

Answers NCERT Solutions For Class 12 Biology

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Evolution

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Question 1: Explain antibiotic resistance observed in bacteria in light of Darwinian selection theory.

Answer Darwinian selection theory states that individuals with favorable variations are better adapted than individuals with less favorable variation. It means that nature selects the individuals with useful variation as these individuals are better evolved to survive in the existing environment. An example of such selection is antibiotic resistance in bacteria. When bacterial population was grown on an agar plate containing antibiotic penicillin, the colonies that were sensitive to penicillin died, whereas one or few bacterial colonies that were resistant to penicillin survived. This is because these bacteria had undergone chance mutation, which resulted in the evolution of a gene that made them resistant to penicillin drug. Hence, the resistant bacteria multiplied quickly as compared to non-resistant (sensitive) bacteria, thereby increasing their number. Hence, the advantage of an individual over other helps in the struggle for existence.

Question 2: Find out from newspapers and popular science articles any new fossil discoveries or controversies about evolution.

Answer Fossils of dinosaurs have revealed the evolution of reptiles in Jurassic period. As a result of this, evolution of other animals such as birds and mammals has also been discovered. However, two unusual fossils recently unearthed in China have ignited a controversy over the evolution of birds. Confuciusornis is one such genus of primitive birds that were crow sized and lived during the Cretaceous period in China.

Question 3: Attempt giving a clear definition of the term species

Answer Species can be defined as a group of organisms, which have the capability to interbreed in order to produce fertile offspring.

Question 4: Try to trace the various components of human evolution (hint: brain size and function, skeletal structure, dietary preference, etc.)

Answer The various components of human evolution are as follows.

- (i) Brain capacity
- (ii) Posture
- iii. Food / dietary preference and other important features

	Name	Brain capacity	Posture	Food	Features
1.	<i>Dryopithecus africanus</i>	---	Knuckle walker, walked similar to gorillas and chimpanzees (was more ape-like)	Soft fruit and leaves	Canines large, arms and legs are of equal size
2.	<i>Ramapithecus</i>	---	Semi-erect (more man-like)	Seeds, nuts	Canines were small while molars were

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3.	<i>Australopithecus africanus</i>	450 cm ³	Full erect posture, height (1.05 m)	Herbivorous (ate fruits)	Hunted with stone weapons, lived at trees, canines and incisors were small
4.	<i>Homo habilis</i>	735cm ³	Fully erect posture, height (1.5 m)	Carnivorous	Canines were small. They were first tool makers.
5.	<i>Homo erectus</i>	800-1100 cm ³	Fully erect posture, height(1.5-1.8 m)	Omnivorous	They used stone and bone tools for hunting games.
6.	<i>Homo neanderthalensis</i>	1300-1600 cm ³	Fully erect posture, height (1.5-1.66 m)	Omnivorous	Cave dwellers, used hides to protect their bodies, and buried their dead

7.	<i>Homo sapiens fossilis</i>	1650 cm ³	Fully erect posture with height (1.8 m)	Omnivorous	They had strong jaw with teeth close together. They were cave dwellers, made paintings and carvings in the caves. They developed a culture and were called first modern men.
8.	<i>Homo sapiens sapiens</i>	1200-1600 cm ³	Fully erect posture, height (1.5-1.8 m)	Omnivorous	They are the living modern men, with high intelligence. They developed art, culture, language, speech, etc.

Question 5: Find out through internet and popular science articles whether animals other than man have self-consciousness.

Answer There are many animals other than humans, which have self consciousness. An example of an animal being self conscious is dolphins. They are highly intelligent. They have a sense of self and they also recognize others among themselves and others. They communicate with each other by

whistles, tail-slapping, and other body movements. Not only dolphins, there are certain other animals such as crow, parrot, chimpanzee, gorilla, orangutan, etc., which exhibit self-consciousness.

Question 6: List 10 modern-day animals and using the internet resources link it to a corresponding ancient fossil. Name both.

Answer The modern day animals and their ancient fossils are listed in the following table.

Animal		Fossil
1.	Man	<i>Ramapithecus</i>
2.	Horse	<i>Eohippus</i>
3.	Dog	<i>Leptocyon</i>
4.	Camel	<i>Protylopus</i>
5.	Elephant	<i>Moerithers</i>
6.	Whale	<i>Protocetus</i>
7.	Fish	<i>Arandaspis</i>
8.	Tetrapods	<i>Ichthyostega</i>
9.	Bat	<i>Archaeonycteris</i>
10.	Giraffe	<i>Palaeotragus</i>

Question 7: Practise drawing various animals and plants.

Answer Ask your teachers and parents to suggest the names of plants and animals and practice drawing them. You can also take help from your book to find the names of plants and animals.

Question 8: Describe one example of adaptive radiation.

Answer Adaptive radiation is an evolutionary process that produces new species from a single, rapidly diversifying lineage. This process occurs due to natural selection. An example of adaptive radiation is Darwin finches, found in Galapagos Island. A large variety of finches is present in Galapagos Island that arose from a single species, which reached this land accidentally. As a result, many new species have evolved, diverged, and adapted to occupy new habitats. These finches have developed different eating habits and different types of beaks to suit their feeding habits. The

insectivorous, blood sucking, and other species of finches with varied dietary habits have evolved from a single seed eating finch ancestor.

Question 9: Can we call human evolution as adaptive radiation?

Answer No, human evolution cannot be called adaptive radiation. This is because adaptive radiation is an evolutionary process that produces new species from a single, rapidly diversifying lineage, which is not the case with human evolution. Human evolution is a gradual process that took place slowly in time. It represents an example of anagenesis.

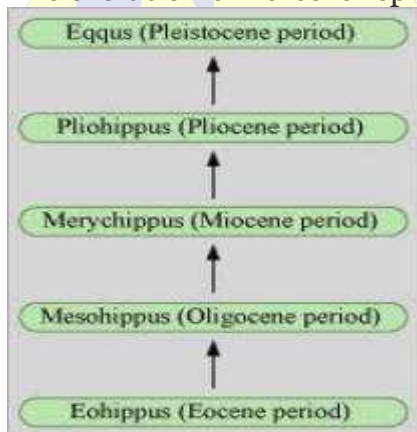
Question 10: Using various resources such as your school library or the internet and discussions with

your teacher, trace the evolutionary stages of any one animal say horse.

Answer The evolution of horse started with Eohippus during Eocene period. It involved the following evolutionary stages.

- (i) Gradual increase in body size
- (ii) Elongation of head and neck region
- (iii) Increase in the length of limbs and feet
- (iv) Gradual reduction of lateral digits
- (v) Enlargement of third functional toe
- (vi) Strengthening of the back
- (vii) Development of brain and sensory organs
- (viii) Increase in the complexity of teeth for feeding on grass

The evolution of horse is represented as



(i) Eohippus

It had a short head and neck. It had four functional toes and a splint of 1 and 5 on each hind limb and a splint of 1 and 3 in each forelimb. The molars were short crowned that were adapted for grinding the plant diet.

(ii) Mesohippus

It was slightly taller than Eohippus. It had three toes in each foot.

(iii) Merychippus

It had the size of approximately 100 cm. Although it still had three toes in each foot, but it could run on one toe. The side toe did not touch the ground. The molars were adapted for chewing the grass.

(iv) Pliohippus

It resembled the modern horse and was around 108 cm tall. It had a single functional toe with splint of 2nd and 4th in each limb.

(v) Equus

Pliohippus gave rise to Equus or the modern horse with one toe in each foot. They have incisors for cutting grass and molars for grinding food.

Answers NCERT Solutions For Class 12 Biology

<http://freehomedelivery.net/> Solutions Chapter 8 Human Health and Disease

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Question 1: What are the various public health measures, which you would suggest as safeguard against infectious diseases?

Answer Public health measures are preventive measures which are taken to check the spread of various infectious diseases. These measures should be taken to reduce the contact with infectious agents.

Some of these methods are:

(1) Maintenance of personal and public hygiene: It is one of the most important methods of preventing infectious diseases. This measure includes maintaining a clean body, consumption of healthy and nutritious food, drinking clean water, etc. Public hygiene includes proper disposal of waste material, excreta, periodic cleaning, and disinfection of water reservoirs.

(2) Isolation: To prevent the spread of air-borne diseases such as pneumonia, chicken pox, tuberculosis, etc., it is essential to keep the infected person in isolation to reduce the chances of spreading these diseases.

(3) Vaccination: Vaccination is the protection of the body from communicable diseases by administering some agent that mimics the microbe inside the body. It helps in providing passive immunization to the body. Several vaccines are available against many diseases such as tetanus, polio, measles, mumps, etc.

(4) Vector Eradication: Various diseases such as malaria, filariasis, dengue, and chikungunya spread through vectors. Thus, these diseases can be prevented by providing a clean environment and by preventing the breeding of mosquitoes. This can be achieved by not allowing water to stagnate around residential areas. Also, measures like regular cleaning of coolers, use of mosquito nets and insecticides such as malathion in drains, ponds, etc. can be undertaken to ensure a healthy environment. Introducing fish such as Gambusia in ponds also controls the breeding of mosquito larvae in stagnant water.

Question 2: In which way has the study of biology helped us to control infectious diseases?

Answer Various advancements that have occurred in the field of biology have helped us gain a better understanding to fight against various infectious diseases. Biology has helped us study the life cycle of various parasites, pathogens, and vectors along with the modes of transmission of various diseases and the measures for controlling them. Vaccination programmes against several infectious diseases such as small pox, chicken pox, tuberculosis, etc. have helped eradicate these diseases. Biotechnology has helped in the preparation of newer and safer drugs and vaccines. Antibiotics have also played an important role in treating infectious diseases.

Question 3: How does the transmission of each of the following diseases take place?

- (a) Amoebiasis
- (b) Malaria
- (c) Ascariasis

(d) Pneumonia

Answer

	Disease	Causative organism	Mode of transmission
a.	Amoebiasis	<i>Entamoeba histolytica</i>	It is a vector-borne disease that spreads by the means of contaminated food and water. The vector involved in the transmission of this disease is the housefly.
b.	Malaria	<i>Plasmodium sp.</i>	It is a vector-borne disease that spreads by the biting of the female <i>Anopheles</i> mosquito.
c.	Ascariasis	<i>Ascaris lumbricoides</i>	It spreads via contaminated food and water.
d.	Pneumonia	<i>Streptococcus pneumoniae</i>	It spreads by the sputum of an infected person.

Question 4: What measure would you take to prevent water-borne diseases?

Answer Water-borne diseases such as cholera, typhoid, hepatitis B, etc. spread by drinking contaminated water. These water-borne diseases can be prevented by ensuring proper disposal of sewage, excreta, periodic cleaning. Also, measures such as disinfecting community water reservoirs, boiling drinking water, etc. should be observed.

Question 5: Discuss with your teacher what does 'a suitable gene' means, in the context of DNA vaccines.

Answer A 'suitable gene' refers to a specific DNA segment which can be injected into the cells of the host body to produce specific proteins. This protein kills the specific disease-causing organism in the host body and provides immunity.

Question 6: Name the primary and secondary lymphoid organs.

Answer (a) Primary lymphoid organs include the bone marrow and the thymus.

(b) Secondary lymphoid organs are the spleen, lymph nodes, tonsils, Peyer's patches of small intestine, and appendix.

Question 7: The following are some well-known abbreviations, which have been used in this chapter. Expand each one to its full form:

(a) MALT

(b) CMI

(c) AIDS

(d) NACO

(e) HIV

Answer (a) MALT- Mucosa-Associated Lymphoid Tissue
(b) CMI- Cell-Mediated Immunity
(c) AIDS- Acquired Immuno Deficiency Syndrome
(d) NACO- National AIDS Control Organization
(e) HIV- Human Immuno Deficiency virus

Question 8: Differentiate the following and give examples of each:

- (a) Innate and acquired immunity
- (b) Active and passive immunity

Answer

- (a) Innate and acquired immunity



(a) Innate and acquired immunity

	Innate immunity		Acquired immunity
1.	It is a non-pathogen specific type of defense mechanism.	1.	It is a pathogen specific type of defense mechanism.
2.	It is inherited from parents and protects the individual since birth.	2.	It is acquired after the birth of an individual.



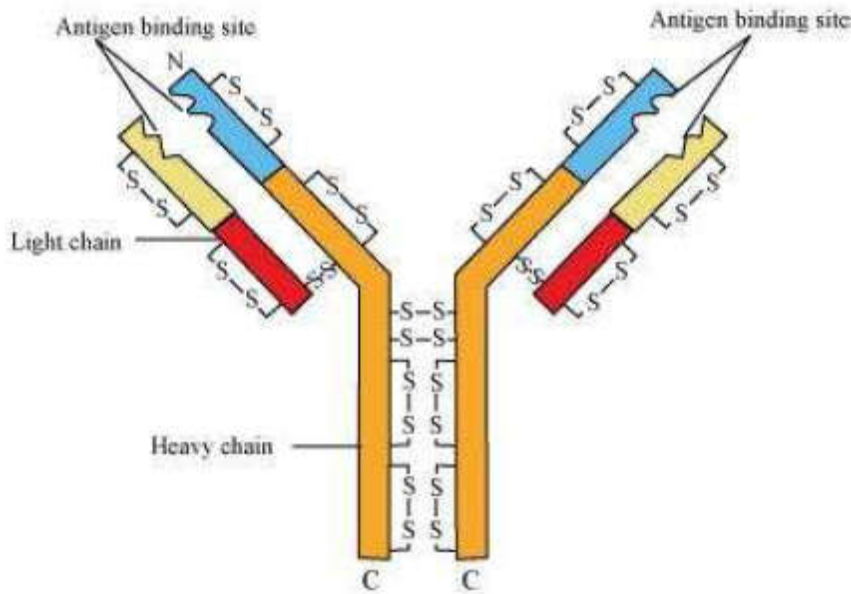
3.	It operates by providing barriers against the entry of foreign infectious agents.	3.	It operates by producing primary and secondary responses, which are mediated by B-lymphocytes and T-lymphocytes.
4	It does not have a specific memory.	4	It is characterized by an immunological memory.

