

BRILLIANT PUBLIC SCHOOL, SITAMARHI

(Affiliated up to +2 level to C.B.S.E., New Delhi)



X Biology Chapter Notes

Session: 2014-15

**Office: Rajopatti, Dumra Road, Sitamarhi (Bihar), Pin-843301
Ph.06226-252314 , Mobile:9431636758, 9931610902
Website: www.brilliantpublicschool.com; E-mail: brilliantpublic@yahoo.com**

Class X: Biology

Ch 6: Life Processes.

Chapter Notes

Key learnings:

- 1) The ability to perform the basic life processes distinguishes a living organism from a non-living one.
- 2) Life processes are the vital processes carried out by living organisms in order to maintain and sustain life. Molecular movements are essential to carry out the various life processes.
- 3) Specialised body parts perform the various life processes in multicellular organisms. No such organs are present in unicellular organisms.
- 4) Energy required to carry out the different life processes, is obtained from carbon-based food sources through nutrition.
- 5) Depending on the mode of obtaining nutrition, organisms are classified as autotrophs or heterotrophs.
 - i) Autotrophs can prepare their own food from simple inorganic sources like carbon dioxide and water. (eg- green plants, some bacteria)
 - ii) Heterotrophs cannot synthesize their own food and is dependent on the autotrophs for obtaining complex organic substances for nutrition. (eg. – animals)
- 6) Green plants prepare their food by the process of photosynthesis. Here, they utilize CO_2 , H_2O and sunlight, with the help of chlorophyll, giving out O_2 as a byproduct.

- 7) In the light reaction of photosynthesis, light energy is absorbed and converted to chemical energy in the form of ATP. Also water molecules are split into hydrogen and oxygen.
- 8) Carbon dioxide is reduced to carbohydrates in the dark phase of photosynthesis.
- 9) Plants carry out gaseous exchange with surrounding through stomata.
- 10) Heterotrophs may be herbivores, carnivores, parasites or saprophytes.
- 11) In Amoeba, digestion occurs in the food vacuole, formed by the engulfing of food by its pseudopodia.
- 12) In humans, digestion of food takes place in the alimentary canal, made up of various organs and glands.
- 13) In mouth, food is crushed into small particles through chewing and mixed with saliva, which contains amylase for digesting starch.
- 14) On swallowing, food passes through pharynx and oesophagus to reach stomach. The gastric juice contains pepsin (for digesting proteins), HCl and mucus.
- 15) Liver secretes bile which emulsifies fat.
- 16) Pancreatic juice contains enzymes amylase, trypsin and lipase for digesting starch, proteins and fats respectively.
- 17) In the small intestine, carbohydrates, proteins and fats are completely digested into glucose, amino acids, and fatty acids and glycerol respectively.

18) The villi of small intestine absorb the digested food and supply it to every cell of the body.

19) The undigested food is egested from the body through anus.

20) During respiration, the digested food materials are broken down to release energy in the form of ATP.

22) Depending on the requirement of oxygen, respiration may be

i) Aerobic - occurring in presence of oxygen or

ii) Anaerobic – occurring in absence of oxygen.

23) The end-products are lactic acid or ethanol + CO_2 , in anaerobic respiration or CO_2 and water in aerobic respiration. Large amount of energy is released in aerobic respiration as compared to anaerobic respiration.

24) Plants release CO_2 at night and oxygen during the day.

25) Terrestrial organisms use atmospheric oxygen for respiration whereas aquatic organisms use the dissolved oxygen in water.

26) In humans, air takes the following path on entering the nostrils.

Nostrils → Nasal passage → Pharynx → Larynx → Trachea → Bronchus → Bronchiole → Alveolus.

27) The alveoli of lungs are richly supplied with blood and are the sites where exchange of gases (O_2 and CO_2) occurs between blood and atmosphere.

28) In humans, the respiratory pigment haemoglobin, carry oxygen from lungs to different tissues of the body.

30) In humans, the circulatory system transports various materials throughout the body and is composed of the heart, blood and blood vessels.

31) Human heart has 4 chambers – 2 atria (right and left) and 2 ventricles (right and left). Right half of the heart receives deoxygenated blood whereas the left half receives oxygenated blood.

32) Ventricular walls are much thicker than atrial walls.

33) Arteries carry blood from heart to different parts of the body whereas veins deliver the blood back to the heart. Arteries are connected to veins by thin capillaries, wherein materials are exchanged between blood and cells.

34) Humans show double circulation and complete separation of oxygenated and deoxygenated blood.

35) Blood platelets are essential for clotting of blood at the place of injury and thus preventing blood loss.

36) Lymphatic system consists of lymph, lymph nodes, lymphatic capillaries and lymph vessels which drain into larger veins. Lymph is also important in the process of transportation.

37) In plants, water is transported through the xylem tissue, from roots to the aerial parts of the plant. Root pressure and transpiration pull are the major forces involved in pulling water up the xylem.

38) Translocation of food is carried out through phloem tissue from leaves and storage organs to other parts of the plant. This process requires energy from ATP.

39) During excretion, the harmful metabolic nitrogenous wastes generated are removed from the body.

40) In humans, a pair of kidneys, a pair of ureters, urinary bladder and urethra constitutes the excretory system.

41) Nephrons are the basic filtration units of kidneys. They carry out filtration, selective reabsorption and tubular secretion to form urine in kidney, which is then passed out through the urethra, via the ureters and urinary bladder.

42) Plants do not have an excretory system and carries out excretion in various ways like transpiration, releasing wastes into surrounding soil, losing the leaves and storing in cell vacuoles and in old xylem.

Top definitions

- 1) Life processes - The vital processes carried out by living organisms in order to maintain and sustain life.
- 2) Nutrition - The process of obtaining and utilizing the nutrients necessary to sustain life.
- 3) Autotrophic nutrition - Nutrition characterized by the ability to use simple inorganic substances for the synthesis of more complex organic compounds, as in green plants and some bacteria
- 4) Autotroph - An organism capable of synthesizing its own food from simple inorganic substances, using light or chemical energy.

- 5) Heterotrophic nutrition – A type of nutrition in which energy is derived from the intake and digestion of organic substances, normally plant or animal tissues
- 6) Heterotrophs – An organism that cannot synthesize its own food and is dependent on complex organic substances for nutrition
- 7) Photosynthesis – The process by which plants and other organisms generate carbohydrates and oxygen from carbon dioxide and water using light energy, with the help of chlorophyll.
- 8) Stomata – The minute pores present in the epidermis of a leaf or stem through which gaseous exchange and transpiration occur.
- 9) Alimentary canal – A long tube extending from the mouth to the anus that has regions specialized for ingestion, digestion, absorption, and egestion.
- 10) Enzymes – The biological catalysts which speed up the rate of biochemical reactions in the body.
- 11) Peristalsis – The process of wave-like contractions and relaxations of the alimentary tract that propels the food forward through the tract.
- 12) Gastric glands – The glands present in the wall of the stomach that release HCl, pepsin and mucus.
- 13) Pepsin – A digestive enzyme found in gastric juice that catalyzes the breakdown of proteins to peptides.

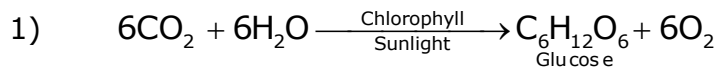
- 14) Emulsification of fat – A process in which bile salts emulsifies fat globules, i.e. increases the surface area of the oil–water interface, which promotes the breakdown of fats by pancreatic lipase.
- 15) Bile – A digestive juice secreted by the liver, stored in the gallbladder and aids in the digestion of fats.
- 16) Pancreatic juice - A clear alkaline secretion of the pancreas containing enzymes that aid in the digestion of proteins, carbohydrates, and fats.
- 17) Trypsin – A pancreatic enzyme that catalyzes the breakdown of proteins into smaller units.
- 18) Lipase – An enzyme that catalyze the breakdown of fats into fatty acids and glycerol.
- 19) Intestinal juice – The digestive fluid secreted by the glands lining the walls of the small intestine.
- 20) Villi – The numerous projections arising from the inner lining of the small intestine, which increase the surface area for absorption.
- 21) Egestion – The elimination of the waste and undigested matter from the digestive tract through the anus.
- 22) Respiration – The process by which food is burned by living cells to release energy in the form of ATP, for various body purposes.
- 23) Aerobic respiration – The metabolic process that uses oxygen to break down food and produce carbon dioxide and water, along with the release of energy.

- 24) Anaerobic respiration – The metabolic process by which nutrients are broken down in the absence of oxygen to release energy.
- 25) Alveoli – The tiny air sacs of the lungs where gas exchange occurs with the circulatory system.
- 26) Trachea – A thin walled tube of the respiratory system with cartilaginous rings that conveys inhaled air from the larynx to the bronchi.
- 27) Bronchus – Either of the two main branches of the trachea, which delivers air to the lungs from trachea.
- 28) Haemoglobin – The respiratory pigment present in the red blood cells of vertebrates, which transports oxygen from lungs to the tissues.
- 29) Blood plasma – The fluid portion of the blood in which the blood cells are normally suspended.
- 30) Atria – The two upper chambers in the heart, which receive blood from the veins and push it into the ventricles.
- 31) Ventricles – The two lower chambers of the heart, which receive blood from the atria and pump it into the arteries.
- 32) Double circulation – A type of circulation in which the blood flows through the heart twice, during each cycle of passage through the body.

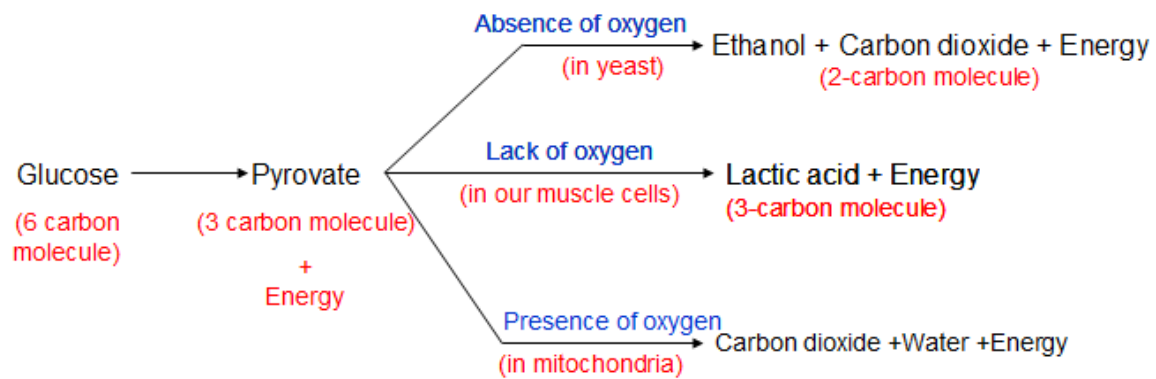
- 33) Arteries – The blood vessels which carry blood away from the heart to various organs of the body.
- 34) Veins – The blood vessels which collect blood from different organs of the body and bring it back to the heart.
- 35) Blood clotting – The process by which the blood coagulates to form solid masses, or clots so as to prevent blood loss during injury.
- 36) Blood clot - A semisolid gelatinous mass of coagulated blood that consists of red blood cells, white blood cells, and platelets entrapped in a fibrin network.
- 37) Root pressure – Pressure exerted in the roots of plants as the result of osmosis that causes sap to rise through a plant stem to the leaves.
- 38) Transpiration – The loss of water vapour from the aerial parts of the plant.
- 39) Translocation – The transport of soluble products of photosynthesis from leaves or storage organs to other parts of the plant through phloem.
- 40) Excretion – The biological process by which the harmful metabolic wastes are removed from the body.
- 41) Kidney – Either of the two bean-shaped excretory organs that filter wastes (especially urea) from the blood and excrete them and water in urine.

42) Nephron – The basic filtration unit in the kidneys, which removes waste products from the blood and forms urine.

Top Reactions



2)



Top diagrams

1.

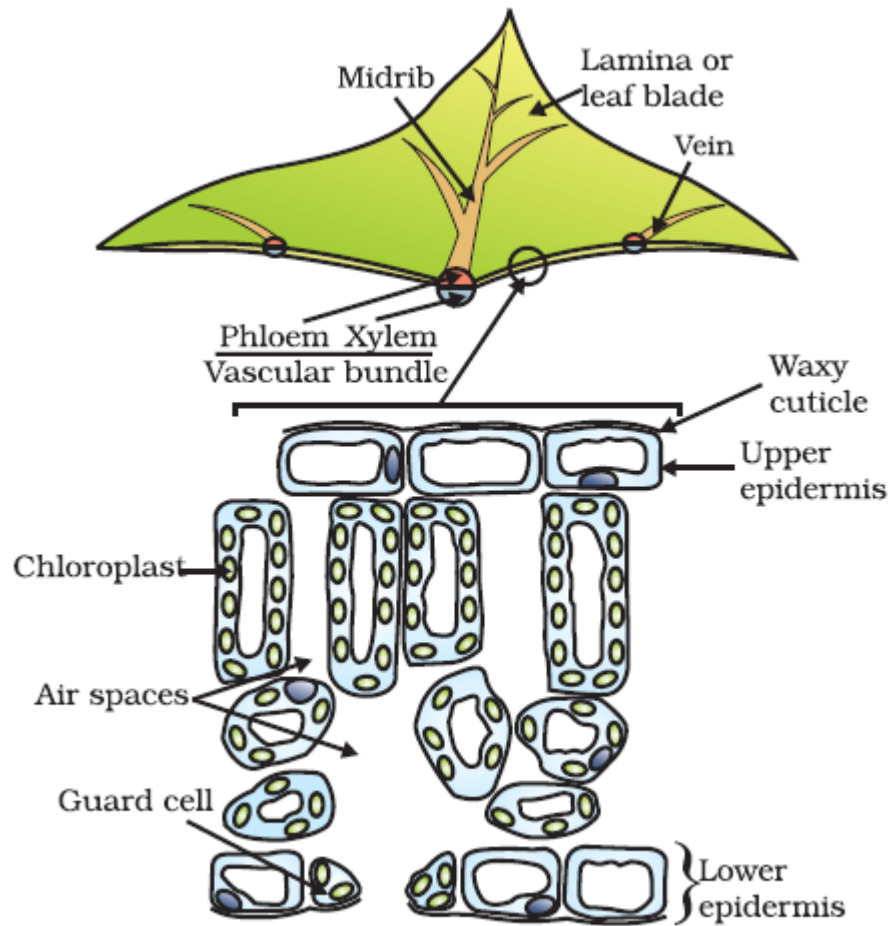


Diagram: Cross - section of a leaf

2.

