NCERT BOOK QUESTIONS AND EXERCISES
(with answers)

Chapter : LIFE PROCESSES

NCERT Book, Page 95

Q. 1. Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans ?

Ans. In large multicellular organisms like humans, the oxygen of air will have to travel large distances inside the human body to reach each and every cell of the body. Now, since diffusion is a very, very slow process, it will take a very long time to make oxygen available to all the body cells. Thus, diffusion is insufficient to meet the oxygen requirements of multicellular organisms like humans because the volume of human body is so big that oxygen (of air) cannot diffuse into all the internal cells of the human body quickly. So, when the size of the multicellular organism is large, then respiratory pigments (such as haemoglobin) present in blood take up the oxygen from the air in the lungs and carry it quickly to all the body cells.

Q. 2. What criteria do we use to decide whether something is alive ?

Ans. We can decide whether something is alive (or living) by using the following characteristics of livings things :

(*i*) Living things can move by themselves.
(*ii*) Living things need food, air and water.
(*iii*) Living things can grow
(*iv*) Living things can respond to changes around them. They are sensitive.
(*v*) Living things respire (release energy from food).
(*vi*) Living things excrete (get rid of waste materials from their body).
(*vii*) Living things can reproduce. They can have young ones.

Q. 3. What are outside raw materials used by an organism ?

Ans.
(*i*) An autotrophic organism (like a green plant) uses outside raw materials such as carbon dioxide, water and minerals alongwith sunlight to make its own food by the process of photosynthesis.
(*ii*) A heterotrophic organism (like an animal) uses outside raw material such as readymade organic food to grow, develop, synthesise proteins and other substances needed in the body.
(*iii*) Most of the organisms use oxygen (of air) as outside material for breaking down food and releasing energy for themselves in a process called respiration.

Q. 4. What processes would you consider essential for maintaining life ?

Ans. The various processes essential for maintaining life are : Nutrition, Respiration, Transport, Excretion, Control and Coordination, Growth, Movement and Reproduction.

NCERT Book, Page 101

Q. 1. What are the differences between autotrophic nutrition and heterotrophic nutrition ?

Ans. (*i*) In autotrophic nutrition, an organism synthesises its own organic food from simple inorganic materials like carbon dioxide, water and minerals present in the surroundings by using sunlight energy. In heterotrophic nutrition, an organism cannot synthesise its own food, it depends on other organisms for food.

(*ii*) Autotrophic nutrition takes place in green plants and certain bacteria which can carry out photosynthesis. Heterotrophic nutrition occurs in all animals, and non-green plants which cannot carry out photosynthesis.

Q. 2. Where do plants get each of the raw materials required for photosynthesis ?

Ans. The two raw materials required by the plants for photosynthesis are : Carbon dioxide and Water. The plants get carbon dioxide gas from the air (or atmosphere). The plants get water from the soil.

Q. 3. What is the role of the acid in our stomach ?

Ans. The role of acid in the stomach is to make the medium of gastric juice acidic so that the enzyme pepsin can break down proteins of the food effectively. This is because the enzyme pepsin can digest proteins effectively only in the acidic medium. Another role of acid is that it kills any bacteria which may enter the stomach with our food.

Q. 4. What is the function of digestive enzymes ?

Ans. Digestive enzymes are the biological catalysts which break down the complex food molecules (like carbohydrates, proteins and fats) into such small particles which can be absorbed from the alimentary canal into the blood stream.

Q. 5. How is the small intestine designed to absorb digested food ?

Ans. The inner surface of small intestine has millions of tiny, finger-like projections called villi. The presence of villi gives the inner walls of the small intestine a very large surface area. And the large inner surface area of small intestine helps in the rapid absorption of the digested food.

NCERT Book, Page 105

Q. 1. What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration ?

Ans. The aquatic organisms use the oxygen dissolved in water for carrying out respiration. The amount of oxygen dissolved in water is, however, limited. The terrestrial organisms take oxygen from air which contains much higher amount of oxygen. Thus, a terrestrial organism has an advantage over an aquatic organism in regard to obtaining oxygen because it is surrounded by an oxygen-rich air from which it can take any amount of oxygen.

Q. 2. What are the different ways in which glucose is oxidised to provide energy in various organisms ?

Ans. There are two different ways in which glucose is oxidised to provide energy in various organisms : aerobic respiration, and anaerobic respiration. Aerobic respiration uses oxygen (of air) whereas anaerobic respiration takes place without oxygen.

(*i*) In aerobic respiration, the glucose food is completely broken down by the oxygen (of air) inhaled during breathing to form carbon dioxide and water, and a lot of energy is released.

(*ii*) In anaerobic respiration, the glucose food is incompletely broken down by micro-organisms like yeast in the absence of oxygen (of air) to form ethanol and carbon dioxide, but much less energy is released.

Q. 3. How are oxygen and carbon dioxide transported in human beings ?

Ans. In human beings, oxygen is carried from the lungs by the respiratory pigment haemoglobin which is present in red blood corpuscles. Haemoglobin has a very high affinity for oxygen. Carbon dioxide is more soluble in water than oxygen. So, most of the carbon dioxide produced during respiration in the human body is transported in the dissolved form in our blood.

Q. 4. How are the lungs designed in human beings to maximise the area for exchange of gases ?

Ans. There are millions of alveoli in the lungs. The presence of millions of alveoli in the lungs provides a very large area for the exchange of gases. And the availability of large surface area maximises the exchange of gases. For example, if all alveoli from the two human lungs are unfolded, they would give an area of about 80 square metres (which is nearly the size of a tennis court !).

NCERT Book, Page 110

Q. 1. What are the components of transport system in human beings ? What are the functions of these components ?

Ans. The components of transport system in human beings are blood and lymph. The functions of blood and lymph are as follows :

(*i*) Red blood cells carry oxygen from the lungs to all the cells of the body. Blood plasma carries digested food, proteins, common salt, waste products (like carbon dioxide and urea) and hormones from one part to another part in the body.

(*ii*) Lymph puts into circulation large protein molecules by carrying them from the tissues into the blood stream (which could not be absorbed by blood capillaries due to their large size). Lymph also carries digested fat from intestine to other tissues, and excess fluid from the extra-cellular space back into blood.

Q. 2. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds ?

Ans. The mammals and birds are warm-blooded animals which have high energy needs because they constantly require energy to maintain their body temperature. It is necessary to separate oxygenated blood and deoxygenated blood in mammals and birds because such a separation allows a highly efficient supply of oxygen to the body cells which is required for producing a lot of energy needed by them.

Q. 3. What are the components of the transport system in highly organised plants ?

Ans. The two components of transport in highly organised plants are xylem and phloem.

(*i*) Xylem tissue is made of dead cells in the form of xylem vessels and tracheids. It transports water and dissolved minerals from roots to all the parts of the plant.

(*ii*) Phloem tissue is made of living cells in the form of sieve tubes and companion cells. It transports food made in leaves by photosynthesis to all the parts of a plant.

Q. 4. How are water and minerals transported in plants ?

Ans. Water and the minerals dissolved in it are transported in plants by xylem tissue. In xylem tissue, the xylem vessels and tracheids of the roots, stems and leaves are interconnected to form a continuous water conducting channel which reaches all the parts of the plant. The mechanism of transport of water in plants is as follows: The leaves of plants have tiny pores called stomata. The water brought in by xylem to the leaves is constantly being lost by evaporation through stomata. The loss of water in the form of water vapour from the leaves of a plant is called transpiration. The continuous evaporation of water (or transpiration) from the cells of leaves creates a kind of suction which pulls up water from the roots through the xylem (just as a cold drink moves up the straw when we suck at the upper end of the straw). Thus,

transpiration helps in the upward movement of water and dissolved minerals from the roots to the leaves.

Q. 5. How is food transported in plants ?

Ans. The transport of food (made by photosynthesis) in the plant leaves takes place through 'phloem tissue'. The phloem tissue consists of sieve tubes alongwith their companion cells. The mechanism of movement of food in phloem (or translocation) by utilising energy is described below : The sugar (food) made in leaves is loaded into the sieve tubes of phloem tissue by using energy from ATP. Water now enters into sieve tubes containing sugar by the process of osmosis due to which the pressure in the phloem tissue rises. This high pressure produced in the phloem tissue moves the food to all the parts of the plant having less pressure in their tissues. This allows the phloem to transport food according to the needs of the plant. The movement of food in phloem can be upwards or downwards depending on the requirements of the plant.

NCERT Book, Page 112

Q. 1. Describe the structure and functioning of nephrons.

Ans. The nephron has a cup-shaped bag at its upper end which is called Bowman's capsule. The lower end of Bowman's capsule is tube-shaped and it is called a tubule. The Bowman's capsule and the tubule taken together make a nephron (Each kidney has about 1 million nephrons). One end of the tubule is connected to Bowman's capsule and its other end is connected to a urine-collecting duct of the kidney. The Bowman's capsule contains a bundle of capillaries which is called glomerulus. One end of glomerulus is attached to renal artery which brings the dirty blood containing the urea waste in it. The other end of glomerulus comes out of Bowman's capsule as a blood capillary, surrounds the tubule of nephron and finally joins a renal vein (putting urea-free clean blood into it). The function of glomerulus is to filter the blood passing through it. The dirty blood containing waste like urea (brought by renal artery) enters the glomerulus. The glomerulus filters this blood. During filtration, the substances like glucose, amino acids, salts, water and urea, etc., present in the blood pass into Bowman's capsule and then enter the tubule of nephron. When the filtrate containing useful substances as well as the waste substances passes through the tubule, then the useful substances like all glucose, all amino acids, most salts, and most water, etc., are reabsorbed into the blood through blood capillaries surrounding the tubule. Only the waste substances urea, some unwanted salts and excess water remain behind in the tubule. The liquid left behind in the tubule of nephron is urine. The nephron carries this urine into the collecting duct of the kidney from where it is carried to ureter. From the ureter, urine passes into urinary bladder. Urine is stored in the bladder for some time and ultimately passed out of the body through urethra.

Q. 2. What are the methods used by plants to get rid of excretory products ?

Ans. (*i*) The plants produce carbon dioxide as a waste product during respiration and oxygen as a waste product during photosynthesis. The plants get rid of gaseous waste products through stomata in their leaves and lenticels in stems.

(*ii*) The plants store some of the solid and liquid wastes in their body parts such as leaves, bark and fruits. The plants get rid of stored solid and liquid wastes by the shedding of leaves, peeling of bark and felling of fruits.

(*iii*) The plants get rid of their wastes by secreting them in the form of gums and resins. The plants also secrete some waste substances into the soil around them.

Q. 3. How is the amount of urine produced regulated ?

Ans. The amount of urine produced is regulated by reabsorption of water and some of the dissolved substances into the blood through blood capillaries surrounding the tubules of nephrons. The amount of urine produced depends on how much excess water is present in the body and how much of dissolved wastes are to be excreted.

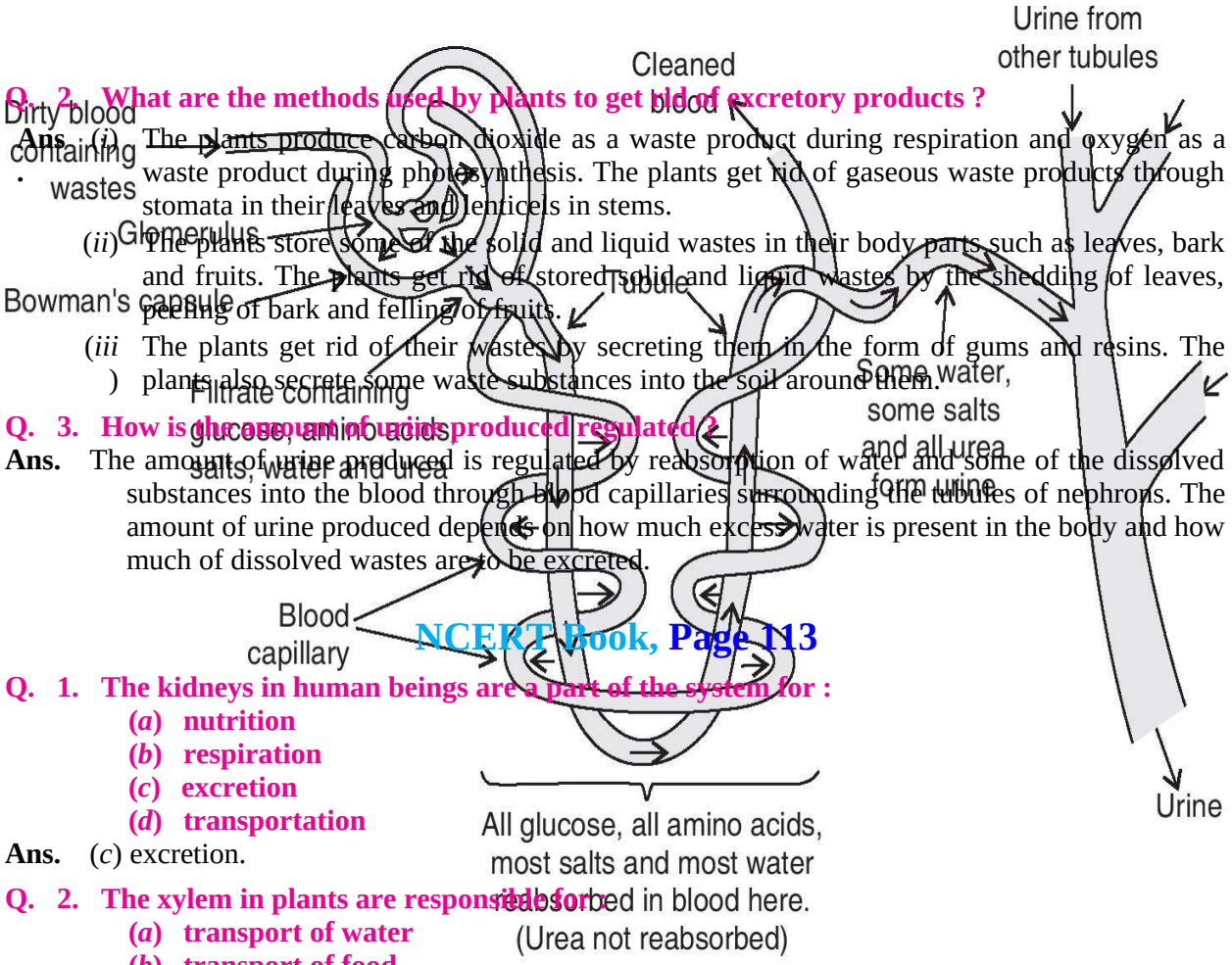


Diagram to show the working of a nephron.

NCERT Book, Page 113

Q. 1. The kidneys in human beings are a part of the system for :

(*a*) nutrition
(*b*) respiration
(*c*) excretion
(*d*) transportation

Ans. (*c*) excretion.

Q. 2. The xylem in plants are responsible for :

(*a*) transport of water
(*b*) transport of food
(*c*) transport of amino acids
(*d*) transport of oxygen

Ans. (*a*) transport of water.

Q. 3. The autotrophic mode of nutrition requires :

(*a*) carbon dioxide and water
(*b*) chlorophyll
(*c*) sunlight
(*d*) all of the above

Ans. (*d*) all of the above

Q. 4. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in :

(*a*) cytoplasm
(*b*) mitochondria
(*c*) chloroplast
(*d*) nucleus

Ans. (*b*) mitochondria

Q. 5. How are fats digested in our bodies ? Where does this process take place ?

Ans. Fats are digested in the small intestine in our body. The liver secretes an alkaline liquid called bile into small intestine. The salts present in bile emulsify (or break) large globules of fat present in our food into smaller globules making it easy for the enzymes to act on them and digest them. Pancreas secretes pancreatic juice into small intestine which also contains an

enzyme called 'lipase'. The enzyme lipase breaks down the emulsified fat further. And finally, the enzymes present in intestinal juice brings about the complete digestion of fats by converting them into fatty acids and glycerol.

Q. 6. What is the role of saliva in the digestion of food ?

Ans. Saliva contains an enzyme called salivary amylase. The enzyme salivary amylase present in saliva breaks down the complex 'starch' carbohydrate present in food into a simpler sugar.

Q. 7. What are the conditions necessary for autotrophic nutrition and what are its by-products ?

Ans. Autotrophic mode of nutrition involves the making of food by green plants by the process of photosynthesis. The conditions necessary for autotrophic nutrition are the presence of : Carbon dioxide, Water, Chlorophyll and Sunlight. Carbon dioxide combines with water in the presence of sunlight energy (absorbed by chlorophyll) to form food like glucose. This glucose carbohydrate is used for providing energy to the plant. A part of glucose is stored in plants as starch which can be used as a source of energy whenever the plant needs it. The major by-product of autotrophic nutrition (or photosynthesis) is oxygen gas which goes into the air.

Q. 8. (*a*) What are the differences between aerobic and anaerobic respiration ?
(*b*) Name some organisms that use the anaerobic mode of respiration.

Ans. (*a*) See Table on page 36 of this book.
(*b*) Anaerobic mode of respiration is used by certain micro-organisms such as yeast and some bacteria known as anaerobic bacteria.

Q. 9. How are the alveoli designed to maximise the exchange of gases ?

Ans. There are millions of alveoli (thin-walled air-sacs) in the lungs. The presence of millions of alveoli in the lungs provides a very large area for the exchange of gases. And the availability of large surface area maximises the exchange of gases. For example, if all alveoli from the two human lungs are unfolded, they would give an area of about 80 square metres (which is nearly the size of a tennis court !).