(b) Active and passive immunity

	Active immunity		Passive immunity
1.	It is a type of acquired immunity in which the body produces its own antibodies against disease-causing antigens.	1.	It is a type of acquired immunity in which readymade antibodies are transferred from one individual to another.
2.	It has a long lasting effect.	2.	It does not have long lasting effect.
3.	It is slow. It takes time in producing antibodies and giving responses.	3.	It is fast. It provides immediate relief.
4.	Injecting microbes through vaccination inside the body is an example of active immunity.	4.	Transfer of antibodies present in the mother's milk to the infant is an example of passive immunity.

Question 9: Draw a well-labelled diagram of an antibody molecule.

Answer



Structure of an antibody molecule

Question 10: What are the various routes by which transmission of human immunodeficiency virus takes place?

Answer AIDS (Acquired Immuno Deficiency Syndrome) is caused by the Human immunodeficiency virus (HIV).

It has the following modes of transmission:

- (a) Unprotected sexual contact with an infected person.
- (b) Transfusion of blood from a healthy to an infected person.
- (c) Sharing infected needles and syringes.
- (d) From an infected mother to a child through the placenta.

Question 11: What is the mechanism by which the AIDS virus causes deficiency of immune system of the infected person?

Answer AIDS (Acquired Immuno Deficiency Syndrome) is caused by the human immunodeficiency virus (HIV) via sexual or blood-blood contact. After entering the human body, the HIV virus attacks and enters the macrophages. Inside the macrophages, the RNA of the virus replicates with the help of enzyme reverse transcriptase and gives rise to viral DNA. Then, this viral DNA incorporates into the host DNA and directs the synthesis of virus particles. At the same time, HIV enters helper T-lymphocytes. It replicates and produces viral progeny there. These newly formed progeny viruses get released into the blood, attacking other healthy helper T-lymphocytes in the body. As a result, the number of T-lymphocytes in the body of an infected person decreases progressively, thereby decreasing the immunity of a person.

Question 12: How is a cancerous cell different from a normal cell?

Answer

	Normal cell		Cancerous cell
1.	Normal cells show the property of contact inhibition. Therefore, when these cells come into contact with other cells, they stop dividing.	1	Cancerous cells lack the property of contact inhibition. Therefore, they continue to divide, thereby forming a mass of cells or tumor.
2.	They undergo differentiation after attaining a specific growth.	2.	They do not undergo differentiation.
3.	These cells remain confined at a particular location.	3	These cells do not remain confined at a particular location. They move into neighboring tissues and disturb its function.

Question 13: Explain what is meant by metastasis.

Answer The property of metastasis is exhibited by malignant tumors. It is the pathological process of spreading cancerous cells to the different parts of the body. These cells divide uncontrollably, forming a mass of cells called tumor. From the tumor, some cells get sloughed off and enter into the blood stream. From the blood stream, these cells reach distant parts of the body and therefore, initiate the formation of new tumors by dividing actively.

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Question 14: List the harmful effects caused by alcohol/drug abuse.

Answer Alcohol and drugs have several adverse effects on the individual, his family, and the society.

A. Effects of alcohol:

Effects on the individual: Alcohol has an adverse effect on the body of an individual. When an individual consumes excess alcohol, it causes damage to the liver and the nervous system. As a result, other symptoms such as depression, fatigue, aggression, loss of weight and appetite may also be observed in the individual. Sometimes, extreme levels of alcohol consumption may also lead to heart failure, resulting coma and death. Also, it is advisable for pregnant women to avoid alcohol as it may inhibit normal growth of the baby.

Effects on the family:

Consumption of excess alcohol by any family member can have devastating effects on the family. It leads to several domestic problems such as quarrels, frustrations, insecurity, etc.

Effects on the society:

- (a) Rash behavior
- (b) Malicious mischief and violence
- (c) Deteriorating social network
- (d) Loss of interest in social and other activities

B Effects of drugs: An individual who is addicted to drugs creates problems not only for himself but also for his family.

Effects on the individual:

Drugs have an adverse effect on the central nervous system of an individual. This leads to the malfunctioning of several other organs of the body such as the kidney, liver, etc. The spread of HIV is most common in these individuals as they share common needles while injecting drugs in their body. Drugs have long-term side effects on both males and females. These side effects include increased aggressiveness, mood swings, and depression. Effects on the family and society: A person addicted to drugs creates problems for his family and society. A person dependant on drugs becomes frustrated, irritated, and anti-social.

Question 15: Do you think that friends can influence one to take alcohol/drugs? If yes, how may one protect himself/herself from such an influence?

Answer Yes, friends can influence one to take drugs and alcohol. A person can take the following steps for protecting himself/herself against drug abuse:

- (a) Increase your will power to stay away from alcohol and drugs. One should not experiment with alcohol for curiosity and fun.
- (b) Avoid the company of friends who take drugs.
- (c) Seek help from parents and peers.
- (d) Take proper knowledge and counseling about drug abuse. Devote your energy in other extra-curricular activities.
- (e) Seek immediate professional and medical help from psychologists and psychiatrists if symptoms of depression and frustration become apparent.

Question 16: Why is that once a person starts taking alcohol or drugs, it is difficult to get rid of this habit? Discuss it with your teacher.

Answer Drug and alcohol consumption has an inherent addictive nature associated with euphoria and a temporary feeling of well-being. Repeated intake of drugs increases the tolerance level of the body's receptors, leading to more consumption of drugs.

Question 17: In your view what motivates youngsters to take to alcohol or drugs and how can this be avoided?

Answer Many factors are responsible for motivating youngsters towards alcohol or drugs. Curiosity, need for adventure and excitement, experimentation are the initial causes of motivation. Some youngsters start consuming drugs and alcohol in order to overcome negative emotions (such as stress, pressure, depression, frustration) and to excel in various fields. Several mediums like television, internet, newspaper, movies etc. are also responsible for promoting the idea of alcohol to the younger generation. Amongst these factors, reasons such as unstable and unsupportive family structures and peer pressure can also lead an individual to be dependant on drugs and alcohol. Preventive measures against addiction of alcohol and drugs:

- (a) Parents should motivate and try to increase the will power of their child.
- (b) Parents should educate their children about the ill-effects of alcohol. They should provide them with proper knowledge and counselling regarding the consequences of addiction to alcohol.
- (c) It is the responsibility of the parent to discourage a child from experimenting with alcohol. Youngsters should be kept away from the company of friends who consume drugs.
- (d) Children should be encouraged to devote their energy in other extra-curricular and recreational activities.
- (e) Proper professional and medical help should be provided to a child if sudden symptoms of depression and frustration are observed.

Answers NCERT Solutions For Class 12 Biology

<http://freehomedelivery.net/> Solutions Chapter 9

Strategies for Enhancement in Food Production

Answers NCERT Solutions For Class 12 Biology <http://freehomedelivery.net/> Solutions Chapter 9
Strategies for Enhancement in Food Production

Answers NCERT Solutions For Class 12 Biology <http://freehomedelivery.net/> **Solutions Chapter 9 Strategies for Enhancement in Food Production**

Question 1: Explain in brief the role of animal husbandry in human welfare.

Answer Animal husbandry deals with the scientific management of livestock. It includes various aspects such as feeding, breeding, and control diseases to raise the population of animal livestock. Animal husbandry usually includes animals such as cattle, pig, sheep, poultry, and fish which are useful for humans in various ways. These animals are managed for the production of commercially important products such as milk, meat, wool, egg, honey, silk, etc. The increase in human population has increased the demand of these products. Hence, it is necessary to improve the management of livestock scientifically.

Question 2: If your family owned a dairy farm, what measures would you undertake to improve the quality and quantity of milk production?

Answer Dairy farm management deals with processes which aim at improving the quality and quantity of milk production. Milk production is primarily dependent on choosing improved cattle breeds, provision of proper feed for cattle, maintaining proper shelter facilities, and regular cleaning of cattle. Choosing improved cattle breeds is an important factor of cattle management. Hybrid cattle breeds are produced for improved productivity. Therefore, it is essential that hybrid cattle breeds should have a combination of various desirable genes such as high milk production and high resistance to diseases. Cattle should also be given healthy and nutritious food consisting of roughage, fibre concentrates, and high levels of proteins and other nutrients. Cattle's should be housed in proper cattle-houses and should be kept in well ventilated roofs to prevent them from harsh weather conditions such as heat, cold, and rain. Regular baths and proper brushing should be ensured to control diseases. Also, time-to-time check ups by a veterinary doctor for symptoms of various diseases should be undertaken.

Question 3: What is meant by the term 'breed'? What are the objectives of animal breeding?

Answer A breed is a special variety of animals within a species. It is similar in most characters such as general appearance, size, configuration, and features with other members of the same species. Jersey and Brown Swiss are examples of foreign breeds of cattle. These two varieties of cattle have the ability to produce abundant quantities of milk. This milk is very nutritious with high protein content. Objectives of animal breeding:

- (i) To increase the yield of animals.
- (ii) To improve the desirable qualities of the animal produce.
- (iii) To produce disease-resistant varieties of animals.

Question 4: Name the methods employed in animal breeding. According to you which one of the methods is best? Why?

Answer Animal breeding is the method of mating closely related individuals. There are several methods employed in animals breeding, which can be classified into the following categories:

(A) Natural methods of breeding include inbreeding and out-breeding. Breeding between animals of the same breed is known as inbreeding, while breeding between animals of different breeds is known as out-breeding. Out-breeding of animals is of three types:

(a). Out-crossing: In this type of out-breeding, the mating of animals occurs within the same breed. Thus, they have no common ancestors up to the last 4-5 generations.

(b). Cross-breeding: In this type of out-breeding, the mating occurs between different breeds of the same species, thereby producing a hybrid.

(c). Interspecific hybridization: In this type of out-breeding, the mating occurs between different species.

(B) Artificial methods of breeding include modern techniques of breeding. It involves controlled breeding experiments, which are of two types:-

(a). Artificial insemination: It is a process of introducing the semen (collected from the male) into the oviduct or the uterus of the female body by the breeder. This method of breeding helps the breeder overcome certain problems faced in abnormal mating.

(b). Multiple ovulation embryo technology (MOET): It is a technique for cattle improvement in which super-ovulation is induced by a hormone injection. Then, fertilization is achieved by artificial insemination and early embryos are collected. Each of these embryos are then transplanted into the surrogate mother for further development of the embryo. The best method to carry out animal breeding is the artificial method of breeding, which includes artificial insemination and MOET technology. These technologies are scientific in nature. They help overcome problems of normal mating and have a high success rate of crossing between mature males and females. Also, it ensures the production of hybrids with the desired qualities. This method is highly economical as a small amount of semen from the male can be used to inseminate several cattle.

Question 5: What is apiculture? How is it important in our lives?

Answer Apiculture is the practice of bee-keeping for the production of various products such as honey, bee's wax, etc. Honey is a highly nutritious food source and is used as an indigenous system of medicines. It is useful in the treatment of many disorders such as cold, flu, and dysentery. Other commercial products obtained from honey bees include bee's wax and bee pollen. Bee's wax is used for making cosmetics, polishes, and is even used in several medicinal preparations. Therefore, to meet the increasing demand of honey, people have started practicing bee-keeping on a large scale. It has become an income generating activity for farmers since it requires a low investment and is labour intensive.

Question 6: Discuss the role of fishery in enhancement of food production.

Answer Fishery is an industry which deals with catching, processing, and marketing of fishes and other aquatic animals that have a high economic value. Some commercially important aquatic animals are prawns crabs, oysters, lobsters, and octopus. Fisheries play an important role in the Indian economy. This is because a large part of the Indian population is dependent on fishes as a source of food, which is both cheap and high in animal protein. A Fishery is an employment generating industry especially for people staying in the coastal areas. Both fresh water fishes (such as Catla, Rohu, etc) and marine fishes (such as tuna, mackerel pomfret, etc.) are of high economic value.

Question 7: Briefly describe various steps involved in plant breeding.

Answer Plant breeding is the process in which two genetically dissimilar varieties are purposely crossed to produce a new hybrid variety. As a result, characteristics from both parents can be obtained in the hybrid plant variety. Thus, it involves the production of a new variety with the desired

characteristics such as resistance to diseases, climatic adaptability, and better productivity. The various steps involved in plant breeding are as follows:

(a). Collection of genetic variability: Genetic variability from various wild relatives of the cultivated species are collected to maintain the genetic diversity of a species. The entire collection of the diverse alleles of a gene in a crop is called the germplasm collection.

(b). Evaluation of germplasm and selection of parents: The germplasm collected is then evaluated for the desirable genes. The selected plants with the desired genes are then used as parents in plant breeding experiments and are multiplied by the process of hybridization.

