollution are:

Organic pollutants:

Domestic sewage, agriculture run off, organic waste from breweries, bacteria, milk dairies, sugar mills, hotel etc.

Chemical Pollutants:

Pesticides, insecticides, fungicides, herbicides, detergents, heavy metals, acid, mine waste, oil and oil dispersants, radioactive material etc.

Thermal Pollutants:

Effluents from electric power plants or nuclear reactor plants.

Siltation:

Deposition of soil and sand in the bottom of water reservoirs which raise the water leaves and decrease water holding capacity. At last this silting cause floods.

Control of water pollution:

- Public awareness at all levels is important. It should be through social media, political leaders, institution from pre-primary level.
- Strict legislation and implementation is required on sewage treatment and industrial recycling processes.
- No industrial and agricultural waste should be added to water bodies before complete treatment.

Q.20. What is soil pollution? Write the causes and control of soil pollution.

Soil pollution:

Soil pollution is defined as the undesirable changes in the physical, chemical or biological characteristics or land or soil that will harmfully affect human life and other organisms.

Causes of soil pollution:

- Utilization of lane resources.
- Mining, excavation of soil for bricks, cement making and construction of road, dams, building etc.
- Dumping of solid waste in open space have reduced soil resources.
- Deforestation for building and industries.
- Over grazing by cattle of domestic use have destroyed the properties of soil.
- Excessive use of fertilizers, pesticides and poor drainage system.

Control of soil pollution:

- Recycling of solid waste.
- Proper dumping of solid waste.
- Plantation, development of forest.
- Development of pasture and meadows for grazing of animals.
- Proper irrigation system like drip system.

Q.21. Write the plans for conservation of nature in Pakistan.

Plans for Conservation of Nature in Pakistan:

Pakistan has diversified ecosystems therefore authorities developed different plans.

- National parks.
- Wild life sanctuaries (shelter/oasis)
- Game reserves
- Protected wetlands
- Protected and reserved forest 07
- Marine protected areas
- Biosphere reserves (MAB) Lal suhanar Biosphere reserve Punjab, Ziarat Juniper forest, Pallas valley in Kohistan KPK
- Pakistan National Biodiversity strategy and action plan 2015.
- Biodiversity action plain by IUCN/WWF/World bank, 1999.
- National Conservation Strategy plan, 1993,
- Wild life conservation project in Pakistan, 2007.
- Sustainable Forest Management UNDP in Pakistan. Project 2016-2020.
- Himalayan Jungle Project (HJP), 1991-1994.
- Palas Conservation and development project (PCDP) 1994
- Indus Dolphin project (IDP), 1977
- Marine Turtle Conservation Project, 1980
- Kirthar national park, Sindh
- Toghar Conservation Project (TCP), Balochistan, 1985
- Conservation of chilghoza Forest and Associated Biodiversity of Suleiman Range, Balochistan, 1992
- Maintaining Biodiversity with Rural Community Development, 1999
- Mountain area conservancy project (MACP), 1999
- Northern area Conservation Project (NACP), 2000
- Conservation of snow leopard in Northern Pakistan.
- Conservation of Migratory birds in Chitral, NWFP (KPK), 1992
- Himalayan Wild life Project (HWP), 1993
- Conservation of Chiltan Markhor in Hazarganji Chiltan National Park, Quetta.
- Protected areas Management Project.
- Bear Baiting in Pakistan.

Institution in Pakistan Work for Conservation:

- Environment and climate change (UNDP) In Pakistan.
- Society for Conservation and Protection of environment, SCOPE
- Environment and natural Resource Management (National Rural Support Program) Conservation in Pakistan.
- National Energy Efficiency & Conservation Authority.
- Environmental organization in Pakistan (Help save Pakistan's environment)
- Pakistan Environmental protection and resources conservation project.
- Pakistan Environmental protection agency (PEPA)
- Himalayan Wild life Foundation (HWF)

SHORT QUESTIONS

Q.6. What is the effect of light on ecosystem? (For answer Q#3)

Q.7. Which one is the first trophic level of ecosystem and how? (For answer Q#4)

Q.8. What do we mean by nitrogen fixation and how it occurs in an ecosystem?

Ans: (For answer Q#10)

Q.9. What is interaction?

Ans: A biological interaction is the effect that a pair of organisms living together in a community have on each other.

Q.10. What is pyramid of number? (For answer Q#7)

Q.11. What is greenhouse effect? (For answer Q#13)

Q.12. What is algal bloom and how it destroy the life of an aquatic ecosystem.

Ans. Growth of algae with very high rate due to increases in Phosphorous and nitrogen containing compounds called algal bloom or eutrophication. Algal bloom when floats on water sourface spoil fishing, swimming and recreational (Amusment /entertainment) qualities of water.

Q.13. What measure can be taken to control water pollution? (For answer Q#19)

Q.14. Write down the name of some endangered mammals of Pakistan.