Q. 10. What would be the consequences of a deficiency of haemoglobin in our bodies ?

Ans. The oxygen required for breathing and respiration (release of energy) is carried by haemoglobin present in our blood. The deficiency of haemoglobin in the blood of a person reduces the oxygen-carrying capacity of blood resulting in breathing problems, tiredness and lack of energy. The person looks pale and loses weight.

Q. 11. Describe double circulation in human beings. Why is it necessary ?

Ans. A circulatory system in which the blood travels twice through the heart in one complete cycle of the body is called double circulation. In the human circulatory system, the pathway of blood from the heart to the rest of the body and back to the heart is called systemic circulation ; and the pathway of blood from the heart to the lungs and back to the heart is called pulmonary circulation. These two types of circulation taken together make double circulation. The double circulation is necessary to supply oxygenated blood to the whole body (except lungs), and then to get deoxygenated blood reoxygenated in the lungs. (For detailed description of double circulation in human beings, see page 61 of this book).

Q. 12. What are the differences between the transport of materials in xylem and phloem ?

Ans. (*i*) Xylem tissue transports water and dissolved minerals in plants whereas phloem tissue transports the food (made by photosynthesis) to all the parts of the plant.

(*ii*) Xylem tissue carries the water and dissolved minerals only upwards from the roots of the plant but the movement of food from the leaves through phloem can be upwards as well as downwards depending on the requirements of the plant.

(*iii*) The upward movement of water and dissolved minerals in xylem tissue is caused by a suction force produced by the continuous evaporation of water (or transpiration) from the cells of leaves of the plant which pulls up water from the roots. On the other hand, the food made in leaves is transported through phloem tissue by utilising energy from ATP.

Q. 13. Compare alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

Ans. (*i*) Structure. Alveoli in the lungs and nephrons in the kidneys, both possess an elaborate network of blood capillaries.

(*ii*) Functioning. Alveoli purify the deoxygenated blood by removing carbon dioxide from it and making it oxygenated by introducing oxygen in it (during the gaseous exchange). Similarly, nephrons purify the dirty blood by filtering out waste products like urea from it in the form of urine.

Chapter : CONTROL AND COORDINATION

NCERT Book, Page 119

Q. 1. What is the difference between a reflex action and walking ?

Ans. Reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain. It is a kind of involuntary action which involves only the spinal cord. A reflex action is not based on our thinking. On the other hand, walking is a voluntary action which we undertake knowingly. The action of walking involves thinking by the brain. The central nervous system (brain and spinal cord) takes part in the action of walking.

Q. 2. What happens at the synapse between two neurons ?

Ans. The synapse is a microscopic gap between any two adjacent neurons. Electrical impulses (or nerve impulses) carrying messages pass over the synapse when going from one neuron to another. Actually, synapse between two neurons acts as a one-way valve which allows electrical impulses to pass in one direction only. This happens as follows : When an electrical impulse coming from the receptor reaches the end of the axon of sensory neuron, then the electrical impulse releases tiny amount of a chemical substance (called neurotransmitter substance) into the synapse (or gap) between two adjacent neurons. This chemical substance crosses the synapse (or gap) and starts a similar electrical impulse in the dendrite of the next neuron. In this way, the electrical impulses (or messages) are passed from one neuron to the next across the synapse.

Q. 3. Which part of the brain maintains posture and equilibrium of the body ?

Ans. Cerebellum.

Q. 4. How do we detect the smell of an *agarbatti* (incense stick) ?

Ans. When the *agarbatti* burns, it produces vapours having a characteristic pleasant smell. This smell is detected by the olfactory receptors present inside our nose. The action of smell of *agarbatti* on receptors sets off chemical reactions which generate electrical impulses. The sensory neurons carry these electrical impulses to the sensory area of forebrain (called cerebrum). This makes us detect the smell of burning *agarbatti*.

Q. 5. What is the role of the brain in reflex action ?

Ans. Reflex action takes place in the spinal cord. Only the information that a reflex action has taken place goes on to reach the brain.

NCERT Book, Page 122

Q. 1. What are plant hormones ?

Ans. The organic chemical substances produced in plants which control growth, development and responses in plants, are called plant hormones. The examples of plant hormones are : Auxins, Gibberellins, Cytokinins and Abscisic acid.

Q. 2. How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light ?

Ans. See Sample Problem 3 on page 92 of this book.

Q. 3. Give an example of a plant hormone that promotes growth.

Ans. Auxin.

Q. 4. How do auxins promote the growth of a tendril around a support ?

Ans. See Sample Problem 2 on page 92 of this book.

Q. 5. Design an experiment to demonstrate hydrotropism.

Ans. See page 87 of this book.

NCERT Book, Page 125

Q. 1. How does the chemical coordination take place in animals ?

Ans. The chemical coordination in animals takes place through the action of chemicals called 'hormones'. Hormones are the chemicals which are made inside the animal body in very small amounts by certain glands. Hormones are released directly into the blood. They are carried by the blood circulatory system to other parts of the body. Hormones travel all over the body but affect only particular organs at particular places. The organs which they affect are called target organs. The hormones control and coordinate several functions of the animal body such as growth, development, metabolism, behaviour and secondary sexual characteristics, etc.

Q. 2. Why is the use of iodised salt advisable ?

Ans. Iodine is necessary for the thyroid gland to make thyroxine hormone. Thyroxine hormone regulates the metabolism of carbohydrates, fats and proteins so as to produce the best balance for growth. If there is deficiency of iodine in our diet, the formation of thyroxine hormone will be reduced and lead to a disease called goitre. One of the symptoms of goitre disease is that the neck of the person appears to be swollen. Iodised salt contains appropriate amounts of iodine compounds. Iodised salt can provide all the iodine needed by the thyroid gland to make sufficient thyroxine hormone for the body. So, if we take iodised salt, there can be no deficiency of iodine (or thyroxine) in the body and hence goitre disease can be prevented.

Q. 3. How does our body respond when adrenaline is secreted into the blood ?

Ans. The adrenaline hormone prepares our body to function at maximum efficiency during emergency situations like danger, anger, excitement, etc. This happens as follows : When we are faced with a dangerous situation (like being chased by a ferocious dog), then our nervous system stimulates the adrenal glands to secrete more adrenaline hormone into our blood. This adrenaline hormone increases our 'heart beats', 'breathing rate', 'blood flow into muscles' and causes liver 'to put more stored glucose into our blood'. All these actions of adrenaline hormone produce a lot of energy in our body very, very quickly. And this energy helps us to cope up with emergency situations (like running away very fast from a ferocious dog or fighting an enemy, etc.).

Q. 4. Why are some patients of diabetes treated by giving injections of insulin ?

Ans. Insulin is a hormone which is produced and secreted by a gland called pancreas. The function of insulin hormone is to lower the blood sugar level. Deficiency of insulin hormone in the body raises the blood sugar level causing a disease known as diabetes. The high sugar level in the blood of a diabetic person can lead to many harmful effects. Some persons having diabetes are treated by giving injections of insulin because addition of insulin hormone to blood lowers the blood sugar level.

NCERT Book, Pages 125 and 126

Q. 1. Which of the following is a plant hormone ?

(*a*) Insulin
(*b*) Thyroxin
(*c*) Oestrogen
(*d*) Cytokinin

Ans. (*d*) Cytokinin.

Q. 2. The gap between two neurons is called a :

(*a*) dendrite
(*b*) synapse
(*c*) axon
(*d*) impulse

Ans. (*b*) synapse.

Q. 3. The brain is responsible for :

(*a*) thinking
(*b*) regulating the heart beat
(*c*) balancing the body
(*d*) all of the above

Ans. (*d*) all of the above.

Q. 4. What is the function of receptors in our body ? Think of situations where receptors do not work properly. What problems are likely to arise ?

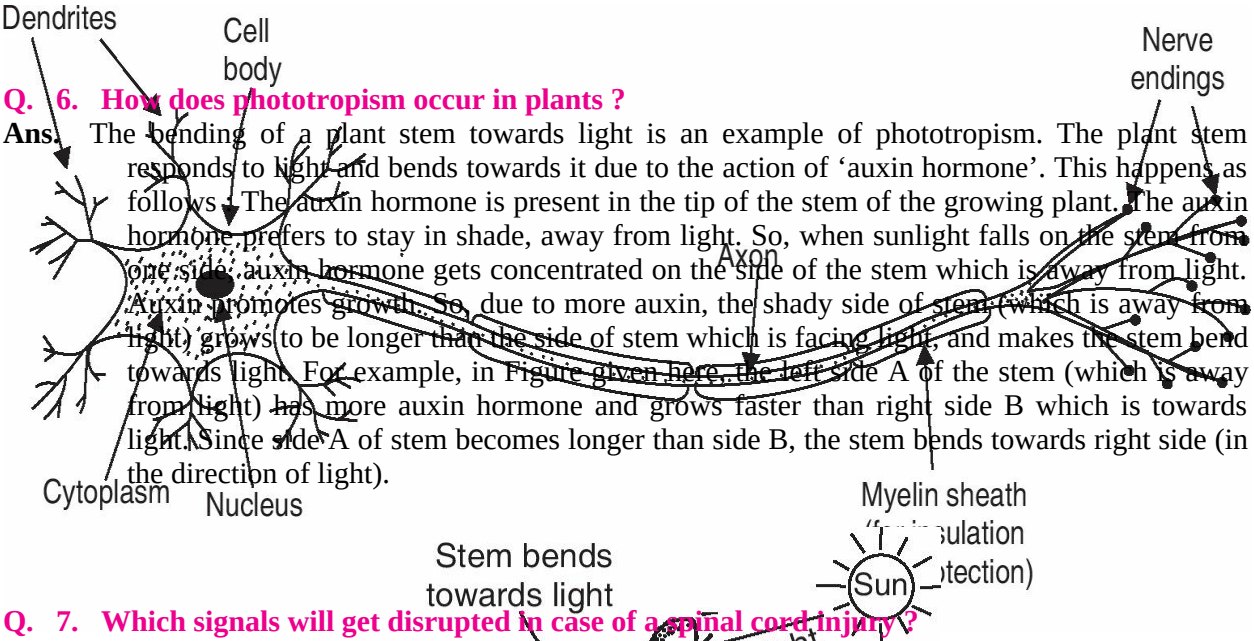
Ans. Receptors are the special cells present in our sense organs. Receptors detect all the information from our environment and feed it to the nervous system. For example, gustatory receptors present in our tongue detect taste of our food whereas olfactory receptors present in our nose detect smell. Now, if the gustatory receptors of our tongue do not work properly, we will not be able to know the taste of different types of foods (whether sweet, salty, sour or bitter, etc.). And if the olfactory receptors present in our nose do not work properly, we will not be able to smell things (like the flavour of a food or the fragrance of a perfume).

Q. 5. Draw the structure of a neuron and explain its function.

Ans. A neuron consists of three parts : cell body, dendrites and axon (see Figure on next page). The cell body of a neuron is like a typical animal cell which contains cytoplasm and a nucleus. A number of long and thin fibres stretch out from the cell body of a neuron. They are called nerve fibres. The shorter fibres on the cell body of a neuron are called dendrites. The longest fibre on the cell body of a neuron is called axon. The axon has an insulating and protective sheath (or cover) of myelin around it. The function of neurons is to carry messages over long distances in the body of a person quickly. The messages which neurons transmit in nervous system are in the form of electrical impulses (also called nerve impulses). Actually, neurons make the whole nervous system work efficiently. For example, the sensory neurons transmit impulses from the sensory cells or receptors (present in sense organs) towards the central nervous system (spinal cord and brain). And the motor neurons transmit impulses from the central nervous system towards the muscle cells (or effectors) for taking appropriate action.

Q. 6. How does phototropism occur in plants ?

Ans. The bending of a plant stem towards light is an example of phototropism. The plant stem responds to light and bends towards it due to the action of 'auxin hormone'. This happens as follows : The auxin hormone is present in the tip of the stem of the growing plant. The auxin hormone prefers to stay in shade, away from light. So, when sunlight falls on the stem from one side, auxin hormone gets concentrated on the side of the stem which is away from light. Auxin promotes growth. So, due to more auxin, the shady side of stem (which is away from light) grows to be longer than the side of stem which is facing light, and makes the stem bend towards light. For example, in Figure given here, the left side A of the stem (which is away from light) has more auxin hormone and grows faster than right side B which is towards light. Since side A of stem becomes longer than side B, the stem bends towards right side (in the direction of light).



Mechanism of phototropism.

Q. 7. Which signals will get disrupted in case of a spinal cord injury ?

Ans. Reflex actions and involuntary actions will get disrupted in case of a spinal cord injury.

Q. 8. How does chemical coordination occur in plants ?

Ans. The plants do not have nervous system but they can still sense things. The plants can sense the presence of stimuli such as light, gravity, chemicals, water, and touch, etc., and respond to them by the action of hormones. Thus, the plants coordinate their behaviour against environmental changes by using organic chemicals called hormones. This is called 'chemical coordination'. The hormones in plants coordinate their behaviour by affecting the growth of a part of the plant resulting in the movement of that plant part in response to a stimulus. For example, when sunlight falls on a shoot from one side, the auxin hormone causes the shady side of shoot to grow faster, making the shoot bend towards sunlight.

Q. 9. What is the need for a system of control and coordination in an organism ?

Ans. An organism needs a system of control and coordination for its survival in this world. The system of control and coordination is necessary in plants as well as animals (including human beings).

(*i*) The plants need carbon dioxide, water and sunlight. It is due to the presence of a hormonal system of control and coordination in plants that the stomata in their leaves open to allow in carbon dioxide gas, the roots bend towards water and the shoots grow towards sunlight. It is also due to control and coordination that tendrils in plants having weak stems make them climb on to neighbouring supports.

(*ii*) In human beings, the system of control and coordination is needed for all our actions, thinking and behaviour. The human nervous system receives information from the surroundings, processes it and then responds accordingly. Our heart beats, breathing, reading, writing, cycling, dancing and various reflex actions are all because of the nervous system. The hormonal system (endocrine system) helps in controlling and coordinating activities like metabolism, development, reproduction and preparing our body to cope up with grave situations.

Q. 10. How are involuntary actions and reflex actions different from each other ?

Ans. Involuntary actions are those which we cannot control even if we want to. There is no stimulus involved in the involuntary actions. They take place on their own. For example, our heart beats all the time without our thinking about it. So, the beating of heart is a purely

involuntary action. Involuntary actions are regulated by the brain. The reflex actions are also a kind of involuntary actions but they take place in response to a stimulus. For example, the decrease in the size of the pupil of our eye on stepping out in bright light is a reflex action which takes place in response to a stimulus 'light'. Reflex actions are usually regulated by the spinal cord.

Q. 11. Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.

Ans. See Table on page 114 of this book.

Q. 12. What is the difference between the manner in which movement takes place in a sensitive plant and the movement in your legs ?

Ans. See Sample Problem 4 on page 92 of this book.

Chapter : HOW DO ORGANISMS REPRODUCE

NCERT Book, Page 128

Q. 1. What is the importance of DNA copying in reproduction ?

Ans. (*i*) The chromosomes in the nucleus of a cell contain information for the inheritance of features from the parents to next generation in the form of DNA (Deoxyribo Nucleic Acid) molecules. So, the first importance of DNA copying is that the characteristics of the parent organism are transmitted to its offsprings.

(*ii*) When the DNA already present in the nucleus of a parent cell is copied by making more of DNA by certain biochemical reactions, then slight variations come in the two copies formed. These slight variations in the copying of DNA molecules lead to slight variations in the offspring produced. Thus, another importance of DNA copying is that some variations are produced in the offsprings during reproduction which form the basis for evolution.

Q. 2. Why is variation beneficial to the species but not necessarily for the individual ?

Ans. Variation is useful for the survival of a species even in adverse environmental conditions. This happens as follows : There may be some drastic changes like excessive heat or cold or shortage of water (drought), etc., in the habitat of a species of organisms. Now, if all the organisms of a population living in that habitat are exactly identical, then there is danger that all of them may die and no one would survive under those conditions. This will eliminate the species from that habitat completely. However, if some variations are present in some individual organisms to tolerate excessive heat or cold or survive on meagre water supply, then there is a chance for them to survive and flourish even in adverse environment. For example, if there is a population of certain bacteria living in temperate water (which is neither very hot nor very cold) and the temperature of water increases too much due to global warming, then most of these bacteria will not be able to tolerate excessive heat and hence die. But some bacteria which had variations to resist heat would survive and grow further.

NCERT Book, Page 133

Q. 1. How does binary fission differ from multiple fission ?

Ans. In binary fission, the parent organism splits (or divides) to form two new organisms. On the other hand, in multiple fission the parent organism splits (or divides) to form many new organisms simultaneously. *Amoeba* reproduces by the process of binary fission whereas the malarial parasite *Plasmodium* reproduces by the process of multiple fission.

Q. 2. How will an organism be benefitted if it reproduces through spores ?

Ans. The reproduction by spores takes place in plants. Spores are covered by hard protective coat which enables them to survive under unfavourable conditions like lack of food, lack of water and extreme temperatures. But when the conditions become favourable (food and water are available, and temperature is suitable), then the spores can grow to produce new plants. Thus, the reproduction by spores benefits the plants because by surviving under adverse conditions, the spores make these plants live for ever.

Q. 3. Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration ?

Ans. In complex multicellular organisms, specialised cells make up tissues; tissues make up organs; organs make up organ systems; and finally organ systems make up organisms. Since

complex multicellular organisms have a very high degree of organisation in their body, they cannot be reproduced from their cut body parts by the process of regeneration. For example, a dog is a complex multicellular organism which cannot be regenerated from its cut body part say, a cut tail. This is because the cells present in the cut tail of a dog cannot produce dog's organs like heart, brain, lungs, stomach, intestines and limbs, etc., needed for the making of a complete dog. The complex multicellular organisms need more complex ways of reproduction like sexual reproduction.