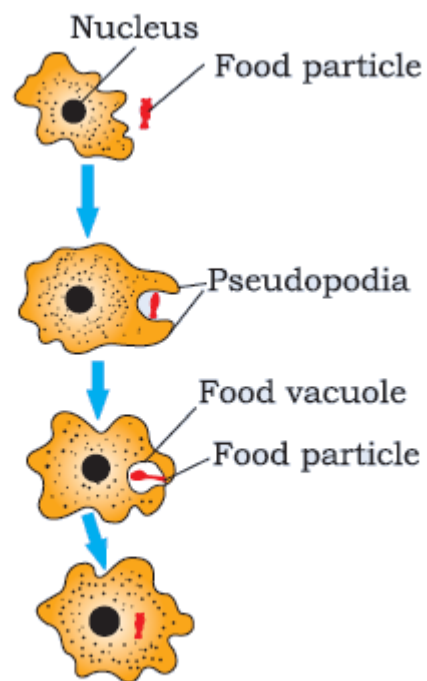


Diagram: Nutrition in Amoeba

3.

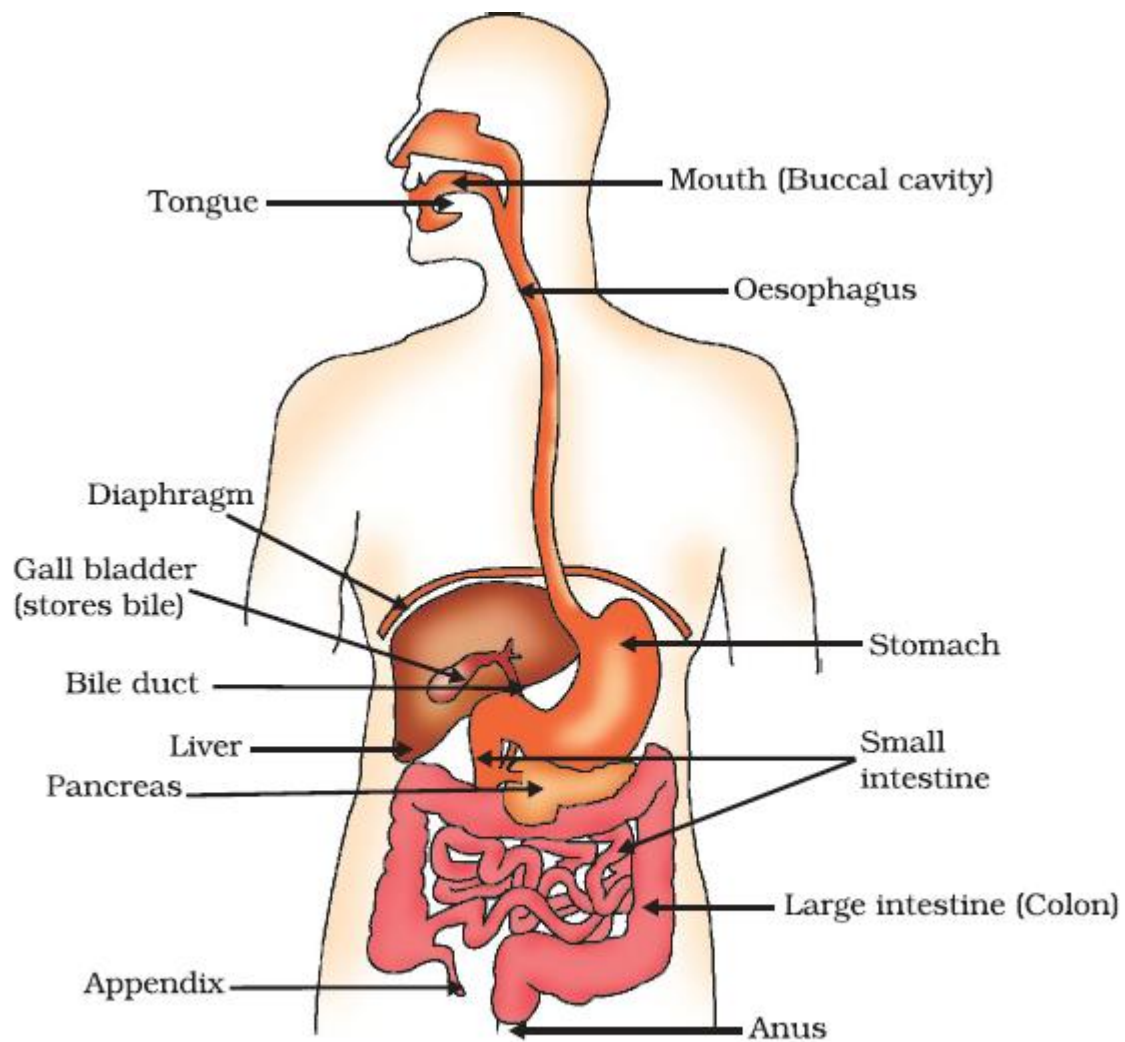


Diagram: Human alimentary canal

4.

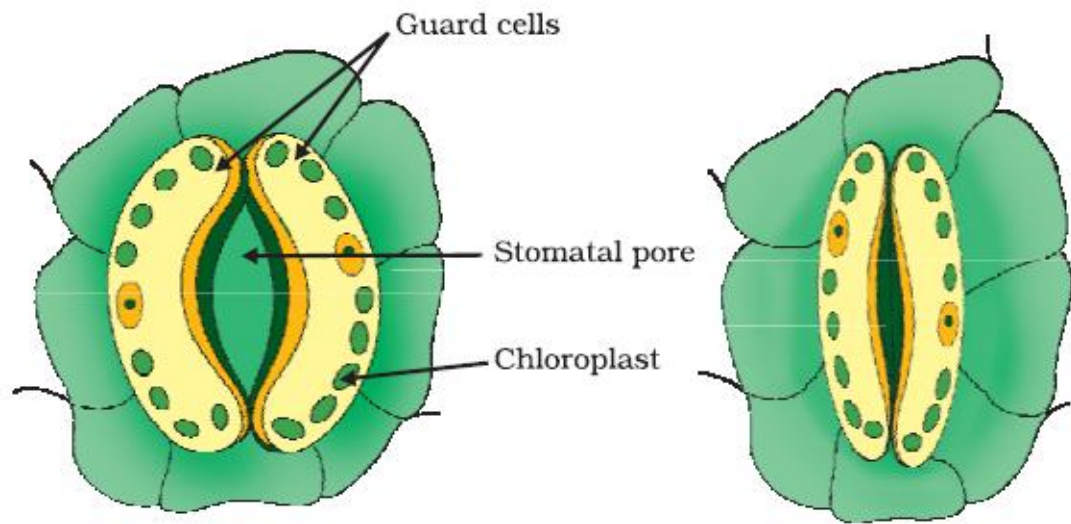


Diagram: Open stomatal pore

Diagram: Closed stomatal pore

5.

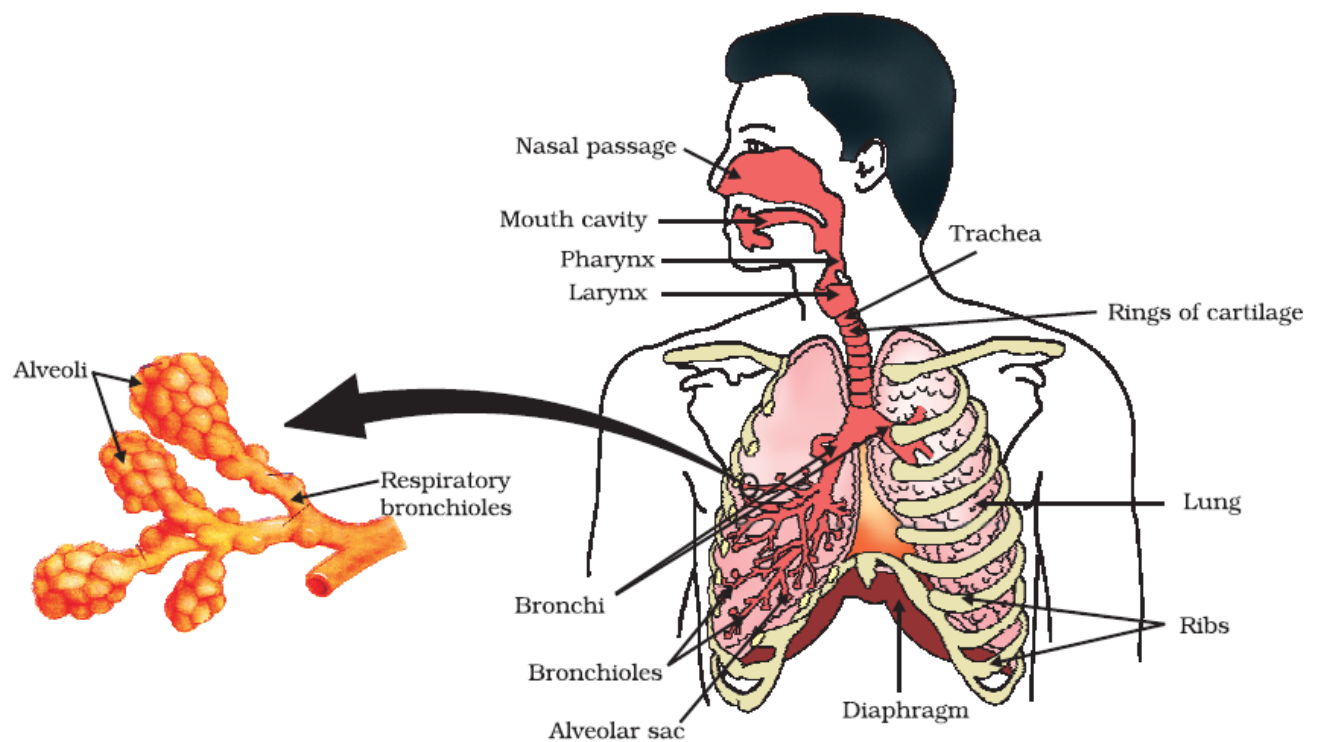


Diagram: Human Respiratory System

6.

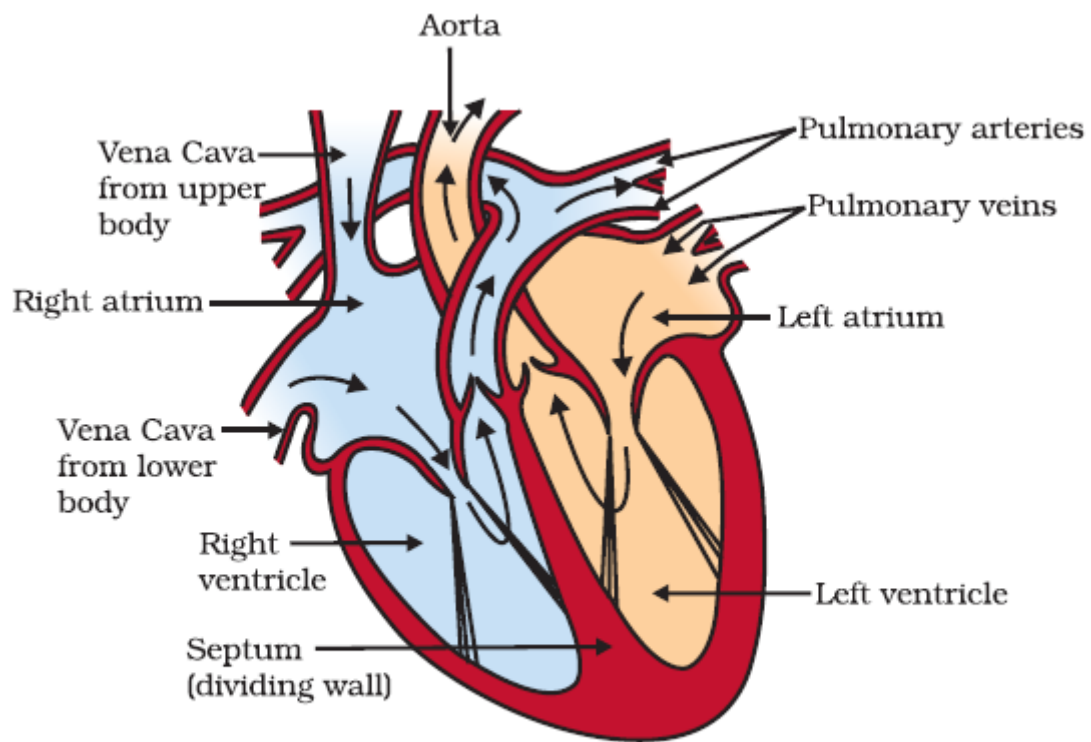


Diagram: Sectional view of the Human Heart

7.

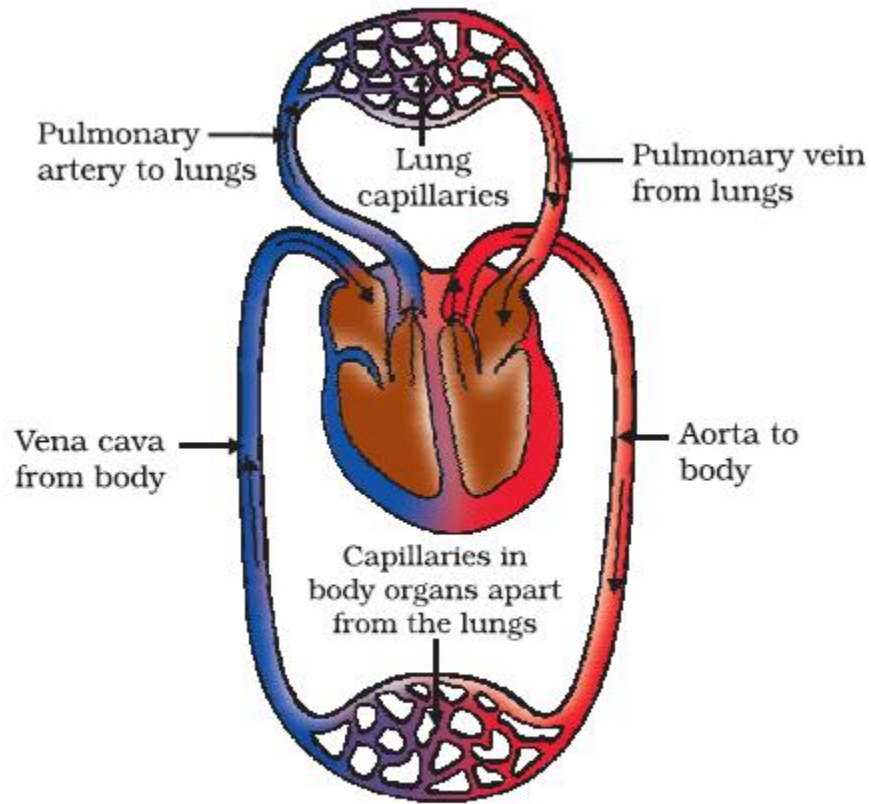


Diagram: Schematic representation of transport & exchange of oxygen & carbon dioxide

8.