An. Punjab Urial, Markhor, Snow leopard, Green turtle, Indus river Dolphin, Bear of deosal

Q.15. Draw the diagram of nitrogen cycle.

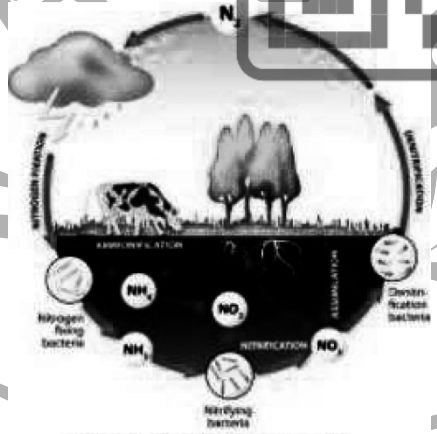


Fig. 7.12 Nitrogen cycle

TERMINOLOGY AND DEFINITIONS

Environmental biology:

The scientific study of environment, ecology, evolution and global change with in a combined form called environmental biology.

Biome:

Any bio-geographical region recognized by specific vegetation or climate called biome.

Ecology:

The scientific study of various relationships exists between organism and their environment is called ecology.

Trophic Level:

The steps by which energy is transferred in the form of rich are called trophic level.

Pyrumid of energy:

The energy is transferred at various levels in reduction form in an ecosystem is expressed in the form of a pyramid is called pyramid of energy.

Predator:

A predator is an animal which capture and kills live animal for their food. They are mostly carnivore.

Prey:

The animals upon which a predator fees are called prey.

Predation:

The relationship between predator and prey is called predation.

Competition:

The state in which two or more individuals have to complete for same resource such as food, water, living space or sun light is called competition.

Competitors:

The organism which compete with one another for their basic needs are called competitors.

Ectoparasite:

The parasite which lives outside the body of its host is called ectoparasite. Examples leeches, mosquito, bugs etc.

Endoparasite:

The parasite which lives outside the body of its host is called endoparasite. Bacteria, virus plasmodium, protozoa etc.

Ecological balance:

In an ecosystem living organism interact with other living organisms as well as with their abiotic factors. The all interactions are important and help to keep the ecosystem balanced. This is called ecological balance.

Conservation:

Conservation is the way of caring, saving the species, inhabit on earth from dangers.

Aerosol:

A suspension of fine solid or liquid particles in gas.

Eutrophication or algal bloom:

Growth of algae with very high rate due to increase in phosphorous and nitrogen containing compounds called algal bloom or eutrophication.

Non-renewable resources:

The non-renewable resources are natural resources that cannot be replaced or replenished by natural means but they can conserve.

Renewable resources:

The renewable resources are can be used repeatedly, reproduced and does not run out because it is naturally replaced or recycled.

Conservation:

The careful preservation of natural resource is called conservation.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. The life sustaining envelop earth is:
   - Biomass
   - Biomes
   - Biosphere
   - Atmosphere
2. The group of organisms helog to the same species live in a particular area called:
   - Community
   - Species
   - Gen
   - Population
3. An area where community interacts with non-living environment is called:
   - Community
   - Ecology
   - Ecosystem
   - Biome
4. Any biological region recognized by its climate or vegetation is called:
   - Ecosystem
   - Biomes
   - Biosphere
   - Biomass
5. The transfer of food material from producers through some organisms with repeated eating and being eaten is called:
   - Food pyramid
   - Food chian
   - Food web
   - Ecological pyramid
6. The elements in ecosystem recycle through organisms with environment is called:
   - Food chain
   - Food web
   - Chemical cycle
   - Biogeochemical cycle
7. Process where nitrogenous compound of living organism convert into nitrates is called.
   - Ammonification
   - Nitrification
   - Denitrificaiton
   - Deamination
8. The cold war between the organisms of a community occupying the same habitat is called:
   - Predation
   - Competition
   - Mutualism
   - Commensalism
9. The association between two different types of organism which get benefit to each other, cannot live without each other is called:
   - Parasitism
   - Commensalism
   - Mutualism
   - Predation
10. The amount of solid waste or concentration of gases other than oxygen increase in atmosphere is called:
    - Air pollution
    - Ozone depletion
    - Acid rain
    - Greenhouse effect

BIOTECHNOLOY Ch # 08

DETAILED QUESTIONS

Q.1. Write the aims/objectives complete draft of the human genome objects.

In 1990, the human project was launched to map all the genes of the human cell. The complete draft of the human genome sequence was published in 2002 with the following objective.

- Determining the human DNA sequence
- Understanding the function of the human genetic code.
- Identifying all of the genes.
- Determining their functions.
- Understanding how and when genes are turned on and off throughout the lifetime of an individual.

Q.2. Write the scope and importance of biotechnology.