Q. 4. Why is vegetative propagation practised for growing some types of plants ?

Ans. Vegetative propagation is practised for growing some type of plants because it has the following advantages :

(*i*) All the plants produced by vegetative propagation are genetically similar enough to the parent plant to have all its characteristics.

(*ii*) The fruit trees grown from seeds may take many years before they start to bear fruits. But the fruit trees grown by vegetative propagation methods like cuttings or by grafting start to bear fruits much earlier (only after a few growing seasons).

(*iii*) The plants grown by vegetative propagation usually need less attention in their early years than the plants grown from seeds.

(*iv*) Many plants can be grown from just one parent plant by artificial propagation.

(*v*) Vegetative propagation makes possible the propagation of plants such as banana, rose, jasmine and orange that have lost the capacity to produce viable seeds.

Q. 5. Why is DNA copying an essential part of the process of reproduction ?

Ans. DNA contains information for the inheritance of characteristics from the parents to the next generation. DNA copying is an essential part of the process of reproduction because it makes possible the transmission of characteristics of the parents to its offsprings in the next generation.

NCERT Book, Page 140

Q. 1. How is the process of pollination different from fertilisation ?

Ans. Pollination is the transfer of pollen grains from the anther of stamen of a flower to the stigma of a carpel in the same flower or another flower of the same species. On the other hand, fertilisation occurs when the male gamete present in the pollen grain joins with the female gamete (or egg) present in ovule to form a zygote.

Q. 2. What is the role of seminal vesicles and prostrate gland ?

Ans. Seminal vesicles and prostrate gland occur in male reproductive system. The seminal vesicles and prostrate gland add their secretions to the vas deferens which carries sperms from the testes. The secretions of seminal vesicles and prostrate gland provide nutrition to the sperms and also make their further transport easier.

Q. 3. What are the changes seen in girls at the time of puberty ?

Ans. The various changes which occur in girls at puberty are : Hair grow under armpits and pubic region. Mammary glands (or breasts) develop and enlarge. The hips broaden. Extra fat is deposited in various parts of the body like hips and thighs. Fallopian tubes, uterus and vagina enlarge. Ovaries start to release eggs. Menstruation (monthly periods) starts. Feelings and sexual drives associated with adulthood begin to develop.

Q. 4. How does the embryo get nourishment inside the mother's body ?

Ans. The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. Placenta is a disc-shaped tissue which is embedded in the uterus wall (uterine wall). It has villi on the embryo side of the tissue. On the mother's side are blood spaces which

surround the villi. Placenta provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The developing embryo also produces waste substances which can be removed by transferring them into the mother's blood through the placenta.

Q. 5. If a woman is using a copper-T, will it help in protecting her from sexually transmitted diseases ?

Ans. No, the use of copper-T for contraception will not protect a woman from sexually transmitted diseases.

NCERT Book, Page 141

Q. 1. Asexual reproduction takes place through budding in :

(*a*) amoeba
(*b*) yeast
(*c*) plasmodium
(*d*) leishmania

Ans. (*b*) yeast

Q. 2. Which of the following is not a part of the female reproductive system in human beings ?

(*a*) ovary
(*b*) uterus
(*c*) vas deferens
(*d*) fallopian tube

Ans. (*c*) vas deferens

Q. 3. The anther contains :

(*a*) sepals
(*b*) ovules
(*c*) carpel
(*d*) pollen grains

Ans. (*d*) pollen grains

Q. 4. What are the advantages of sexual reproduction over asexual reproduction ?

Ans. (*i*) Sexual reproduction combines DNA from two individuals (male and female) due to which the offspring has a lot of variations. On the other hand, in asexual reproduction, only the DNA of one individual is copied due to which the variations in the offspring are extremely small.

(*ii*) Due to lot of variations sexual reproduction allows species to change to more advanced forms from one generation to the next and speed up evolution. On the other hand, asexual reproduction does not allow a species to change much from one generation to the next and hence evolution becomes very, very slow.

Q. 5. What are the functions performed by testes in human beings ?

Ans. The function of testes is to make male sex cells (or male gametes) called sperms and also to make the male sex hormone called testosterone. The testosterone hormone brings about changes seen in the appearance of boys at the time of puberty such as deeper voice, beard, moustache, and more body hair (than girls).

Q. 6. Why does menstruation occur ?

Ans. Since the ovary of a woman releases one egg (or ovum) every month, therefore, the uterus also prepares itself every month to receive a fertilised egg (if formed). In this process, the inner lining of the uterus becomes thick and soft with lots of blood capillaries (blood vessels) in it. This preparation in uterus is necessary because in case the egg is fertilised by a sperm, then the uterus has to keep this fertilised egg and nourish it to develop it into a baby. If, however,

the egg released by the ovary is not fertilised, then the thick lining of the uterus is not needed. So, the uterus lining breaks down and comes out through the vagina in the form of blood and mucous. This is called menstruation.

Q. 7. Draw a labelled diagram of the longitudinal section of a flower.

Ans. See Figure 43 on page 150 of this book.

Q. 8. What are the different methods of contraception ?

Ans. The various methods of contraception (preventing pregnancy in woman) are : Barrier methods, Chemical methods, use of Loop or Copper–T, and Surgical methods.

(*i*) In the barrier methods of preventing pregnancy, the physical devices such as condoms and diaphragm (or cap) are used. Condoms are used by males (by putting them as a covering on the penis). Diaphragm (or cap) is used by females (by putting it in the vagina to cover the cervix). Condom as well as diaphragm prevent the sperms from meeting the ovum (or egg) by acting as a barrier between them.

(*ii*) In the chemical methods of preventing pregnancy, the females use oral pills. The oral pills contain hormones which stop the ovaries from releasing ovum (or eggs) into the oviduct.

(*iii*) The loop or copper–T are also very effective in preventing pregnancy. A loop or copper–T is placed inside the uterus by a doctor or a trained nurse. The loop or copper–T prevents the implantation of fertilised egg in the uterus. Loop and copper–T are called intra-uterine contraceptive devices (IUCD).

(*iv*) Surgical methods of birth control are available for males as well as females. In males, a small portion of the sperm duct (or vas deferens) is removed by surgical operation and both the cut ends are ligated (or tied) properly. This prevents the sperms from coming out. The surgical procedure carried out in males is called ‘vasectomy’. In females, a small portion of the oviducts is removed by surgical operation and the cut ends are ligated (or tied). This prevents the ovum (or egg) from entering into the oviducts. The surgical procedure carried out in females is called tubectomy.

Q. 9. How are the modes of reproduction different in unicellular and multicellular organisms ?

Ans. (*a*) Most of the unicellular organisms (such as protozoa and bacteria) reproduce by the asexual process of ‘fission’. In this process, mere cell division leads to the creation of new individuals.

(*b*) In simple multicellular organisms, reproduction occurs by asexual methods such as budding, spore formation, fragmentation and regeneration, etc. But in complex multicellular organisms, reproduction takes place by sexual methods involving gametes (sex cells) from two parents — a male and a female.

Q. 10. How does reproduction help in providing stability to populations of species ?

Ans. The process of reproduction introduces some variations in the individual organisms of a species. The variations introduced in some individual organisms may enable them to survive even in adverse environmental conditions such as excessive heat or cold or shortage of water, etc. (when most other members of the species will die). In this way, the introduction of variations during reproduction provides stability to the populations of various species by preventing some of their individuals from getting wiped out during adverse environmental conditions.

Q. 11. What could be the reasons for adopting contraceptive methods ?

Ans. (*i*) The use of contraceptive methods helps in family planning (birth control). By adopting contraceptive methods, a couple can avoid unwanted pregnancy. They can choose how many children to have and when to have them. A couple can also space the birth of children properly by using contraceptive methods.

(*ii*) Some of the contraceptive methods (like the use of condom) also provide protection to a person from sexually transmitted diseases.

Chapter : HEREDITY AND EVOLUTION

NCERT Book, Page 143

Q. 1. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier ?

Ans. The trait B which exists in 60% of the population is likely to have arisen earlier. This is because the traits (or variations) produced in an organism during successive generations get accumulated in the populations of the species.

Q. 2. How does the creation of variations in a species promote its survival ?

Ans. Due to the creation of variations, a species can adjust to the changing environment around it. And this promotes the survival of the species in the changing environment. For example, the accumulation of 'heat resistant' variation (or trait) in some bacteria will ensure its survival even when the temperature in its environment rises too much due to a heat wave or some other reasons. On the other hand, the bacteria which did not have this variation to withstand heat would not survive under these circumstances and die.

NCERT Book, Page 147

Q. 1. How do Mendel's experiments show that traits may be dominant or recessive ?

Ans. Mendel first crossed pure-bred tall pea plants with pure-bred dwarf pea plants and found that only tall pea plants were produced in the first generation or F_1 generation (see Figure 1). No dwarf pea plants (or short pea plants) were obtained in the first generation of progeny. From this Mendel concluded that the first generation (or F_1 cross) showed the traits of only one of the parent plants : tallness. The trait of other parent plant, dwarfness, did not show up in the progeny of first generation.

Mendel then crossed the tall pea plants of the first generation (F_1 generation) and found that tall plants and dwarf plants were obtained in the second generation (or F_2 generation) in the ratio of 3 : 1. In other words, in the F_2 generation, three-fourth plants were tall and one-fourth were dwarf (see Figure 2). Mendel noted that the dwarf trait of the parent pea plant which had seemingly disappeared in the first generation progeny, reappeared in the second generation. Mendel said that the trait of dwarfness of one of the parent pea plant had not been lost, it was merely concealed or supressed in the first generation to re-emerge in the second generation. Mendel called the repressed trait of 'dwarfness' as 'recessive trait' and the expressed trait of 'tallness' as the 'dominant trait'. In this way, Mendel's experiments with tall and dwarf pea plants showed that the traits may be *dominant* or *recessive*.

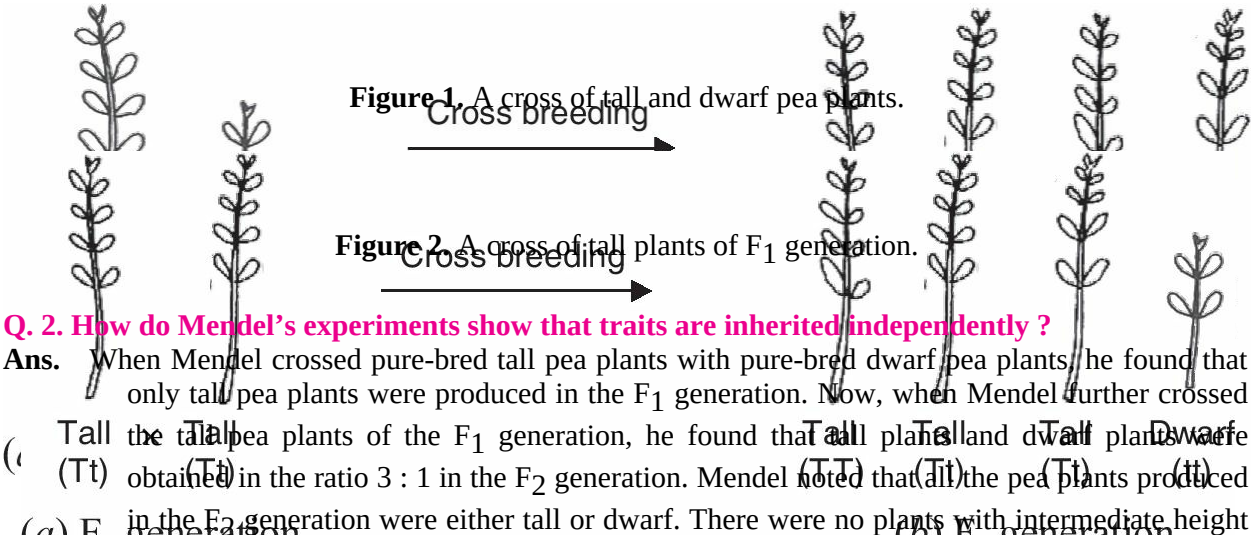


Figure 1. A cross of tall and dwarf pea plants.

Figure 2. A cross of tall plants of F_1 generation.

Q. 2. How do Mendel's experiments show that traits are inherited independently ?

Ans. When Mendel crossed pure-bred tall pea plants with pure-bred dwarf pea plants, he found that only tall pea plants were produced in the F_1 generation. Now, when Mendel further crossed the tall pea plants of the F_1 generation, he found that tall plants and dwarf plants were obtained in the ratio 3 : 1 in the F_2 generation. Mendel noted that all the pea plants produced in the F_2 generation were either tall or dwarf. There were no plants with intermediate height (or medium height) in-between the tall and dwarf plants. In this way, Mendel's experiment showed that the traits (like tallness and dwarfness) are inherited independently. This is because if the traits of tallness and dwarfness had blended (or mixed up), then medium sized pea plants would have been produced.

Q. 3. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits — blood group A or O— is dominant ? Why or why not ?

Ans. No, this information is not enough to tell us which of the traits, blood group A or blood group O, is dominant. This is because :

(*i*) if the blood group A is dominant trait and blood group O is recessive trait, the daughter can have blood group O, and

(*ii*) even if the blood group A is recessive trait but blood group O is dominant trait, the daughter can still have blood group O.

Let us discuss these two possibilities in detail.

Possibility 1 : **When blood group A is dominant trait but blood group O is recessive trait**

When father's blood group A is dominant trait, it can have two genotypes : I^AI^A and I^AI^O. And when mother's blood group O is recessive trait it can have only one genotype : I^OI^O (because it should have two recessive alleles). Now, if one recessive allele I^O comes from father and one recessive allele I^O comes from mother, then the daughter can also have the genotype I^OI^O which can give her blood group O.

Possibility 2 : **When blood group A is recessive trait but blood group O is dominant trait**

When father's blood group A is recessive trait, it can have only one genotype: I^A I^A (because it should have two recessive alleles). And when mother's blood group O is dominant trait, then it can have two genotypes : I^OI^O and I^OI^A. Now, if one dominant allele I^O comes from the mother and one recessive allele I^A comes from the father, the daughter will have the genotype I^OI^A which will again give her blood group O.

Q. 4. How is the sex of the child determined in human beings ?

Ans. Genetics is involved in the determination of the sex of a child. This can be explained as follows : The chromosomes which determine the sex of a child are called sex chromosomes. There are two types of sex chromosomes, one is called X chromosome and the other is called Y

chromosome.

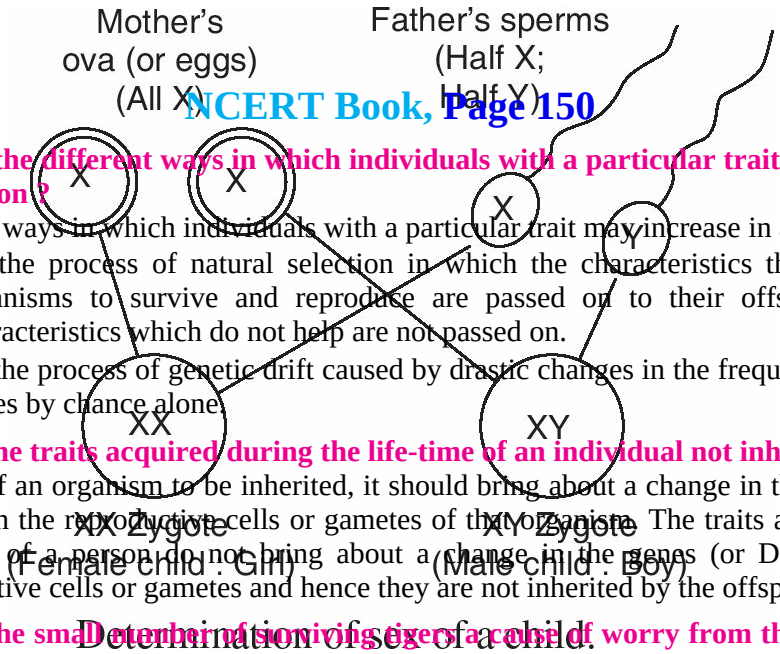
(*i*) A male (man or father) has one X chromosome and one Y chromosome. This means that half the male gametes or half the sperms will have X chromosomes and the other half will have Y chromosomes.

(*ii*) A female (woman or mother) has two X chromosomes (but no Y chromosomes). This means that all the female gametes called ova (or eggs) will have only X chromosomes.

The sex of a child depends on what happens at fertilisation :

(*a*) If a sperm carrying X chromosome fertilises an ovum (or egg) which carries X chromosome, then the child born will be a girl (or female). This is because the child will have XX combination of sex chromosomes.

(*b*) If a sperm carrying Y chromosome fertilises an ovum (or egg) which carries X chromosome, then the child born will be a boy (or male). This is because the child will have XY combination of sex chromosomes.



Determination of sex of a child.

NCERT Book, Page 150

Q. 1. What are the different ways in which individuals with a particular trait may increase in a population ?

Ans. The various ways in which individuals with a particular trait may increase in a population are :

(*i*) By the process of natural selection in which the characteristics that help individual organisms to survive and reproduce are passed on to their offsprings, and those characteristics which do not help are not passed on.

(*ii*) By the process of genetic drift caused by drastic changes in the frequencies of particular genes by chance alone.

Q. 2. Why are the traits acquired during the life-time of an individual not inherited ?

Ans. For a trait of an organism to be inherited, it should bring about a change in the genes (or DNA) present in the reproductive cells or gametes of that organism. The traits acquired during the life-time of a person do not bring about a change in the genes (or DNA) present in its reproductive cells or gametes and hence they are not inherited by the offsprings.