(c). Cross-hybridization between selected parents: The next step in plant breeding is to combine the desirable characters present in two different parents to produce hybrids. It is a tedious job as one has to ensure that the pollen grains collected from the male parent reach the stigma of the female parent.

(d). Selection of superior hybrids: The progenies of the hybrids having the desired characteristics are selected through scientific evaluation. The selected progenies are then self-pollinated for several generations to ensure homozygosity.

(e). Testing, release, and commercialization of new cultivars: The selected progenies are evaluated for characters such as yield, resistance to diseases, performance, etc. by growing them in research fields for at least three growing seasons in different parts of the country. After thorough testing and evaluation, the selected varieties are given to the farmers for growing in fields for a large-scale production.

Question 8: Explain what is meant by biofortification.

Answer Biofortification is a process of breeding crops with higher levels of vitamins, minerals, proteins, and fat content. This method is employed to improve public health. Breeding of crops with improved nutritional quality is undertaken to improve the content of proteins, oil, vitamins, minerals, and micro-nutrients in crops. It is also undertaken to upgrade the quality of oil and proteins. An example of this is a wheat variety known as Atlas 66, which has high protein content in comparison to the existing wheat. In addition, there are several other improved varieties of crop plants such as rice, carrots, spinach etc. which have more nutritious value and more nutrients than the existing varieties.

Question 9: Which part of the plant is best suited for making virus-free plants and why?

Answer Apical and axillary meristems of plants is used for making virus-free plants. In a diseased plant, only this region is not infected by the virus as compared to the rest of the plant region. Hence, the scientists remove axillary and apical meristems of the diseased plant and grow it in vitro to obtain a disease-free and healthy plant. Virus-free plants of banana, sugarcane, and potato have been obtained using this method by scientists.

Question 10: What is the major advantage of producing plants by micropropagation?

Answer Micropropagation is a method of producing new plants in a short duration using plant tissue culture. Some major advantages of micropropagation are as follows:

(a) Micropropagation helps in the propagation of a large number of plants in a short span of time.

(b) The plants produced are identical to the mother plant. (c) It leads to the production of healthier plantlets, which exhibit better disease-resisting powers.

Question 11: Find out what the various components of the medium used for propagation of explants in vitro are?

Answer The major components of medium used for propagation of explants in vitro are carbon

sources such as sucrose, inorganic salts, vitamins, amino acids, water, agar-agar, and certain growth hormones such as auxins and gibberellins.

Question 12: Name any five hybrid varieties of crop plants which have been developed in India.

Answer The five hybrid varieties of crop plants which have been developed in India are:

Crop plant	Hybrid variety
Wheat	Sonalika and kalia sona
Rice	Jaya and Ratna
Cauliflower	Pusa shubra and Pusa snowball K-1
Cowpea	Pusa komal
Mustard	Pusa swarnim



Answers NCERT Solutions For Class 12 Biology **<http://freehomedelivery.net/> Solutions Chapter 10** **Microbes in Human Welfare**

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Microbes in Human Welfare

Answers NCERT Solutions For Class 12 Biology <http://freehomedelivery.net/> **Solutions Chapter 10 Microbes in Human Welfare**

Question 1: Bacteria cannot be seen with the naked eyes, but these can be seen with the help of a microscope. If you have to carry a sample from your home to your biology laboratory to demonstrate the presence of microbes under a microscope, which sample would you carry and why?

Answer Curd can be used as a sample for the study of microbes. Curd contains numerous lactic acid bacteria (LAB) or Lactobacillus. These bacteria produce acids that coagulate and digest milk proteins. A small drop of curd contains millions of bacteria, which can be easily observed under a microscope.

Question 2: Give examples to prove that microbes release gases during metabolism.

Answer The examples of bacteria that release gases during metabolism are:

(a) Bacteria and fungi carry out the process of fermentation and during this process, they release carbon dioxide. Fermentation is the process of converting a complex organic substance into a simpler substance with the action of bacteria or yeast. Fermentation of sugar produces alcohol with the release of carbon dioxide and very little energy.

(b) The dough used for making idli and dosa gives a puffed appearance. This is because of the action of bacteria which releases carbon dioxide. This CO₂ released from the dough gets trapped in the dough, thereby giving it a puffed appearance.

Question 3: In which food would you find lactic acid bacteria? Mention some of their useful applications.

Answer Lactic acid bacteria can be found in curd. It is this bacterium that promotes the formation of milk into curd. The bacterium multiplies and increases its number, which converts the milk into curd. They also increase the content of vitamin B₁₂ in curd. Lactic acid bacteria are also found in our stomach where it keeps a check on the disease-causing micro-organisms.

Question 4: Name some traditional Indian foods made of wheat, rice and Bengal gram (or their products) which involve use of microbes.

Answer (a) Wheat: Product: Bread, cake, etc.

2. Rice: Product: Idli, dosa

2. Bengal gram: Product: Dhokla, Khandvi

Question 5: In which way have microbes played a major role in controlling diseases caused by harmful bacteria?

Answer Several micro-organisms are used for preparing medicines. Antibiotics are medicines produced by certain micro-organisms to kill other disease-causing micro-organisms. These medicines are commonly obtained from bacteria and fungi. They either kill or stop the growth of disease-causing micro-organisms. Streptomycin, tetracycline, and penicillin are common antibiotics. Penicillium notatum produces chemical penicillin, which checks the growth of staphylococci bacteria in the body. Antibiotics are designed to destroy bacteria by weakening their cell walls. As a result of this weakening, certain immune cells such as the white blood cells enter the bacterial cell and cause cell lysis. Cell lysis is the process of destroying cells such as blood cells and bacteria.

Question 6: Name any two species of fungus, which are used in the production of the antibiotics.

Answer Antibiotics are medicines that are produced by certain micro-organisms to kill other disease-causing micro-organisms. These medicines are commonly obtained from bacteria and fungi. The species of fungus used in the production of antibiotics are:

Antibiotic	Fungus source
Penicillin	Penicillium notatum
Cephalosporin	Cephalosporium acremonium

Question 7: What is sewage? In which way can sewage be harmful to us?

Answer Sewage is the municipal waste matter that is carried away in sewers and drains. It includes both liquid and solid wastes, rich in organic matter and microbes. Many of these microbes are pathogenic and can cause several water-borne diseases. Sewage water is a major cause of polluting drinking water. Hence, it is essential that sewage water is properly collected, treated, and disposed.

Question 8: What is the key difference between primary and secondary sewage treatment?

Answer

	Primary sewage treatment		Secondary sewage treatment
1.	It is a mechanical process involving the removal of coarse solid materials.	1.	It is a biological process involving the action of microbes.
2.	It is inexpensive and relatively less complicated.	2.	It is a very expensive and complicated process.

Question 9: Do you think microbes can also be used as source of energy? If yes, how?

Answer Yes, microbes can be used as a source of energy. Bacteria such as Methane bacterium is used for the generation of gobar gas or biogas. The generation of biogas is an anaerobic process in a biogas plant, which consists of a concrete tank (10–15 feet deep) with sufficient outlets and inlets. The dung is mixed with water to form the slurry and thrown into the tank. The digester of the tank is filled with numerous anaerobic methane-producing bacteria, which produce biogas from the slurry. Biogas can be removed through the pipe which is then used as a source of energy, while the spent slurry is removed from the outlet and is used as a fertilizer.

Question 10: Microbes can be used to decrease the use of chemical fertilisers and pesticides. Explain how this can be accomplished.

Answer Microbes play an important role in organic farming, which is done without the use of chemical fertilizers and pesticides. Bio-fertilizers are living organisms which help increase the fertility of soil. It involves the selection of beneficial micro-organisms that help in improving plant growth through the supply of plant nutrients. Bio-fertilizers are introduced in seeds, roots, or soil to mobilize the availability of nutrients. Thus, they are extremely beneficial in enriching the soil with organic nutrients. Many species of bacteria and cyanobacteria have the ability to fix free atmospheric nitrogen. Rhizobium is a symbiotic bacteria found in the root nodules of leguminous plants. Azospirillum and Azotobacter are free living nitrogen-fixing bacteria, whereas Anabaena, Nostoc and Oscillatoria are examples of nitrogen-fixing cyanobacteria. Bio-fertilizers are cost effective and eco-friendly. Microbes can also act as bio-pesticides to control insect pests in plants. An example of bio-pesticides is Bacillus thuringiensis, which produces a toxin that kills the insect pests. Dried bacterial spores are mixed in water and sprayed in agricultural fields. When larvae of insects feed on crops, these bacterial spores enter the gut of the larvae and release toxins, thereby it. Similarly, Trichoderma are free living fungi. They live in the roots of higher plants and protect them from various pathogens. Baculoviruses is another bio-pesticide that is used as a biological control agent against insects and other arthropods.

Question 11: Three water samples namely river water, untreated sewage water and secondary effluent discharged from a sewage treatment plant were subjected to BOD test. The samples were labelled A, B and C; but the laboratory attendant did not note which was which. The BOD values of the three samples A, B and C were recorded as 20mg/L, 8mg/L and 400mg/L, respectively. Which sample of the water is most polluted? Can you assign the correct label to each assuming the river water is relatively clean?

Answer Biological oxygen demand (BOD) is the method of determining the amount of oxygen required by micro-organisms to decompose the waste present in the water supply. If the quantity of organic wastes in the water supply is high, then the number of decomposing bacteria present in the water will also be high. As a result, the BOD value will increase. Therefore, it can be concluded that if the water supply is more polluted, then it will have a higher BOD value. Out of the above three samples, sample C is the most polluted since it has the maximum BOD value of 400 mg/L. After untreated sewage water, secondary effluent discharge from a sewage treatment plant is most polluted. Thus, sample A is secondary effluent discharge from a sewage treatment plant and has the BOD value of 20 mg/L, while sample B is river water and has the BOD value of 8 mg/L.

Hence, the correct label for each sample is:

Label	BOD value	Sample
A.	20 mg/L	Secondary effluent discharge from a sewage treatment plant
B.	8 mg/L	River water
C.	400 mg/L	Untreated sewage water

Question 12:

Find out the name of the microbes from which Cyclosporin A (an immunosuppressiv drug) and Statins (blood cholesterol lowering agents) are obtained.

Answer

	Drug	Function	Microbe
1.	Cyclosporine – A	Immuno suppressive drug	<i>Trichoderma polysporum</i>
2.	Statin	Blood cholesterol lowering agent	<i>Monascus purpureus</i>

Question 13: Find out the role of microbes in the following and discuss it with your teacher.

(a) Single cell protein (SCP)

(b) Soil

Answer (a) Single cell protein (SCP)

A single cell protein is a protein obtained from certain microbes, which forms an alternate source of proteins in animal feeds. The microbes involved in the preparation of single cell proteins are algae, yeast, or bacteria. These microbes are grown on an industrial scale to obtain the desired protein. For example, Spirulina can be grown on waste materials obtained from molasses, sewage, and animal manures. It serves as a rich supplement of dietary nutrients such as proteins, carbohydrate, fats, minerals, and vitamins. Similarly, micro-organisms such as Methylophilus and methylotrophus have a large rate of biomass production. Their growth can produce a large amount of proteins.

(b) Soil Microbes play an important role in maintaining soil fertility. They help in the formation of nutrient-rich humus by the process of decomposition. Many species of bacteria and cyanobacteria have the ability to fix atmospheric nitrogen into usable form. Rhizobium is a symbiotic bacteria found in the root nodules of leguminous plants. Azospirillum and Azotobacter are free living nitrogen-fixing bacteria, whereas Anabena, Nostoc, and Oscillatoria are examples of nitrogen-fixing cyanobacteria.

Question 14: Arrange the following in the decreasing order (most important first) of their importance, for the welfare of human society. Give reasons for your answer. Biogas, Citric acid, Penicillin and Curd

Answer The order of arrangement of products according to their decreasing importance is:

Penicillin- Biogas – Citric acid – Curd

Penicillin is the most important product for the welfare of human society. It is an antibiotic, which is

used for controlling various bacterial diseases. The second most important product is biogas. It is an eco-friendly source of energy. The next important product is citric acid, which is used as a food preservative. The least important product is curd, a food item obtained by the action of lactobacillus bacteria on milk. Hence, the products in the decreasing order of their importance are as follows: Penicillin- Biogas – Citric acid – Curd

Question 15: How do biofertilisers enrich the fertility of the soil?

Answer Bio-fertilizers are living organisms which help in increasing the fertility of soil. It involves the selection of beneficial micro-organisms that help in improving plant growth through the supply of plant nutrients. These are introduced to seeds, roots, or soil to mobilize the availability of nutrients by their biological activity. Thus, they are extremely beneficial in enriching the soil with organic nutrients. Many species of bacteria and cyanobacteria have the ability to fix free atmospheric nitrogen. Rhizobium is a symbiotic bacteria found in the root nodules of leguminous plants. Azospirillum and Azotobacter are free living nitrogen-fixing bacteria, whereas Anabena, Nostoc, and Oscillatoria are examples of nitrogen-fixing cyanobacteria. Bio-fertilizers are cost effective and eco-friendly.