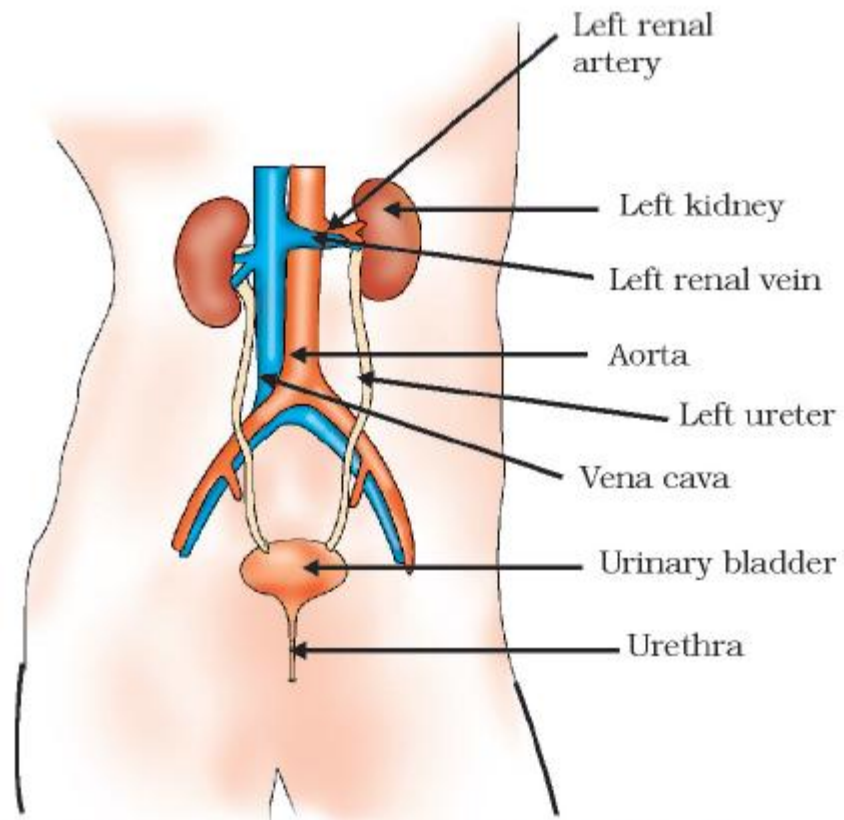


Diagram: Excretory System in Human Beings

9.

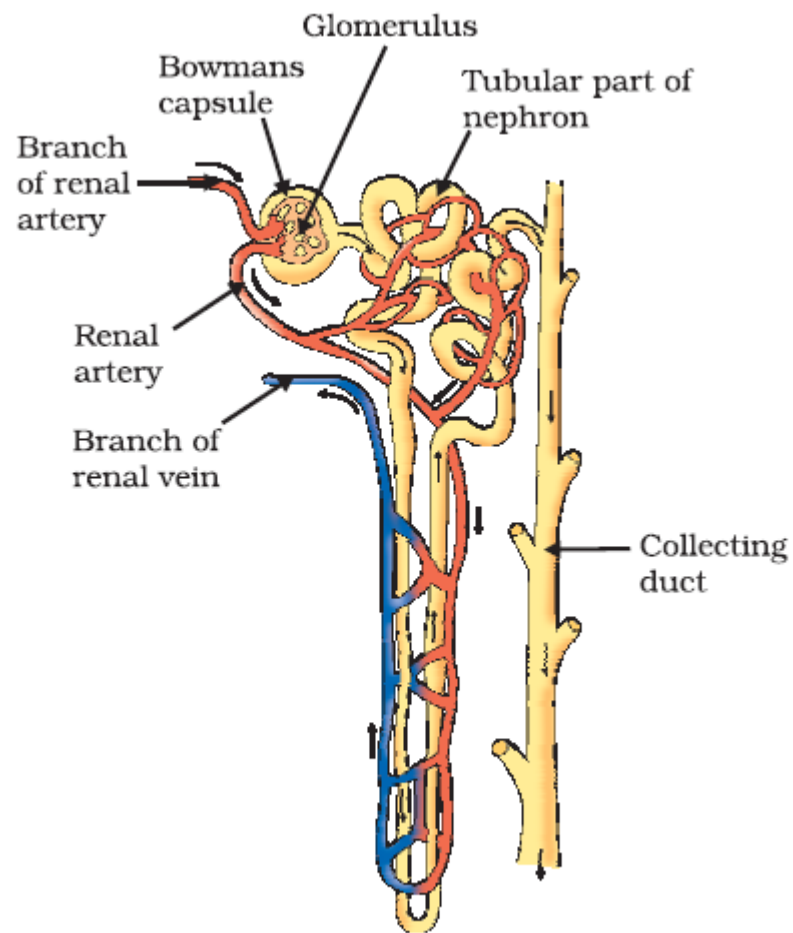


Diagram: Structure of a Nephron

Class X: Biology

Chapter 2: Control and coordination.

Chapter Notes

Key learnings:

- 1) A system of control and coordination is essential in living organisms so that the different body parts can function as a single unit to maintain homeostasis as well as respond to various stimuli.
- 2) In animals, the nervous system and hormonal system are responsible for control and coordination.
- 3) Neurons are specialized cells of the nervous system. They use electrical and chemical signals for transferring information.
- 4) Receptors are specialized tips of the nerve fibres that collect the information to be conducted by the nerves.
- 5) Nerve impulses travel in the following manner from one neuron to the next : Dendrites → Cell body → Axon → Nerve endings at the tip of axon → Synapse → Dendrite of next neuron.
- 6) Chemicals released from axon tip of one neuron, cross the synapse or neuromuscular junction to reach the next cell (neuron or muscle fibre).
- 7) Nerve impulses from many neurons interact to carry out the complex process of thinking.

- 8) Central nervous system and peripheral nervous system are parts of our nervous system.
- 9) Central nervous system is made up of the brain and spinal cord.
- 10) Spinal cord controls the reflex actions and conducts messages between different parts of the body and brain.
- 11) Reflex action is an automatic, rapid and immediate reaction to a stimulus and is below the level of consciousness. No thinking is involved in reflex action.
- 12) Reflex arc is the neural pathway that mediates a reflex action.
Pathway of reflex arc : Receptor → Sensory neuron → Relay neuron → Motor neuron → Effector
- 13) The sensory neurons of reflex arcs synapse in the spinal cord which then activates the spinal motor neurons without delay to execute a quick action, especially in case of emergencies. The brain also receives the information while the reflex action occurs.
- 14) The 3 main parts of the brain are forebrain, midbrain and hindbrain.
- 15) The largest part of the brain, the forebrain, is the main thinking region. It is made up of cerebrum, hypothalamus and thalamus. Cerebellum, pons and medulla constitute the hindbrain.
- 16) Cerebrum is the largest part of the brain whereas the cerebellum is the second largest part.
- 17)

Part of brain	Function
Cerebrum	Governs intelligence, thinking, memory and other mental abilities, voluntary actions, sensations, emotions and speech
Hypothalamus	Coordinates messages from the autonomous nervous system, controls certain involuntary actions, as well as the sexual and emotional behaviour and forms an axis with the pituitary
Thalamus	Functions as major coordinating center for sensory and motor signaling.
Midbrain	Acts as the coordinating centre between forebrain and hindbrain; also controls certain involuntary movements
Cerebellum	Responsible for precision and fine control of voluntary movements as well as maintaining posture and equilibrium of the body
Pons	Relays impulses between the lower cerebellum and spinal cord, and higher parts of the brain like the cerebrum and mid brain; also regulates respiration
Medulla	Contains vital centres for controlling blood pressure, respiration, swallowing, salivation, vomiting, sneezing and coughing.

- 18) Brain is protected by a bony box called cranium, within which are present 3 layers of fluid-filled membranes for absorbing shock.

- 19) Peripheral nervous system consists of cranial nerves and spinal nerves and assists in transmitting information between central nervous system and rest of the body.
- 20) Reflex actions, voluntary actions and involuntary actions are the various types of responses shown by the nervous system.
- 21) The sense organs detect changes in surroundings and pass this information to the central nervous system, which after processing the information, acts through the muscles.
- 22) `The movements of muscle tissues are brought about by the contraction and relaxation of the contractile proteins in response to nerve impulses.
- 23) Plants lack nervous and muscular system.
- 24) Plants respond to stimuli by showing 2 types of movements – growth independent and growth dependent.
- 25) Growth independent movements are usually quicker than growth dependent ones, and involve the use of electrochemical signals by the plant. To achieve this movement, the plant cells change shape by altering their water content.
- 26) Growth dependent movements or tropic movements are slow, occurring either towards or away from the stimulus.
- 27) Tropic movements are shown in response to environmental factors such as light, gravity, water and chemicals.

- 28) Plant roots are positively geotropic and negatively phototropic whereas plant shoots are usually negatively geotropic and positively phototropic.
- 29) Pollen tubes show chemotropism by growing towards the ovules.
- 30) In addition to electrochemical signals, plants and animals use hormones for control and coordination.
- 31) Important plant hormones are auxin, gibberellin, cytokinin, abscisic acid and ethylene.

Plant hormone	Function
Auxin	Cell elongation
Cytokinin	Cell division
Gibberellin	Growth of stem
Absciscic acid	Inhibits growth
Ethylene	Ripening of fruits

- 32) Auxin causes the bending of plant stem towards light as well as the curling of plant tendrils around a support.
- 33) Animal hormones do not bring about directional growth depending on environmental cues, but promote controlled growth in various areas to maintain the body design.
- 34) The various endocrine glands in humans are hypothalamus, pineal gland, pituitary gland, thyroid gland, parathyroid glands, thymus, pancreas, adrenal glands, ovary (in female) and testis (in males).

35) Some important hormones and their functions in human body:

Hormone	Endocrine gland	Function
Growth hormone	Pituitary	Regulates growth and development of body
Thyroxin	Thyroid gland	Controls carbohydrate, protein and fat metabolism
Adrenaline	Adrenal gland	Prepares the body to deal with emergency situations
Insulin	Pancreas	Regulates blood sugar levels
Testosterone	Testis	Causes development of sexual organs and secondary sexual characteristics in males
Oestrogen	Ovary	Causes development of sexual organs and secondary sexual characteristics in females

35) In case of flight or fight reaction to an emergency situation, Adrenal glands → release adrenaline into blood → which acts on heart and other tissues → causes faster heart beat → more oxygen to muscles → reduced blood supply to digestive system and skin → diversion of blood to skeletal muscles → increase in breathing rate.

36) Deficiency of iodine causes goiter whereas deficiency of growth hormone and insulin causes dwarfism and diabetes respectively.

37) Feedback mechanisms are present to regulate the hormone action.

38) Difference between nervous and endocrine system

	Nervous system	Endocrine system
Mode of communication	Electrical impulses	Chemical compounds

Speed of communication	Very quick	Slow
Can reach	Only cells connected by nervous system	All cells of the body
Continuity	Cannot continuously transmit impulses	Can act steadily and persistently

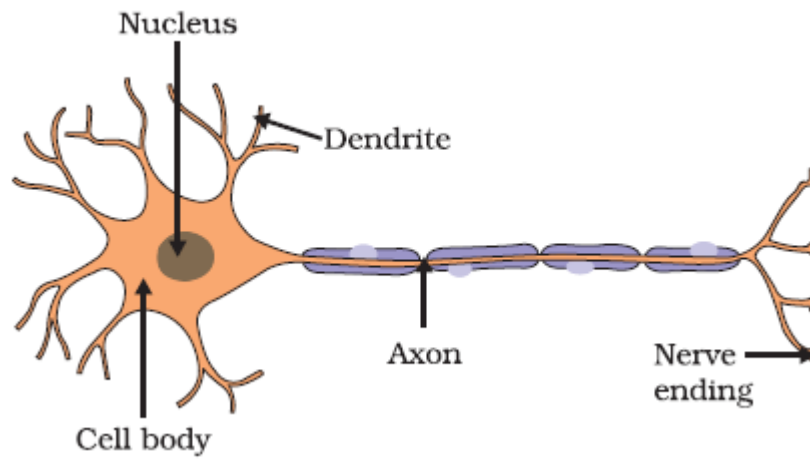
Top Definitions

- 1) Receptors – Specialized structures at the ends of the nerve fibres that collect the information to be conducted by the nerves, and are located in the sense organs.
- 2) Gustatory receptors – Receptors present in tongue and capable of detecting taste.
- 3) Olfactory receptors – Receptors present in nose and capable of detecting smell.
- 4) Synapse – A specialized junction between two neurons, across which nerve impulse passes.
- 5) Neuromuscular junction – The junction between a nerve fiber and the muscle cell it supplies.

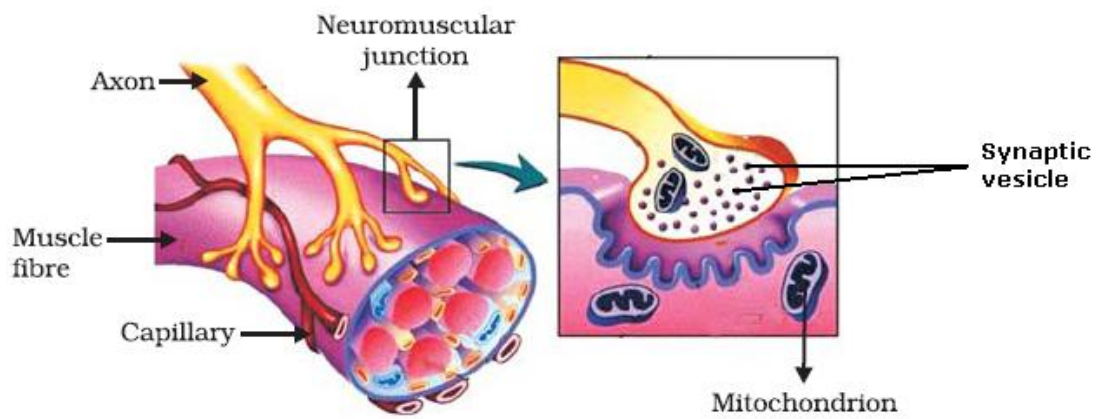
- 6) Nerve impulse – An electrochemical signal that travels through a neuron in response to a stimulus.
- 7) Effectors – A muscle, gland, or organ capable of responding to a stimulus, especially a nerve impulse.
- 8) Sensory neuron – A neuron that conducts impulses from a receptor organ to the central nervous system.
- 9) Motor neuron – A neuron that conducts impulses from the central nervous system to muscle or gland.
- 10) Relay neuron – A neuron which connects sensory neurons with motor neurons in neural pathways.
- 11) Reflex action - An automatic, rapid, involuntary and immediate reaction to a stimulus.
- 12) Reflex arc – The neural pathway that mediates a reflex action.
- 13) Cranial nerves – Nerves arising from the brain
- 14) Spinal nerves – Nerves arising from the spinal cord.
- 15) Tropic movements – The directional movements shown by plants in response to environmental factors.
- 16) Hormone – The secretion of an endocrine gland that is transmitted by blood to specific tissues in the body.