Q. 3. Why are the small number of surviving tigers a cause of worry from the point of view of genetics ?

Ans. Sometimes a species (a type of animal or plant) may completely die out. It may become extinct. Once a species is extinct, its genes are lost for ever. It cannot re-emerge at all. The small numbers of surviving tigers are a cause of worry from the point of view of genetics because if they all die out and become extinct, their genes will be lost for ever. Our coming generations will not be able to see tigers at all.

NCERT Book, Page 151

Q. 1. What factors could lead to the rise of a new species ?

Ans. The important factors which could lead to the rise (or formation) of a new species are the following :

(*i*) Geographical isolation of a population caused by various types of barriers (such as mountain ranges, rivers and sea). The geographical isolation leads to reproductive isolation due to which there is no flow of genes between separated groups of population.

(*ii*) Genetic drift caused by drastic changes in the frequencies of particular genes by chance

alone.

(*iii*) Variations caused in individuals due to natural selection.

Q. 2. Will geographical isolation be a major factor in the speciation of a self-pollinating plant species ? Why or why not ?

Ans. Geographical isolation will not be a major factor in the speciation of a self-pollinating plant because it does not depend on other plants for its process of reproduction to be carried out.

Q. 3. Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually ? Why or why not ?

Ans. Geographical isolation cannot be a major factor in the speciation of an asexually reproducing organism because it does not require any other organism to carry out reproduction.

NCERT Book, Page 156

Q. 1. Give an example of the characteristics being used to determine how close two species are in evolutionary terms.

Ans. The changes in DNA during reproduction are mainly responsible for evolution. The changes which take place in the DNA of species go on accumulating from one generation to the next. So, if the changes in the DNA of any two species are less, then the two species are quite close to one another in evolutionary terms. But if the changes in the DNA of two species are much more, then the two species will be far apart from one another in evolutionary terms. Thus, it is the characteristic of the extent of change in the DNA which is being used to determine how close two species are in evolutionary terms.

Q. 2. Can the wings of a butterfly and the wings of a bat be considered homologous organs ? Why or why not ?

Ans. The wings of a butterfly and the wings of a bat cannot be considered homologous organs because though the function of wings in both cases is the same (flying) but they have different basic design. The butterfly (which is an insect) has a fold of membranes as wings which are associated with a few muscles but no bones are present. On the other hand, a skeleton made of bones supports the bat's wings.

Q. 3. What are fossils ? What do they tell us about the process of evolution ?

Ans. The remains (or impressions) of dead animals or plants that lived in the remote past are known as fossils. The fossils provide evidence for evolution. For example, a fossil bird called *Archaeopteryx* looks like a bird but it has many other features which are found in reptiles. This is because *Archaeopteryx* has feathered wings like those of birds but teeth and tail like those of reptiles. *Archaeopteryx* is, therefore, a connecting link between the reptiles and birds, and hence suggests that the birds have evolved from the reptiles. Thus, fossils provide the evidence that the present animals (and plants) have originated from the previously existing ones through the process of continuous evolution.

NCERT Book, Page 158

Q. 1. Why are human beings who look so different from each other in terms of size, colour and looks said to belong to the same species ?

Ans. The human beings who look so different from each other in terms of size, colour and looks are said to belong to the same species (*Homo sapiens*) because they can interbreed to produce fertile offsprings (sons and daughters).

Q. 2. In evolutionary terms can we say which among bacteria, spiders, fish and chimpanzees have a 'better' body design? Why or why not ?

Ans. In evolutionary terms, we can say that bacteria has a 'better' body design than spiders, fish, and chimpanzees. This is because though bacteria is one of the simplest and primitive life forms but it still inhabits and survives in some of the most inhospitable (most unfavourable) habitats such as hot springs, deep-sea thermal vents and ice in Antarctica. Most other organisms (including spider, fish and chimpanzees) cannot survive in such harsh environments.

NCERT Book, Page 159

Q. 1. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short. This suggests that the genetic make up of the tall parent can be depicted as :

(*a*) TTWW
(*b*) TTww
(*c*) TtWW
(*d*) TtWw

Give reason for your choice.

Ans. (*c*) TtWW.

Explanation : T is the gene for tallness, t is the gene for shortness (or dwarfness), W is the gene for violet colour and w is the gene for white colour. Now, in this case, all the progeny bore violet flowers, so the parent tall plant must contain only the dominant genes for colour (which is violet colour). That is, the parent plant should have the gene pair WW. Again, since almost half of progeny plants were short, this means that the parent tall plant should contain genes for tallness as well as shortness. That is, the parent plant should have genes Tt in it. Now, combining Tt and WW, the genetic make up of the parent plant becomes TtWW.

Q. 2. An example of homologous organs is :

(*a*) Our arm and a dog's foreleg
(*b*) Our teeth and an elephants' tusks
(*c*) potato and runners of grass
(*d*) all of the above

Ans. (*d*) all of the above

Q. 3. In evolutionary terms, we have more in common with :

(*a*) a Chinese school boy
(*b*) a chimpanzee
(*c*) a spider
(*d*) a bacterium

Ans. (*a*) a Chinese school boy.

Q. 4. A study found that children with light coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive ? Why or why not ?

Ans. Just on the basis of the statement that children with light-coloured eyes are likely to have parents with light-coloured eyes, we cannot say whether the light eye colour trait is dominant or recessive. This is because two copies of a trait (say eye colour) are inherited from both parents (one from father and the other from mother) and unless we know the nature of the two eye-colour traits, we cannot tell which is dominant and which is recessive. Recessive traits appear only when both the parents contribute recessive genes. So, from the statement given here we can only presume that both the parents are contributing recessive genes.

Q. 5. How are the areas of study–evolution and classification–interlinked ?

Ans. The classification of organisms is a reflection of their evolutionary relationships. Classification is based on similarities and differences amongst organisms :

(*i*) The more characteristics two organisms have in common, the more closely they are related. And the more closely they are related, the more recently they will have had a common ancestor in the evolutionary chain.

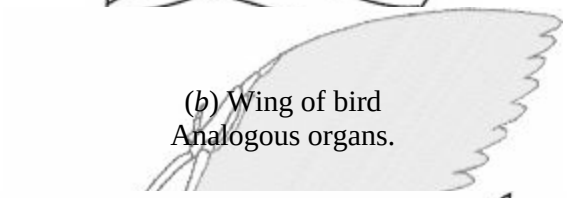
(*ii*) The more different characteristics two organisms have, the more remotely they are related. And the more remotely they are related, they will have had a common ancestor in the more remote past.

Q. 6. Explain the terms analogous and homologous organs with examples.

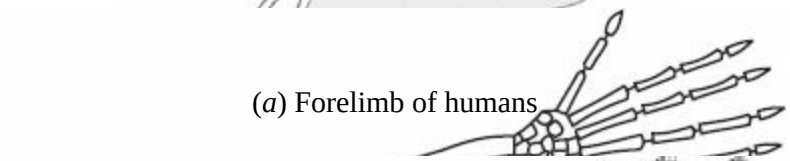
Ans. Those organs which have different basic structure (or different basic design) but have similar appearance and perform similar functions are called analogous organs. The wings of an insect and the wings of a bird are analogous organs. The wings of an insect and a bird have different structures (the insects have a fold of membranes as wings which are associated with a few muscles whereas a skeleton of bones, flesh and feathers support bird's wings) but they perform the same function of flying.

Those organs which have the same basic structure (or same basic design) but different functions are called homologous organs. The forelimbs of humans (man) and a lizard are homologous organs. Both these organs have the same basic design of bones but they perform different functions. The forelimbs of a human (man) are used for grasping whereas the forelimbs of a lizard are used for running.

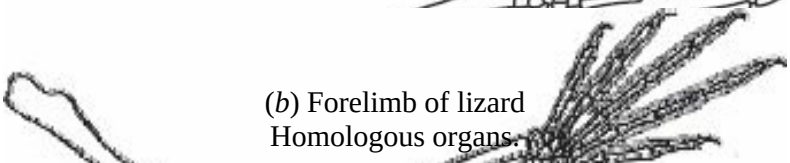
(*a*) Wing of insect



(*b*) Wing of bird
Analogous organs.



(*a*) Forelimb of humans



(*b*) Forelimb of lizard
Homologous organs.

Q. 7. Outline a project which aims to find the dominant coat colour in dogs.

Ans. In order to find the dominant coat colour (or dominant hair colour) in dogs, we should first select pure-bred male and female dogs having black colour and pure-bred male and female dogs having brown colour. Then :

(*i*) cross the pure-bred black male dog with pure-bred brown female dog

(*ii*) also, cross the pure-bred brown male dog with pure-bred black female dog Observe the coat colour (or hair colour) of progeny (or puppies) produced.

(*a*) If all the progeny (or puppies) are black in colour, then black will be the dominant coat colour in dogs.

(*b*) If, however, all the progeny (or puppies) are brown in colour, then brown will be the dominant coat colour in dogs.

Q. 8. Explain the importance of fossils in deciding evolutionary relationships.

Ans. The importance of fossils in deciding evolutionary relationships is that they provide evidence that the present animals (and plants) have originated from the previously existing animals (and plants) through the process of continuous evolution. For example, a fossil bird called *Archaeopteryx* looks like a bird but it has many other features which are found in reptiles. This is because *Archaeopteryx* has feathered wings like those of birds but teeth and tail like those of reptiles. *Archaeopteryx* is, therefore, a connecting link between the reptiles and birds, and hence suggests that the birds have evolved from the reptiles.

Q. 9. What evidence do we have for the origin of life from inanimate matter (lifeless matter) ?

Ans. The British Scientist J.B.S. Haldane suggested in 1929 that life must have originated from inanimate matter (lifeless matter) consisting of simple inorganic molecules such as methane, ammonia and hydrogen sulphide, etc., which were present on the earth soon after it was formed. The evidence for the origin of life from inanimate matter was provided by the experiments conducted by Stanley L. Miller and Harold C. Urey in 1953. They assembled an apparatus to create an early earth atmosphere which was supposed to consist of gases like methane, ammonia and hydrogen sulphide, etc., (but no oxygen), over water. This was maintained at a temperature just below 100°C and electric sparks were then passed through the mixture of gases (to simulate lightning) for about one week. At the end of one week, it was found that about 15 per cent of carbon (from methane) had been converted into simple compounds of carbon including 'amino acids' which make up protein molecules found in living organisms. This experiment provides the evidence that the life originated from inanimate matter (or lifeless matter) like inorganic molecules.

Q. 10. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually ?

Ans. (*a*) The asexual reproduction gives rise to small variations because in this process the DNA of only one parent is copied. Due to this, the offsprings produced look almost the same. For example, sugarcane reproduces by the process of asexual reproduction, so if we observe a field of sugarcane, we will find very little variations in various sugarcane plants. All the sugarcane plants look alike. On the other hand, sexual reproduction gives rise to large variations because in this process DNA from the gametes of two parents (male and female) is combined together. For example, it is due to the large variations produced by sexual reproduction that no two human beings look alike (except identical twins).

(*b*) The large genetic variations produced during sexual reproduction lead to the continuous evolution of those organisms which reproduce sexually. In fact, sexual reproduction plays an important role in the origin of new species having different characteristics. All this is not possible in the case of asexual reproduction.

Q. 11. How is the equal genetic contribution of male and female parents ensured in the progeny ?

Ans. The equal genetic contribution of male and female parents in a progeny is ensured through the special type of reproductive cells (called gametes) which have only half the amount of DNA as compared to other body cells (called non-reproductive cells). So, when the gametes from male and female parents combine during sexual reproduction to form a fertilised egg called zygote, they contribute equal amount of DNA (half each). For example, the normal body cells of human beings contain 46 chromosomes each (made of DNA). Now, the human sperm cell (or male gamete) has 23 chromosomes and the human egg cell (or female gamete)

has also 23 chromosomes. So, the combination of 23 chromosomes from male and an equal number of 23 chromosomes from female during sexual reproduction ensures equal genetic contribution of male and female parents in the progeny (to give 23 + 23 = 46 chromosomes).

Q. 12. Only variations that confer advantage to an individual organism will survive in a population. Do you agree with this statement ? Why or why not ?

Ans. Yes, only those variations that confer advantage to an individual organism will survive in a population. This will become clear from the following example. Suppose there is a population of red beetles in the green bushes and a colour variation arises during reproduction so that one beetle is now green in colour (instead of red). This variation offers advantage of survival because the green beetle can mix up with green bushes, it cannot be spotted and eaten up by a crow and hence its population will increase. If, however, the variation had produced a blue coloured beetle, then this colour could not offer any survival advantage because blue beetle in green bushes could be easily spotted by a crow and eaten by it.

Chapter : OUR ENVIRONMENT

NCERT Book, Page 257

Q. 1. Why are some substances biodegradable and some non-biodegradable ?

Ans. The micro-organisms like bacteria and other decomposer organisms (called saprophytes) present in our environment are 'specific' in their action. They break down the natural substances or products made from natural substances (like dead remains of plants and animals, and their waste products, paper, etc.) but do not break down man-made substances such as plastics, metals and glass objects, etc. So, it is due to the property of decomposer organisms of being specific in their action that some waste substances are biodegradable whereas some are non-biodegradable.

Q. 2. Give any two ways in which biodegradable substances would affect the environment.

Ans. (*i*) The rotting biodegradable wastes (like rotting plant and animal wastes) act as breeding grounds for flies and cockroaches. These flies and cockroaches carry germs and spread various diseases to people living in that area.

(*ii*) The rotting biodegradable wastes emit foul smell in the environment which makes the life of people in the area miserable.

Q. 3. Give any two ways in which non-biodegradable substances would affect the environment.

Ans. (*i*) Some of the non-biodegradable wastes (such as pesticides like DDT and metals like mercury) enter the food chain of humans. These non-biodegradable wastes get concentrated in human beings and damage their health in the long run.

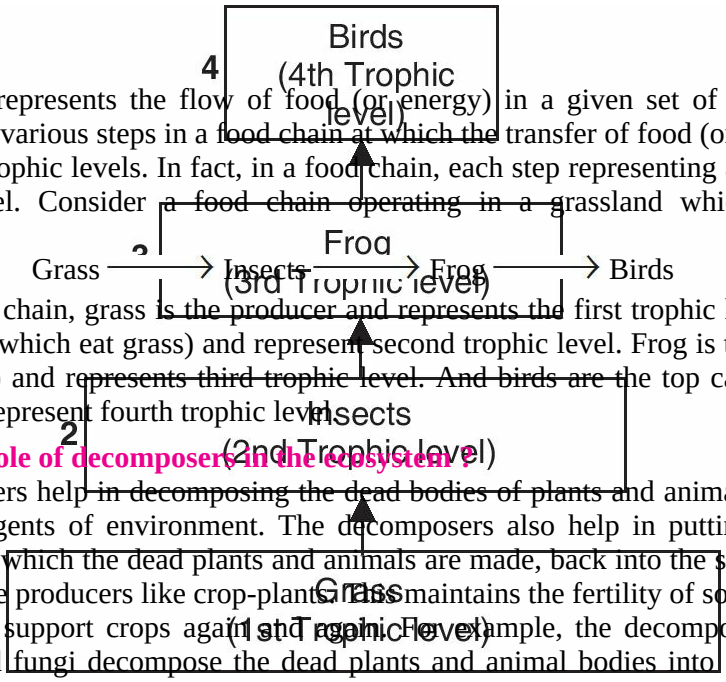
(*ii*) The excessive use of non-biodegradable fertilisers in agriculture makes the soil either too much acidic or too much alkaline. When the soil becomes too acidic or too alkaline, the crop yield is reduced.

(*iii*) The dumping of non-biodegradable wastes like plastic, glass and metal objects here and there acts as an eyesore and spoils the environment.

NCERT Book, Page 261

Q. 1. What are trophic levels ? Give an example of a food chain and state the different trophic levels in it.

Ans. A food chain represents the flow of food (or energy) in a given set of organisms or living beings. The various steps in a food chain at which the transfer of food (or energy) takes place are called trophic levels. In fact, in a food chain, each step representing an organism forms a trophic level. Consider a food chain operating in a grassland which consists of four organisms :



In this food chain, grass is the producer and represents the first trophic level. Insects are the herbivores (which eat grass) and represent second trophic level. Frog is the carnivore (which eats insects) and represents third trophic level. And birds are the top carnivores (which eat frogs) and represent fourth trophic level.

Q. 2. What is the role of decomposers in the ecosystem ?

Ans. The decomposers help in decomposing the dead bodies of plants and animals, and hence act as cleansing agents of environment. The decomposers also help in putting back the various elements of which the dead plants and animals are made, back into the soil, air and water for re-use by the producers like crop-plants. This maintains the fertility of soil and the soil would continue to support crops again and again. For example, the decomposers like putrefying bacteria and fungi decompose the dead plants and animal bodies into ammonia (and other simpler substances). This ammonia is converted into nitrates by the nitrifying bacteria present in soil. These nitrates act as fertilizer in the soil and are again absorbed by the plants for their growth.

NCERT Book, Page 264

Q. 1. What is ozone and how does it affect any ecosystem ?

Ans. Ozone is a gas made up of three atoms of oxygen joined together. The molecular formula of ozone is O_3. Ozone is formed high up in the atmosphere by the action of ultraviolet radiations (coming from the sun) on the oxygen gas. The ozone layer present high up in the atmosphere protects all forms of life on earth by absorbing harmful ultraviolet radiations coming from the sun. Certain chemicals like chlorofluorocarbons (CFCs) which are widely used in refrigeration, fire extinguishers and aerosol sprayers reach the upper atmosphere and react with ozone gas present in ozone layer and destroy it gradually. Due to this the ozone layer in the upper atmosphere is becoming thinner, allowing more harmful ultraviolet rays to pass through it and reach the earth. Thus, due to the depletion of ozone layer caused by chlorofluorocarbons, more ultraviolet rays reach the earth. These ultraviolet rays can cause skin cancer, cataract in the eyes and damage immune system of human beings. They also harm animals and plants.