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Biotechnology and its Applications

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Biotechnology and its Applications

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Question 1: Crystals of Bt toxin produced by some bacteria do not kill the bacteria themselves because –

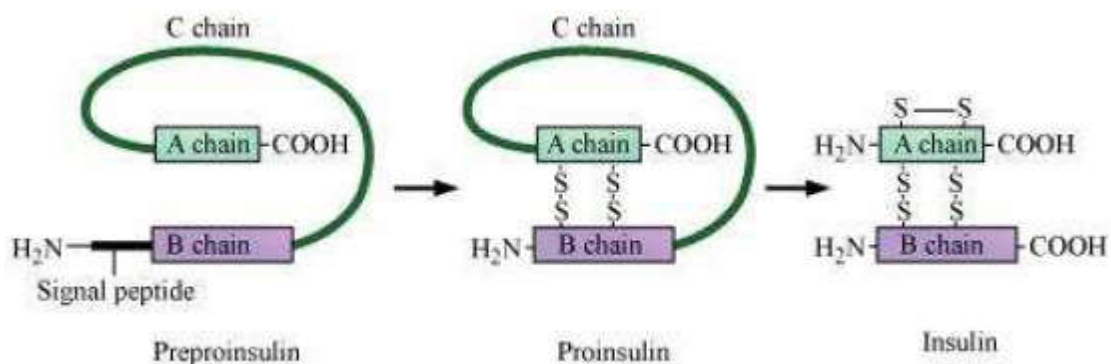
- (a) bacteria are resistant to the toxin
- (b) toxin is immature:
- (c) toxin is inactive:
- (d) bacteria encloses toxin in a special sac.

Answer toxin is inactive:

In bacteria, the toxin is present in an inactive form, called prototoxin, which gets converted into active form when it enters the body of an insect.

Question 2: What are transgenic bacteria? Illustrate using any one example.

Answer Transgenic bacteria contain foreign gene that is intentionally introduced into its genome. They are manipulated to express the desirable gene for the production of various commercially important products. An example of transgenic bacteria is E.coli. In the plasmid of E.coli, the two DNA sequences corresponding to A and B chain of human insulin are inserted, so as to produce the respective human insulin chains. Hence, after the insertion of insulin gene into the bacterium, it becomes transgenic and starts producing chains of human insulin. Later on, these chains are extracted from E.coli and combined to form human insulin.



Question 3: Compare and contrast the advantages and disadvantages of production of genetically modified crops.

Answer The production of genetically modified (GM) or transgenic plants has several advantages.

- (i) Most of the GM crops have been developed for pest resistance, which increases the crop

productivity and therefore, reduces the reliance on chemical pesticides.

(ii) Many varieties of GM food crops have been developed, which have enhanced nutritional quality. For example, golden rice is a transgenic variety in rice, which is rich in vitamin A.

(iii) These plants prevent the loss of fertility of soil by increasing the efficiency of mineral usage.

(iv) They are highly tolerant to unfavourable abiotic conditions.

(v) The use of GM crops decreases the post harvesting loss of crops. However, there are certain controversies regarding the use of genetically modified crops around the world. The use of these crops can affect the native biodiversity in an area. For example, the use of Bt toxin to decrease the amount of pesticide is posing a threat for beneficial insect pollinators such as honey bee. If the gene expressed for Bt toxin gets expressed in the pollen, then the honey bee might be affected. As a result, the process of pollination by honey bees would be affected. Also, genetically modified crops are affecting human health. They supply allergens and certain antibiotic resistance markers in the body. Also, they can cause genetic pollution in the wild relatives of the crop plants. Hence, it is affecting our natural environment.

Question 4: What are Cry proteins? Name an organism that produces it. How has man exploited this protein to his benefit?

Answer Cry proteins are encoded by cry genes. These proteins are toxins, which are produced by *Bacillus thuringiensis* bacteria. This bacterium contains these proteins in their inactive form. When the inactive toxin protein is ingested by the insect, it gets activated by the alkaline pH of the gut. This results in the lysis of epithelial cell and eventually the death of the insect. Therefore, man has exploited this protein to develop certain transgenic crops with insect resistance such as Bt cotton, Bt corn, etc.

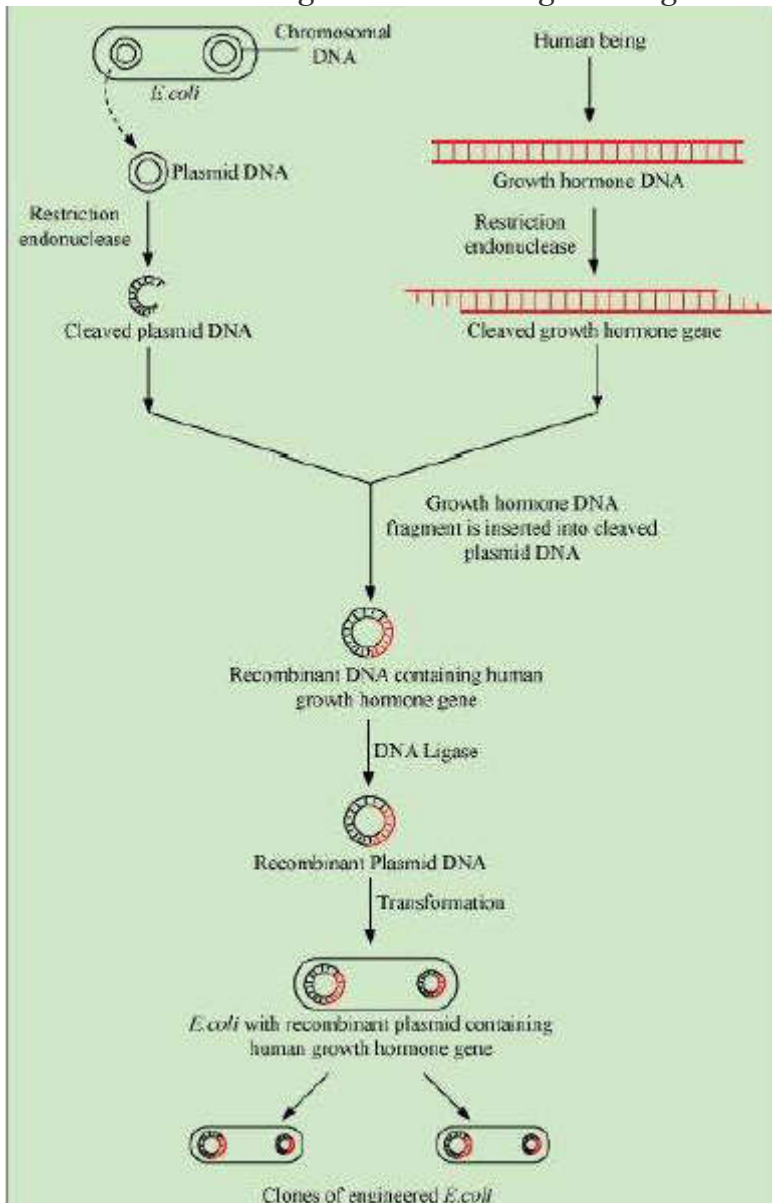
Question 5: What is gene therapy? Illustrate using the example of adenosine deaminase (ADA) deficiency.

Answer Gene therapy is a technique for correcting a defective gene through gene manipulation. It involves the delivery of a normal gene into the individual to replace the defective gene, for example, the introduction of gene for adenosine deaminase (ADA) in ADA deficient individual. The adenosine deaminase enzyme is important for the normal functioning of the immune system. The individual suffering from this disorder can be cured by transplantation of bone marrow cells. The first step involves the extraction of lymphocyte from the patient's bone marrow. Then, a functional gene for ADA is introduced into lymphocytes with the help of retrovirus. These treated lymphocytes containing ADA gene are then introduced into the patient's bone marrow. Thus, the gene gets activated producing functional T- lymphocytes and activating the patient's immune system.

Question 6: Diagrammatically represent the experimental steps in cloning and expressing an human gene (say the gene for growth hormone) into a bacterium like *E. coli* ?

Answer DNA cloning is a method of producing multiple identical copies of specific template DNA. It involves the use of a vector to carry the specific foreign DNA fragment into the host cell. The

mechanism of cloning and transfer of gene for growth hormone into *E. coli* is represented below.



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Question 7: Can you suggest a method to remove oil (hydrocarbon) from seeds based on your understanding of rDNA technology and chemistry of oil?

Answer Recombinant DNA technology (rDNA) is a technique used for manipulating the genetic material of an organism to obtain the desired result. For example, this technology is used for removing oil from seeds. The constituents of oil are glycerol and fatty acids. Using rDNA, one can obtain oilless seeds by preventing the synthesis of either glycerol or fatty acids. This is done by removing the specific gene responsible for the synthesis.

Question 8: Find out from internet what is golden rice.

Answer Golden rice is a genetically modified variety of rice, *Oryza sativa*, which has been developed as a fortified food for areas where there is a shortage of dietary vitamin A. It contains a precursor of pro-vitamin A, called beta-carotene, which has been introduced into the rice through genetic engineering. The rice plant naturally produces beta-carotene pigment in its leaves. However, it is absent in the endosperm of the seed. This is because beta-carotene pigment helps in the process of photosynthesis while photosynthesis does not occur in endosperm. Since beta-carotene is a precursor of pro-vitamin

A, it is introduced into the rice variety to fulfill the shortage of dietary vitamin A. It is simple and a less expensive alternative to vitamin supplements. However, this variety of rice has faced a significant opposition from environment activists. Therefore, they are still not available in market for human consumption.

Question 9: Does our blood have proteases and nucleases?

Answer No, human blood does not include the enzymes, nucleases and proteases. In human beings, blood serum contains different types of protease inhibitors, which protect the blood proteins from being broken down by the action of proteases. The enzyme, nucleases, catalyses the hydrolysis of nucleic acids that is absent in blood.

Question 10: Consult internet and find out how to make orally active protein pharmaceutical. What is the major problem to be encountered?

Answer Orally active protein pharmaceuticals contain biologically active materials such as peptides or proteins, antibodies, and polymeric beads. It is administrated orally into the body through various formulations. It involves the encapsulation of protein or peptide in liposomes or formulations using penetration enhancers. These proteins or peptides are used for treatment of various diseases and are also used as vaccines. However, the oral administration of these peptides or proteins has some problems related to it. Once these proteins are ingested, the proteases present in the stomach juices denature the protein. As a result, their effect will be nullified. Hence, it is necessary to protect the therapeutic protein from digestive enzymes, if taken orally. This is the reason for the proteins to be injected directly into the target site.



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Organisms and Populations

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Question 1: How is diapause different from hibernation?

Answer Diapause is a stage of suspended development to cope with unfavourable conditions. Many species of Zooplankton and insects exhibit diapause to tide over adverse climatic conditions during their development. Hibernation or winter sleep is a resting stage where in animals escape winters (cold) by hiding themselves in their shelters. They escape the winter season by entering a state of inactivity by slowing their metabolism. The phenomenon of hibernation is exhibited by bats, squirrels, and other rodents.

Question 2: If a marine fish is placed in a fresh water aquarium, will the fish be able to survive? Why or why not?

Answer If a marine fish is placed in a fresh water aquarium, then its chances of survival will diminish. This is because their bodies are adapted to high salt concentrations of the marine environment. In fresh water conditions, they are unable to regulate the water entering their body (through osmosis). Water enters their body due to the hypotonic environment outside. This results in the swelling up of the body, eventually leading to the death of the marine fish.

Question 3: Define phenotypic adaptation. Give one example.

Answer Phenotypic adaptation involves changes in the body of an organism in response to genetic mutation or certain environmental changes. These responsive adjustments occur in an organism in order to cope with environmental conditions present in their natural habitats. For example, desert plants have thick cuticles and sunken stomata on the surface of their leaves to prevent transpiration. Similarly, elephants have long ears that act as thermoregulators.

Question 4: Most living organisms cannot survive at temperature above 45°C°. How are some microbes able to live in habitats with temperatures exceeding 100°C°?

Answer Archaeobacteria (Thermophiles) are ancient forms of bacteria found in hot water springs and deep sea hydrothermal vents. They are able to survive in high temperatures (which far exceed 100°C°) because their bodies have adapted to such environmental conditions. These organisms contain specialized thermo-resistant enzymes, which carry out metabolic functions that do not get destroyed at such high temperatures.

Question 5: List the attributes that populations but not individuals possess.

Answer A population can be defined as a group of individuals of the same species residing in a particular geographical area at a particular time and functioning as a unit. For example, all human beings living at a particular place at a particular time constitute the population of humans. The main attributes or characteristics of a population residing in a given area are:-

- (a) Birth rate (Natality): It is the ratio of live births in an area to the population of an area. It is expressed as the number of individuals added to the population with respect to the members of the population.
- (b) Death rate (Mortality): It is the ratio of deaths in an area to the population of an area. It is expressed as the loss of individuals with respect to the members of the population.
- (c) Sex ratio: It is the number of males or females per thousand individuals.
- (d) Age Distribution: It is the percentage of individuals of different ages in a given population. At any given time, the population is composed of individuals that are present in various age groups. The age distribution pattern is commonly represented through age pyramids.
- (e) Population density: It is defined as the number of individuals of a population present per unit area at a given time.

Question 6: If a population growing exponentially double in size in 3 years, what is the intrinsic rate of increase (r) of the population?