Scope and importance of biotechnology:

Biotechnology In Medicine:

Production of a monoclonal antibody, DNA, RNA probes for diagnosis of virous diseases; valuable drugs like insulin and interferon have been synthesized by bacteria for the treatment of human disease. DNA fingerprinting is utilized for identification of parents and criminals. Development of recombinant vaccines like human hepatitis B etc. various enzymes are being synthesized for medicinal and industrial use. Gene therapy also gift of biotechnology.

Biotechnology in Agriculture:

In agriculture, plant cell, tissue, and organ culture are used for rapid and economic clonal multiplication of fruit and forest trees, for production of virus-free genetic stocks and planting material as well as in the creation of novel genetic variations through soma-clonal variation. Genetic engineering techniques are utilized to produce transgenic plants with desirable resistance, herbieide resistance, an increased shelf life of fruits etc.

Biotechnology in Industry:

Industrial biotechnology is an area with which biotechnology was initiated for large scale production of alcohol and antibiotics by microorganisms. Even today, a variety of pharmaceutical drug and chemicals like lactic acid, glycerine etc. are being produced by genetic engineering for better quality and quantity.

Biotechnology In The Environment:

Environmental problems like pollution control, depletion of natural resources for nonrenewable energy, conservation of biodiversity etc. are being dealt with using biotechnology.

Q.3. Define fermentation. Describe its different types.

Fermentation:

"Fermentation is the process by which living organisms such as yeast or bacteria are employed to produce useful compounds or products."

Type of fermentation:

There are two major types of fermentation.

Lactic Acid Fermentation:

In lactic acid fermentation, pyruvic acid from glycolysis changes to lactic acid. In the process, NAD+ forms NADH. NAD, in turn, lets glycolysis continue. This type of fermentation is carried out by the bacteria streptococcus and lactobacillus species for souring milk into yogurt and production of various types of cheese. It is also used by your own muscle cells when you work them hard and fast. It is quite important I diary industry for souring milk and production of various types of cheese.

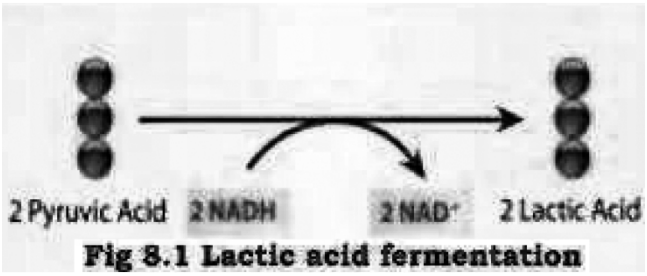


Fig 8.1 Lactic acid fermentation

Alcoholic Fermentation:

In alcoholic fermentation, pyruvic acid changes into alcohol and carbon dioxide. NAD+ also forms from NADH, allowing glycolysis to continue making ATP. This type of fermentation is carried out by yeast saccharomyces cerevisiae and some bacteria. Ethanol fermentation converts two pyruvate molecules, the products of glycolysis into two molecules of ethanol and two molecules of carbon dioxide. It is used to make bread, beer, wine, ethanol, spirit and biofuels.

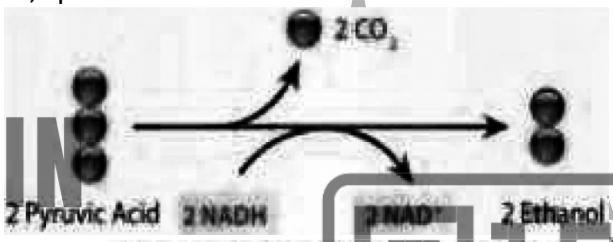


Fig 8.2 Alcoholic fermentation

Q.4. Write the importance or uses of fermentation in industrial biotechnology.

Fermentation in Industrial Biotechnology:

In the world of biotechnology, the term fermentation is used rather loosely to refer to the growth of microorganisms, forming on food, under either aerobic or anaerobic conditions. The industrial microorganisms are grown under controlled conditions with an aim of optimizing the growth of the organism for the production of targeted microbial products such as foods (cheese, yogurt, fermented pickles & sausages, soy sauce), beverages (beers, wines), and spirit.

Q.5. Write the application/uses of fermentation.

Application/Uses of Fermentation:

- Fermentation changes the chemical environment of a food.
- By fermentation, the microorganisms that are needed were included in the recipe.
- Fermentation is an important process in the preparation of foods more nutrition and more tastier for human consumption.
- Many plant products undergo a fermentation process in order to produce the final product.
- Pre-sterilized (pasteurized) material assembled into packages and aseptically filled (Aseptic packaging) for the grocery shelf.

Q.6. Describe the method of fermentation as a food preservation technique.

Fermentation as a food Preservation technique:

Fermented foods are foods that have been prepared in a way so that the bacteria naturally found within them starts to ferment. Fermentation, also known as lacto-fermentation, is a chemical process in which bacteria and other micro-organisms break down starch and sugars within the foods, possibly making them easier to digest, and resulting in a product that is filled with helpful organisms and enzymes. This process of fermentation is a natural preservative, which means that fermented foods can last a long time.

Q.7. Write about the products of Fermentation.