Q. 2. How can you help in reducing the problem of waste disposal ? Give any two methods.

Ans. The two methods which can help in reducing the problem of waste disposal are : recycling, and preparation of compost. These are described below.

(*i*) The solid wastes like paper, plastics, glass and metals, etc., are recycled. For example, waste paper is sent to paper mills where it is reprocessed to form new paper once again. The broken plastic articles like plastic bags, buckets, bowls, cups, plates, etc., are sent to plastic processing factories where they are melted and remoulded to make new articles. Similarly, waste metal articles are sent to metal industries where they are melted and recycled as solid metal for various purposes.

(*ii*) Biodegradable domestic wastes such as left-over food, fruit and vegetable peels, and leaves of potted plants, etc., can be converted into compost by burying in a pit dug into

ground, and used as manure.

NCERT Book, Pages 264 and 265

Q. 1. Which of the following groups contain only biodegradable items ?

(*a*) Grass, flowers and leather
(*b*) Grass, wood and plastic
(*c*) Fruit peels, cake and lime juice
(*d*) Cake, wood and grass

Ans. (*a*), (*c*) and (*d*).

Q. 2. Which of the following constitute a food chain ?

(*a*) Grass, wheat and mango
(*b*) Grass, goat and human
(*c*) Goat, cow and elephant
(*d*) Grass, fish and goat

Ans. (*b*) Grass, goat and human

Q. 3. Which of the following are environment-friendly practices ?

(*a*) Carrying cloth bags to put purchases in while shopping
(*b*) Switching off unnecessary lights and fans
(*c*) Walking to school instead of getting your mother to drop you on her scooter
(*d*) All of the above

Ans. (*d*) All of the above.

Q. 4. What will happen if we kill all the organisms in one trophic level ?

Ans. If we kill all the organisms in one trophic level, then transfer of food (and energy) to the next trophic level will stop due to which the organisms of next trophic level will starve and die or migrate to other areas. The killing of all the organisms in one trophic level will also lead to the overpopulation of organisms in the previous trophic level. These effects will cause an imbalance in the ecosystem. For example, if we kill all the herbivorous animals like deer, rabbits, etc., in a forest, then the carnivorous animals like lions, tigers, etc., will not get food. Due to this, the lions and tigers, etc., will starve and die or migrate from forest and go towards human settlements and attack people. Moreover, in the absence of herbivores like deer, rabbits, etc., the population of the previous trophic level 'plants' (or vegetation) will increase too much (because there are no deer or rabbits to eat them). All these effects will create an imbalance in the ecosystem.

Q. 5. Will the impact of removing all the organisms in a trophic level be different for different trophic levels ? Can the organisms of any trophic level be removed without causing any damage to the ecosystem ?

Ans. (*a*) Yes, the impact of removing all the organisms in a trophic level will be different for different trophic levels. For example, in the food chain : Grass $\longrightarrow$ Deer $\longrightarrow$ Lion :

(*i*) If we remove all the lions at the third trophic level, then the number of deer will increase too much. All these deer will eat up all the grass and other plants turning the forest into a desert.

(*ii*) If we remove all the deer at the second trophic level, then lions will not get sufficient food, they will starve and die. Deer eat grass and other green plants, so the amount of grass and other green plants will increase too much.

(*b*) No, all the organisms of any trophic level cannot be removed without causing any damage to the ecosystem.

Q. 6. What is biological magnification ? Will the level of this magnification be different at

different levels of the ecosystem ?

Ans. (*a*) The harmful chemicals like pesticides enter the food chain at the producer level (plant level) and in the process of transfer of food through food chains these harmful chemicals get concentrated at each trophic level. The increase in concentration of harmful chemical substances like pesticides in the body of living organisms at each trophic level of a food chain is called biological magnification. Pesticides are non-biodegradable chemicals, so they get accumulated at each trophic level.

(*b*) Yes, the level of biological magnification is different for different trophic levels of an ecosystem. For example, in the food chain : Plants → Goat → Man, the harmful chemicals enter into plants from soil and water. When goat eats these plants, the chemicals enter into goat's body. And ultimately when a non-vegetarian man eats the goat meat, the harmful chemicals are transferred to his body. The level or concentration of the harmful chemicals increases with increasing trophic level. In the above given food chain, the concentration of harmful chemicals is minimum in the plants, higher in the goat and maximum in man.

Q. 7. What are the problems caused by the non-biodegradable wastes that we generate ?

Ans. The non-biodegradable wastes cannot be made less toxic easily, so they cause a lot of problems for us as well as the environment. For example :

(*i*) Some of the non-biodegradable wastes (such as pesticides like DDT and metals like mercury) enter the food chain of humans. These non-biodegradable wastes get concentrated in human beings and damage their health in the long run.

(*ii*) The excessive use of non-biodegradable fertilisers in agriculture makes the soil either too much acidic or too much alkaline. When the soil becomes too acidic or too alkaline, the crop yields is reduced.

Q. 8. If all the waste we generate is biodegradable, will this have no impact on the environment ?

Ans. Even if all the waste we generate is biodegradable, it will have an impact on the environment. This is because too much biodegradable waste cannot be broken down into harmless simpler substances by the decomposers like micro-organisms at the right time. Due to this, the biodegradable wastes will go on accumulating in the environment and act as pollutants resulting in harmful effects on the environment. For example, the rotting biodegradable wastes act as breeding grounds for flies and cockroaches, etc., which spread diseases. Moreover, the rotting biodegradable wastes emit foul smell in the environment which makes the life of people miserable.

Q. 9. Why is the damage to the ozone layer a cause for concern ? What steps are being taken to limit this damage ?

Ans. The ozone gas layer high up in the atmosphere is very important for the existence of life on earth because it absorbs most of the harmful ultraviolet radiations coming from the sun and prevents them from reaching the earth. The damage to the ozone layer is a cause for concern because damage to ozone layer will make it thinner which will allow much more harmful ultraviolet radiations (coming from the sun) to reach the earth. These ultraviolet radiations can then cause skin cancer in humans. They can also damage the eyes by causing an eye disease called cataract. Ultraviolet rays damage immune system by lowering the body's resistance to diseases. They also damage crop plants. In fact, if too much damage occurs to the ozone layer and it disappears completely, then all the life on the earth would be destroyed gradually. The depletion of ozone layer is due to the use of chemicals called chlorofluorocarbons (CFCs) in refrigeration, fire extinguishers and aerosol sprayers. So, in 1987, in an attempt to protect ozone layer, the United Nations Environment Programme (UNEP) forged an agreement among its member countries to freeze CFC production at 1986

levels. The chlorofluorocarbons (CFCs) are now being replaced by hydroflurorocarbons (HFCs) which do not damage the ozone layer.

Chapter : MANAGEMENT OF NATURAL RESOURCES

NCERT Book, Page 269

Q. 1. What changes can you make in your habits to become more environment friendly ?

Ans. We can make the following changes in our habits to become more environment friendly :

(*i*) Switch off the lights, fans, TV, geyser and other electrical appliances when not needed.

(*ii*) Stop using polythene bags and start using bags made of cloth or jute.

(*iii*) Start going to nearby school on bicycle instead of asking parents to drop us on scooter or car.

(*iv*) Stop using any products made of animal skin, fur or ivory.

(*v*) Collect used articles made of paper, plastic, glass and metals, and send them for recycling.

Q. 2. What would be the advantages of exploiting resources with short-term aims ?

Ans. If the resources are exploited to the hilt with short-term aims, then the present generation will benefit too much. For example, the exploitation of resources with short-term aims would provide more than sufficient food, water, and energy to all the people in the present generation.

Q. 3. How would these advantages differ from the advantages of using a long-term perspective in managing our resources ?

Ans. Exploiting the natural resources with short-term aims would be too much beneficial for the present generation but no resources will be left for the needs of future generations. On the other hand, the management of natural resources on a long-term perspective will meet the basic needs of the present generation and also ensure that sufficient natural resources are left for the needs of future generations.

Q. 4. Why do you think there should be equitable distribution of natural resources ? What forces would be working against an equitable distribution of resources ?

Ans. At present, the rich and powerful people are cornering a major share of the country's natural resources (such as irrigation water from canals). There should be an equitable distribution of natural resources so that even poor people may benefit more by using them. Some vested interests with money and influence are working against the equitable distribution of natural resources.

NCERT Book, Page 273

Q. 1. Why should we conserve forests and wildlife ?

Ans. (*i*) We should conserve forests because they provide raw materials for a number of industries like timber industry, paper industry, lac industry and sports equipment industry. Forests prevent floods and soil erosion. Forests help in bringing sufficient rainfall by maintaining a perfect water cycle in nature. Forests also provide natural habitat to wild animals and birds, and help in their conservation. Forests are essential for maintaining the ecological balance by preserving the biodiversity (large number of species of plants and animals).

(*ii*) The wild animals and birds which live in a forest are called 'wildlife'. We should conserve wildlife to maintain ecological balance in nature. For example, it is necessary to conserve

wild animals like lions and tigers to maintain the forest ecosystem because they keep the population of herbivorous animals (like deer) under control and save the vegetation from overgrazing and its ill effects on environment. This is because overgrazing destroys the green plants and reduces the rainfall in that area. Due to less rainfall, the lush green forest environment can turn into a desert over a period of time. Wildlife should also be conserved to prevent the extinction of rare varieties of animals and birds from this earth.

Q. 2. Suggest some approaches towards the conservation of forests.

Ans. Some of the measures which can be taken for the conservation of forests are as follows :

(*i*) The indiscriminate and unauthorised felling (cutting) of forest trees for timber trade and firewood should be curbed immediately.

(*ii*) In case of Government authorised felling of forest trees, for every acre of forest cut down, an equal area of land should be planted with saplings of trees to make up for the loss in the long run.

(*iii*) Overgrazing of forest vegetation by the cattle of local people should be prevented.

(*iv*) Measures should be taken to prevent and control forest fires.

(*v*) The local people of villages in and around the forest should be involved in the conservation of forests by giving employment in silviculture and harvesting operations of the forest.

NCERT Book, Page 276

Q. 1. Find out about the traditional systems of water harvesting/management in your region.

Ans. The traditional systems of water harvesting in our region are ponds and lakes where rainwater is stored.

Q. 2. Compare the above systems with the probable systems in hilly/mountainous areas or plains or plateau regions.

Ans. Dams are built over rivers in hilly/mountainous areas. They are more advantageous because they store running river water which can be used to generate electricity. Moreover, since the water stored in dam keeps flowing to turn the turbines, it does not act as a breeding ground for mosquitoes (which spread malaria). The stagnant water in ponds and lakes, however, becomes a breeding ground for mosquitoes.

Q. 3. Find out the source of water in your region/locality. Is water from this source available to all people living in that area ?

Ans. In our region, the source of water is a river flowing through the city and some tube-wells dug at various places in the area. The river water and tube-well water is supplied to the homes through taps after suitable treatment. Though water from these sources is available to all the people living in this area but it is not available in sufficient quantity everywhere. There is usually some shortage of water which becomes very severe during hot summer season. Some villages on the outskirts of the city also obtain their water supply directly from the wells.

NCERT Book, Pages 278 and 279

Q. 1. What changes would you suggest in your home in order to be environment friendly ?

Ans.

(*i*) Use energy efficient compact fluorescent lamps (CFLs) instead of traditional filament-type electric bulbs.

(*ii*) Install solar cell panels to generate as much electricity as possible.

(*iii* Use solar cooker to cook food whenever possible.

)

(*iv*) Use solar water heater for getting hot water instead of electric geyser.

(*v*) Reuse the empty plastic and glass containers for storage purposes in the kitchen, and send the useless papers, plastic, glass and metal objects for recycling.

Q. 2. Can you suggest some changes in your school which would make it environment friendly ?

Ans. (*i*) School buses should be run on CNG instead of diesel.

(*ii*) Rainwater harvesting should be done to recharge ground water.

(*iii*) Trees should be planted along the school boundary.

(*iv*) The fallen leaves of trees should be collected and made into compost. This compost can be used in school garden.

(*v*) Install solar cell panels to produce electricity.

Q. 3. We saw in this chapter that there are four main stakeholders when it comes to forests and wildlife. Which among these should have the authority to decide the management of forest produce ? Why do you think so ?

Ans. The four main stakeholders in the management of forests and wildlife are :

(*i*) The local people who live in and around the forest,

(*ii*) The Forest department of the Government,

(*iii*) The industrialists who use various forest products for their factories, and

(*iv*) The forest and wildlife activists who want to save forests.

The local people who live in and around the forest area should have the authority to decide the management of forest produce. This is because the local people are well versed in the practices to use the forest produce in a sustainable manner as they have been using the forest and wildlife resources since the ancient times without causing any damage to the environment.

Q. 4. How can you as an individual contribute or make a difference to the management of (a) forests and wildlife (b) water resources, and (c) coal and petroleum ?

Ans. (*a*) Cutting of trees will not be allowed. The products made from animal skin, fur or ivory will not be used.

(*b*) Running tap water will not be used for brushing the teeth or taking bath. Water will be taken in a mug and bucket for these purposes to prevent its wastage. Leaking taps will be repaired immediately.

(*c*) Switch off unnecessary lights and fans, etc., and use bicycle to cover short distances instead of a scooter or car.

Q. 5. What can you as an individual do to reduce your consumption of the various natural resources ?

Ans. (*i*) Use energy efficient CFLs instead of filament-type electric bulbs to save electricity (and reduce the consumption of coal).

(*ii*) Switch off unnecessary lights and fans, and use stairs instead of using lift to save electricity.

(*iii*) Use solar cooker to cook food whenever possible and solar heater to obtain hot water (so as to reduce the consumption of coal, kerosene or LPG).

(*iv*) Use bicycle to cover short distances instead of scooter or car to reduce the consumption of petrol.

(*v*) Prevent wastage of water by getting the leaking taps repaired.

Q. 6. List five things you have done over the last one week to :

(*a*) conserve our natural resources.

(*b*) increase the pressure on our natural resources.

Ans. (*a*) The five things done by me over the last one week to conserve our natural resources were :

(*i*) Replaced all the filament-type bulbs in my house by CFLs.

(*ii*) Bought a pressure cooker to cook the food to save fuel.

(*iii*) Cooked rice and pulses (*dal*) for lunch by using a solar cooker.

(*iv*) Installed a solar water heater to obtain hot water.

(*v*) Went to school by bicycle when I missed the school bus.

(*b*) The five things done by me over the last one week which increased the pressure on our natural resources were :

(*i*) Forgot to switch off light in my room once before going to sleep.

(*ii*) Did not close the tap while brushing the teeth one day.

(*iii*) Asked my father to drop me to school on his car one day when I missed the school bus.

(*iv*) Wasted two big paper sheets while performing a science experiment in the laboratory.

(*v*) Threw away a used plastic container which could have been reused to store salt or sugar in the kitchen.

Q. 7. On the basis of the issues raised in this chapter, what changes would you incorporate in your life-style in a move towards a sustainable use of our resources ?

Ans. (*i*) Walking on foot or riding a bicycle to go to nearby market or other nearby places.

(*ii*) Using stairs in a building up to at least three floors instead of using a lift.

(*iii*) Put on an extra sweater on a cold day rather than use a room heater.

(*iv*) Stop using any products made of animal skin, fur or ivory.

(*v*) Switch off the lights, fans, TV, geyser and other electrical appliances when not needed.

(*vi*) Use compact fluorescent lamps (CFLs) instead of filament-type bulbs.

(*vii*) Use solar cooker and solar water heater.

(*viii*) Stop using polythene bags and start using bags made of cloth or jute.

(*ix*) Recycle products made of paper, plastics, glass and metals.

Value Based Questions
(with Answers)

FIRST TERM

Q. 1. Suman purchased a number of earthen flower pots (*gamle*) and planted beautiful plants in them by adding proper fertiliser to the soil. She started watering these plants everyday by putting lots of water in the earthen flower pots. After about one month, Suman noticed that though most of the potted plants were growing well and appeared to be healthy, but one of the plants was on the verge of dying (though it was being watered daily alongwith other potted plants). Suman told about this problem to her friend Geeta. Geeta examined the earthen flower pot of this dying plant carefully including its bottom and immediately understood what the problem was. She advised Suman to change the earthen pot of this plant. Suman then shifted this plant to another earthen pot and watered it. The same plant now started growing normally and became a healthy plant after some time.

(*a*) What defect do you think could have been observed by Geeta at the bottom of earthen pot of this plant ?

(*b*) How was this defect affecting the growth of plant and making it almost die ?

(*c*) Which life process could not be performed efficiently by the roots of this plant under these conditions ?

(*d*) What special term is used for the condition which existed in this particular earthen flower pot ?

(*e*) Why did Suman use another earthen pot for this plant ?

(*f*) What values are displayed by Geeta in this incident ?

Ans. (*a*) Geeta could have observed that there was no hole at the bottom of this earthen flower pot (*gamla*) for the excess water to be drained out.

(*b*) Since there was no hole at the bottom of this earthen pot, too much water collected in it. This too much water expelled all the air from in-between the soil particles in the earthen flower pot. Due to this, oxygen was not available to the roots of this plant for aerobic respiration. Under these conditions, the roots respire anaerobically, producing alcohol. And this was killing the plant gradually.

(*c*) Aerobic respiration.