Answer A population grows exponentially if sufficient amounts of food resources are available to the individual. Its exponential growth can be calculated by the following integral form of the exponential growth equation:

$$N_t = N_0 e^{rt}$$

Where,

N_t = Population density after time t

N_0 = Population density at time zero

r = Intrinsic rate of natural increase

e = Base of natural logarithms (2.71828)

From the above equation, we can calculate the intrinsic rate of increase (r) of a population.

Now, as per the question,

Present population density = x

Then,

Population density after two years = 2x

t = 3 years

Substituting these values in the formula, we get:

$$\Rightarrow 2x = x e^{3r}$$

$$\Rightarrow 2 = e^{3r}$$

Applying log on both sides:

$$\Rightarrow \log 2 = 3r \log e$$

$$\Rightarrow \frac{\log 2}{3 \log e} = r$$

$$\Rightarrow \frac{\log 2}{3 \times 0.434} = r$$

$$\Rightarrow \frac{0.301}{3 \times 0.434} = r$$

$$\Rightarrow \frac{0.301}{1.302} = r$$

$$\Rightarrow 0.2311 = r$$

Hence, the intrinsic rate of increase for the above illustrated population is 0.2311.

Question 7: Name important defence mechanisms in plants against herbivory.

Answer Several plants have evolved various mechanisms both morphological and chemical to protect themselves against herbivory.

(1) Morphological defence mechanisms:

(a) Cactus leaves (Opuntia) are modified into sharp spines (thorns) to deter herbivores from feeding on them.

(b) Sharp thorns along with leaves are present in Acacia to deter herbivores.

(c) In some plants, the margins of their leaves are spiny or have sharp edges that prevent herbivores from feeding on them.

(2) Chemical defence mechanisms:

(a) All parts of Calotropis weeds contain toxic cardiac glycosides, which can prove to be fatal if ingested by herbivores.

(b) Chemical substances such as nicotine, caffeine, quinine, and opium are produced in plants as a part of self-defense.

Question 8: An orchid plant is growing on the branch of mango tree. How do you describe this interaction between the orchid and the mango tree?

Answer An orchid growing on the branch of a mango tree is an epiphyte. Epiphytes are plants growing on other plants which however, do not derive nutrition from them. Therefore, the relationship between a mango tree and an orchid is an example of commensalism, where one species gets benefited while the other remains unaffected. In the above interaction, the orchid is benefited as it gets support while the mango tree remains unaffected.

Question 9: What is the ecological principle behind the biological control method of managing with pest insects?

Answer The basis of various biological control methods is on the concept of predation. Predation is a biological interaction between the predator and the prey, whereby the predator feeds on the prey. Hence, the predators regulate the population of preys in a habitat, thereby helping in the management of pest insects.

Question 10: Distinguish between the following:

(a) Hibernation and Aestivation

(b) Ectotherms and Endotherms

Answer

(a) Hibernation and Aestivation

	Hibernation		Aestivation
1.	Hibernation is a state of reduced activity in some organisms to escape cold winter conditions.	1.	Aestivation is a state of reduced activity in some organisms to escape desiccation due to heat in summers.
2.	Bears and squirrels inhabiting cold regions are examples of animals that hibernate during winters.	2.	Fishes and snails are examples of organisms aestivating during summers.

(b) Ectotherms and Endotherms

	Ectotherms		Endotherms
1.	Ectotherms are cold blooded animals. Their temperature varies with their surroundings.	1.	Endotherms are warm blooded animals. They maintain a constant body temperature.
2.	Fishes, amphibians, and reptiles are ectothermal animals.	2	Birds and mammals are endothermal animals.

Question 11: Write a short note on

(a) Adaptations of desert plants and animals

(b) Adaptations of plants to water scarcity

(c) Behavioural adaptations in animals

(d) Importance of light to plants

(e) Effect of temperature or water scarcity and the adaptations of animals.

Answer (a) Adaptations of desert plants and animals:

(i) Adaptations of desert plants:

Plants found in deserts are well adapted to cope with harsh desert conditions such as water scarcity and scorching heat. Plants have an extensive root system to tap underground water. They bear thick cuticles and sunken stomata on the surface of their leaves to reduce transpiration. In Opuntia, the leaves are entirely modified into spines and photosynthesis is carried out by green stems. Desert plants have special pathways to synthesize food, called CAM (C₄ pathway). It enables the stomata to remain closed during the day to reduce the loss of water through transpiration.

(ii) Adaptations of desert animals:

Animals found in deserts such as desert kangaroo rats, lizards, snakes, etc. are well adapted to their habitat. The kangaroo rat found in the deserts of Arizona never drinks water in its life. It has the ability to concentrate its urine to conserve water. Desert lizards and snakes bask in the sun during early morning and burrow themselves in the sand during afternoons to escape the heat of the day. These adaptations occur in desert animals to prevent the loss of water.

(b) Adaptations of plants to water scarcity

Plants found in deserts are well adapted to cope with water scarcity and scorching heat of the desert. Plants have an extensive root system to tap underground water. They bear thick cuticles and sunken stomata on the surface of their leaves to reduce transpiration. In Opuntia, the leaves are modified into spines and the process of photosynthesis is carried out by green stems. Desert plants have special pathways to synthesize food, called CAM (C₄ pathway). It enables their stomata to remain closed during the day to reduce water loss by transpiration.

(c) Behavioural adaptations in animals Certain organisms are affected by temperature variations.

These organisms undergo adaptations such as hibernation, aestivation, migration, etc. to escape environmental stress to suit their natural habitat. These adaptations in the behaviour of an organism are called behavioural adaptations. For example, ectothermal animals and certain endotherms exhibit behavioral adaptations. Ectotherms are cold blooded animals such as

fish, amphibians, reptiles, etc. Their temperature varies with their surroundings. For example, the desert lizard basks in the sun during early hours when the temperature is quite low. However, as the temperature begins to rise, the lizard burrows itself inside the sand to escape the scorching sun. Similar burrowing strategies are exhibited by other desert animals. Certain endotherms (warm-

blooded animals) such as birds and mammals escape cold and hot weather conditions by hibernating during winters and aestivating during summers. They hide themselves in shelters such as caves, burrows, etc. to protect against temperature variations.

(d) Importance of light to plants

Sunlight acts as the ultimate source of energy for plants. Plants are autotrophic organisms, which need light for carrying out the process of photosynthesis. Light also plays an important role in generating photoperiodic responses occurring in plants. Plants respond to changes in intensity of light during various seasons to meet their photoperiodic requirements for flowering. Light also plays an important role in aquatic habitats for vertical distribution of plants in the sea.

(e) Effects of temperature or water scarcity and the adaptations of animals.

Temperature is the most important ecological factor. Average temperature on the Earth varies from one place to another. These variations in temperature affect the distribution of animals on the Earth. Animals that can tolerate a wide range of temperature are called eurythermals. Those which can tolerate a narrow range of temperature are called stenothermal animals. Animals also undergo adaptations to suit their natural habitats. For example, animals found in colder areas have shorter ears and limbs that prevent the loss of heat from their body. Also, animals found in Polar regions have thick layers of fat below their skin and thick coats of fur to prevent the loss of heat. Some organisms exhibit various behavioural changes to suit their natural habitat. These adaptations present in the behaviour of an organism to escape environmental stresses are called behavioural adaptations. For example, desert lizards are ectotherms. This means that they do not have a temperature regulatory mechanism to escape temperature variations. These lizards bask in the sun during early hours when the temperature is quite low. As the temperature begins to increase, the lizard burrows itself inside the sand to escape the scorching sun. Similar burrowing strategy is seen in other desert animals. Water scarcity is another factor that forces animals to undergo certain adaptations to suit their natural habitat. Animals found in deserts such as desert kangaroo rats, lizards, snakes, etc. are well adapted to stay in their habitat. The kangaroo rat found in the deserts of Arizona never drinks water in its life. It has the ability to concentrate its urine to conserve water. Desert lizards and snakes bask in the sun during early morning and burrow in the sand as the temperature rises to escape the heat of the day. Such adaptations can be seen to prevent the loss of water.

Question 12: Define decomposition and describe the processes and products of decomposition.

Answer Decomposition is the process that involves the breakdown of complex organic matter or biomass from the body of dead plants and animals with the help of decomposers into inorganic raw materials such as carbon dioxide, water, and other nutrients. The various processes involved in decomposition are as follows:

- (1) **Fragmentation:** It is the first step in the process of decomposition. It involves the breakdown of detritus into smaller pieces by the action of detritivores such as earthworms.
- (2) **Leaching:** It is a process where the water soluble nutrients go down into the soil layers and get locked as unavailable salts.
- (3) **Catabolism:** It is a process in which bacteria and fungi degrade detritus through various enzymes into smaller pieces.
- (4) **Humification:** The next step is humification which leads to the formation of a dark- coloured colloidal substance called humus, which acts as reservoir of nutrients for plants.
- (5) **Mineralization:** The humus is further degraded by the action of microbes, which finally leads to the release of inorganic nutrients into the soil. This process of releasing inorganic nutrients from the humus is known as mineralization. Decomposition produces a dark coloured, nutrient-rich substance called humus. Humus finally degrades and releases inorganic raw materials such as CO₂, water, and other nutrient in the soil.

Question 13: Give an example for:

- (a) An endothermic animal
- (b) An ectothermic animal
- (c) An organism of benthic zone

Answer (a) Endothermic animal: Birds such as crows, sparrows, pigeons, cranes, etc. and mammals such as bears, cows, rats, rabbits, etc. are endothermic animals.

(b) Ectothermic animal: Fishes such as sharks, amphibians such as frogs, and reptiles such as tortoise, snakes, and lizards are ectothermic animals.

(c) Organism of benthic zone: Decomposing bacteria is an example of an organism found in the benthic zone of a water body.

Question 14: Define population and community.

Answer Population:

A population can be defined as a group of individuals of the same species residing in a particular geographical area at a particular time and functioning as a unit. For example, all human beings living at a particular place at a particular time constitute the population of humans.

Community:

A community is defined as a group of individuals of different species, living within a certain geographical area. Such individuals can be similar or dissimilar, but cannot reproduce with the members of other species.

Question 15: Define the following terms and give one example for each:

- (a) Commensalism
- (b) Parasitism
- (c) Camouflage
- (d) Mutualism
- (e) Interspecific competition

Answer (a) Commensalism: Commensalism is an interaction between two species in which one species gets benefited while the other remains unaffected. An orchid growing on the branches of a mango tree and barnacles attached to the body of whales are examples of commensalisms.

(b) Parasitism: It is an interaction between two species in which one species (usually smaller) gets positively affected, while the other species (usually larger) is negatively affected. An example of this is liver fluke. Liver fluke is a parasite that lives inside the liver of the host body and derives nutrition from it. Hence, the parasite is benefited as it derives nutrition from the host, while the host is negatively affected as the parasite reduces the host fitness, making its body weak.

(c) Camouflage: It is a strategy adapted by prey species to escape their predators. Organisms are cryptically coloured so that they can easily mingle in their surroundings and escape their predators. Many species of frogs and insects camouflage in their surroundings and escape their predators.

(d) Mutualism: It is an interaction between two species in which both species involved are benefited. For example, lichens show a mutual symbiotic relationship between fungi and blue green algae, where both are equally benefited from each other.

(e) Interspecific competition: It is an interaction between individuals of different species where both species get negatively affected. For example, the competition between flamingoes and resident fishes in South American lakes for common food resources i.e., zooplankton.

Question 16: With the help of suitable diagram describe the logistic population growth curve.

Answer The logistic population growth curve is commonly observed in yeast cells that are grown under laboratory conditions. It includes five phases: the lag phase, positive acceleration phase, exponential phase, negative acceleration phase, and stationary phase.

(a) Lag phase: Initially, the population of the yeast cell is very small. This is because of the limited

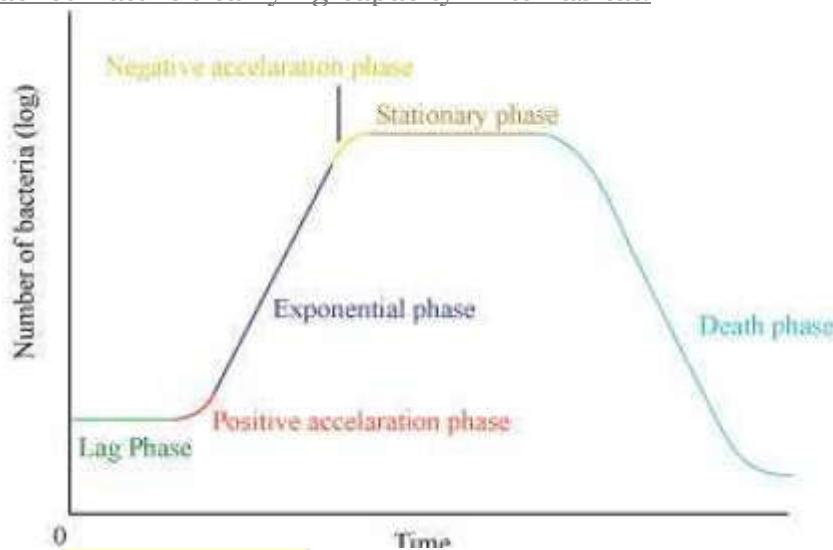
resource present in the habitat.

(b) Positive acceleration phase: During this phase, the yeast cell adapts to the new environment and starts increasing its population. However, at the beginning of this phase, the growth of the cell is very limited.