Products of Fermentation:

Foods that undergo fermentation include are as under

- Dairy products: yogurt, cheese
- Cereal products: bread, cakes
- Fruit and vegetable products: flavorings, candy, fruit juice, silage
- Beverages: beer, wine, cider.

- Pickling involves fermentation.
- Foods that are frequently pickled include beans, onions, cauliflower, cucumbers, tomatoes, and cabbage.
- Fermentation helps preserve the food and lowers the need of refrigerator.
- Non-food items that undergo fermentation include antibiotics, laundary detergent, insulin, growth hormones, cellulose, monoclonal antibodies, compost, chemicals and medicine to dissolve tumors and to clot blood.

Q.8. What is fermenter? Write the advantages of fermenter.

Fermenter:

The fermenter is a container or an apparatus which is used for the fermentation activity of the microorganisms like bacteria and fungi to grow on large scale. The general idea behind the fermenter is to provide a stable and optimal environment for microorganisms to reproduce and interact with substrate for required product.

Advantage of Fermenter:

- Fermenter provies the monitor and controlled environment to organism for each biotechnological process.
- A fermenter optimizes the growth of organisms by controlling many factors like nutrients, oxygen, growth inhibitors, pH and temperature.
- Fermenters help to make the production of material in bulk quantities.
- Fermenters help in production of massive amounts of medicines, insulin, human growth hormone and other proteins.

Q.9. What is genetic engineering? Write it uses.

Genetic engineering:

Genetic engineering has been defined as the artificial manipulation, modification, and recombination of DNA or other nucleic acid molecules in order to modify an organism or population of organisms.

Uses/Impacts of Genetic Engineering:

- Identify the gene that produces the protein of interest.
- Cut the DNA sequence that contains the gene from a sample of DNA.
- Place the gene into a vector, such as a plasmid or a Bacteriophage.
- Use the vector to carry the gene into the DNA of the host cells, such as Escherichia coli (E coil) or mammalian cells grown in culture.
- Induce the cells to activate the gene and produce the desired protein.
- Extract and purify the protein for therapeutic use.

Q.10. Describe the Different Genetic Engineering Tools.

Genetic engineering tools:

To manipulate cells and DNA, scientists use tools that are borrowed from nature, including.

Restriction Enzymes:

These naturally occurring enzymes are used as a defense by bacteria to cut up DNA from viruses. There are hundreds of specific restriction enzymes that researchers use like scissors to snip specific genes from DNA.

DNA Ligase:

This enzyme is used in nature to repair broken DNA. It can also be used to paste new genes into DNA.

DNA vector:

a. **Plasmids:**
   These are mostly circular units of DNA. They can be engineered to carry genes of interest.
b. **Bacteriophages (also known as phages):**
   These are viruses that infect bacteria. Bacteriophages can be engineered to carry recombinant DNA.

Q.11. Describe the major achievements of genetic engineering.

Major achievements of genetic engineering:

Achievements of genetic engineering are as under.

- The creation of new synthetic vaccine for foot and mouth disease is a strange and more impressive tale. The trick was to carve up the virus genome to make a DNA copy that codes only for the three capsid proteins.
- A vaccine made against coccidiosis by using avian protein to immunize chicken against avian coccidian. Coccidiosis is a disease of both invertebrates and vertebrates caused by parasitic protozoa.
- Sleeping sickness (trypanosomiasis) is caused by a parasite called Trypanosoma brucei. The availability of a genetic transformation made possible the treatment of this disease.
- Molecular biology has introduced in modern medicine a new way to cure diseases, namely genetic therapy, direct intervention in the genetic makeup of an individual.
- Cloning humans in the second half of the 20th century as dramatic advances were taking place in genetic knowledge, as well as in the genetic technology.
- Genetically modified (GM) foods possess specific traits such as tolerance to herbicides or resistance to insects or viruses.
- Adding a gene from insect-killing bacteria to cotton so that insects, eat cotton will be poisoned!
- Genetic engineering also includes insertion of human genes into sheep so that they secrete alpha-1 antitrypsin in their milk – a useful substance in treating some cases of lung disease.
- By inserting a gene for human insulin into an E. coli bacterium, the E. coli will make lots of insulin, which scientists and doctors can collect and use.
- Scientists have found a gene called p-53 which normally keeps cells under control and works best to suppress cancer cells.

Q.12. Define the single cell protein and write its uses.

Single Cell Protein:

It is an alternative protein or refined protein derived from microorganism such as yeast, fungi and bacteria. It is prepared by fermentation process. It is called single cell protein because it is combination of single cell organisms.