(*d*) Waterlogging.

(*e*) Suman used another earthen pot for this plant which had a hole at its bottom (to drain off the excess water).

(*f*) The values displayed by Geeta in this incident are (*i*) Awareness (or knowledge) that plant roots require air for respiration (*ii*) Curiosity to get at the bottom of the problem, and (*iii*) Helping nature.

Q. 2. Abhinav was participating in a marathon (long distance race). He was running at position two right from the beginning. Just when he was nearing the finishing line, he started running even faster so as to stand first. And when he was about to win the marathon, he got a severe muscle cramp in his leg. This cramp prevented Abhinav from running any further and shattered his dream of winning the marathon.

(*a*) Which process provides most of the energy to Abhinav for running the marathon ?

(*b*) Which process provides a little extra energy to Abhinav for running very, very fast

towards the end of race ?

(*c*) Which substance gets accumulated in the leg muscles of Abhinav that causes muscle cramp ?

(*d*) Why does this substance get accumulated in the leg muscles of Abhinav ?

(*e*) What advice will you give to Abhinav so as to get relief from this cramp ? How will it help ?

Ans. (*a*) Most of the energy in the leg muscles of Abhinav for running the marathon is provided by aerobic respiration (which breaks down food like glucose with oxygen to produce large amount of energy).

(*b*) The little extra energy in the leg muscles for running very, very fast is provided by the process of anaerobic respiration (which breaks down food like glucose without oxygen to produce small amount of energy).

(*c*) Lactic acid.

(*d*) The lactic acid gets accumulated in the leg muscles of Abhinav because during very fast running, oxygen gets used faster in the muscles than can be supplied by the blood. So, anaerobic respiration (without oxygen) takes place in muscle cells causing partial oxidation of glucose food to form lactic acid (and releasing some energy). This lactic acid gets accumulated in leg muscles.

(*e*) Abhinav should take a hot water bath or a massage. Hot water bath and massage improve the circulation of blood. Due to improved blood flow, the supply of oxygen to the leg muscles increases. This oxygen breaks down lactic acid accumulated in leg muscles and gives relief from cramp.

Q. 3. One day Mohan had a severe toothache. His father took Mohan to a dentist. The dentist examined all the teeth of Mohan very carefully and said that he had tiny holes in his two teeth. He also told Mohan that all his teeth were covered with a sticky, yellowish layer. The dentist performed a certain procedure on his two teeth having tiny holes and also gave him some medicines. Mohan's toothache disappeared gradually.

(*a*) What are the tiny holes in the teeth known as ?

(*b*) How are the tiny holes formed in the teeth ?

(*c*) What kind of procedure was performed by dentist on Mohan's two teeth ?

(*d*) What is the sticky, yellowish layer on Mohan's teeth known as ?

(*e*) How is the sticky, yellowish layer formed on the teeth ?

(*f*) What advice will you give to Mohan to avoid such dental problems in future ?

Ans. (*a*) The tiny holes formed in the teeth are known as 'cavities' or 'dental caries'.

(*b*) When a person eats sugary food (sugar-containing food), then the bacteria present in mouth act on sugarpresent in food to produce acids. These acids first dissolve the calcium salts from tooth enamel and thenfrom dentine forming tiny holes (or cavities) in the tooth over a period of time.

(*c*) Mohan's dental cavities (or holes) were first cleaned by the dentist and then 'filled' with appropriatefilling material.

(*d*) The sticky, yellowish layer on the teeth is known as 'dental plaque'.

(*e*) If the teeth are not cleaned regularly, they become covered with a stickly, yellowish layer of food particlesand bacteria cells called 'dental plaque'.

(*f*) (*i*) Mohan should eat less of sugary food such as toffees, chocolates and sweets, etc. He should also avoid drinking too much of sweetened drinks such as Coca-Cola, Pepsi, etc.

(*ii*) Mohan should brush his teeth regularly with a toothpaste (after eating food). This will remove the dental plaque before bacteria produce acids.

(*iii*) Mohan should get his teeth examined by a dentist at least once in three months.

Q. 4. Abhishek's house is very near to a main road crossing having traffic signals. It was a Diwali night and there was a big traffic jam on the main road just outside his house. All the neighbours of Abhishek and other colony residents were also bursting crackers and enjoying many other types of fireworks. Abhishek's 70 year old grandmother, who was watching the fireworks, was taken ill suddenly. She complained of difficulty in breathing and also felt nausea and headache. Abhishek's grandmother was rushed to a nearby hospital where the doctors made her inhale some medicine and then put her on oxygen for some time. Abhishek's grandmother recovered fairly quickly. The doctor advised his grandmother to remain inside the house for that night with all the doors and windows closed. The doctor also asked her to buy a small, portable oxygen gas cylinder and use it to breathe at home if she felt suffocated again.

(*a*) What made Abhishek's grandmother suddenly ill ?

(*b*) Which system/body part of grandmother got affected ? Why was only Abhishek's grandmother affected ?

(*c*) Give two reasons for this condition of Abhishek's grandmother.

(*d*) What deficiency was caused in the body of Abhishek's grandmother ?

(*e*) Why was grandmother advised to remain inside the house all the time with doors and windows closed ?

(*f*) What advice would you give to others to avoid such a situation ?

Ans. (*a*) Abhishek's grandmother became ill because she had inhaled air polluted with toxic gases emitted byvehicles on the nearby road and Diwali fireworks.

(*b*) Respiratory system (including lungs) got affected. Only Abhishek's grandmother was affected becauseher lungs had become very weak due to old age.

(*c*) (*i*) Air pollution caused by the exhaust gases of vehicles on the road just outside the house.
(*ii*) Air pollution caused by Diwali fireworks.

(*d*) The deficiency of oxygen was caused in the body of grandmother.

(*e*) Abhishek's grandmother was advised to remain inside the house to avoid breathing too much pollutedair outside.

(*f*) (*i*) Avoid fireworks on Diwali day to prevent too much air pollution.
(*ii*) Use less polluting fuels (such as CNG) in motor vehicles.
(*iii*) Use public transport (such as buses, metro, etc.) to travel within the city instead of individual vehicles.
(*iv*) If possible, take a house away from main road and traffic signals.

Q. 5. Shyam had just recovered from dengue fever for which he was confined to bed for many days. He was really fed up and wanted to go out with his friend Ram. So, Ram and Shyam went out into city forest for a walk. While walking in the city forest, Shyam fell down and got a cut on his leg from barbed wire lying nearby. The leg started bleeding. Shyam thought that the bleeding from cut would stop automatically after some time. But this did not happen. The bleeding from cut went on continuously. After some time, Shyam also started having breathing difficulty and he now wanted to go back home. Ram held Shyam firmly by the arm to give support and both came out of the city forest. Ram then hailed a taxi and took Shyam straight to the hospital. He told everything to doctors. After performing some tests quickly, doctors gave blood transfusion to Shyam. His parents were also informed.

(*a*) Which component was deficient in the blood of Shyam which led to too much bleeding from the cut ?

(*b*) Could the deficiency of this component of blood have been caused by dengue ?

(*c*) What is the function of this component in our body ?

(*d*) What could be the probable reason for the breathing difficulty of Shyam ? Explain.

(*e*) What is the cause of dengue disease : virus, bacteria or protozoa ? Name the carrier which spreads dengue.

(*f*) What values are displayed by Ram in this episode ?

Ans. (*a*) Shyam's blood was deficient in platelets.

(*b*) Yes, dengue reduces the blood platelet count of a person drastically.

(*c*) Platelets help in the coagulation of blood (or clotting of blood) in a cut. It is due to the presence of platelets that the blood coming out of a cut becomes semi-solid and plugs the cut (or seals the cut) due to which bleeding stops.

(*d*) The deficiency of haemoglobin could be the probable cause of Shyam's breathing difficulty. This can be explained as follows : Haemoglobin present in blood carries oxygen and hence is essential for breathing. When a lot of blood was lost by Shyam through the cut, then the amount of blood and hence that of haemoglobin in the body became less. This less amount of haemoglobin carried less oxygen into the lungs and caused breathing difficulty.

(*e*) The cause of dengue disease is a virus (called dengue virus). It is spread by *Aedes* mosquitoes.

(*f*) The values displayed by Ram in this episode are (*i*) Awareness or knowledge (that too much blood loss from the body could endanger the life of Shyam) (*ii*) Concern to save life of his friend (by taking him straight to hospital), and (*iii*) Correct decision-making skill (of not wasting precious time in going back home first).

Q. 6. Meena is always in a hurry. She just gulps her food quickly and rushes out to play badminton with her friend. Moreover, she is fond of eating junk food such as burgers and pizzas. Meena hates to eat fresh green vegetables and prefers only pulses (*dal*). Meena usually complains of stomach ache while playing. Meena looks pale, feels very weak and tires easily. Her nails are turning white and she has also started losing weight.

(*a*) What could probably be the reason for Meena's stomach ache while playing ?

(*b*) What is the harm of eating too much junk food ?

(*c*) Name the disease Meena is suffering from which makes her look pale, feel very weak and tired, and lose weight.

(*d*) What is the cause of Meena's disease ?

(*e*) How does this disease affect Meena ? Explain.

(*f*) What advice would you give to Meena to get rid of all the ailments described above ?

Ans. (*a*) One of the probable reasons for the stomach ache of Meena while playing could be that she gulps her food in big chunks (without chewing) just before going to play. The big chunks of food could hit the stomach wall while playing and cause stomach ache.

(*b*) Junk food does not make a balanced diet. Junk food lacks many essential nutrients leading to some deficiency diseases.

(*c*) Meena is suffering from a disease called 'anaemia'.

(*d*) The cause of Meena's disease anaemia is the deficiency of haemoglobin in her blood which comes from the deficiency of iron mineral in her diet (because iron mineral is essential for making haemoglobin).

(*e*) The function of haemoglobin is to carry oxygen in the body. Due to deficiency of haemoglobin (caused by lack of iron in diet), the blood of Meena is not able to carry sufficient oxygen to all the body cells to meet their requirements of oxidation of food and production of energy. In this way, deficiency of haemoglobin results in the production of less energy for Meena. Since she has less energy than needed, she feels weak, tired and

loses weight. The deficiency of red coloured haemoglobin also makes her look pale and turns her nails white (instead of red).

(*f*) (*i*) Meena should chew her food properly while eating and convert it into as small particles as possible. This will also help in mixing saliva with food for proper digestion. In this way, her stomach ache may disappear.

(*ii*) Meena should avoid eating too much of junk food. It may cause deficiency diseases and also lead to obesity.

(*iii*) Meena should include spinach (*palak, saag*), other green leafy vegetables, apples, etc., in her diet because all these food items contain a good amount of iron mineral. This will cure anaemia.

Q. 7. Raman's 50 year old ailing uncle Vinod was admitted to a hospital. The doctors performed many blood tests and found that the blood of Vinod contained some unwanted wastes in it. These wastes had accumulated in blood due to non-functioning of a pair of vital organs in the body of Vinod. The doctors suggested two options for the treatment of Vinod so as to save his life. Raman is a student of class X who has studied various life processes in detail. So, he could easily make out the ailment his uncle was suffering from.

(*a*) What could be the pair of organs of Vinod which were not functioning properly ? Where are these organs located in the body ?

(*b*) What is the function of these organs ?

(*c*) Name the major waste which is removed by these organs from the blood.

(*d*) Name the ailment (or disease) Vinod is suffering from.

(*e*) What could be the two options for the treatment of Vinod ?

(*f*) What advice Raman could give to others so as to prevent such an ailment ?

Ans. (*a*) The pair of organs of Vinod which were not functioning properly are the two kidneys. The kidneys are bean-shaped organs towards the back of our body, just above the waist.

(*b*) The function of kidneys is to remove the poisonous substance urea, other waste salts, and excess water from the blood and excrete them in the form of a yellowish liquid called urine.

(*c*) Urea.

(*d*) Vinod is suffering from 'kidney failure'.

(*e*) The two options available to Vinod for the treatment of his ailment are :

(*i*) Dialysis (in which the dirty blood of kidney patient containing unwanted wastes is cleaned periodically by passing through a kidney machine), and

(*ii*) Kidney transplant (in which the matching kidney donated by a healthy person is transplanted in place of damaged kidney by surgical operation).

(*f*) Kidneys can usually be damaged by continued high blood pressure (called hypertension), and also by very high blood sugar (called diabetes). So, the general advice given by Raman to others so as to prevent kidney ailment would be :

(*i*) Keep your blood pressure under control.

(*ii*) Keep your blood sugar (diabetes) under control.

(*iii*) Get the kidney functioning test done from time to time.

Q. 8. Rashmi lives alone in Delhi. Her house is near a main road where heavy traffic plies all day and night. The construction activities for building a huge commercial complex are also in full swing near her house. Rashmi had to go to America for six months. She was worried about her beautiful houseplants kept on terrace. She gave the keys of her house to a neighbour and requested her to water the plants daily. The neighbour kept her promise and watered the plants daily (because there was no rain at all during those six

months). When Rashmi returned after six months, she found that most of the plants had pest infestations and diseases. The plants had become very weak and unhealthy. Rashmi could not understand why, even after regular watering, the plants were in a very bad shape. One day Rashmi's niece Laxmi, who is a student of class X, came to meet her. Rashmi told her problem to Laxmi. Laxmi examined the plants carefully and came to know what the problem was. She explained everything to Rashmi and gave advice to restore the good health of these plants.

(*a*) What had happened to the plants kept on the terrace when Rashmi was away for six months ?

(*b*) Which process in plants could not take place at optimal level due to the above happening ? Explain.

(*c*) Why had the plants become weak and caught pests and diseases ?

(*d*) What advice was given by Laxmi to Rashmi to restore the good health of these plants ?

(*e*) Which natural process/processes perform the similar functions which Rashmi was told to perform ?

Ans. (*a*) A lot of dust had deposited on both sides of leaves of plants and covered them.

(*b*) The process of photosynthesis (food making) could not take place at optimal level due to thick layer of dust on the leaves. This happened as follows : The layer of dust on the leaves blocks the sunlight and reduces the leaves' ability to carry out photosynthesis to make food for the plant. Even the stomata on the surface of leaves get blocked reducing the intake of carbon dioxide from surrounding air. This further retards photosynthesis.

(*c*) Photosynthesis is the process by which plants make their own food. Since photosynthesis was reduced, the plants did not get sufficient food to remain healthy. The plants became weak and hence prone to pests and diseases.

(*d*) Laxmi advised Rashmi to wash the leaves of houseplants by spraying water on them, so as to remove the thick layer of dust from them.

(*e*) (*i*) The rain usually washes away the dust from the leaves of plants and trees and makes them dust-free.

(*ii*) The fast blowing wind shakes the leaves of plants and trees and also helps in removing dust from them.

Q. 9. John is a 50 year old man. He was complaining of pain in the abdominal area for the last few days. He went to a hospital where doctors performed an ultrasound scan on him. The ultrasound scan showed the presence of a number of tiny stones in the sac-shaped organ on the underside of the liver. The doctors performed a keyhole surgery on John and removed the sac-shaped organ from his body alongwith tiny stones. John got immediate relief from pain.

(*a*) What is the sac-shaped organ beneath the liver known as ?

(*b*) What liquid does this sac-shaped organ contain ?

(*c*) What are the functions of the liquid contained in this sac-shaped organ ?

(*d*) Why do you think it is possible to remove this sac-shaped organ containing stones but the kidneys having stones cannot be removed ?

(*e*) What advice would you give to John regarding his diet ?

Ans. (*a*) The sac-shaped organ beneath the liver is known as 'gall bladder'.

(*b*) Gall bladder stores bile (until needed for digestion). Bile is a greenish-yellow liquid made and secreted by the liver.

(*c*) Bile is alkaline and contains salts which help to emulsify or break the fats (or lipids) present in food. Bile performs two functions :

(*i*) Bile makes the partially digested acidic food coming from the stomach alkaline so that pancreatic enzymes can act on it.

(*ii*) Bile salts break the fats (or oils) present in food into small globules making it easy for the enzymes to act and digest them.

(*d*) Gall bladder is not a vital organ of our body, so our body can cope well without it. But kidneys are vital

organs of our body, so our body cannot function properly without them.

(*e*) John should avoid eating oily food (or fried food). He should also avoid eating spicy food.

Q. 10 Bhushan noticed that his sister Seema had developed swollen neck. Being a science student of class 10, Bhushan knew the reason that causes the neck of a person to swell up. Bhushan asked his mother which type of common salt she purchases from the market for cooking food. The mother told Bhushan that she never checked the brand or contents of the common salt packet. She purchased whatever common salt shopkeeper gave her. Bhushan then went to the market himself and purchased a special type of common salt. He asked his mother to always use this salt in preparing food for the whole family. When Bhushan's sister was taken to a doctor, he confirmed what Bhushan had in mind. The doctor also advised his sister and everyone else in the family to use a special type of salt to prevent such a condition.

(*a*) Name the disease which Seema is suffering from ?

(*b*) What causes this disease ?

(*c*) Which part of endocrine system is involved in this disease ? What happens to this part during the occurrence of this disease ?

(*d*) What type of salt was recommended by Bhushan and doctor for the whole family ? Why was this salt recommended ?

(*e*) Why does this disease occur more in hilly areas but not at all in coastal areas ?

(*f*) What values are displayed by Bhushan in this episode ?

Ans. (*a*) Seema is suffering from a disease called 'goitre'.

(*b*) Goitre disease is caused by the deficiency of iodine mineral in the diet.