- 17) Phototropism – The movement of a plant towards or away from light.
- 18) Hydrotropism – The movement of a plant either towards or away from water.
- 19) Geotropism – The directional movements shown by plants in response to gravity.
- 20) Chemotropism – Movement or growth of an organism or part of an organism in response to a chemical stimulus.
- 21) Endocrine gland – A ductless gland that secretes hormones directly into the bloodstream.
- 22) Feedback mechanism – A type of self-regulating mechanism in which the level of one substance in body influences the level of another.

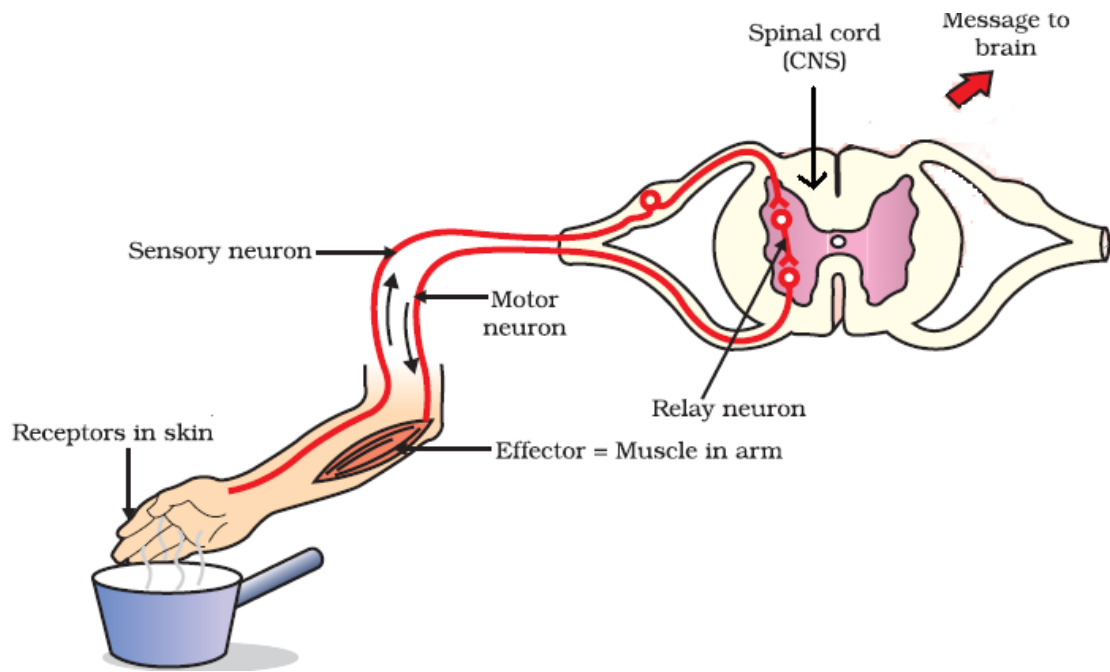
Top diagrams



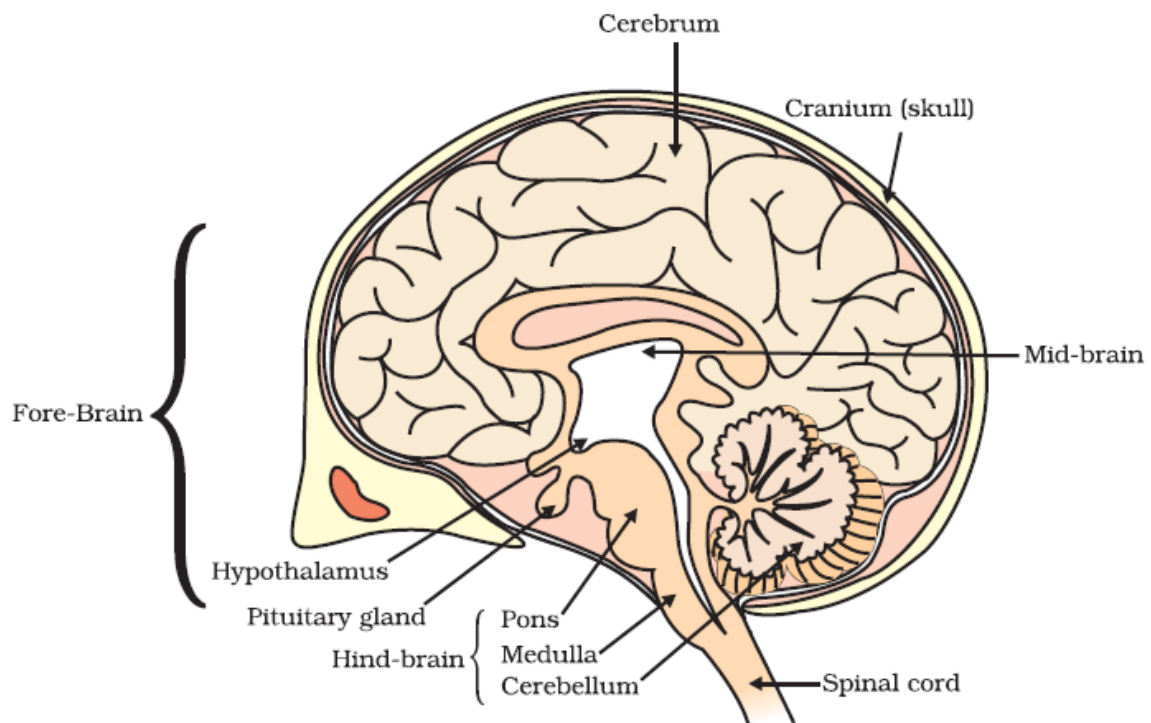
Structure of neuron



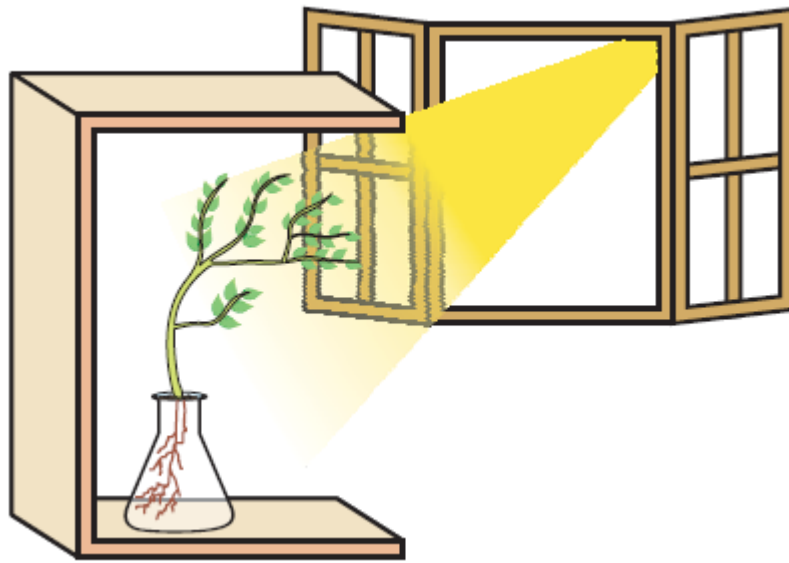
Neuromuscular junction



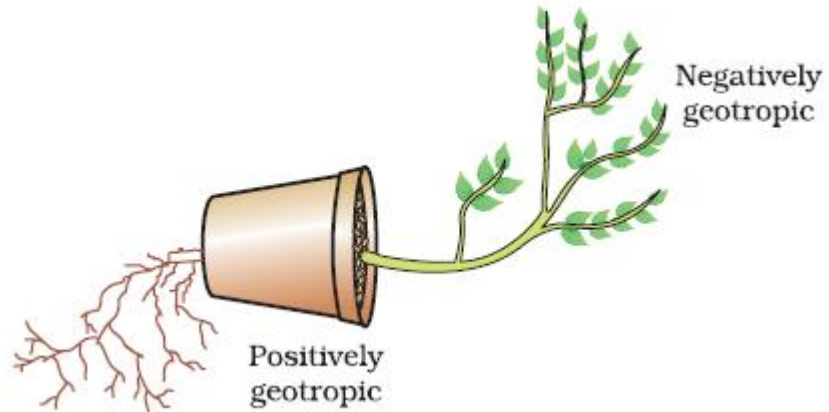
Reflex arc



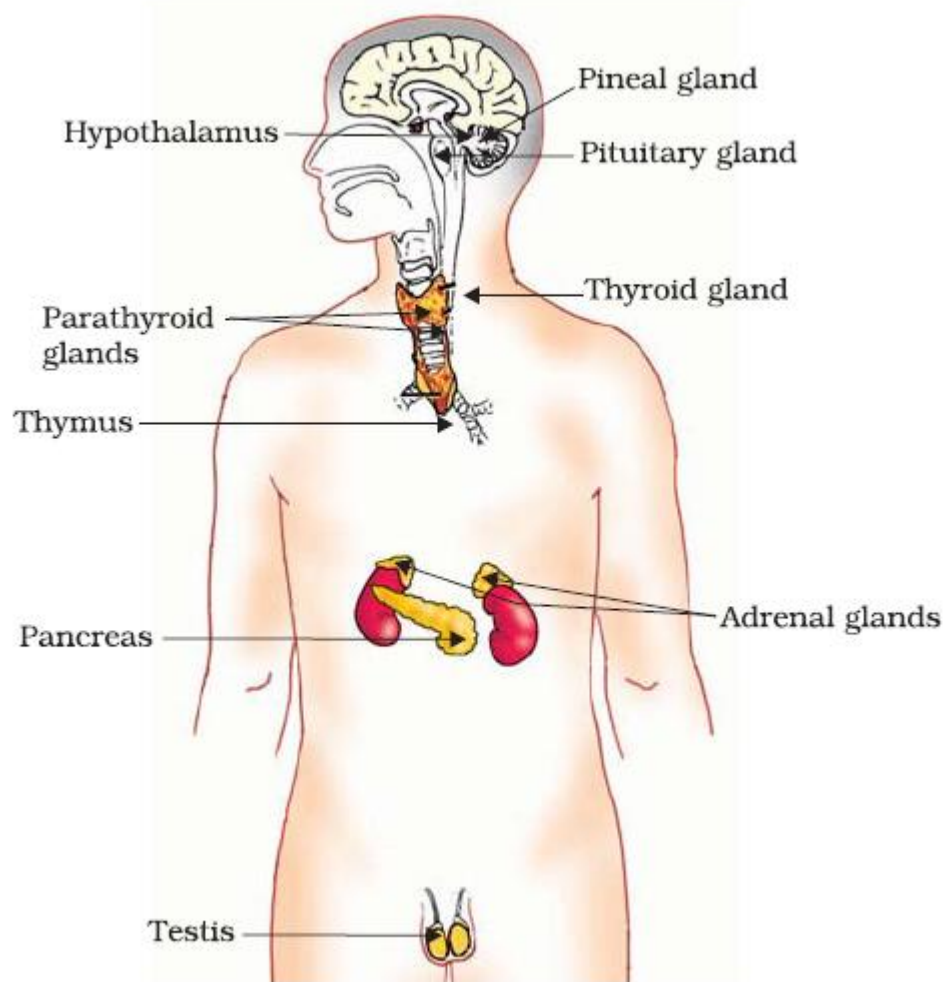
Human brain



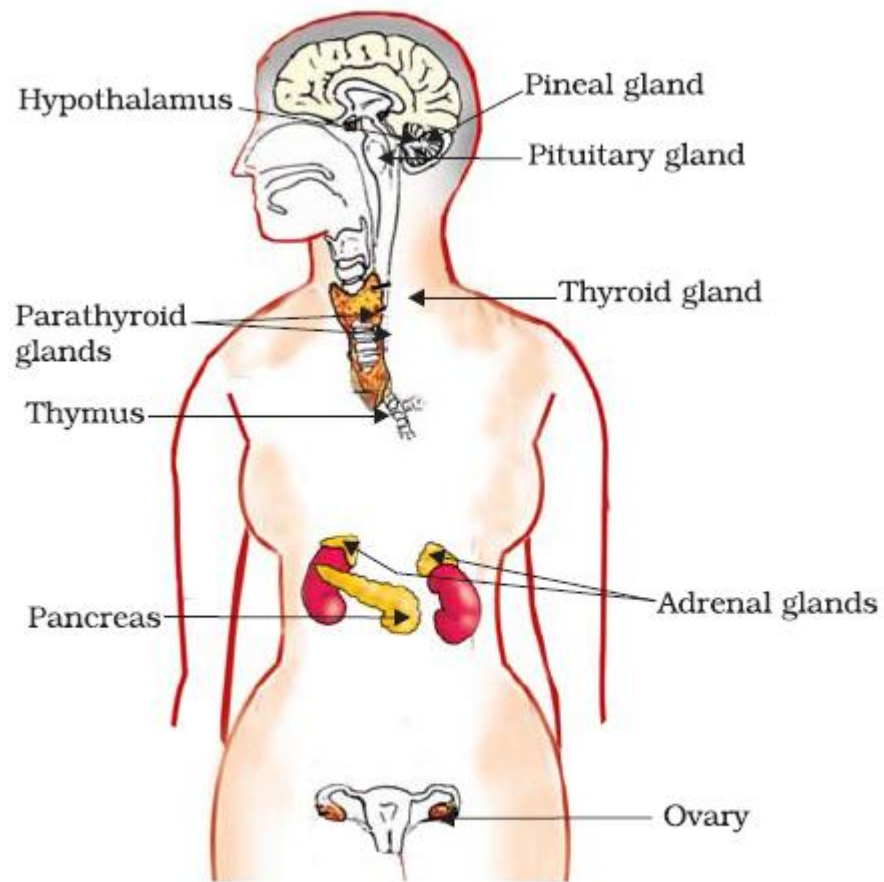
Plant showing phototropism



Plant showing geotropism



Endocrine glands in human male



Endocrine glands in human female

Class X: Biology

Chapter 8: How do organisms reproduce?