Uses of Single Cell Protein:

- Single Cell protein (SCP) is not a pure protein but refers to whole cells of bacteria, yeasts, filamentous fungi or algae contains carbohydrates, lipids, nucleic acids, mineral salts, and vitamins.
- Carbon substrates: major substrates used in commercial SCP production are alcohols, n- alkanes, molasses, sulphite, liquor and whey.
- Single cell protein is a protein extracted from cultured algae, yeasts, or bacteria and used as a substitute for protein-rich foods, especially in animal feeds or as dietary supplements.
- Many types of animal feeds contain single cell proteins. 60-80% dry cell weight; contains nucleic acid, fats, CHO, vitamins, and minerals rich in essential amino acids (Lys-Met).
- Microbes can be used to ferment some of the vast amounts of waste materials, such as straws; wood and wood processing wastes; food, cannery and food processing wastes; and residues from alcohol production or from human and animal excreta.

SHORT QUESTIONS

Q.1. What kind of enzymes allows scientists to cut and paste piece of DNA together to form recombinant DNA?

Ans. The restriction enzymes is used for cutting DNA and the enzyme DNA ligase is used for pasting pieces of DNA together to form recombinant DNA.

Q.2. Explain how making human tissue plasminogen activator (t-PA) in Chinese hamster ovary (CHO) cells is an example of genetic engineering.

Ans. Making human tissue plasminogen activator (t-PA) in Chinese hamster ovary (CHO) cells is an example of genetic engineering because any process in which an organism's genome is altered refers to genetic engineering.

Q.3. How do organisms obtain energy?

Ans. Organisms obtain energy from the food they consume.

Q.4. How does fermentation work?

Ans. Fermentation is a metabolic process in which organism converts carbohydrates such as starch into alcohol or lactic acid.

Q.5. What types of microorganisms cause fermentation to occur?

Ans. The microorganisms cause fermentation to occur which respire anaerobically like streptococcus and lactobacillus.

Q.6. What food and non-food products are created by fermentation?

Ans. For answer Q#7

Q.7. What are some advantages of fermentation in food processing?

Ans. For answer Q#5

Q.8. What factors can affect the fermentation process?

Ans. Temperature, pH, acidity, ethanol etc. factors can affect the fermentation process.

Q.9. Define biotechnology?

Ans. For answer terminology and definition.

Q.10. What is the classical biotechnology?

Ans. Classical biotechnology is a technique to use alter the genetic makeup (genotype) of microorganisms, plants and animals for the purpose of changing their physical characteristics (phenotype).

Q.11. What is your justification in considering biotechnology an old technology?

Ans. Old technology involves use of natural organisms to create or modify food or other useful products for human use, while modern biotechnology involves manipulation of genes and living tissues in a controlled environment to generate new tissue.

Q.12. Describe the contribution of Louis Pasteur toward development of classical biotechnology.

Ans. Pasteurized material assembled into packages and aseptically filled (aseptic package) for the grocery shelf.

Q.13. What are the different types of fermentation?

Ans. For answer Q#3

Q.14. What is lactic acid bacillus? Explain its role in the formation of curd.

Ans. Lactic acid bacteria (LAB) are heterogenous group of bacteria which plays an important role in a variety of fermentation processes. It helps in souring milk into curd.

Q.15. Name some of the fermented food products of Pakistan.

Ans. For answer Q#7

Q.16. Name four recombinant DNA products available in the market.

Ans. Pharmaceutical products, protein-based polymers for drug delivery, antibodies and enzymes for disease treatment, protein scaffolds for tissue engineering.

TERMINOLOGY AND DEFINITIONS

Biotechnology:

"The use of living organisms, cells or cellular components for the production of compounds or precise genetic improvement of living things for the benefit of man".

Transgenic:

The organism with modified genome genetic make-up.

Recombinant DNA:

When segments of DNA are cut and pasted together to form new sequences, the result is known as recombinant DNA. "OR" The vector DNA and the attached gene of interest are collectively called recombinant DNA.

Genetically Modified organism (GMO) or transgenic cells:

When recombinant DNA is inserted into cells, the cells use this modified blueprint and their own cellular machinery to make the protein encoded by the recombinant DNA. Cells that have recombinant DNA are known as genetically modified organism (GMO) or transgenic cells.

Gene TP-53/P-53:

The TP53 gene provides instructions for making a protein called tumor protein p53 (or p-53). This protein acts as a tumor suppressor, which means that it regulates cell division by keeping cells from growing and dividing too fast or in an uncontrolled way. It works to suppress cancer cells.

Alpha-1- antitrypsin (AAT):

Alpha – 1 – antitrypsin (AAT) is a protein produced in the liver that protects the body's tissues from being damaged by infection – fighting agents released by its immune system. In alpha – 1 antitrypsin deficiency, the body's normal production of AAT is reduced, resulting in the destruction of sensitive lung tissue.

Chinese Hamster Ovary (CHO):

Chinese hamster ovary (CHO) cells are an epithelial cell line derived from the ovary of the Chinese hamster, often used in biological and medical research and commercially in the production of recombinant therapeutic proteins.