(*c*) Thyroid gland of the endocrine system is involved in this disease. Due to the deficiency of iodine in the diet, thyroid gland is not able to make sufficient amount of iodine-containing hormone called 'thyroxine'. And due to the deficiency of thyroxine hormone, thyroid gland present in the neck of Seema enlarges too much, causing the neck to swell too much.

(*d*) Bhushan and the doctor both recommended iodised common salt or iodised salt (which contains an appropriate amount of iodine mineral). This was done to make up for the deficiency of iodine (and that of thyroxine hormone) in the body to prevent goitre.

(*e*) Goitre disease occurs more in hilly areas because the soil (in which food is grown), and water in hilly areas is deficient in iodine mineral. Goitre disease does not occur at all in coastal areas (or sea-side areas) because the people of coastal areas eat a lot of sea food (sea fish, etc.) which contains a good amount of iodine.

(*f*) The values displayed by Bhushan in this episode are (*i*) Awareness (or knowledge) that goitre disease develops due to the deficiency of iodine in the diet and can be prevented by using iodised salt, and (*ii*) Concern to protect his family from goitre disease by using iodised salt in cooking food.

Q. 11. Ahmad is a 50 year old man who is mainly a sedentary worker. He always gets his medical check up done once in a year. Till last year all his blood reports were normal. This year his blood (and even urine) tests showed the presence of large quantities of sugar. The doctor gave him some medicines to control sugar. The doctor also asked him to avoid

certain food items and adopt a healthy life-style.

(*a*) Name the disease which Ahmad is suffering from.

(*b*) Name the gland whose malfunctioning causes this disease.

(*c*) How does the malfunctioning of this gland cause this disease ?

(*d*) What is done if this disease does not get controlled by taking oral medicines ?

(*e*) Name one vital organ which gets damaged if this disease persists uncontrolled for a long time.

(*f*) What life-style changes would you suggest for Ahmad which can help him control this 'disease' ?

Ans. (*a*) Ahmad is suffering from 'diabetes'.

(*b*) Malfunctioning of pancreas causes diabetes.

(*c*) Pancreas makes and secretes insulin hormone into the blood. The function of insulin hormone is to lower

the blood sugar level (or blood glucose level). If due to malfunctioning, pancreas does not produce and secrete sufficient amount of insulin hormone into blood, then the sugar level in blood rises too much leading to diabetes.

(*d*) The persons having severe diabetes which cannot be controlled by medicines are given insulin injections.

(*e*) If uncontrolled diabetes persists for a long time, it may damage kidneys.

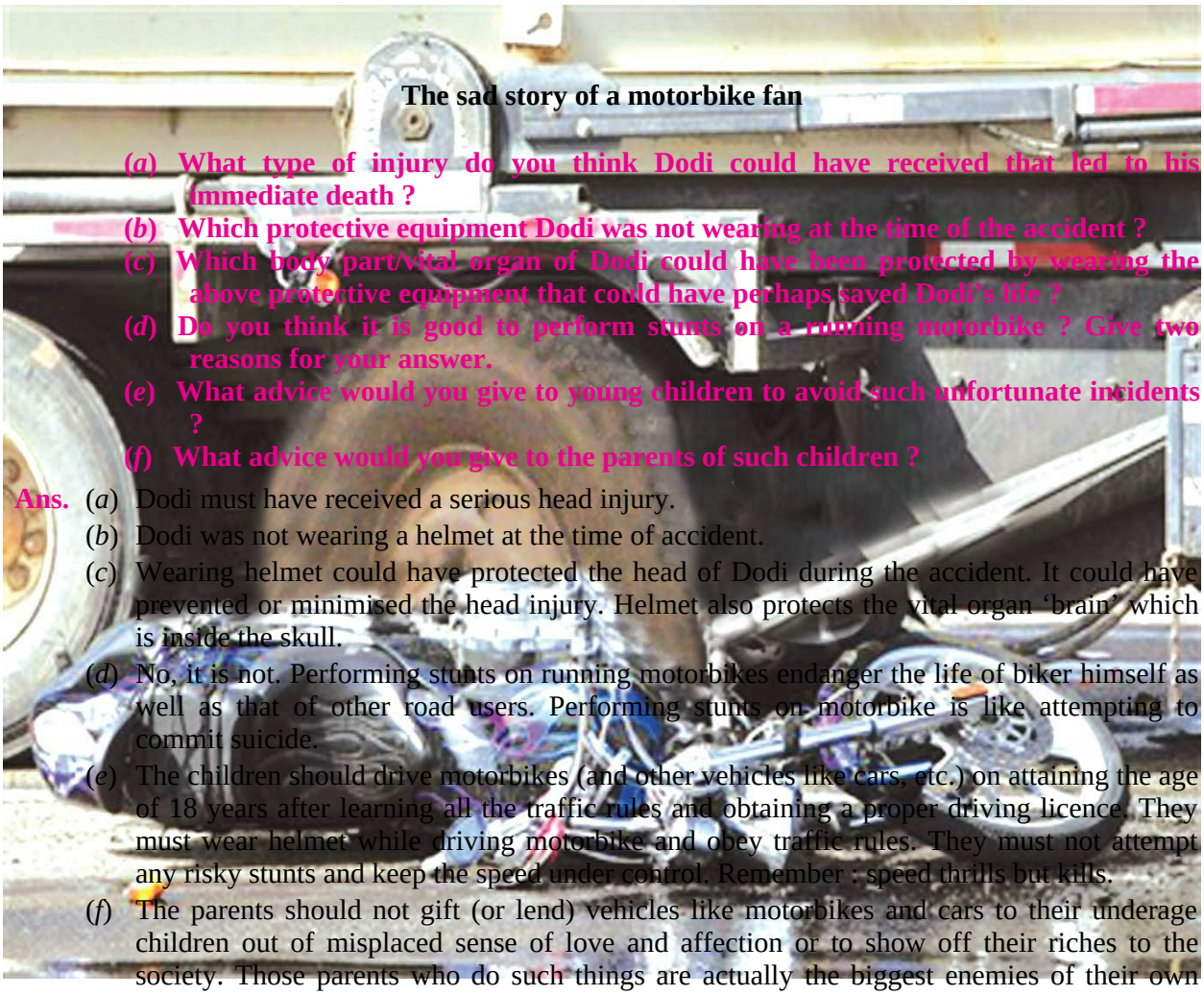
(*f*) Ahmad can control diabetes :

(*i*) by controlling diet (by avoiding sweet food items containing sugar such as chocolates, sweets, softdrinks, etc.),

(*ii*) by taking regular physical exercise (including brisk walk, etc.), and

(*iii*) by reducing weight.

Q. 12. Dodi is the only child of his rich parents. He insisted on getting a new motorbike on his 16th birthday. Though Dodi was underage by two years for obtaining a driving licence but he started driving motorbike without a driving licence. He even did not wear any protective equipment while driving the motorbike. Neighbours usually saw Dodi driving the motorbike very fast and rashly. He did not obey any traffic rules while driving. One day Dodi was driving his motorbike very fast on the main road with a friend seated behind him. He was trying to show off his misplaced sense of adventure by performing some dangerous stunts. Just then a heavily loaded truck appeared on the road in front of him. When this truck applied brakes suddenly to save a dog crossing the road, Dodi could not stop his speeding motorbike in time. The motorbike went under the truck banging Dodi's head against the rear side of truck. Dodi was hurt badly. Dodi was rushed to the nearby hospital where he was declared brought dead. Dodi's friend was lucky to escape with minor injuries.



The sad story of a motorbike fan

(*a*) What type of injury do you think Dodi could have received that led to his immediate death ?

(*b*) Which protective equipment Dodi was not wearing at the time of the accident ?

(*c*) Which body part/vital organ of Dodi could have been protected by wearing the above protective equipment that could have perhaps saved Dodi's life ?

(*d*) Do you think it is good to perform stunts on a running motorbike ? Give two reasons for your answer.

(*e*) What advice would you give to young children to avoid such unfortunate incidents ?

(*f*) What advice would you give to the parents of such children ?

Ans. (*a*) Dodi must have received a serious head injury.

(*b*) Dodi was not wearing a helmet at the time of accident.

(*c*) Wearing helmet could have protected the head of Dodi during the accident. It could have prevented or minimised the head injury. Helmet also protects the vital organ 'brain' which is inside the skull.

(*d*) No, it is not. Performing stunts on running motorbikes endanger the life of biker himself as well as that of other road users. Performing stunts on motorbike is like attempting to commit suicide.

(*e*) The children should drive motorbikes (and other vehicles like cars, etc.) on attaining the age of 18 years after learning all the traffic rules and obtaining a proper driving licence. They must wear helmet while driving motorbike and obey traffic rules. They must not attempt any risky stunts and keep the speed under control. Remember : speed thrills but kills.

(*f*) The parents should not gift (or lend) vehicles like motorbikes and cars to their underage children out of misplaced sense of love and affection or to show off their riches to the society. Those parents who do such things are actually the biggest enemies of their own children.

SECOND TERM

Q. 13. Seeta and Geeta are neighbours in the same colony where they live. Seeta's father and Geeta's father both work in the same company and earn equal salary (or equal money). Seeta has one brother whereas Geeta has four brothers and sisters. Geeta is very bright in her studies. Earlier Geeta used to study in one of the top city schools alongwith Seeta but now her father has shifted Geeta to an ordinary school. Seeta's family has a new car whereas Geeta's family has an old scooter. Seeta and her brother wear beautiful clothes whereas Geeta's siblings wear ordinary clothes. Seeta's mother is very healthy whereas Geeta's mother usually suffers from one ailment or another. Seeta's home atmosphere is relaxed and happy whereas there is always some tension in Geeta's house.

(*a*) What do you think is the main reason for the lower living standard of Geeta's family than Seeta's family (though their incomes are equal) ?

(*b*) What is the most probable reason for shifting Geeta from one of the top schools to an ordinary school (though she is very bright in studies) ?

(*c*) What type of measures do you think were not taken by Geeta's parents at appropriate times in the past for limiting the size of their family ?

(*d*) What factor is responsible for the poor health of Geeta's mother (whereas Seeta's

mother is very healthy) ?

(*e*) What values are displayed by Seeta's parents in this episode ?

Ans. (*a*) The main reason for the comparatively lower living standard of Geeta's family is their large family consisting of 7 persons (father, mother and 5 children) whereas Seeta's family has only 4 persons (father, mother and 2 children). Due to this, in Geeta's family, the father's income is used for the upkeep of 7 persons whereas in Seeta's family, an equal income is available for just 4 persons.

(*b*) The most probable reason for shifting Geeta from a top school to an ordinary school is that due to large number of children, her father cannot afford much higher school fee in a top school.

(*c*) Geeta's parents did not take family planning measures (or birth control measures) to control the size of their family by having less number of children at the appropriate times in the past.

(*d*) Every pregnancy puts a lot of demands (nutritional, physical and emotional) on the body of the mother. So, the frequent pregnancies (to have a large number of children) have spoiled the health of Geeta's mother. On the other hand, just two pregnancies (to have only two children) have kept Seeta's mother in good health.

(*e*) Seeta's parents displayed the values of (*i*) Awareness of birth control measures (to limit the size of their family) (*ii*) Concern for the health of mother of children (*iii*) Desire to provide best possible education and facilities to children, and (*iv*) National responsibility (of not adding too much to country's population).

Q. 14. Mamta is a married woman having two children. She does not want to have any more children. Her husband also supports her decision not to have more children. They are both happy with just two children, both of whom are daughters.

(*a*) Suggest any two types of birth control methods which Mamta and her husband can make use of to avoid pregnancy. Explain how these methods work to prevent pregnancy.

(*b*) Which birth control method has additional advantage of giving protection from sexually transmitted diseases (STDs) ?

(*c*) What values are displayed by Mamta and her husband in not wanting to have any more children ?

Ans. (*a*) The two common type of birth control methods which can be followed by Mamta and her husband are :

(*i*) **Barrier Methods.** In these methods, a condom (*nirodh*) is used by the husband or a diaphragm (cap) is used by the wife to prevent the meeting of sperms with ovum (or egg) and prevent pregnancy.

(*ii*) **Chemical Methods.** In these methods, oral pills and vaginal pills can be used by the wife. Oral pills contain hormones which stop ovaries from releasing the ovum (or egg) into oviduct. Vaginal pills contain the chemicals called spermicides which kill the sperms.

(*b*) The use of condom (*nirodh*) is a birth control method which provides additional advantage of protection from sexually transmitted diseases.

(*c*) The values displayed by Mamta and her husband are :

(*i*) Awareness (or knowledge) that various birth control methods are available to prevent pregnancy and limit the size of family.

(*ii*) Concern for the health of woman (because too many pregnancies spoil the health of woman or mother).

(*iii* Concern for the future of children (because good facilities and best education can

) be provided only if the number of children is less).

(*iv*) Responsible citizens (because they do not want to increase country's population too much and put pressure on its limited resources).

Q. 15. Vidya is a married woman who has a cleft chin (a deep hollow in her chin). Vidya has recently been blessed with a baby girl who has also a cleft chin. Anita is a close friend of Vidya. When she learnt that Vidya's baby girl also has a cleft chin like Vidya, she got worried. This is because Anita has a huge scar on her left cheek which remained permanently after she got a cut on the cheek during an accident which took place in her school days. Anita is worried that her baby (which is due shortly), may also have a scar on her left cheek just like her. One day, Anita's niece Radha, who is a science student of class X, came to see her. Anita shared her apprehension with Radha. Radha could understand her problem. She told Anita that her case is entirely different from that of Vidya. Radha explained everything to Anita clearly. Anita was now very much relaxed.

(*a*) What is an acquired trait ?

(*b*) What is an inherited trait ?

(*c*) What type of trait is (*i*) cleft chin, and (*ii*) cheek scar ?

(*d*) Explain why, Vidya's cleft chin has been passed on to her baby but Anita's cheek scar cannot be passed on to her baby.

(*e*) What values are displayed by Radha in this episode ?

Ans. (*a*) A trait (or characteristic) of an organism which is 'not inherited' but develops in response to the environment, is called an acquired trait. Acquired trait involves changes only in the non-reproductive cells of an organism and hence cannot be passed on to the next generation.

(*b*) A trait (or characteristic) of an organism which is caused by a change in the genes (or DNA) present in the reproductive cells (or gametes) of parent organism is called inherited trait. Inherited trait can be passed on to the next generation.

(*c*) (*i*) Cleft chin is an inherited trait.
(*ii*) Cheek scar is an acquired trait.

(*d*) Vidya's cleft chin trait has been passed on to her baby because it is an inherited trait involving reproductive cells (or gametes). Anita's cheek scar cannot be passed on to her baby because it is an acquired trait involving only non-reproductive body cells.

(*e*) The values displayed by Radha in this episode are (*i*) Awareness (or knowledge) of acquired traits and inherited traits (*ii*) Application of knowledge in real-life situations, and (*iii*) concern for the health of Anita during pregnancy (by reducing her tension).

Q. 16. Mohan and Radha are husband and wife who live in a village. They are going to have their first baby. Mohan has blonde hair (pale yellow hair) with genotype hh whereas Radha has black hair with genotype HH. A discussion started between Mohan and Radha whether their baby would have blonde hair (pale yellow hair) like father or black hair like mother. Bikram is Mohan's nephew. He had come to meet his uncle (*mama ji*) Mohan in the village. Bikram, who is a science student of class 10 in a city school, was listening to their discussion. When Mohan and Radha could not come to a conclusion about the hair colour of their would-be baby, Bikram said that the baby would have black hair colour. He explained the reason for this to Mohan and Radha.

(*a*) What are the factors which transmit characteristics (or traits) from the parents to their baby ?

(*b*) Name the process through which these factors are transmitted from parents to their baby.

(*c*) Explain how Bikram could tell in advance that the baby to be born would have black hair colour like mother (and not blonde hair like father).

(*d*) What values are exhibited by Bikram in this episode ?

Ans. (*a*) The characteristics (or traits) are transmitted from the parents to their baby through genes present on
their sex chromosomes.

(*b*) Sexual reproduction.

(*c*) (*i*) Mother's (Radha's) cells contain two dominant genes HH for black hair, so she has black hair.

(*ii*) Father's (Mohan's) cells contain two recessive genes hh for blonde hair, so he has blonde hair.

(*iii*) Baby will get one dominant gene H for black hair (from mother) and one recessive gene h for blonde hair (from father), so its genotype will be Hh and phenotype will be black hair.

(*d*) The values exhibited by Bikram in this episode are (*i*) Awareness (or knowledge) of the transmission of characteristics (or traits) from parents to progeny, and (*ii*) Application of knowledge in solving real-life problems.

Q. 17. Rahul and his classmates toured some of the villages in North Indian States during the summer holidays. They found that in this area there were many more boys than girls in the age group of up to 6 years. Rahul and his friends then went to a small Government Hospital just outside a village. The doctor told them that in this area the birth of a girl child is considered a burden on the family. So, every family in the village wants to have only boys (or sons). He said that people of the village are going to private clinics in cities for getting the pre-natal (before birth) determination of sex done on pregnant women and if the foetus is of a girl child, it is aborted. Due to this illegal practice of selective abortions, child sex ratio is declining at an alarming rate and has created many social problems. The doctor also told that in many households, the women are harassed and tortured for giving birth to a girl child. The village elders blame only the woman for bearing the girl child. The doctor said that they are trying to change the mind set of village people at great personal risk but it will take a lot of time to get rid of this social evil.

(*a*) What term is used for the act of deliberately aborting the foetus if it is of a girl child ?

(*b*) What is child sex ratio ? Why is it declining rapidly ?

(*c*) Why is the birth of a girl child considered a burden in the family ?

(*d*) In our society, the woman (or wife) is blamed for giving birth to a girl child. Prove scientifically that it is actually the man (or husband) who is responsible for the birth of a girl child.