Points to remember

Key learnings:

- 1) Reproduction is the biological process by which new individuals of the same kind are produced.
- 2) Reproduction is not essential for the survival of an organism, but is vital for the survival of a species.
- 3) Reproduction produces identical copies of the body design.
- 4) DNA is the informational macromolecule of our body. It provides information for protein synthesis.
- 5) During cellular reproduction, DNA duplication occurs followed by creation of an additional cellular apparatus.
- 6) The process of DNA copying is not accurate, resulting in variations arising during reproduction, which is the basis for evolution.
- 7) Variations may or may not be beneficial for the individual, but help in the survival of the species during adverse conditions.
- 8) Depending on their body design, the modes of reproduction differ in different organisms.
- 9) Reproduction is broadly divided into asexual and sexual reproduction.
- 10) Fission, fragmentation, regeneration, budding, vegetative propagation and spore formation are various modes of asexual reproduction.
- 11) Fission occurs in unicellular organisms like bacteria and protozoa through simple cell division. Depending on the number of individuals formed, fission may be binary or multiple fission.
- 12) On maturation, certain multi-cellular organisms (with simple body makeup) break up into smaller fragments, each of which

develops into new individual. This reproductive method is called fragmentation.

- 13) Simple reproductive methods cannot occur in higher multi-cellular organisms, since they have a complex and carefully organized body structure.
- 14) In complex multi-cellular organism, reproduction is brought about by a single, specialized cell type that is capable of proliferating and forming all other cell types of the body.
- 15) Regeneration is found in many completely differentiated simple organisms, like *Hydra* and *Planaria*. If such an organism is split into several parts, most of the parts will develop into complete organisms.
- 16) Regeneration involves specialized totipotent cells which proliferate and differentiate to form the complete body.
- 17) Certain organisms like *Hydra* produce buds on their body surface, which mature into new individuals and separate from parent body.
- 18) Vegetative propagation is used by many plants, especially those incapable of producing seeds. Here, new plants are produced from roots, stems or leaves of parent plant. This reproductive method is widely used by plant breeders.
- 19) Spore formation is an asexual mode of reproduction found in certain multicellular organisms like *Rhizopus*. The thick walled spores have the capacity to develop into new individuals under suitable conditions.
- 20) Sexual reproduction requires both male and female sexes to produce the offspring.
- 21) Sexual reproduction creates large number of novel variations.
- 22) In comparison to the non-reproductive body cells, the germ cells contain only half the chromosome number.
- 23) The male gamete is smaller and motile whereas the female gamete is larger and stores food.
- 24) When the offspring is produced by the union of the male and female gametes, its specific chromosome number and DNA content is re-established.
- 25) In angiosperms, flower is the reproductive organ of the plant.

- 26) Stamen, the male reproductive part of flower, is made up of anther and filament. Carpel is the female reproductive part and is composed of stigma, style and ovary.
- 27) The pollen grain is present in the anther whereas the egg cell is enclosed in the ovary.
- 28) Pollination and fertilization are two essential events in reproduction of angiosperms.
- 29) Pollination is the transfer of pollen grains from anther to stigma. It may be either self-pollination or cross-pollination.
- 30) Pollen tube carries the male gamete from stigma to the female gamete in ovary.
- 31) Fertilization of male and female gametes produces the zygote, which then forms the embryo.
- 32) Following fertilization, the ovule develops into seed whereas the ovary forms the fruit. On germination, the seed develops into a seedling.
- 33) In humans, reproduction occurs sexually.
- 34) Puberty is the time when the juvenile body of a person starts sexual maturation.
- 35) Before puberty, the body resources are used mainly to grow and develop the organism to its adult size. Once this is achieved, puberty sets in.
- 36) Some changes occurring during puberty are common to boys and girls, whereas other changes are specific to boys and girls.
- 37) Changes such as appearance of pimples on face, growth of thick hair in armpits and genital areas occur in both boys and girls.
- 38) Increase in breast size, darkening of nipples and occurrence of menstruation are puberty associated changes in girls. In boys, facial hair growth, cracking of voices and occasional enlargement of penis occur during puberty.
- 39) Changes associated with puberty are slow and gradual and does not occur uniformly in everyone.

- 40) The changes taking place during puberty, signals the occurrence of sexual maturation in an individual to other members of the same population.
- 41) In humans, the male reproductive system is composed of testes, vas deferens, seminal vesicles, prostate gland, urethra and penis.
- 42) Testis is situated outside the abdominal cavity. It produces sperms and secretes testosterone.
- 43) Sperm shows a small head containing the genetic material and a long tail, which helps in motility.
- 44) Vas deferens and urethra are the thin tubes through which sperms are transported from testes to outside. The sperms are nourished in the seminal fluid.
- 45) The female reproductive system is made up of ovaries, fallopian tubes, uterus, cervix and vagina.
- 46) Ovaries are responsible for production of ova/egg as well as for secreting the hormones, estrogen and progesterone.
- 47) On reaching puberty, ovulation occurs once a month in females, wherein one immature egg present in any one of the ovaries becomes mature and is released. This egg is carried by the fallopian tube.
- 48) Sperms which are introduced into the vagina of females during intercourse, may encounter the egg on reaching the fallopian tube, resulting in fertilization.
- 49) The zygote gets implanted in the uterus and develops into the embryo.
- 50) The placenta provides nourishment and oxygen to the embryo and removes the waste generated by the embryo.
- 51) Gestation period is nine months in humans after which the child is born due to uterine contractions.
- 52) In case fertilization does not occur, the released egg along with the thickened lining of the uterus is shed out through the vagina in a process called menstruation.
- 53) Engaging in unprotected sexual intercourse can cause pregnancy as well as spreading of sexually transmitted diseases like gonorrhea, syphilis and AIDS.

- 54) Condoms help to control the spread of sexually transmitted diseases.
- 55) Unwanted pregnancies can be avoided through several contraceptive methods.
- 56) Mechanical barrier methods prevent sperm from reaching the egg. E.g. – condom.
- 57) Oral contraceptive pills alter the hormonal balance, thereby preventing the egg from being released.
- 58) Surgical blocking of vas deferens in male or fallopian tube in female can also prevent pregnancy.
- 59) Abortions remove unwanted pregnancies, but this method is being misused to carry out female foeticide.
- 60) Birth control methods are essential to keep the human population in check and thereby improve the standard of living for everyone.

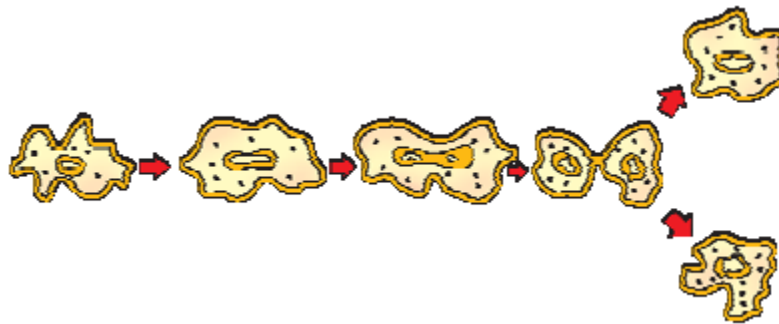
Top definitions

- 1) Reproduction - The biological process by which new individuals of the same parental kind are produced.
- 2) Variation – The differences found among individuals of a group or species, caused either by genetic differences or by the effect of environment on genes.
- 3) Asexual reproduction – Reproduction in which new generations are created from a single individual.
- 4) Fission – A type of asexual reproduction in which the unicellular parent organism divides into two or more parts, each developing into genetically identical individuals.
- 5) Binary fission – Fission in which the parent cell divides to form two similar daughter cells.

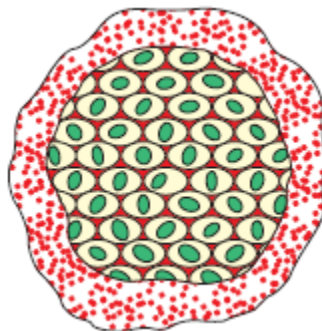
- 6) Multiple fission – Fission in which the parent cell divides to produce more than two daughter cells.
- 7) Fragmentation – The reproductive method in which certain multi-cellular organisms, on maturation, break up into smaller fragments, each of which develops into new individual.
- 8) Budding – The reproductive method in which an organism produces an outgrowth on its body surface, which then matures and develops into a new individual.
- 9) Vegetative propagation – The reproductive method in which new plants are produced asexually from roots, stems or leaves of the parent plant.
- 10) Spore - A small, usually single-celled reproductive body produced by certain fungi, bacteria, algae, and nonflowering plants, which is highly resistant to desiccation and heat and is capable of growing into a new organism.
- 11) Sexual reproduction - Mode of reproduction in which new individuals are produced by fusion of a male and a female gamete.
- 12) Pollination – Transfer of pollen grains from the anther to the stigma.
- 13) Self-pollination – Transfer of pollen grains from the anther to the stigma of the same flower.
- 14) Cross-pollination – Transfer of pollen grains from the anther of one flower to the stigma of another flower.
- 15) Fertilization – Fusion of male and female gametes to form zygote, which eventually develops into an embryo.
- 16) Germination – The process in which a seed develops into a seedling under appropriate conditions.
- 17) Puberty - The period during adolescence when a child's body becomes sexually mature and develops into adult form.
- 18) Sperm – The male reproductive cell or gamete produced in the testes.
- 19) Ova – The female reproductive cell or gamete produced in the ovary.

- 20) Ovulation – The periodic release of an ovum from the ovary.
- 21) Menstruation - The monthly discharge of blood and shed mucous lining of the uterus through the vagina of non-pregnant women from puberty to menopause.
- 22) Contraception – The prevention of conception by the use of birth control devices or pills or surgery.