Therapeutics:

The branch of medicine concerned with the treatment of disease and the action of remedial agents like a treatment, therapy, or drug.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. The artificial manipulation, medication and recombination of DNA.
   - Genetic engineering
   - Biotechnology
   - Molecular biology
   - Genetic
2. The earlier biotechnologist were:
   - Biologist
   - Agriculturist
   - Genetist
   - Farmers
3. The complete graph of human genome was studied by;
   - PCR
   - HGP
   - Medicine
   - Soma-clonal
4. Alcohol and antibiotics on large scale production by organism is an area of:
   - Environmental biotechnology
   - Fermentation
   - Biotechnology in industry
   - Medicinal biotechnology
5. Most of the living things use O2 to produce:
   - ATP
   - Alcohol
   - Organic Acid
   - Ecological Pyramid
6. In acidic formulation lactic acid produced from:
   - Pyruic acid
   - Acetic acid
   - Citric acid
   - Glyceric acid
7. The bread dough rises during alcoholic fermentation is due to:
   - Methyl alcohol
   - CO2
   - Ethyl alcohol
   - H2O
8. The container use to grow bacteria on large scale are called:
   - Chillers
   - Sterilizers
   - Fermenters
   - Ferments
9. Naturally occurring enzyme used as a defense chemical by bacteria:
   - Defense protein
   - Restriction enzyme
   - Hydrolytic enzyme
   - Ligase enzyme
10. Extra circular DNA which use as vector of gene is:
    - Genome
    - Plasmid
    - Pilli
    - Ligase

PHARMACOLOGY Ch # 09

DETAILED QUESTIONS

Q.1. What is drug? Define its types.

Drug:

Drug is a chemical substance used to treat, cure prevent a disease or to promote well-being or artificial pleasure. Drugs can be derived from plants and animals.

Types of drugs:

There are two categories of drugs.

Pharmaceutical drugs or medicinal drugs:

These drugs are used to treat the diseases and makes the patient physically normal.

Addictive drugs:

These drugs makes the person relaxed by feeling pleasure, acting on the CNS of the person, finally the person become dependent on it.

Q.2. What are medicinal drugs? Describe the various sources of medicinal drugs.

Medicinal drugs:

For Answer Q # 1

Sources of medicinal drugs:

These beneficial drugs are obtained from various sources:

Drugs from plants:

Many plants produce special substances in their roots, leaves, flowers, or seeds that help to form drugs in laboratory or can be used directly as herbs. For example cinchona tree contains quinine in its bark which is used in the prevention and treatment of malaria and Opium is used as pain-killer drug extracted from the unripe seed pods of the opium poppy.

Drugs from Microorganisms:

Microorganisms such as Bacteria and fungi not only produce many primary metabolites, but also help in producing of antibiotics and antifungal drugs.

Example: tetracycline are produced by bacteria and Lovastain produced by fungi.

Drugs from animals:

Certain animal parts and animal products are used as drug in therapeutics. The major group of animal products used in medicine is hormone, enzymes, animal extractives, organs and bile acid.

Example: Gonadotropin hormone is prepared commercially from horse serum.

Drugs from Minerals:

Some of the drugs are synthesized from minerals or can be given with mineral as supplement, such as iron is used in treatment of iron deficiency (anemia). Zinc is used to make zinc oxide paste which is used in wounds and in eczema.

Synthetic Drugs:

Synthetic drugs are synthesized in labs by using man-made chemicals rather than natural ingredients. A number of synthetic drugs in the market are available.

Example: Synthetic marijuana, goes by many names: K2, Spice, fake pot, potpourri, legal weed and more.

Q.3. Describe the principles usage of important medicinal drugs.

Principles usage of important medicinal drugs:

Pain killers:

Painkillers (analgesic) reduces the pain by acting on CNS.

Example: Paracetamol, Aspirin and Panadol etc.

Antibiotics:

Antibiotics work against bacterial infections. It either kills or inhibit the bacterial growth. For example: Penicillin, Cephalosporin and tetracycline etc.

Vaccine:

The vaccine is vital for One's life, vaccine prevent the living body from the microbial diseases by developing immunity in the body. For example: Hepatitis vaccine, rabies vaccine, Covid-19 vaccine etc.

Sedatives:

Sedative drugs are helpful for treating anxiety and sleep problems. Such as, diazepam (Valium), Alprazolam (Xanax), and Clonazepam (Klonopin).

Q.4. Describe the discovery of antiseptic and antibiotics.

Discovery of antiseptic and antibiotics:

Joseph Lister is called as "Father of Antiseptic Surgery", Joseph Lister's contributions paved the way to safer medical procedures. His introduction of the antiseptic process dramatically decreased death from childbirth and surgery. He used carbolic acid as a disinfectant, he used it for washing hands and instrument. He also designed his spray machine with carbolic acid to kill the air-borne germs.

Sir Alexander Fleming, a Scottish researcher, is credited with the discovery of penicillin in 1928. At the time, Fleming was experimenting with the influenza virus in the Laboratory of the Inoculation Department at St. Mary's Hospital in London.