(c) Exponential phase: During this phase, the population of the yeast cell increases suddenly due to rapid growth. The population grows exponentially due to the availability of sufficient food resources, constant environment, and the absence of any interspecific competition. As a result, the curve rises steeply upwards.

(d) Negative acceleration phase: During this phase, the environmental resistance increases and the growth rate of the population decreases. This occurs due to an increased competition among the yeast cells for food and shelter.

(e) Stationary phase: During this phase, the population becomes stable. The number of cells produced in a population equals the number of cells that die. Also, the population of the species is said to have reached nature's carrying-capacity in its habitat.



A Verhulst–pearl logistic curve is also known as an S-shaped growth curve.

Question 17: Select the statement which explains best parasitism.

(a) One organism is benefited.

(b) Both the organisms are benefited.

(c) One organism is benefited, other is not affected.

(d) One organism is benefited, other is affected.

Answer (d) One organism is benefited, other is affected.

Parasitism is an interaction between two species in which one species (parasite) derives benefit while the other species (host) is harmed. For example, ticks and lice (parasites) present on the human body represent this interaction where in the parasites receive benefit (as they derive nourishment by feeding on the blood of humans). On the other hand, these parasites reduce host fitness and cause harm to the human body.

Question 18: List any three important characteristics of a population and explain

Answer A population can be defined as a group of individuals of the same species, residing in a particular geographical area at a particular time and functioning as a unit. For example, all human beings living at a particular place at a particular time constitute the population of humans.

Three important characteristics of a population are:

(a) Birth rate (Natality): It is the ratio of live births in an area to the population of an area. It is expressed as the number of individuals added to the population with respect to the members of the

population.

(b) Death rate (Mortality): It is the ratio of deaths in an area to the population of an area. It is expressed as the loss of individuals with respect to the members of the population.

(c) Age Distribution: It is the percentage of individuals of different ages in a given population. At any given time, a population is composed of individuals that are present in various age groups. The age distribution pattern is commonly represented through age pyramids.



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Ecosystem

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Question 1: Fill in the blanks.

- (a) Plants are called as _____ because they fix carbon dioxide.
- (b) In an ecosystem dominated by trees, the pyramid (of numbers) is _____ type.
- (c) In aquatic ecosystems, the limiting factor for the productivity is _____.
- (d) Common detritivores in our ecosystem are _____.
- (e) The major reservoir of carbon on earth is _____.

(a) Plants are called as autotrophs because they fix carbon dioxide.

(b) In an ecosystem dominated by trees, the pyramid (of numbers) is of inverted type.

(c) In aquatic ecosystems, the limiting factor for productivity is light.

(d) Common detritivores in our ecosystem are earthworms.

(e) A major reservoir of carbon on Earth is oceans.

Question 2: Which one of the following has the largest population in a food chain?

- (a) Producers
- (b) Primary consumers
- (c) Secondary consumers
- (d) Decomposers

Answer (d) Decomposers

Decomposers include micro-organisms such as bacteria and fungi. They form the largest population in a food chain and obtain nutrients by breaking down the remains of dead plants and animals.

Question 3: The second trophic level in a lake is-

- (a) Phytoplankton
- (b) Zooplankton
- (c) Benthos
- (d) Fishes

Answer (b) Zooplankton

Zooplankton are primary consumers in aquatic food chains that feed upon phytoplankton. Therefore, they are present at the second trophic level in a lake.

Question 4: Secondary producers are

- (a) Herbivores
- (b) Producers
- (c) Carnivores
- (d) None of the above

Answer (d) None of the above

Plants are the only producers. Thus, they are called primary producers. There are no other producers in a food chain.

Question 5: What is the percentage of photosynthetically active radiation (PAR), in the incident solar radiation.

- (a) 100%
- (b) 50 %
- (c) 1-5%
- (d) 2-10%

Answer (b) 50%

Out of total incident solar radiation, about fifty percent of it forms photosynthetically active radiation or PAR.

Question 6: Distinguish between

- (a) Grazing food chain and detritus food chain
- (b) Production and decomposition
- (c) Upright and inverted pyramid
- (d) Food chain and Food web
- (e) Litter and detritus
- (f) Primary and secondary productivity

Answer

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(a) Grazing food chain and detritus food chain

	Grazing food chain		Detritus food chain
1.	In this food chain, energy is derived from the Sun.	1.	In this food chain, energy comes from organic matter (or detritus) generated in trophic levels of the grazing food chain.
2.	It begins with producers, present at the first trophic level. The plant biomass is then eaten by herbivores, which in turn are consumed by a variety of carnivores.	2.	It begins with detritus such as dead bodies of animals or fallen leaves, which are then eaten by decomposers or detritivores. These detritivores are in turn consumed by their predators.
3.	This food chain is usually large.	3.	It is usually smaller as compared to the grazing food chain.

(b) Production and decomposition

	Production		Decomposition
1.	It is the rate of producing organic matter (food) by producers.	2.	It is the process of breaking down of complex organic matter or biomass from the body of dead plants and animals with the help of decomposers into organic raw material such as CO ₂ , H ₂ O, and other nutrients.

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2.	It depends on the photosynthetic capacity of the producers.	2.	It occurs with the help of decomposers.
3	Sunlight is required by plants for primary production.	3.	Sunlight is not required for decomposition by decomposers

(c) Upright and inverted pyramid

	Upright pyramid		Inverted pyramid
1.	The pyramid of energy is always upright.	1.	The pyramid of biomass and the pyramid of numbers can be inverted.
2.	In the upright pyramid, the number and biomass of organisms in the producer level of an ecosystem is the highest, which keeps on decreasing at each trophic level in a food chain.	2.	In an inverted pyramid, the number and biomass of organisms in the producer level of an ecosystem is the lowest, which keeps on increasing at each trophic level.

(d) Food chain and Food web

	Food chain		Food web
1.	It is a single linear sequence of organisms.	1.	It contains a number of interconnected food chains.
2.	Members present at higher trophic levels feed on single types of organisms.	2.	One organism has alternate food sources.

(e) Litter and detritus

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	Litter		Detritus
1.	Litter contains all kinds of wastes generated above the ground.	1.	Detritus is composed of the remains of dead plants and animals.
2.	Litter contains both biodegradable and non-biodegradable matter.	2.	Detritus contains only biodegradable matter.

(f) Primary and secondary productivity

	Primary productivity		Secondary productivity
1.	It is defined as the amount of organic matter produced by producers per unit area over a period of time.	1.	It is defined as the rate of production of organic matter by consumers over a period of time.

Question 7: Describe the components of an ecosystem.

Answer An ecosystem is defined as an interacting unit that includes both the biological community as well as the non-living components of an area. The living and the non-living components of an ecosystem interact amongst themselves and function as a unit, which gets evident during the processes of nutrient cycling, energy flow, decomposition, and productivity. There are many ecosystems such as ponds, forests, grasslands, etc.

The two components of an ecosystem are:

(a) **Biotic component:** It is the living component of an ecosystem that includes biotic factors such as producers, consumers, decomposers, etc. Producers include plants and algae. They contain chlorophyll pigment, which helps them carry out the process of photosynthesis in the presence of light. Thus, they are also called converters or transducers. Consumers or heterotrophs are organisms that are directly (primary consumers) or indirectly (secondary and tertiary consumers) dependent on producers for their food. Decomposers include micro-organisms such as bacteria and fungi. They form the largest population in a food chain and obtain nutrients by breaking down the remains of dead plants and animals.

(b) **Abiotic component:** They are the non-living component of an ecosystem such as light, temperature, water, soil, air, inorganic nutrients, etc.

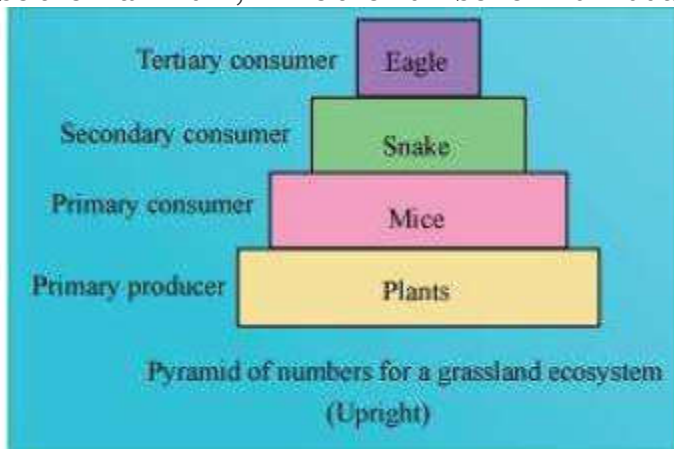
Question 8: Define ecological pyramids and describe with examples, pyramids of number and biomass.

Answer An ecological pyramid is a graphical representation of various ecological parameters such as the number of individuals present at each trophic level, the amount of energy, or the biomass present at each trophic level. Ecological pyramids represent producers at the base, while the apex represents the top level consumers present in the ecosystem. There are three types of pyramids:

- (a) Pyramid of numbers
- (b) Pyramid of energy
- (c) Pyramid of biomass

Pyramid of numbers: It is a graphical representation of the number of individuals present at each trophic level in a food chain of an ecosystem. The pyramid of numbers can be upright or inverted

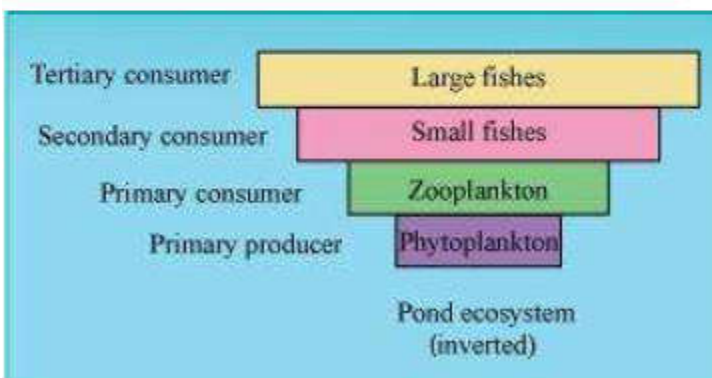
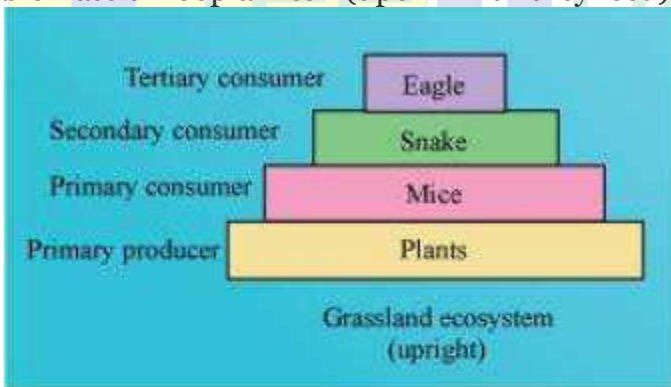
depending on the number of producers. For example, in a grassland ecosystem, the pyramid of numbers is upright. In this type of a food chain, the number of producers (plants) is followed by the number of herbivores (mice), which in turn is followed by the number of secondary consumers (snakes) and tertiary carnivores (eagles). Hence, the number of individuals at the producer level will be the maximum, while the number of individuals present at top carnivores will be least.



On the other hand, in a parasitic food chain, the pyramid of numbers is inverted. In this type of a food chain, a single tree (producer) provides food to several fruit eating birds, which in turn support several insect species.

Pyramid of biomass

A pyramid of biomass is a graphical representation of the total amount of living matter present at each trophic level of an ecosystem. It can be upright or inverted. It is upright in grasslands and forest ecosystems as the amount of biomass present at the producer level is higher than at the top carnivore level. The pyramid of biomass is inverted in a pond ecosystem as the biomass of fishes far exceeds the biomass of zooplankton (upon which they feed).



Question 9: What is primary productivity? Give brief description of factors that affect primary productivity.

Answer It is defined as the amount of organic matter or biomass produced by producers per unit area over a period of time. Primary productivity of an ecosystem depends on the variety of environmental factors such as light, temperature, water, precipitation, etc. It also depends on the availability of nutrients and the availability of plants to carry out photosynthesis.

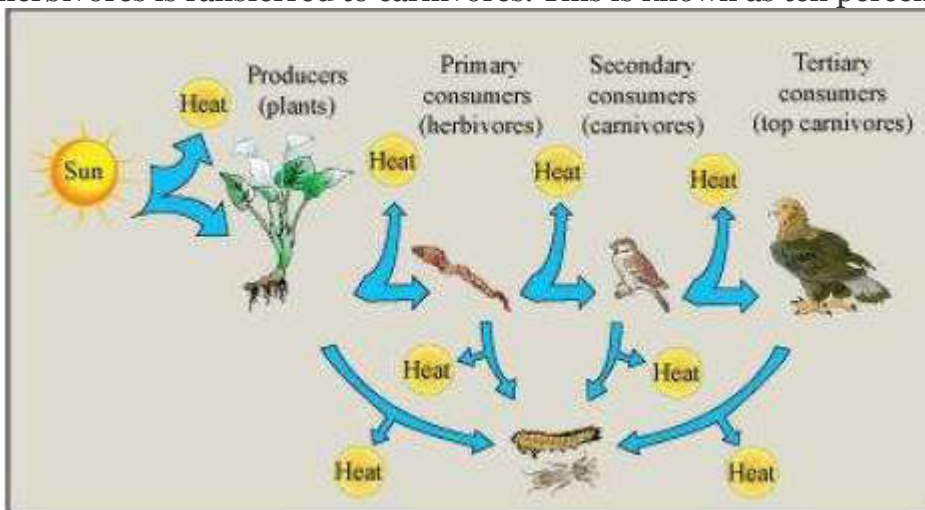
Question 10: Define decomposition and describe the processes and products of decomposition.