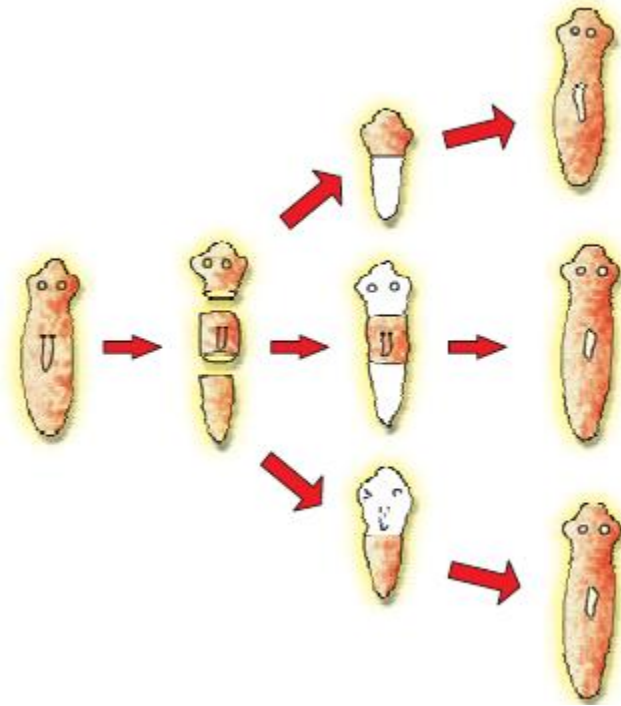
Top diagrams



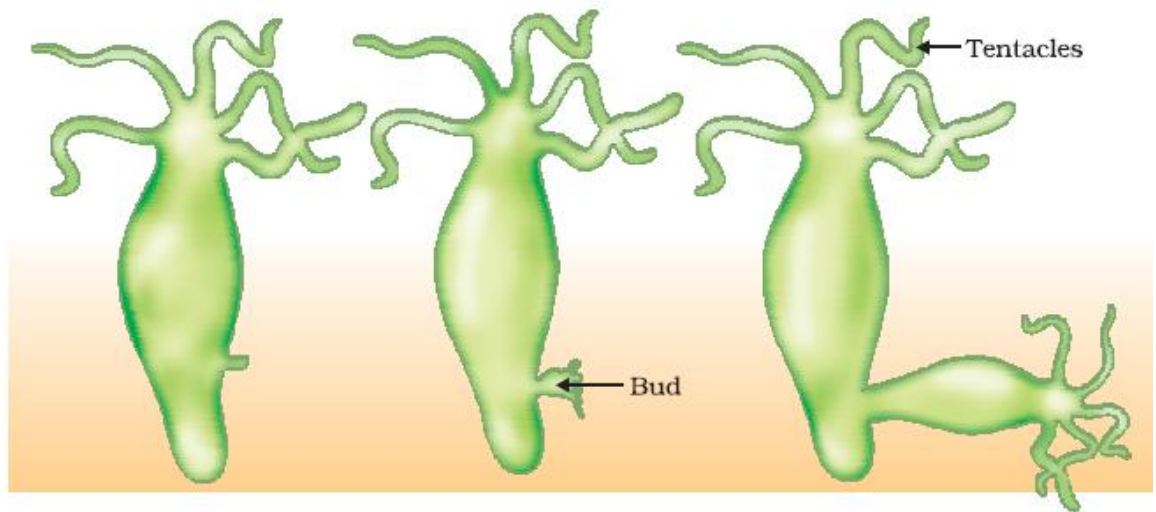
Binary fission in Amoeba



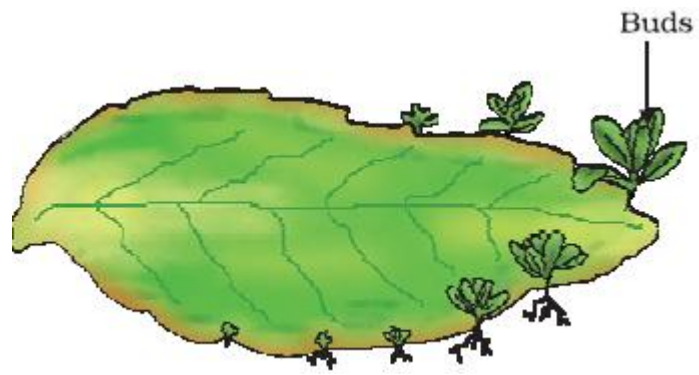
Multiple fission in *Plasmodium*



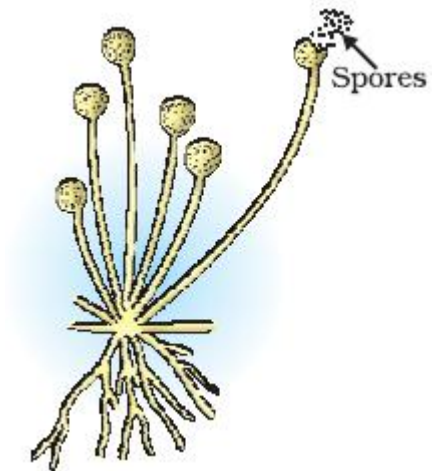
Regeneration in *Planaria*



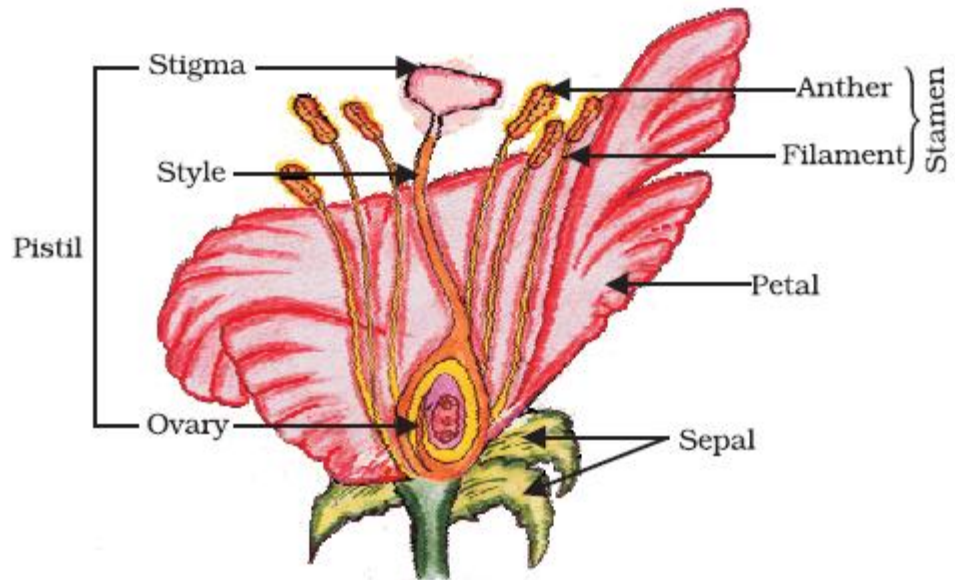
Budding in *Hydra*



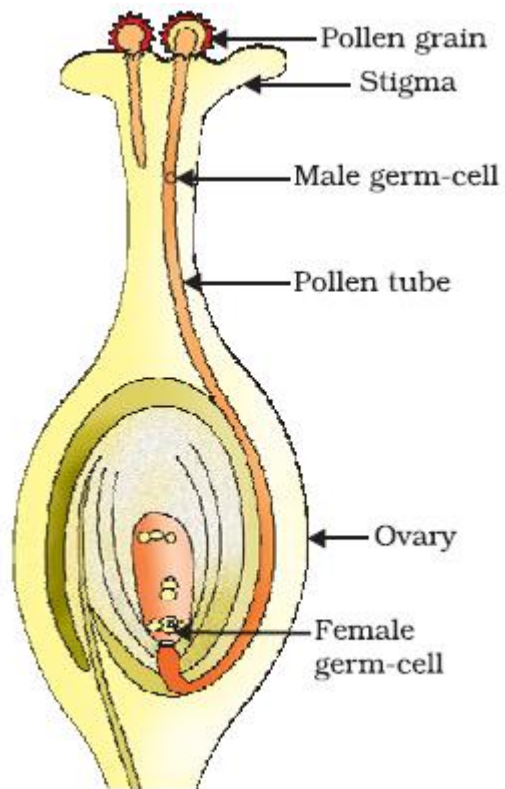
Buds on leaf of *Bryophyllum*



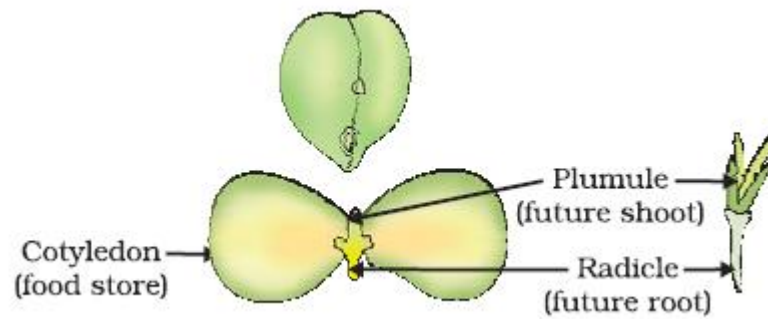
Spore formation in *Rhizopus*



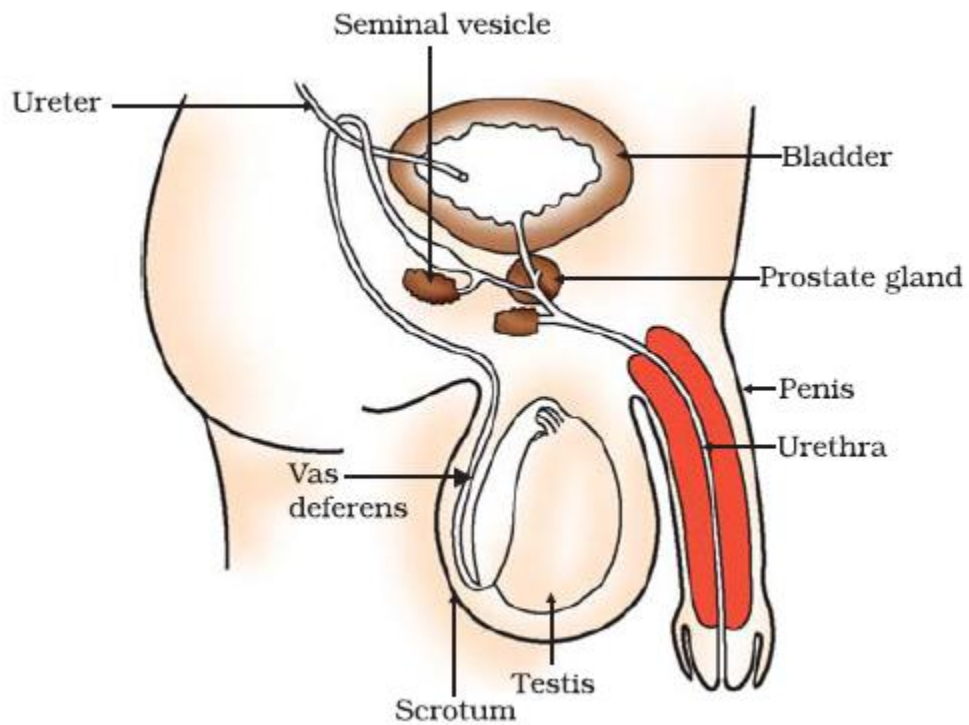
Longitudinal section of flower



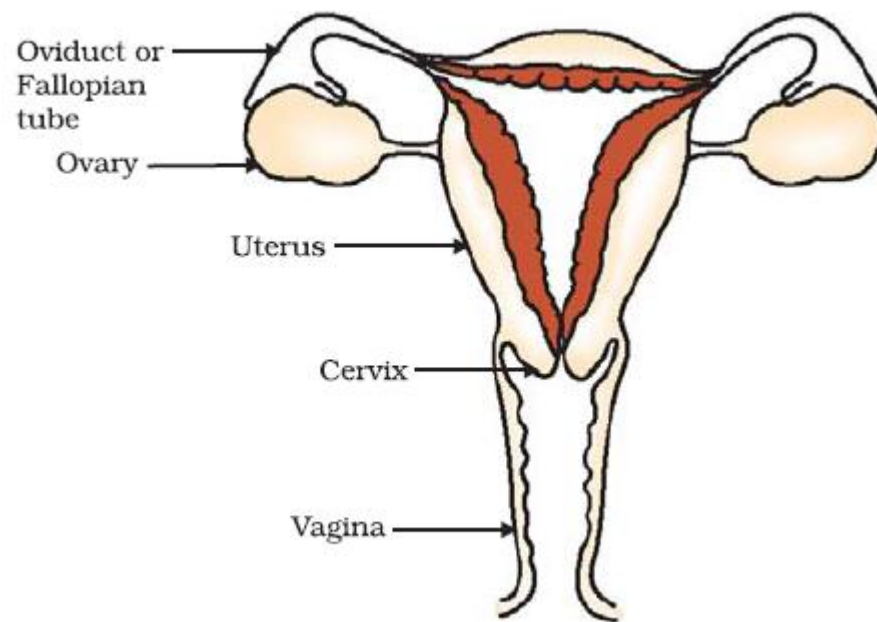
Germination of pollen on stigma



Seed germination



Male reproductive system in humans



Female reproductive system in humans

Class X: Biology
Chapter 9: Heredity and Evolution

Chapter Notes

Key learning:

- 1) Variations arise during the process of reproduction. They may be few in asexual reproduction, but many in case of sexual reproduction.
- 2) The minor variations arising during asexual reproduction are caused by slight inaccuracies in DNA copying. In sexual reproduction, variations are also caused by crossing over process of meiosis.
- 3) Beneficial variations help the species to survive better in the environment.
- 4) Nature selects the beneficial variations thereby leading to evolution.
- 5) Reproduction produces offsprings with similar body design of the parents. However the offspring are not identical, but show a great deal of variation from the parents.
- 6) Sexually reproducing organisms like humans have 2 (or more) versions of genes for each trait, called alleles.
- 7) Gregor Johann Mendel carried out several experiments on pea plants. He carried out large number of monohybrid and dihybrid crosses using many contrasting characteristics and put forward several important conclusions.
- 8) In case of monohybrid cross with pure variety of plants, the phenotypic ratio obtained in F_2 generation is 3:1.
- 9) In case of dihybrid cross involving 2 pairs of contrasting characters, the phenotypic ratio obtained in F_2 generation is 9:3:3:1.
- 10) Mendel concluded that out of any pair of contrasting characters, one is dominant and the other recessive.
- 11) The homozygous dominant trait is denoted by two capital letters whereas the homozygous recessive trait is denoted by two small letters.

- 12) The factors or genes controlling a particular trait separate from each other during gamete formation. Hence gamete is always pure as far as contrasting characters are considered. Each gamete will possess only one gene set.
- 13) In crossing if two or more traits are involved, their genes assort independently, irrespective of the combinations present in the parents.
- 14) Genes carry information for producing proteins, which in turn control the various body characteristics.
- 15) For a particular trait, the offspring receives one allele from the father and one allele from the mother.
- 16) The combination of the male and female germ cells gives a diploid zygote. Thus the normal diploid number of chromosomes in the offspring is restored.
- 17) Different mechanisms are used for sex determination in different species.
- 18) The sex of human offspring is genetically determined.
- 19) Humans have 22 pairs of autosomes and one pair of sex chromosomes.
- 20) Females have similar sex chromosomes XX, whereas males have an imperfect pair i.e. XY. All eggs carry X chromosome.
- 21) The sex of the child depends on whether the egg fuses with the sperm carrying X chromosome (resulting in a girl) or with the sperm carrying Y chromosome (resulting in a boy).
- 22) Variations beneficial to a species have a greater chance of flourishing in the species than the harmful or neutral variations.
- 23) Genetic drift can alter gene frequencies in small population and provide diversity without any survival benefits.
- 24) Several factors like environment, mutations, reproduction etc can cause alterations in gene frequencies in a population over generations, leading to evolution.
- 25) Changes occurring in the DNA of germ cells are heritable whereas changes taking place in the non-reproductive tissues are not inherited.
- 26) Charles Darwin proposed that evolution of species occurred by natural selection, but he did not know the underlying mechanism.

- 27) Natural selection, genetic drift, variations and geographical isolation can lead to speciation in sexually reproducing organisms.
- 28) Gene flow between the members of a population prevents speciation.
- 29) The fundamental characteristics used to classify organisms are
- presence of prokaryotic or eukaryotic cells
 - whether the organism is unicellular or multicellular
 - ability to perform photosynthesis
 - presence of endoskeleton or exoskeleton in heterotrophic organisms.
- 30) Classification of living organisms is closely related to their evolution.
- 31) As we go back in time to trace common ancestors, we find that all organisms must have arisen and radiated from a single species, which in turn originated from non-living material. Thus life arose from non-living matter.
- 32) Study of homologous organs, e.g. hand of man and wing of bird, helps in tracing the evolutionary relationship between different species.
- 33) Analogous organs, e.g. wing of insect and wing of bird, do not have common origins, but arose in different species to fulfill similar functions.
- 34) Fossils help in tracing evolutionary pathways.
- 35) The age of fossils can be determined by using the relative method or the isotope dating method.
- 36) Evolution is not a one-step process, but a continuous process occurring in several stages.
- 37) Complex organs are formed slowly over many generations, sometimes with intermediate forms playing an important role.
- 38) Sometimes the use of certain features gets modified with time. For example- Feathers may have provided insulation initially, but later became associated with flight.
- 39) Evolutionary studies have shown that birds are closely related to reptiles.
- 40) Humans have carried out artificial selection for various features of cabbage and produced different vegetables.

Vegetable produced	Selected feature
Broccoli	Arrested flower development

Cauliflower	Sterile flowers
Kohlrabi	Swollen parts
Kale	Larger leaves

- 41) Molecular phylogeny can also be used to trace evolutionary relationships. Here the DNA of different species is compared. Greater the differences in DNA, more distantly related are the species.
- 42) Disappearance of the existing species is not a requirement for formation of new species.
- 43) The new species formed are better adapted to the environment, but they need not be superior to the existing species.
- 44) The common ancestor of humans and chimpanzees evolved in different ways to produce the present forms.
- 45) Evolution produces more diverse and complex body forms over time, but the newly formed species are not more progressive than the already existing ones. So it is wrong to say that evolution produces progressive higher forms from lower ones.
- 46) All human beings, whether fair skinned or dark skinned, belong to the same species i.e. *Homo sapiens* that originated in Africa.
- 47) The human ancestors gradually migrated from Africa to various parts of the world like Asia, Europe, Australia and America. Thus they spread to different parts of the Earth and adapted as best as they could to their environmental conditions.

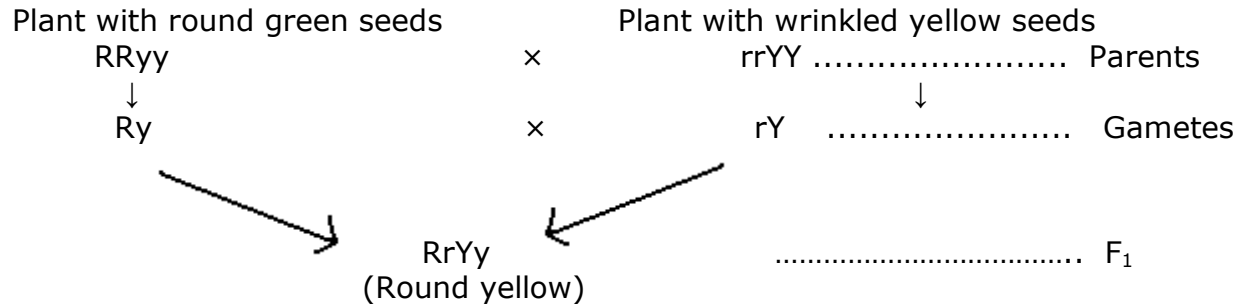
Top Definitions

- 1) F₁ generation- The generation resulting immediately from a cross of the first set of parents (parental generation).
- 2) F₂ generation – Offspring resulting from a cross of the members of F₁ generation.
- 3) Progeny - The offspring produced as a result of reproduction of the parents.