Often described as a careless lab technician, Fleming returned from a two-week vacation to find that a mold had developed on an accidentally contaminated staphylococcus culture plate. Upon examination of the mold, he notice that the culture prevented the growth of staphylococci. And this accident led the discovery of antibiotic named as penicillin.

Q.5. Describe the major types/categories/groups of addictive drugs.

Types/Categories/groups of addictive drugs:

For Answer Q#1.

a. Sedatives:

Sedatives are central nervous system (CNG) depressants, a category of drugs that slow normal brain function. One of the most marked effects of sedatives is their potential for abuse and addiction. It can cause drowsiness and sleepiness and are used to reduce anxiety. They also reduce heart rate and breathing, and can reduce them to the point that death occurs, if there is an overdose.

b. Narcotics:

Narcotics are also called painkiller. These drugs bind with the pain receptor present in CNS and reduces the pain. They are used to treat moderate to severe pain that may not respond well to other pain medications. The short-term effects of opiate use can include feelings of euphoria, pain relief, drowsiness and sedation. Narcotics can be dangerous not only because of their potential for abuse and addiction, but also because they can sometimes lead to overdose and death.

i. Heroine:

Heroin is narcotics and considered highly addictive. Heroin and other opioid drugs interact with dopamine levels in the brain, which is what causes that burst of pleasure associated with their use. Abuse of heroin can quickly lead to drug tolerance, dependence, and addiction.

ii. Morphine:

Being narcotic drug, morphine is used to relieve moderate to severe pain. It remains active in blood stream upto 6Hrs. it acts on the CNS and causes relief from pain but overdose can cause many side effects including nausea, vomiting, constipation. Lightheadedness, dizziness, drowsiness, or sweating.

c. Hallucinogen:

Hallucinogens are a class of drugs that cause hallucinationsprofound distortions in a person's perceptions of reality. Some of the typical effect of hallucinogens are: increased breathing rate, increased heart rate and blood pressure, irregular heartbeat, palpitations and blurred vision etc.

i. Marijuana:

Marijuana is the most commonly used illicit drug in the United States. It can be obtained from the flower, stem and leaves of the Cannabis indica plant. People smoke marijuana in hand-rolled cigarettes or in pipes or water pipes. The intake of this drug produces immediate sensations increased heart rate, reduce coordination and balance, and a "dreamy," unreal state of mind. Marijuana also affects brain development.

Q.6. Write the symptoms of addiction and problem associated to drug addiction.

Symptoms of addiction:

- When a person is addicted to a substance, such as a drug, alcohol or nicotine, they are not able to control the use of that substance.
- When body levels of that substance go below a certain level the patient has physical and mood-related symptoms.
- There are cravings for drugs, bouts of moodiness, bad temper, poor focus, a feeling of being depressed and empty, frustration, anger, bitterness and resentment.
- While under the influence of some substances the addict may engage in risky activities, such as driving fast.

Problems associated to drug addiction:

- The problems associated with drug abuse extend beyond immediate personal impact.
- People being an addictive, suffer in health issues which increases other illness.
- Addiction can damage the one's social life.
- Addictive people can easily involve in crimes such as robbery, stealing/snatching, law violator and a criminal.
- It can also affect their family, when the addict does not get its need he become, angry, aggressive, harsh, short temper and does not behave well, ultimately lose relations.

Q.7. What is antibiotic? Define its types.

Antibiotics:

Antibiotics are chemical substances mostly used to fight infections caused by bacteria. They treat infections by killing or decreasing the growth of bacteria. These can be produced naturally by microorganisms (bacteria or fungi) or can be derived by microorganisms in laboratory or can be synthesized in labs.

Types of antibiotics:

Types of antibiotics are as under.

Bacteriostatic:

Those antibiotics which are inhibit the growth of bacteria is called bacteriostatic antibiotics.

Bactericidal:

Those antibiotics which can kill the bacterial cell is called bactericidal antibiotics.

Q.8. Write the misuse of antibiotics and effect of antibiotics.

Misuse or side effects of antibiotics:

Side effects or misuses of antibiotics are as under.

- Antibiotic resistance
- Diarrhea
- Upset stomach
- Thrush: which is a fungal infection that can affect the mouth or digestive tract
- Vaginal yeast infection caused by Candida albican (discharge, burning, pain, itchiness)
- Can cause yellowing of teeth.

Effect of antibiotics:

- Over use of antibiotics can cause antibiotic resistance in which bacteria become habitual for that antibiotics or alter strategy to hinder the effect of antibiotics.
- The change either protects the bacterium from the action of the medication or neutralizes the medication.
- They can acquire resistance by getting a resistance gene encoded to its chromosomes.

Q.9. Write short note on vaccine.

Vaccine:

"A vaccine is a biological preparation that improves immunity to a particular disease." A vaccine typically contains an agent that resembles a disease-causing microorganism, and is often made from weakened or killed form of the microbe, its toxins or one of its surface proteins. A vaccine can confer active immunity against a specific harmful agent by stimulating the immune system to attack the agent. The first vaccine was introduced by British physician Edward Jenner, who in 1776 used the cowpox virus (vaccinia) to confer protection against smallpox, a related virus, in humans.