Answer Decomposition is the process that involves the breakdown of complex organic matter or biomass from the body of dead plants and animals with the help of decomposers into inorganic raw materials such as carbon dioxide, water, and other nutrients. The various processes involved in decomposition are as follows:

- (1) Fragmentation: It is the first step in the process of decomposition. It involves the breakdown of detritus into smaller pieces by the action of detritivores such as earthworms.
- (2) Leaching: It is a process where the water soluble nutrients go down into the soil layers and get locked as unavailable salts.
- (3) Catabolism: It is a process in which bacteria and fungi degrade detritus through various enzymes into smaller pieces.
- (4) Humification: The next step is humification which leads to the formation of a dark- coloured colloidal substance called humus, which acts as reservoir of nutrients for plants.
- (5) Mineralization: The humus is further degraded by the action of microbes, which finally leads to the release of inorganic nutrients into the soil. This process of releasing inorganic nutrients from the humus is known as mineralization. Decomposition produces a dark coloured, nutrient-rich substance called humus. Humus finally degrades and releases inorganic raw materials such as CO₂, water, and other nutrient in the soil.

Question 11: Give an account of energy flow in an ecosystem.

Answer Energy enters an ecosystem from the Sun. Solar radiations pass through the atmosphere and are absorbed by the Earth's surface. These radiations help plants in carrying out the process of photosynthesis. Also, they help maintain the Earth's temperature for the survival of living organisms. Some solar radiations are reflected by the Earth's surface. Only 2-10 percent of solar energy is captured by green plants (producers) during photosynthesis to be converted into food. The rate at which the biomass is produced by plants during photosynthesis is termed as 'gross primary productivity'. When these green plants are consumed by herbivores, only 10% of the stored energy from producers is transferred to herbivores. The remaining 90 % of this energy is used by plants for various processes such as respiration, growth, and reproduction. Similarly, only 10% of the energy of herbivores is transferred to carnivores. This is known as ten percent law of energy flow.



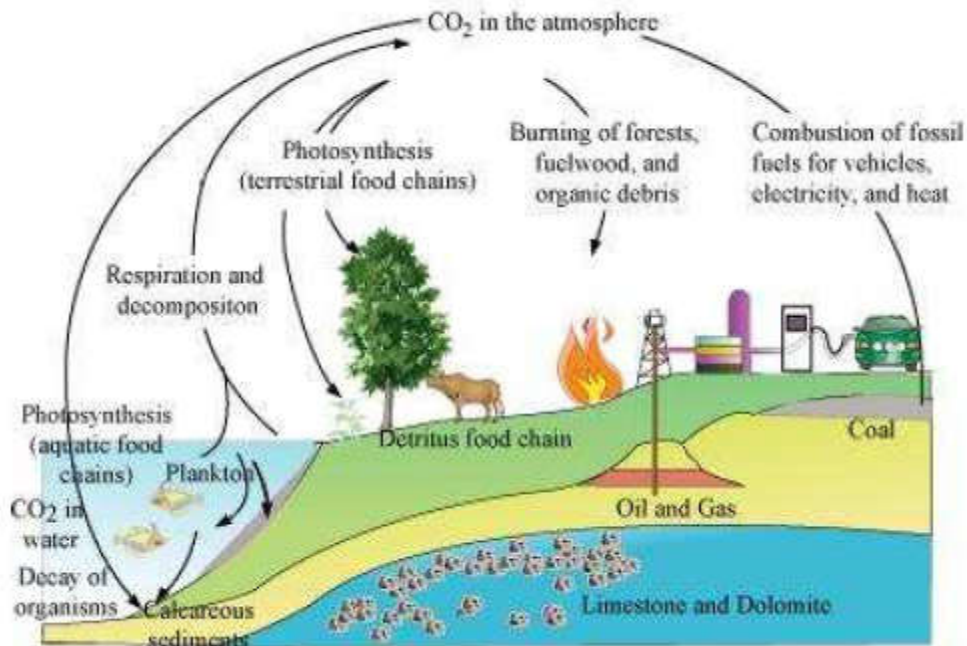
Question 12: Write important features of a sedimentary cycle in an ecosystem.

Answer Sedimentary cycles have their reservoirs in the Earth's crust or rocks. Nutrient elements are found in the sediments of the Earth. Elements such as sulphur, phosphorus, potassium, and calcium have sedimentary cycles.

Sedimentary cycles are very slow. They take a long time to complete their circulation and are considered as less perfect cycles. This is because during recycling, nutrient elements may get locked in the reservoir pool, thereby taking a very long time to come out and continue circulation. Thus, it usually goes out of circulation for a long time.

Question 13: Outline salient features of carbon cycling in an ecosystem

Answer



The carbon cycle is an important gaseous cycle which has its reservoir pool in the atmosphere. All living organisms contain carbon as a major body constituent. Carbon is a fundamental element found in all living forms. All biomolecules such as carbohydrates, lipids, and proteins required for life processes are made of carbon. Carbon is incorporated into living forms through a fundamental process called 'photosynthesis'. Photosynthesis uses sunlight and atmospheric carbon dioxide to produce a carbon compound called 'glucose'. This glucose molecule is utilized by other living organisms. Thus, atmospheric carbon is incorporated in living forms. Now, it is necessary to recycle this absorbed carbon dioxide back into the atmosphere to complete the cycle. There are various processes by which carbon is recycled back into the atmosphere in the form of carbon dioxide gas. The process of respiration breaks down glucose molecules to produce carbon dioxide gas. The process of decomposition also releases carbon dioxide from dead bodies of plants and animals into the atmosphere. Combustion of fuels, industrialization, deforestation, volcanic eruptions, and forest fires act as other major sources of carbon dioxide.

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Biodiversity and Conservation

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Question 1: Name the three important components of biodiversity.

Answer Biodiversity is the variety of living forms present in various ecosystems. It includes variability among life forms from all sources including land, air, and water. Three important components of biodiversity are:

- (a) Genetic diversity
- (b) Species diversity
- (c) Ecosystem diversity

Question 2: How do ecologists estimate the total number of species present in the world?

Answer The diversity of living organisms present on the Earth is very vast. According to an estimate by researchers, it is about seven millions. The total number of species present in the world is calculated by ecologists by statistical comparison between a species richness of a well studied group of insects of temperate and tropical regions. Then, these ratios are extrapolated with other groups of plants and animals to calculate the total species richness present on the Earth.

Question 3: Give three hypotheses for explaining why tropics show greatest levels of species richness.

Answer There are three different hypotheses proposed by scientists for explaining species richness in the tropics.

- (1) Tropical latitudes receive more solar energy than temperate regions, which leads to high productivity and high species diversity.
- (2) Tropical regions have less seasonal variations and have a more or less constant environment. This promotes the niche specialization and thus, high species richness.
- (3) Temperate regions were subjected to glaciations during the ice age, while tropical regions remained undisturbed which led to an increase in the species diversity in this region.

Question 4: What is the significance of the slope of regression in a species – area relationship?

Answer The slope of regression (z) has a great significance in order to find a species-area relationship. It has been found that in smaller areas (where the species-area relationship is analyzed), the value of slopes of regression is similar regardless of the taxonomic group or the region. However, when a similar analysis is done in larger areas, then the slope of regression is much steeper.

Question 5: What are the major causes of species losses in a geographical region?

Answer Biodiversity is the variety of living forms present in various ecosystems. It includes variability among life forms from all sources including land, air, and water. Biodiversity around the world is declining at a very fast pace. The following are the major causes for the loss of biodiversity around the world.

- (i) Habitat loss and fragmentation: Habitats of various organisms are altered or destroyed by

uncontrolled and unsustainable human activities such as deforestation, slash and burn agriculture, mining, and urbanization. This results in the breaking up of the habitat into small pieces, which affects the movement of migratory animals and also, decreases the genetic exchange between populations leading to a declination of species.

(ii) Over-exploitation: Due to over-hunting and over-exploitation of various plants and animals by humans, many species have become endangered or extinct (such as the tiger and the passenger pigeon).

(iii) Alien species Invasions: Accidental or intentional introduction of non-native species into a habitat has also led to the declination or extinction of indigenous species. For example, the Nile perch introduced in Lake Victoria in Kenya led to the extinction of more than two hundred species of native fish in the lake.

(iv) Co-extinction: In a native habitat, one species is connected to the other in an intricate network. The extinction of one species causes the extinction of other species, which is associated with it in an obligatory way. For example, the extinction of the host will cause the extinction of its parasites.

Question 6: How is biodiversity important for ecosystem functioning?

Answer An ecosystem with high species diversity is much more stable than an ecosystem with low species diversity. Also, high biodiversity makes the ecosystem more stable in productivity and more resistant towards disturbances such as alien species invasions and floods.

If an ecosystem is rich in biodiversity, then the ecological balance would not get affected. As we all know, various trophic levels are connected through food chains. If any one organism or all organisms of any one trophic level is killed, then it will disrupt the entire food chain. For example, in a food chain, if all plants are killed, then all deer's will die due to the lack of food. If all deer's are dead, soon the tigers will also die. Therefore, it can be concluded that if an ecosystem is rich in species, then there will be other food alternatives at each trophic level which would not allow any organism to die due to the absence of their food resource. Hence, biodiversity plays an important role in maintaining the health and ecological balance of an ecosystem.

Question 7: What are sacred groves? What is their role in conservation?

Answer Sacred groves are tracts of forest which are regenerated around places of worship. Sacred groves are found in Rajasthan, Western Ghats of Karnataka, and Maharashtra, Meghalaya, and Madhya Pradesh. Sacred groves help in the protection of many rare, threatened, and endemic species of plants and animals found in an area. The process of deforestation is strictly prohibited in this region by tribals. Hence, the sacred grove biodiversity is a rich area.

Question 8: Among the ecosystem services are control of floods and soil erosion. How is this achieved by the biotic components of the ecosystem?

Answer The biotic components of an ecosystem include the living organisms such as plants and animals. Plants play a very important role in controlling floods and soil erosion. The roots of plants hold the soil particles together, thereby preventing the top layer of the soil to get eroded by wind or running water. The roots also make the soil porous, thereby allowing ground water infiltration and preventing floods. Hence, plants are able to prevent soil erosion and natural calamities such as floods and droughts. They also increase the fertility of soil and biodiversity.

Question 9: What measures, as an individual, you would take to reduce environmental pollution?

Answer The following initiatives can be taken to prevent environmental pollution: Measures for preventing Air pollution:

(i) Planting more trees

- (ii) Use of clean and renewable energy sources such as CNG and bio-fuels
- (iii) Reducing the use of fossil fuels
- (iv) Use of catalytic converters in automobiles

Measures for preventing water pollution:-

- (i) Optimizing the use of water
- (ii) Using kitchen waste water in gardening and other household purposes

Measures for controlling Noise pollution:-

- (i) Avoid burning crackers on Diwali
- (i) Plantation of more trees

Measures for decreasing solid waste generation:-

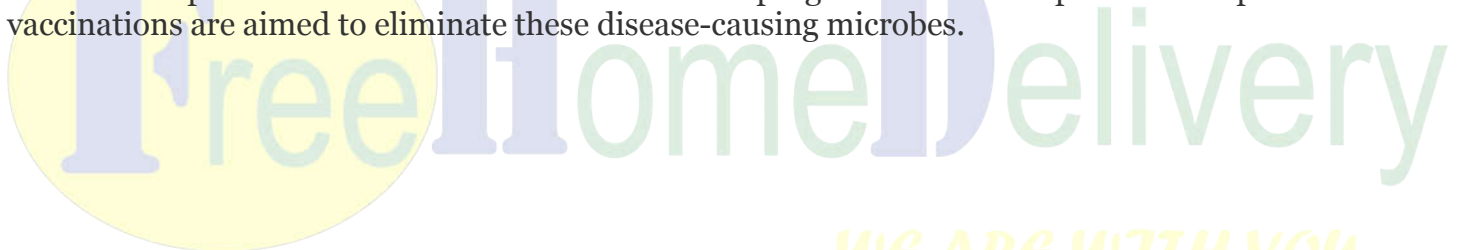
- (i) Segregation of waste
- (ii) Recycling and reuse of plastic and paper
- (iii) Composting of biodegradable kitchen waste
- (iv) Reducing the use of plastics

Question 10: Can you think of a situation where we deliberately want to make a species extinct?

How

would you justify it?

Answer Yes, there are various kinds of parasites and disease-causing microbes that we deliberately want to eradicate from the Earth. Since these micro-organisms are harmful to human beings, scientists are working hard to fight against them. Scientists have been able to eliminate small pox virus from the world through the use of vaccinations. This shows that humans deliberately want to make these species extinct. Several other eradication programmes such as polio and Hepatitis B vaccinations are aimed to eliminate these disease-causing microbes.



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Environmental Issues

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Environmental Issues

Answers NCERT Solutions For Class 12 Biology <http://freehomedelivery.net/> **Solutions Chapter 16 Environmental Issues**

Question 1: What are the various constituents of domestic sewage? Discuss the effects of sewage discharge on a river.