- 4) Dominant trait - A genetic trait is considered dominant if it is expressed in a person who has only one copy of that gene.
- 5) Recessive trait – A genetic trait that is expressed only when two copies of the gene are present.
- 6) Homozygous - having two identical alleles of the same gene
- 7) Heterozygous - having dissimilar alleles at corresponding chromosomal loci
- 8) Monohybrid cross – A type of crossing in which only one pair of contrasting characters are considered.
- 9) Dihybrid cross – A type of cross that involves two sets of characteristics.
- 10) Allele – Either of a pair (or series) of alternative forms of a gene that can occupy the same locus on a particular chromosome and that control the same character.
- 11) Somatic cells- All cells forming the body of an organism, except the reproductive cells.
- 12) Sex chromosomes – Either of a pair of chromosomes, usually designated X or Y, in the germ cells of most animals, that combine to determine the sex and sex-linked characteristics of an individual.
- 13) Gene – A segment of DNA that is involved in producing a polypeptide chain and forms the basic unit of heredity.
- 14) Trait –A trait is a distinct variant of a phenotypic character of an organism that may be inherited or environmentally determined.
- 15) Haploid cell – Cell having only one complete set of chromosomes
- 16) Diploid cell – Cell having two sets of chromosomes, one of paternal origin, the other maternal.
- 17) Micro-evolution – Evolution resulting from small specific genetic changes that can lead to a new subspecies.

- 18) Genetic drift - It refers to the random change in gene frequencies in a small population, presumably owing to chance rather than natural selection, thereby providing diversity without any adaptations.
- 19) Speciation - The process of formation of a new species.
- 20) Homologous organs – Organs of different organisms which may be dissimilar externally, but are similar in origin and in fundamental structural plan.
- 21) Analogous organs – Organs of different organisms which are similar in function and external appearance, but dissimilar in origin and structural plan.
- 22) Fossils – All preserved traces of living organisms.
- 23) Molecular phylogeny - The use of a gene's molecular characteristics to trace the evolutionary history of organisms.

Inheritance of a trait (e.g. height) over two generations



(The gametes obtained by selfing the plants of F_1 are: RY, Ry, rY, ry)

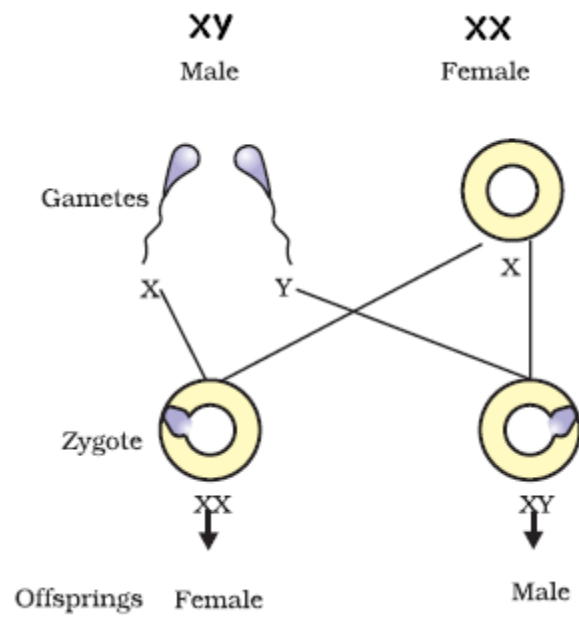
On selfing the F_1 plants,

Male → Female ↓	RY	Ry	rY	ry
RY	$RRYY$ (Round yellow seeds)	$RRYy$ (Round yellow seeds)	$RrYY$ (Round yellow seeds)	$RrYy$ (Round yellow seeds)
Ry	$RRYy$ (Round yellow seeds)	$RRyy$ (Round green seeds)	$RrYy$ (Round yellow seeds)	$Rryy$ (Round green seeds)
rY	$RrYY$ (Round yellow seeds)	$RrYy$ (Round yellow seeds)	$rrYY$ (Wrinkled yellow seeds)	$rrYy$ (Wrinkled yellow seeds)
ry	$RrYy$ (Round yellow seeds)	$Rryy$ (Round green seeds)	$rrYy$ (Wrinkled yellow seeds)	$rryy$ (Wrinkled green seeds)

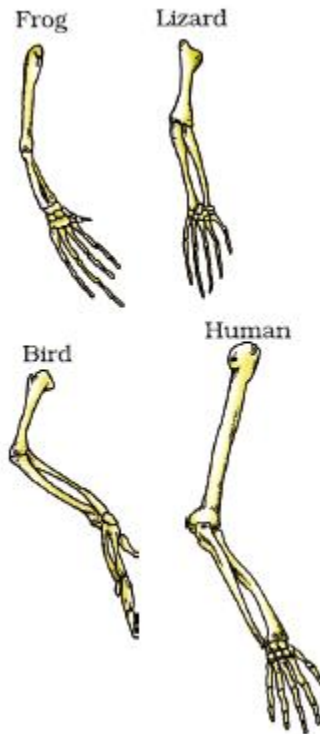
..... F_2

So the ratio of plants in F_2 generation is 9 (Round yellow seeds) : 3 (Round green seeds) : 3(Wrinkled yellow seeds): 1 (Wrinkled green seeds)

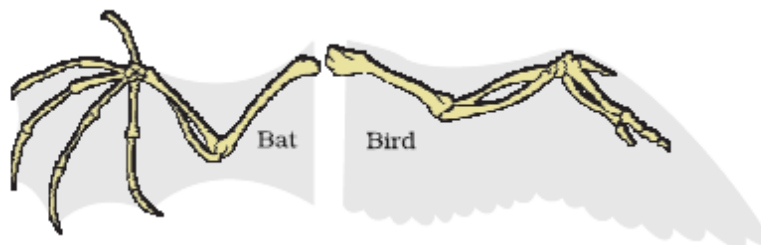
Independent inheritance of two separate traits, shape and colour of seeds



Sex determination in humans



Homologous organs



Analogous organs (Wing of bat and wing of bird)



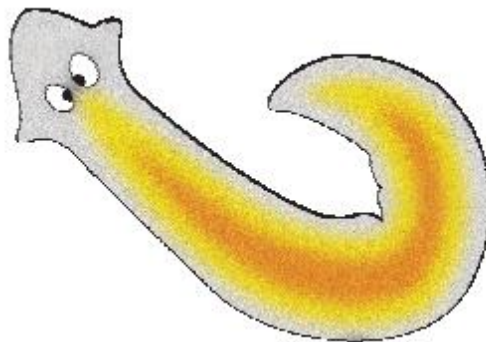
Fossil - invertebrate (Ammonite)



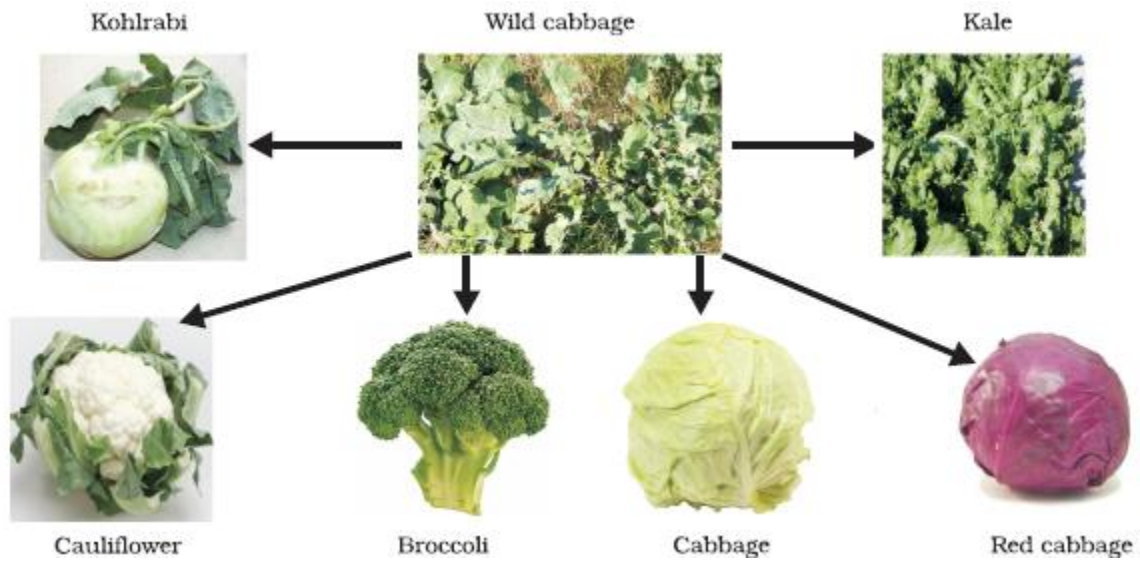
Fossil – invertebrate (Trilobite)



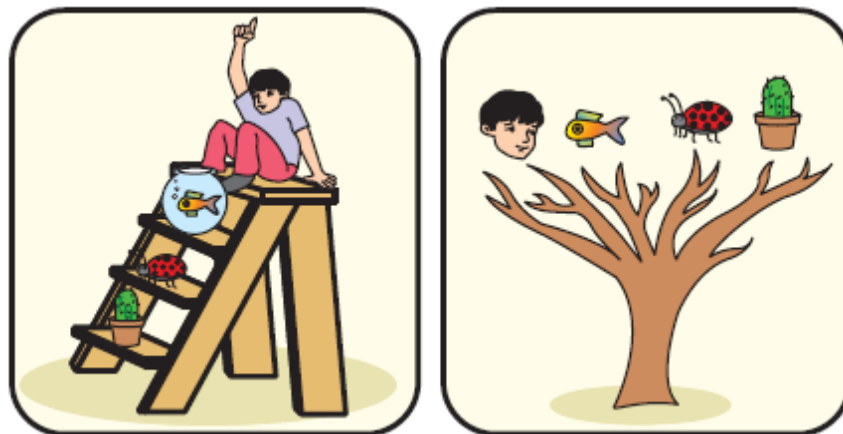
Fossil – dinosaur skull (Rajasaurus)



Eye-spots of Planaria



Evolution of wild cabbage



Evolution – Ladder versus tree

Class X: Biology
Chapter 15: Our environment

Chapter Notes

Key learning:

- 1) Our environment is composed of various biotic and abiotic factors which interact with each other.
- 2) Human activities have a great impact on the functioning of the environment.
- 3) The wastes generated by the various human activities may be biodegradable or non- biodegradable.
- 4) The enzymes present in the body of decomposers are capable of breaking down the biodegradable substances, but not the non- biodegradable materials.
- 5) The non-biodegradable materials like plastic and synthetic pesticides persist in the environment for a long duration and may harm its biotic factors.
- 6) In an ecosystem, the abiotic and biotic factors interact to form a stable unit.
- 7) The size of an ecosystem ranges in size from as small as a pond or a backyard garden to as large as an entire rain forest.
- 8) An ecosystem may be natural (like lakes and forests) or artificial (like crop-fields and aquarium).
- 9) The biotic factors may be classified as producers, consumers and decomposers depending on their mode of nutrition.
- 10) The food manufactured by the producers from simple inorganic substances is utilized directly or indirectly by the consumers.
- 11) Herbivores, carnivores, omnivores and parasites are the various types of consumers.
- 12) The decomposers break down the dead bodies and wastes of organisms and help in nutrient recycling.

- 13) Food chains are present in every ecosystem. Each food chain is composed of three to five trophic levels.

Trophic level	Organisms comprising the trophic level
First	Autotrophs / Producers
Second	Herbivores / Primary consumers
Third	Small carnivores / Secondary consumers
Fourth	Large carnivores / Tertiary consumers

- 14) There is flow of energy between the various trophic levels.
- 15) Producers convert solar energy into chemical energy, which is then utilized by the consumers and decomposers.
- 16) About 1% of solar energy falling on leaves is utilized by plants in photosynthesis to produce food.
- 17) A large amount of energy loss occurs when the organisms of the higher trophic level feeds on the lower trophic level organisms.
- 18) There is only 10% flow of energy from one trophic level to the next higher level. Due to this energy loss, only 4 or 5 trophic levels are present in each food chain.
- 19) The number of individuals in a trophic level decreases as we go up the food chain.
- 20) Food webs, consisting of several interconnected food chains, are more common in nature.
- 21) Flow of energy is unidirectional and cannot be utilized by the previous trophic levels.
- 22) The non-biodegradable chemicals like pesticides and insecticides enter the food chains in land and aquatic ecosystems and then accumulate progressively at each trophic level. This is known as biological magnification.
- 23) Human activities can cause several environmental problems like ozone layer depletion and waste disposal.
- 24) Ozone, composed of three oxygen atoms, is a toxic chemical. It is formed by the combination of free oxygen atom with molecular oxygen.
- 25) The atmospheric ozone layer prevents the entry of solar ultraviolet rays and thus protects all organisms on Earth.
- 26) Use of chemicals like chlorofluorocarbons has greatly depleted the atmospheric ozone layer, which could endanger the environment.

- 27) The disposal of large amounts of garbage produced in any human settlement, especially in cities and towns is causing major environmental problems.
- 28) Changes in our lifestyle and attitude have created many disposable items, many of which are non-biodegradable.
- 29) Effective methods of waste disposal should be found in order to reduce the harmful effects on our environment.

Top definitions

- 1) Biodegradable substances – Substances that are broken down by biological processes.
- 2) Non- biodegradable substances – Substances that are not broken down by biological processes.
- 3) Ecosystem – A unit formed by all the interacting organisms in an area together with their physical environment.
- 4) Biotic factors – The living components of the environment such as plants, animals, which interact with each other as well as with the abiotic factors of the ecosystem.
- 5) Abiotic factors - The nonliving components of the environment such as water, temperature, soil and light that influence the composition and growth of an ecosystem.
- 6) Producers- Organisms like plants and blue green algae that produce complex organic compounds from simple inorganic molecules using energy from sunlight in presence of chlorophyll.
- 7) Consumers - Organisms that feed directly or indirectly on producers and cannot synthesize their own food from inorganic sources.
- 8) Decomposers – Organisms that feed on the dead remains and waste products of organisms and carry out nutrient cycling by breaking down the complex organic materials into simple inorganic ones.
- 9) Herbivore - An animal that feeds chiefly on plants.