SHORT QUESTIONS

Q.1. Why antibiotics are not effective against viral infection?

Ans. Antibiotics are not effective against viral infection because bacteria and viruses have different mechanisms to survive and replicate. Viruses insert their genetic material into a human cell's DNA in order to reproduce. So antiviral drugs work differently to antibiotics, by interfering with the viral enzymes. The antibiotics has no "target" to attack in a virus.

For Answer Q#3.

Q.2. Why addiction is considered as harmful condition?

Ans. For Answer Q#6.

Q.3. How drugs (medicine) can be taken from natural source?

Ans. For Answer Q#2.

Q.4. It is possible to get drugs from animals name some of them?

Ans. For Answer Q#2.

Q.5. Do we have any harm of antibiotics. If, so mention them.

Ans. For Answer Q#8.

Q.6. How vaccine work against pathogen? Explain the process with the help of diagram.

Ans. For Answer Q#7.

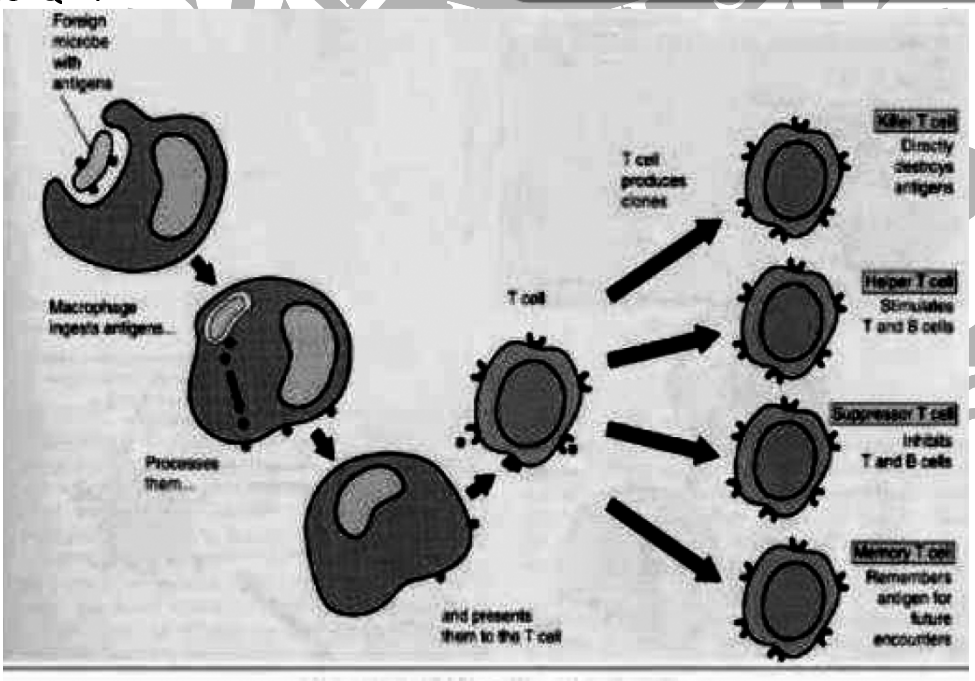


Fig. 9.5 Mechanism of vaccine

TERMINOLOGY AND DEFINITIONS

Pharmacology:

Pharmacology is the branch of biomedical science which is concerned to the uses, effects, and modes of action of drugs.

Pharmacists:

One who studies pharmacy responsible for dispensing prescription medications to patients and advising them are called pharmacists.

Immunization:

Immunization is the process whereby a person is made immune or resistant to an infectious disease.

MULTIPLE CHOICE QUESTIONS

Choose the correct answer:

1. Who is called father of antiseptic?
   - Alexandar Fleming
   - Edward Jenner
   - Lister
   - Oswaled Schmiedeberg
2. Drugs for treatment of rheumatoid arthritis can be obtained from:
   - Animals
   - Minerals
   - Plants
   - Sedatives
3. Drugs that slow normal brain functioning are categorized as:
   - Narcotics
   - Hallucinogen
   - Marijuana
   - Sedatives
4. Vaccination can be administered:
   - After infection
   - Before infection
   - During infection
   - All are correct
5. The substance which inhibit the growth of bacteria can be considered as:
   - Vaccine
   - Bactericidal
   - bacteriostatic
   - Antibiotics
6. Haris is addicted to a drug, which left the following effect on Haris:
   (i) Blurred vision (ii) Making unseen faces in imagination (iii) Euphoria
   Identify the drug, to which Haris is addicted?
   - Narcotics
   - Hallucinogen
   - Antibiotics
   - Antiseptic
7. Which one is not the effect of misuse of antibiotics?
   - Diarrhea
   - Immunization
   - Stomach upset
   - Antibiotic resistance