Answer Domestic sewage is the waste originating from the kitchen, toilet, laundry, and other sources. It contains impurities such as suspended solid (sand, salt, clay), colloidal material (fecal matter, bacteria, plastic and cloth fiber), dissolved materials (nitrate, phosphate, calcium, sodium, ammonia), and disease-causing microbes. When organic wastes from the sewage enter the water bodies, it serves as a food source for micro-organisms such as algae and bacteria. As a result, the population of these micro-organisms in the water body increases. Here, they utilize most of the dissolved oxygen for their metabolism. This results in an increase in the levels of Biological oxygen demand (BOD) in river water and results in the death of aquatic organisms. Also, the nutrients in the water lead to the growth of planktonic algal, causing algal bloom. This causes deterioration of water quality and fish mortality.

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Question 2: List all the wastes that you generate, at home, school or during your Trips to other places, could you very easily reduce? Which would be Difficult or rather impossible to reduce?

Answer Wastes generated at home include plastic bags, paper napkin, toiletries, kitchen wastes (such as peelings of vegetables and fruits, tea leaves), domestic sewage, glass, etc. Wastes generated at schools include waste paper, plastics, vegetable and fruit peels, food wrappings, sewage etc. Wastes generated at trips or picnics include plastic, paper, vegetable and fruit peels, disposable cups, plates, spoons etc. Yes, wastes can be easily reduced by the judicious use of the above materials. Wastage of paper can be minimized by writing on both sides of the paper and by using recycled paper. Plastic and glass waste can also be reduced by recycling and re-using. Also, substituting plastics bags with biodegradable jute bags can reduce wastes generated at home, school, or during trips. Domestic sewage can be reduced by optimizing the use of water while bathing, cooking, and other household activities.

Non- biodegradable wastes such as plastic, metal, broken glass, etc are difficult to decompose because micro-organisms do not have the ability to decompose them.

Question 3: Discuss the causes and effects of global warming. What measures need to be taken to control global warming?

Answer Global warming is defined as an increase in the average temperature of the Earth's surface. Causes of global warming: Global warming occurs as a result of the increased concentration

of greenhouse gases in the atmosphere. Greenhouse gases include carbon dioxide, methane, and water vapour. These gases trap solar radiations released back by the Earth. This helps in keeping our planet warm and thus, helps in human survival. However, an increase in the amount of greenhouse gases can lead to an excessive increase in the Earth's temperature, leading to global warming. Global warming is a result of industrialization, burning of fossil fuels, and deforestation. Effects of global warming: Global warming is defined as an increase in the average temperature of the Earth's surface. It has been observed that in the past three decades, the average temperature of the Earth has increased by 0.6°C . As a result, the natural water cycle has been disturbed resulting in changes in the pattern of rainfall. It also changes the amount of rain water. Also, it results in the melting of Polar ice caps and mountain glaciers, which has caused a rise in the sea level, leading to the inundation of coastal regions.

Control measures for preventing global warming:

- (i) Reducing the use of fossil fuels
- (ii) Use of bio-fuels
- (iii) Improving energy efficiency
- (iv) Use of renewable source of energy such as CNG etc.
- (v) Reforestation.
- (vii) Recycling of materials

Question 4: Match the items given in column A and B:

Column A		Column B	
(a)	Catalytic converter	(i)	Particulate matter
(b)	Electrostatic precipitator	(ii)	Carbon monoxide and nitrogen oxides
(c)	Earmuffs	(iii)	High noise level
(d)	Landfills	(iv)	Solid wastes

Answer

Column A		Column B	
(a)	Catalytic converter	(ii)	Carbon monoxide and nitrogen oxides
(b)	Electrostatic precipitator	(i)	Particulate matter
(c)	Earmuffs	(iii)	High noise level
(d)	Landfills	(iv)	Solid wastes

Question 5: Write critical notes on the following:

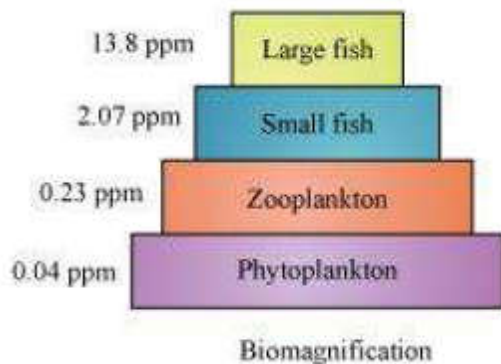
- (a) Eutrophication

(b) Biological magnification

(c) Groundwater depletion and ways for its replenishment

Answer (a) Eutrophication:- It is the natural ageing process of a lake caused due to nutrient enrichment. It is brought down by the runoff of nutrients such as animal wastes, fertilizers, and sewage from land which leads to an increased fertility of the lake. As a result, it causes a tremendous increase in the primary productivity of the ecosystem. This leads to an increased growth of algae, resulting into algal blooms. Later, the decomposition of these algae depletes the supply of oxygen, leading to the death of other aquatic animal life.

(b) Biological magnification: – To protect the crops from the several diseases and pests, a large number of pesticides are used. These pesticides reach the soil and are absorbed by plants with water and minerals from the soil. Due to rain, these chemicals can also enter water sources and into the body of aquatic plants and animals. As a result, chemicals enter the food chain. Since these chemicals cannot be decomposed, they keep on accumulating at each trophic level. The maximum concentration is accumulated at the top carnivore's level. This increase in the concentration of pollutants or harmful chemicals with an increase in the trophic level is called biological magnification. For example, high DDT concentrations were found in a pond. The producers (phytoplankton) were found to have 0.04 ppm concentration of DDT. Since many types of phytoplankton were eaten by zooplankton (consumers), the concentration of DDT in the bodies of zooplankton was found to be 0.23 ppm. Small fish that feed on zooplankton accumulate more DDT in their body. Thus, large fish (top carnivore) that feed on several small fish have the highest concentration of DDT.



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(c) Ground water depletion and ways for its replenishment: – The level of ground water has decreased in the recent years. The source of water supply is rapidly diminishing each year because of an increase in the population and water pollution. To meet the demand of water, water is withdrawn from water bodies such as ponds, rivers etc. As a result, the source of ground water is depleting. This is because the amount of groundwater being drawn for human use is more than the amount replaced by rainfall. Lack of vegetation cover also results in very small amounts of water seeping through the ground. An increase in water pollution is another factor that has reduced the availability of ground water.

Measures for replenishing ground water:-

- (i) Preventing over-exploitation of ground water
- (ii) Optimizing water use and reducing water demand
- (iii) Rain water harvesting
- (iv) Preventing deforestation and plantation of more trees

Question 6: Why ozone hole forms over Antarctica? How will enhanced ultraviolet Radiations affect us?

Answer The ozone hole is more prominent over the region of Antarctica. It is formed due to an increased concentration of chlorine in the atmosphere. Chlorine is mainly released from chlorofluorocarbons (CFC's) widely used as refrigerants. The CFC's migrate from the troposphere to the stratosphere, where they release chlorine atoms by the action of UV rays on them. The release of

Chlorine atoms causes the conversion of ozone into molecular oxygen. One atom of chlorine can destroy around 10,000 molecules of ozone and causes ozone depletion. The formation of the ozone hole will result in an increased concentration of UV – B radiations on the Earth's surface. UV – B damages DNA and activates the process of skin ageing. It also causes skin darkening and skin cancer. High levels of UV – B cause corneal cataract in human beings.

Question 7: Discuss the role of women and communities in protection and conservation of forests.

Answer Women and communities have played a major role in environmental conservation movements.

(i) Case study of the bishnoi community: The Bishnoi community in Rajasthan strictly believes in the concept of living peacefully with nature. In 1731, the king of Jodhpur ordered his ministers to arrange wood for the construction of his new palace. For this purpose, the minister and the workers went to bishnoi village. There, a Bishnoi woman called Amrita Devi along with her daughter and hundreds of other Bishnois showed the courage to step forward and stop them from cutting trees. They embraced the trees and lost their lives at the hands of soldiers of the king. This resistance by the people of the village forced the king to give up the idea of cutting trees.

(ii) Chipko movement: The Chipko movement was started in 1974 in the Garhwal region of the Himalayas. In this movement, the women from the village stopped the contractors from cutting forest trees by embracing them.

Question 8: What measures, as an individual, you would take to reduce environmental pollution?

Answer The following initiatives can be taken to prevent environmental pollution:

Measures for preventing Air pollution:

- (i) Planting more trees
- (ii) Use of clean and renewable energy sources such as CNG and bio-fuels
- (iii) Reducing the use of fossil fuels
- (iv) Use of catalytic converters in automobiles

Measures for preventing water pollution:-

- (i) Optimizing the use of water
- (ii) Using kitchen waste water in gardening and other household purposes

Measures for controlling Noise pollution:-

- (i) Avoid burning crackers on Diwali
- (i) Plantation of more trees

Measures for decreasing solid waste generation:-

- (i) Segregation of waste
- (ii) Recycling and reuse of plastic and paper
- (iii) Composting of biodegradable kitchen waste
- (iv) Reducing the use of plastics

Question 9: Discuss briefly the following:

- (a) Radioactive wastes
- (b) Defunct ships and e-wastes
- (c) Municipal solid wastes

Answer (a) Radioactive wastes: – Radioactive wastes are generated during the process of generating nuclear energy from radioactive materials. Nuclear waste is rich in radioactive materials that generate large quantities of ionizing radiations such as gamma rays. These rays cause mutation in organisms, which often results in skin cancer. At high dosage, these rays can be lethal. Safe disposal of radioactive wastes is a big challenge. It is recommended that nuclear wastes should be stored after pre-treatment in suitable shielded containers, which should then be buried in rocks.

(b) Defunct ships and e-wastes: – Defunct ships are dead ships that are no longer in use. Such ships

are broken down for scrap metal in countries such as India and Pakistan. These ships are a source of various toxicants such as asbestos, lead, mercury etc. Thus, they contribute to solid wastes that are hazardous to health. E-wastes or electronic wastes generally include electronic goods such as computers etc. Such wastes are rich in metals such as copper, iron, silicon, gold etc. These metals are highly toxic and pose serious health hazards. People of developing countries are involved in the recycling process of these metals and therefore, get exposed to toxic substances present in these wastes.

(c) Municipal solid wastes: – Municipal solid wastes are generated from schools, offices, homes, and stores. It is generally rich in glass, metal, paper waste, food, rubber, leather, and textiles. The open dumps of municipal wastes serve as a breeding ground for flies, mosquitoes, and other disease-causing microbes. Hence, it is necessary to dispose municipal solid waste properly to prevent the spreading of diseases. Sanitary landfills and incineration are the methods for the safe disposal of solid wastes.

Question 10: What initiatives were taken for reducing vehicular air pollution in Delhi? Has air quality improved in Delhi?

Answer Delhi has been categorized as the fourth most polluted city of the world in a list of 41 cities. Burning of fossil fuels has added to the pollution of air in Delhi. Various steps have been taken to improve the quality of air in Delhi.

(a) Introduction of CNG (Compressed Natural Gas): By the order of the supreme court of India, CNG-powered vehicles were introduced at the end of year 2006 to reduce the levels of pollution in Delhi. CNG is a clean fuel that produces very little unburnt particles.

(b) Phasing out of old vehicles

(c) Use of unleaded petrol

(d) Use of low-sulphur petrol and diesel

(e) Use of catalytic converters

(f) Application of stringent pollution-level norms for vehicles

(g) Implementation of Bharat stage I, which is equivalent to euro II norms in vehicles of major Indian cities.

The introduction of CNG-powered vehicles has improved Delhi's air quality, which has led to a substantial fall in the level of CO₂ and SO₂. However, the problem of suspended particulate matter (SPM) and respiratory suspended particulate matter (RSPM) still persists.

Question 11: Discuss briefly the following:

(a) Greenhouse gases

(b) Catalytic converter

(c) Ultraviolet B

Answer (a) Greenhouse gases: – The greenhouse effect refers to an overall increase in the average temperature of the Earth due to the presence of greenhouse gases. Greenhouse gases mainly consist of carbon dioxide, methane, and water vapour. When solar radiations reach the Earth, some of these radiations are absorbed. These absorbed radiations are released back into the atmosphere. These radiations are trapped by the greenhouse gases present in the atmosphere.. This helps in keeping our planet warm and thus, helps in human survival. However, an increase in the amount of greenhouse gases can lead to an excessive increase in the Earth's temperature, thereby causing global warming.

(b) Catalytic converter: – Catalytic converters are devices fitted in automobiles to reduce vehicular pollution. These devices contain expensive metals such as platinum, palladium, and rhodium that act as catalysts. As the vehicular discharge passes through the catalytic converter, the unburnt hydrocarbons present in it get converted into carbon dioxide and water. Carbon monoxide and nitric oxide released by catalytic converters are converted into carbon dioxide and nitrogen gas (respectively).

(c) Ultraviolet-B: – Ultraviolet-B is an electromagnetic radiation which has a shorter wavelength than visible light. It is a harmful radiation that comes from sunlight and penetrates through the ozone hole onto the Earth's surface. It induces many health hazards in humans. UV –B damages DNA and activates the process of skin ageing. It also causes skin darkening and skin cancer. High levels of UV –B cause corneal cataract in human beings.