- 10) Carnivores – Organisms that mainly feed on the flesh or meat of animals.
- 11) Omnivore - An animal that feeds on both animal and vegetable substances.
- 12) Parasite - An organism that lives off or in another organism, obtaining nourishment and protection while offering no benefit in return
- 13) Food chain - A succession of organisms in an ecological community that constitutes a continuation of food energy from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member
- 14) Trophic level – Each step or level of the food chain.
- 15) Food web - Complex network of many interconnected food chains and feeding relationships.
- 16) Biological magnification – A cumulative increase in the concentrations of a persistent substance in successively higher levels of the food chain.

Top diagrams



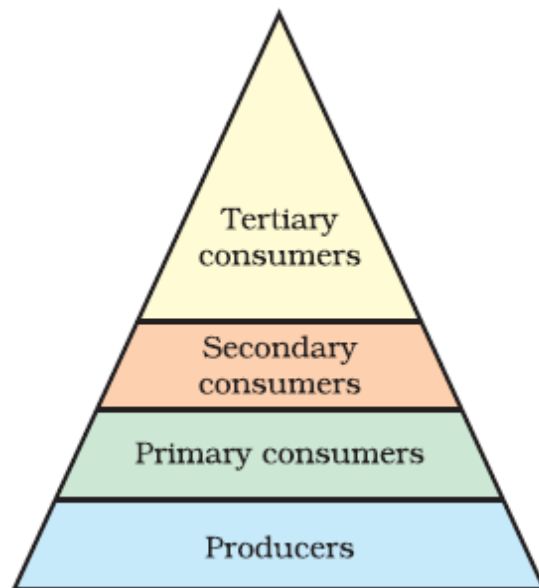
Food chain in forest



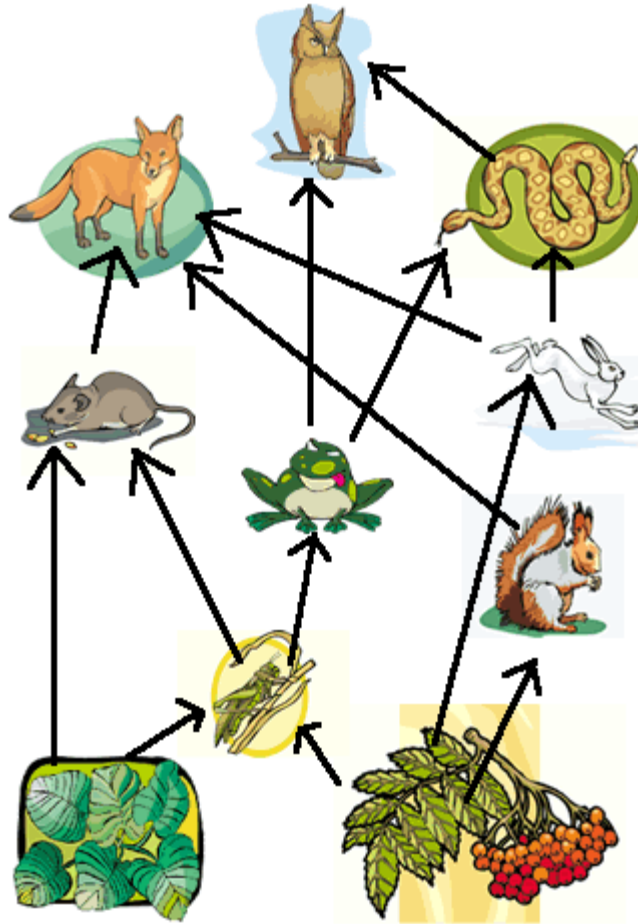
Food chain in grassland



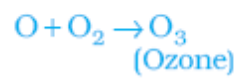
Food chain in a pond



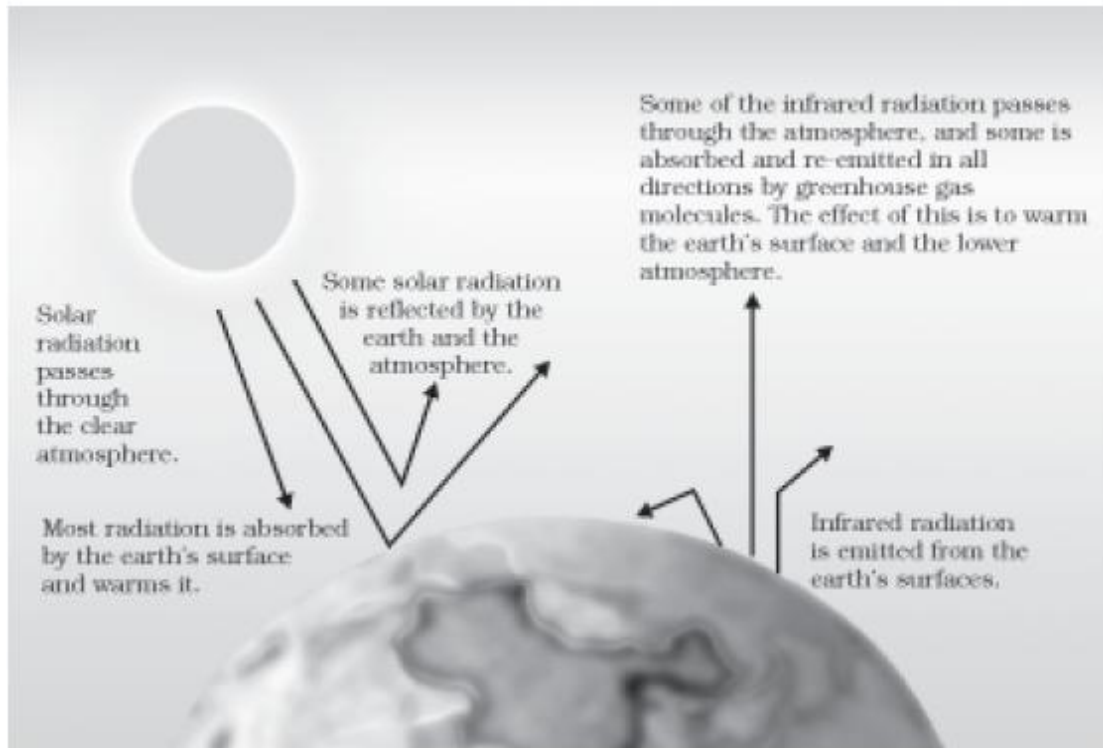
Trophic levels in a food chain



A food web



Ozone formation in atmosphere



Flow of energy in an ecosystem

Class X: Biology
Chapter 16: Management of natural resources

Chapter Notes

Key learnings:

- 1) The natural resources like water, soil, forests, wild-life, coal, petroleum etc. should be utilized in a sustainable manner in order to conserve our environment.
- 2) Over-exploitation of natural resources causes several environmental problems.
- 3) There are a number of laws at national and international level to safeguard our environment.
- 4) Ganga Action Plan was introduced in 1985 to improve the poor water quality of Ganga River.
- 5) The quality of water has to be assessed scientifically before utilizing it for various purposes.
- 6) We can adopt the 3 R's – Reduce, Recycle and Reuse, to conserve our environment.
- 7) Using our resources judiciously will prevent wastage and conserve our resources.
- 8) Recycling materials of paper, plastic, glass etc prevents their fresh extraction thereby reducing the pressure on environment.
- 9) Reusing items over and over again is another environment friendly method.

- 10) Sustainable development is the need of the hour to preserve our environment. Here present human needs are met by keeping in mind the future generation needs.
- 11) The participation of every individual is essential to bring about sustainable development.
- 12) Solar energy is converted into usable form by autotrophs and several processes on Earth.
- 13) Our natural resources should be available equally to everyone and should be used without damaging the environment.
- 14) We should try to preserve the number and range of biodiversity present in a region.
- 15) The stakeholders of forests are the local and tribal people of the area, the Forest Department of the Government, the industrialists and the wild life and nature enthusiasts.
- 16) The local and tribal people depend on the forest products for fulfilling all their needs of shelter, food, transport, fuel, medicines and cattle grazing.
- 17) The Forest Department of India destroyed the huge biodiversity of forests by converting them into monocultures of commercially important plants. Such forests are useful for industrial purposes and not for local needs.
- 18) Industrialists are not dependent on the forests of a particular area and hence do not ensure sustainability of forests.
- 19) The nature and wild life conservationists play an active role in conserving the forest biodiversity.
- 20) The local people should be actively involved in forest management since they ensure its sustainability.

- 21) 'Amrita Devi Bishnoi National Award for Wildlife Conservation' is awarded by Government of India in the memory of late Amrita Devi Bishnoi, who laid down her life for protection of trees.
- 22) Deforestation is mainly caused by industrialism, tourism and development projects.
- 23) Economic and social development should be achieved with due consideration for ecological conservation.
- 24) There are many instances of strong protests by the local people against misuse and over-exploitation of forest resources.
- 25) In Chipko Andolan(which originated in the Reni village of Garhwal), the villagers used to hug the forest trees and prevent their mass felling by the contractors.
- 26) The local people use the forest resources without destroying the trees.
- 27) Destruction of forests affects the soil quality and water sources, in addition to reduced availability of forest resources.
- 28) Combined working of the Forest Department with the local people can ensure the protection and sustainability of forests.
- 29) By actively involving the villagers in the management of the Arabari forest range, the West Bengal Forest Department was able to revive the degraded Sal forests of the region.
- 30) Water is an important resource as we need water for fulfilling all our needs.
- 31) Failure to maintain the ground water level in spite of the plentiful monsoon rains is largely due to human activities like agriculture, pollution and deforestation.

- 32) In pre-British India, water management was carried out locally and optimally, according to the agricultural and daily needs of the local people.
- 33) Mega-projects like large dams and canals were initiated by the British and led to the neglect of the local water sources and irrigation methods.
- 34) Dual purpose of irrigation and electricity generation is achieved by large dams.
- 35) Mismanagement of large dams and canal systems leads to unequal distribution of water and benefits.
- 36) Building large dams brings about social, economic and environmental problems.
- 37) The construction of several dams like Tehri dam and Tawa Dam displaced several poor tribals and peasants without satisfactory rehabilitation or compensation.
- 38) In watershed management, land and water resources are developed scientifically to increase the biomass production with an aim to conserve the ecosystem.
- 39) Updating the ancient water harvesting systems has recharged ground water levels and is a viable option to the large scale water storage projects.
- 40) Water harvesting techniques reduces mismanagement of water resources and ensures benefits for the local people.

State	Water harvesting structures
Rajasthan	Khadins, tanks, nadis
Maharashtra	Bandharas, tals
Uttar Pradesh	Bundhis
Madhya Pradesh	Bundhis
Bihar	Ahars, pynes
Himachal Pradesh	Kulhs
Jammu	Ponds

Tamil Nadu	Eris
Kerals	Surangams
Karnataka	Kattas

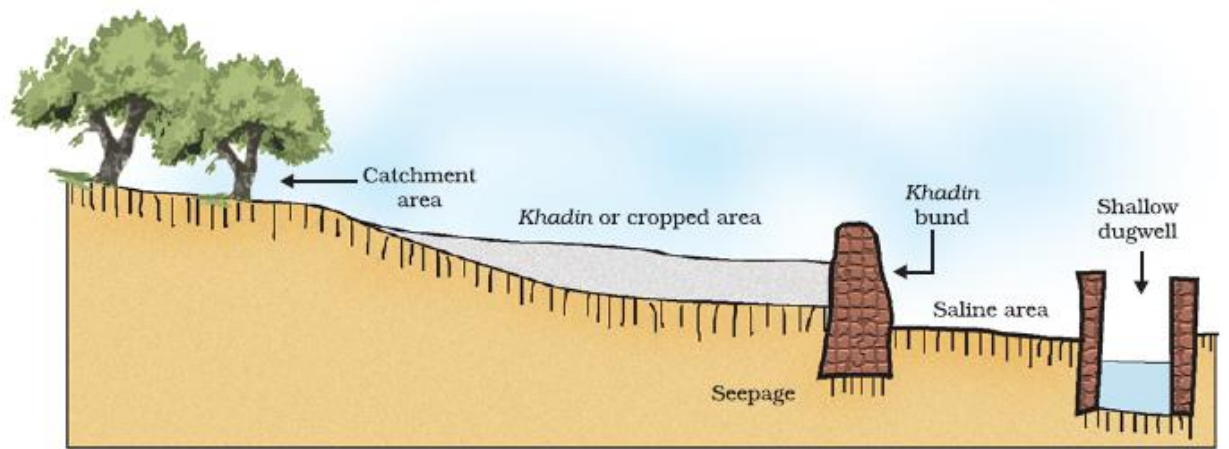
- 41) Water harvesting structures replenishes the ground water levels.
- 42) Ground water is polluted from pollution, breeding of mosquitoes and evaporation and constitutes an important source of water.
- 43) Fossil fuels like coal and petroleum have to be used very carefully due to the following reasons:
 - i) They are present in extremely limited quantity.
 - ii) Their combustion produces harmful gases such as oxides of nitrogen and sulphur and a green house gas i.e. carbon dioxide.
 - iii) The huge reservoirs of carbon present in fossil fuels will be converted into carbon dioxide leading to increased global warming.
- 44) Each person can help in conservation of natural resources by making environment-friendly choices in life as much as possible.
- 45) Sustainable management of natural resources is the only option available to conserve our natural resources and ensure its equitable distribution to everyone.

Top definitions

- 1) Coliform – A group of bacteria found in human intestines, whose presence in water indicates contamination by disease-causing microorganisms.

- 2) Recycling - The act of processing used or abandoned materials for use in creating new products.
- 3) Reuse – The act of using an item more than once.
- 4) Sustainable development – A pattern of resource use for obtaining economic and social growth of the present generation while preserving the resources for the needs of future generations.
- 5) Chipko Andolan – A grassroot level movement in which the villagers used to hug the forest trees and prevent their mass felling by the contractors.
- 6) Fossil fuels – Fuels such as coal and petroleum formed from the decomposition of ancient animal and plant remains millions of years ago and which provide energy by combustion.
- 7) Water shed management – A scientific method of developing land and water resources to increase the biomass production without causing ecological imbalance.
- 8) Water harvesting – It refers to all the different techniques used to collect and store both runoff and rainwater so that it can be used for various purposes like irrigation, human consumption etc.

Top diagrams



An ideal setting of the khadin system