(*e*) State an ill effect of this horrific practice of selective abortions in the long run.

(*f*) How can this evil of killing girl child even before her birth can be prevented ?

Ans. (*a*) The act of deliberately aborting the foetus if it is of a girl child, is called female foeticide. (The deliberate termination of a woman's pregnancy is called abortion).

(*b*) Child sex ratio is the number of girls per thousand boys in human population of an area between the age group of 0 to 6 years. Child sex ratio is declining rapidly due to female foeticide.

(*c*) The demand of dowry during the marriage of a girl is the main reason for thinking that the birth of a girl child is burden on the family.

(*d*) Half of the man's sperms have X sex chromosomes whereas the other half sperms have Y sex chromosomes. On the other hand, all the ova (or eggs) of woman have only X sex chromosomes. Now, a girl child is conceived when the sperm of man carrying X chromosome fertilises the ovum (or egg) of woman carrying X chromosome. It is clear that man (or husband) is responsible for the birth of a girl child and not the wife

(because only man has Y sex chromosome in half of his sperms which is required to have a male child or boy).

(*e*) An ill effect of female foeticide in the long run is that sufficient number of young girls is not available in the area to marry off all the boys in this age group. Due to this shortage of girls, brides are even bought and sold for this purpose.

(*f*) Female foeticide can be prevented :

(*i*) by strict implementation of laws to prohibit pre-natal determination of sex, to stop female foeticide and dowry system.

(*ii*) by spreading awareness that no society can run or flourish without girls.

(*iii*) by providing free and compulsory education to girls and reservation in certain professions (such as teaching) so that they can become financially independent.

Q. 18. Mr. Sharma had a complete medical check-up a few days back. The doctors diagnosed him to be HIV-positive (HIV+ve). This news spread like wildfire in the colony where he lives and also in the office where he works. The neighbours and colleagues who used to greet him with handshakes and warm hugs now tried to shun him (avoid him). They were reluctant to shake hands with him or hug him. Even Mr. Sharma's own family became indifferent towards him and started treating him badly. Mr. Sharma felt neglected and isolated by all the people around him. He went into depression. A good neighbour, Mr. Mukesh, noted that Mr. Sharma was under a lot of depression because of HIV infection. So, Mr. Mukesh met the family of Mr. Sharma and explained them all about HIV infection. He told them that HIV infection can be treated with drugs and kept under control. He also clarified various myths about HIV and AIDS.

(*a*) What is HIV ? What is meant by saying that Mr. Sharma is HIV-positive (HIV+ve) ?

(*b*) What are the various ways in which HIV can be transmitted ?

(*c*) Can HIV be contracted by shaking hands with or hugging a person infected with HIV ? Do you think HIV is the same as AIDS ?

(*d*) What are the various ways of protection from HIV infection ?

(*e*) Do you think people's indifference towards HIV infected person Mr. Sharma is justified ? How should we behave with such persons ?

(*f*) What values are displayed by Mr. Mukesh in this episode ?

Ans. (*a*) HIV stands for Human Immunodeficiency Virus. HIV-positive means that the person has HIV infection.

(*b*) HIV can be transmitted :

(*i*) by having unprotected sex (without condom) with an HIV infected person.

(*ii*) by the transfusion of HIV infected blood.

(*iii*) by using HIV infected needles and syringes for injections.

(*iv*) from HIV infected mother to child during pregnancy and breastfeeding.

(*c*) No, HIV infection cannot be contracted by shaking hands or hugging a person infected with HIV. There is no harm in staying and working with an HIV-positive person. HIV is not the same as AIDS. HIV is the virus that leads to AIDS. A person can have HIV virus for many, many years without having AIDS disease. Being HIV positive does not mean that the person has AIDS disease.

(*d*) A person can protect himself from HIV infection :

(*i*) by having safe sex by using a condom.

(*ii*) by ensuring that any blood needed by him is tested for HIV infection.

(*iii*) by using new and disposable needles and syringes for getting injections.

(*iv*) by getting tested for sexually transmitted diseases (including HIV).

(*e*) The people's indifference (or rudeness) towards the HIV-positive Mr. Sharma is highly unjustified. Our behaviour towards an HIV+ve person should be full of sympathy and concern for his suffering and misfortune. We should help him to come out of depression and encourage him to lead a normal life by taking all the available drugs to control this infection.

(*f*) The values displayed by Mr. Mukesh are (*i*) Awareness (or knowledge) that HIV infection can be treated with drugs and kept under control, and that being HIV positive is not the same as having AIDS disease, and (*ii*) Compassion (sympathy and concern for the sufferings of others).

Q. 19. Budh Ram and Satto are husband and wife who live in a village. They already have two children in the form of two lovely daughters. During third pregnancy, Budh Ram and Satto went to a city clinic and, after paying a hefty bribe, got the pre-natal scan done on the foetus. After knowing the sex of foetus, they went to a famous lady doctor who specialises in gynaecology and requested her to carry out the medical termination of pregnancy. They offered her big money for doing this job. The lady doctor said a firm 'No'. When the couple insisted, the doctor threatened to call the police and get them arrested.

(*a*) What type of scan was done to know the pre-natal (before birth) sex of foetus illegally ?

(*b*) What do you think this scan showed ?

(*c*) Why did Budh Ram and Satto want to terminate this pregnancy ?

(*d*) What term is used specifically for such type of termination of pregnancy ?

(*e*) What values were displayed by the lady doctor ?

Ans. (*a*) An ultrasound scan was done to know the sex of foetus.

(*b*) The ultrasound scan showed that it was a female foetus.

(*c*) Budh Ram and Satto wanted to terminate this pregnancy so as to abort the female foetus (foetus of the girl child). This is because they wanted to try again for having a boy child (or son).

(*d*) Female foeticide.

(*e*) The values displayed by the lady doctor are :

(*i*) Awareness (or knowledge) that it is against the law to abort a female foetus (foetus o the girl child).

(*ii*) Concern for the girl child.

(*iii*) Responsibility towards society (to maintain healthy child sex ratio).

(*iv*) Honesty (in not accepting bribe).

Q. 20. Shivani visited her village with her parents during the winter holidays. When she went to the fields outside the village, she saw a farmer spraying pesticides over the standing crops in the fields. When she looked at the container of pesticide lying on the ground, she knew that it was a pesticide which had been banned from use in most of the countries. The farmer was spraying pesticide without taking any precautions. Shivani asked the farmer to cover his nose and mouth properly with a cloth while spraying the pesticide. She also asked him not to spray too much pesticide on the crops because it is harmful to human beings, other animals and aquatic life in the long run. Shivani educated the farmer about the various harmful effects of this pesticide.

(*a*) What are pesticides ? Why are pesticides sprayed over the crops ? Which pesticide was being sprayed by the farmer on the crops ?

(*b*) (*i*) At which trophic level pesticides enter a food chain ?
(*ii*) At which trophic level of food chain, the concentration of pesticides is the maximum ?
(*c*) What name is given to the process of concentration of pesticides in the body of living organisms at each trophic level of a food chain ?
(*d*) Why do pesticides get accumulated at each trophic level in a food chain ?
(*e*) What are the harmful effects of the pesticide being sprayed by this farmer ?
(*f*) What values are displayed by Shivani in this episode ?

Ans. (*a*) Pesticides are the poisonous chemical substances which are sprayed over the standing crop plants to protect them from pests (harmful small animals) and diseases. The farmer was spraying DDT pesticide on the crops.

(*b*) (*i*) The pesticides enter a food chain at the first trophic level called producer level (which are the plants).

(*ii*) The concentration of pesticides is the maximum at the highest trophic level of organisms in a food chain (which occurs on the extreme right side in a food chain).

(*c*) Biological magnification.

(*d*) Pesticides get accumulated at each trophic level in a food chain because they are non-biodegradable chemical substances (which cannot be decomposed naturally by various micro-organisms present in soil and water bodies).

(*e*) DDT damages liver, nervous system and reproductive system in human beings. DDT can also cause various types of cancers, including liver cancer.

(*f*) The values displayed by Shivani are (*i*) Awareness (that DDT is harmful to human beings and other animals) (*ii*) Concern for the farmer (that DDT may not enter his respiratory system and damage it), and (*iii*) Concern for the environment (because DDT is non-biodegradable pesticide and persists in the soil and water bodies for a very long time).

Q. 21. Diya has just moved into a new house in another colony alongwith her parents. Diya is a keen observer of all the human activities going around her in the colony. She noticed that in the colony people threw the left-over food, and fruit and vegetable peels into overflowing garbage bins to be taken away by the staff of Municipal Corporation. She also saw that the gardener of the colony collected all the fallen leaves of houseplants and garden plants in one corner of the park, let them dry, and ultimately burnt them. It was brought to her knowledge that Residents Welfare Association of the colony spent a lot of money every year in purchasing chemical fertiliser for the garden plants and grass lawns. Keeping all this in view, Diya presented a plan of action to the President of Welfare Association. On the successful completion of this plan after a few months, there was no need to purchase chemical fertiliser anymore. The environment also looked very neat and clean.
(*a*) What do you think was Diya's plan of action ?
(*b*) How did Diya's plan of action help the environment ?
(*c*) How did Diya's plan of action help the Residents Welfare Association ?
(*d*) What values of Diya are displayed by this plan of action ?

Ans. (*a*) Diya used the left-over food, fruit and vegetable peels and fallen leaves collected from the whole colony for making compost.

(*b*) The left-over food, and fruit and vegetable peels which used to rot in garbage bins and emit foul smell were now buried in the compost pit. Similarly, the fallen plant leaves which used to remain scattered here and there, and produced lot of smoke on burning, were now buried in compost pit. These actions helped in keeping the environment neat

and clean.

(*c*) A lot of money which was earlier spent by Residents Welfare Association in purchasing the chemical fertiliser for the garden plants and grass lawns was saved. This is because the compost made in the colony itself was now used as manure to grow plants in the garden as well as in lawns.

(*d*) The values displayed by Diya are (*i*) Awareness (that waste materials such as left-over food, fruit and vegetable peels, and fallen leaves of plants can be converted into a useful material called compost)(*ii*) Concern for the environment (to keep it clean and protect it from the harmful effects of using chemical fertilisers), and (*iii*) Desire to help Residents Welfare Association (by saving money spent on fertilisers).

Q. 22. Mr. Bhatia wanted to buy a new refrigerator and a new air conditioner in place of old ones which were purchased ten years ago. When Mr. Bhatia went to the market to buy these items his son Ankit, who is a student of tenth standard, also went with him. Before buying the new refrigerator and air conditioner, Ankit asked the various details from the shopkeeper and made sure that they did not contain old refrigerant which was not environment-friendly. The shopkeeper told him that these items now work with the new, eco-friendly refrigerant. Mr. Bhatia was puzzled by all this discussion. When they reached home, Ankit explained everything to his father. Ankit's father was happy at his choice.

(*a*) What do you think were the old refrigerants used in earlier refrigerator and air conditioner ?

(*b*) What was the harmful effect of old refrigerants to the environment if they leaked out ?

(*c*) What diseases could have been caused if people of the whole world had continued to use old refrigerants ? Why ?

(*d*) Name the new refrigerant which is being used increasingly in place of old one.

(*e*) Why is the new refrigerant being used these days not harmful to the environment ?

(*f*) What values are displayed by Ankit in this episode ?

Ans. (*a*) CFCs (Chloro-Fluoro-Carbons).

(*b*) CFCs are ozone depleting substances. So, if CFCs leaked out from refrigerators or air conditioners, they would attack the protective ozone layer high up in the atmosphere and destroy it gradually.

(*c*) If the people of whole world continued to use CFCs, then more and more of protective ozone layer in the upper atmosphere could be damaged, allowing more and more harmful ultraviolet radiations coming from the sun to pass through it and reach the earth. These ultraviolet radiations could cause diseases such as skin cancer, eye cataract, and damage the immune system by lowering the body's resistance to diseases.

(*d*) HFCs (Hydro-Fluoro-Carbons).

(*e*) The new refrigerants (HFCs) do not attack or destroy the protective ozone layer in the upper atmosphere. So, they are not harmful to the environment.

(*f*) The values displayed by Ankit are (*i*) Awareness (or knowledge) that ozone-friendly refrigerants (HFCs) are now available which can be used in place of harmful CFCs, and (*ii*) Desire to protect the useful ozone layer and prevent the harmful effects of ozone depletion.

Q. 23. The teacher had just finished the chapter on environment in her class X lecture. She then placed four types of carry bags on the table in the classroom. These were cloth carry bag, paper carry bag, polythene carry bag and jute carry bag. The teacher asked Anushka to choose any two bags which she thinks are the most environment-friendly. Anushka thought for a while and then picked up cloth carry bag and jute carry bag.

(*a*) Explain why, Anushka did not choose the polythene carry bag though it is long lasting and waterproof ?

(*b*) What is the reason for not choosing the paper bag ?

(*c*) Why did Anushka choose only cotton cloth bag and jute bag ?

(*d*) What values are displayed by Anushka in making her choices ?

Ans. (*a*) Anushka did not choose a polythene carry bag because polythene is a plastic which is a non-biodegradable material. Polythene bags lie scattered here and there and cause a lot of pollution. It is also not possible to dispose of old polythene bags by burning because they produce extremely harmful gases on burning.

(*b*) Anushka did not choose the paper bag because though paper is biodegradable material but it is made from wood for which many forest trees have to be cut down regularly. So, Anushka did not choose paper bag to save trees by preventing deforestation.

(*c*) Anushka chose cloth bag and jute bag because cloth bag is made of cloth which comes from cotton crop grown in fields. Similarly, jute for making jute bag is obtained from jute crop grown in fields by the farmers. Since both cotton and jute are grown as crops in fields and they are biodegradable too, therefore, making of cloth bag and jute bag does not harm the environment in any way.

(*d*) The values displayed by Anushka are (*i*) Awareness (or knowledge) of biodegradable and non-biodegradable materials, and (*ii*) Concern for the environment.

Q. 24. Apoorva is a student of tenth class. She has asked her father to replace all the old filament-type bulbs in her house by CFLs. She herself uses a bicycle for going to her school. Apoorva has a habit of writing on both the sides of her notebook pages and never tears away pages from notebooks. One day when Apoorva went to the village fields alongwith her father, she saw two snakes in the standing crops. The farmers wanted to kill these snakes but Apoorva requested them not to do so. While at home or school, Apoorva is very particular to get the leaking taps repaired by the plumber immediately.

(*a*) What really is conserved when Apoorva uses CFLs in her house instead of filament-type bulbs ?

(*b*) What really is conserved when Apoorva goes to her school on bicycle ?

(*c*) What really is conserved when Apoorva writes on both sides of the pages in her notebook ?

(*d*) What really is conserved when Apoorva does not allow the snakes in standing crop fields to be killed ?

(*e*) What is conserved when Apoorva gets the leaking taps repaired immediately ?

(*f*) What are the things conserved by Apoorva commonly known as ?

(*g*) What values are displayed by Apoorva by her actions ?

Ans. (*a*) Coal (because coal is used to produce electricity).

(*b*) Petroleum (because a petroleum product 'petrol' is used in going to school by car or scooter).

(*c*) Forests (because paper used in making notebook is obtained from wood of forest trees).

(*d*) Wildlife (because snake is a part of wildlife which is a friend of the farmer).

(*e*) Water (because leaking taps waste water).

(*f*) Natural resources.

(*g*) The values displayed by Apoorva are (*i*) Management of natural resources (or conservation of natural resources) because coal, petroleum, forests and wildlife, and water are all natural resources, and (*ii*) Concern for a healthy environment.

Q. 25. Mohan, Rohan and Sohan are three classmates. They have three different habits. Mohan is fond of taking bread and apple jam. Whenever all the jam of the container is eaten up by him, Mohan cleans the container thoroughly and puts iodised salt in it which his mother keeps on the kitchen rack. Rohan has a habit of putting old notebooks, newspapers and magazines at one place and sell it to *Kabadiwala* after a month to make some extra pocket money. Sohan has also a unique habit of going from room to room in his big house and switch off the lights and fans when no one is in the rooms. Actually, Mohan, Rohan and Sohan are collectively trying to practise three R's taught by their teacher in their own ways.

(*a*) What is meant by three R's ? In which context are they used ?

(*b*) Which of the three R's is exemplified by Mohan's action ?

(*c*) Which of the three R's is exemplified by Rohan's action ?

(*d*) Which of the three R's is exemplified by Sohan's action ?

(*e*) Why is the R exemplified by Mohan's action better than the R exemplified by Rohan's action ?

(*f*) What values are displayed by Mohan, Rohan and Sohan in this episode ?

Ans. (*a*) The three R's stand for Reduce, Recycle and Reuse. These are used in the context of natural resources.

(*b*) Mohan reuses the empty jam container for storing iodised salt, so the R exemplified by Mohan's action is 'Reuse'.

(*c*) Rohan sells old paper products such as old notebooks, newspapers and magazines to *kabadiwala* for being sent to paper mills for recycling (making new paper), so the R exemplified by Rohan's action is 'Recycle'.

(*d*) Sohan switches off lights and fans when not needed to avoid wastage of electricity and reduces the consumption of coal (which is usually used to produce electricity), so the R exemplified by Sohan's action is 'Reduce'.

(*e*) We have just seen that Mohan practises 'reuse' and Rohan practises 'recycle'. The process of 'reuse' is better than that of recycling because though some energy is used to recycle old objects but no energy is required during reuse.

(*f*) The values displayed by Mohan, Rohan and Sohan are : (*i*) Awareness (or knowledge) of 3 R's to save the environment, and (*ii*) Ability to use their knowledge in everyday situations.