NCERT Solutions for Class 12 Biology

Chapter 15 Biodiversity and Conservation

Question 1.

Name the three important components of biodiversity

Solution:

The three important components of biodiversity are genetic diversity, species diversity and ecological diversity. These components are the basic building blocks of biodiversity. These are intimately linked and may have common elements.

Question 2.

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

Solution:

The diversity of living organisms present on the earth is very vast. According to an estimate by researchers, it is about seven million. The total number of species present in the world is calculated by ecologists by statistical comparison between 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 the greatest levels of species richness.

Solution:

The three hypotheses for higher species richness in tropical areas are:

1. Prolong evolutionary time – Temperate areas have undergone frequent glaciation in the past. It killed most of the species. No such disturbance occurred in the tropics where species continued to flourish and evolve undisturbed for millions of years.
2. Favourable environment – There are no unfavourable seasons in the tropics. The continued favourable environment has helped tropical organisms to gain more niche specialisation and increased diversity.
3. More sunlight – More solar energy is available in the tropics. This promotes higher productivity and increased biodiversity.

Question 4.

What is the significance of the slope of regression in a species-area relationship?

Solution:

The slope of regression/regression co-efficient of species-area relationship indicates that species richness decreases with a decrease in area.

- The regression coefficient is between 0.1 – 0.2 regardless of taxonomic group or region, eg: Plants in Britain, Birds in California.

- But in large areas like continents value is eg:- Frugivorous birds, mammals is tropical forests.

Question 5.

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

Solution:

The major causes of species losses in a geographical area are:

1. Habitat loss and fragmentation
2. Overexploitation
3. Alien species invasion
4. Co-extinctions
5. Disturbance and degradation
6. Pollution
7. Intensive agriculture and forestry.

Question 6.

How is biodiversity important for ecosystem functioning?

Solution:

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 to disturbances such as alien species invasions and floods.

If an ecosystem is rich in biodiversity, then the ecological balance would not get affected. Various trophic levels are connected through food chains. If anyone organism or all organisms of any one trophic level is illed, then it will disrupt the entire food chain. For example, in a food chain, if all plants are killed, then all deer will die due to the lack of food.

If all deer 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?

Solution:

Sacred groves are forest patches around places of work. These are held in high esteem by tribal communities/state or central government. Tribals do not allow to cut even a single branch of trees in these sacred groves. Preserved over the course of many generations, sacred groves represent native vegetation in a natural or near-natural state & thus is rich in biodiversity & harbour many rare species of plants & animals. This is the reason why many endemic species flourish in these regions.

Question 8.

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

Solution:

- Control of soil erosion: Plant roots hold the soil particles tightly and do not allow the topsoil to be drifted away by winds or moving water. Plants increase the porosity and fertility of the soil.
- Control of floods: It is carried out by retaining water and preventing runoff rainwater. Litter and humus of plants function as sponges thus, retaining the water which percolates down and gets stored as underground water. Hence, the flood is controlled.

Question 9.

The species diversity of plants (22 percent) is much less than that of animals (72 percent). What could be the explanations for how animals achieved greater diversification?

Solution:

Scientists recorded 22% of plant species diversity including algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. But they recorded 72% of animal species (including insects, mollusks, fishes, mammals, birds etc.) diversity. Plants have the less adaptive capacity as compared to animals. Animals show locomotory movements and can move from one place to another to suit the environment and also in search of food. On the contrary, plants are fixed. Moreover, animals have well organised body structure with various organs to help adjust to the environment.

Question 10.

Can you think of a situation where we deliberately want to make a species extinct? How would you justify it?

Solution:

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 the smallpox 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.

Chapter 16 Environmental Issues

Question 1.

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

Solution:

The domestic sewage contains every-thing that goes down the drain into the sewer of the house. The various constituents of domestic sewage are suspended solids, colloidal particles, pathogenic contaminants and dissolved materials. Suspended solids are sand and silt. Colloidal particles include clay, faecal matter, fine fibres of paper and cloth. Pathogenic contaminants are eggs of coliforms and enterococci. Dissolved materials includes inorganic nutrients such as nitrates, phosphates, ammonia, sodium and calcium. Effects of sewage discharge on a river :

- Water becomes unfit for bathing and drinking and also for domestic or industrial use as it becomes colored, turbid with a lot of particulate matter floating on water.
- The domestic sewage adds nitrates and phosphates into the river. These nitrates and phosphates encourage a thick bloom of blue green algae, which depletes the oxygen content of the water during night. This suffocates the fish and other aquatic life. Consequently river become highly polluted.

Question 2.

List all the wastes that you generate, at home, school, or during your trips to other places. Could you very easily reduce the generation of these wastes? Which would be difficult or rather impossible to reduce?

Solution:

Wastes generated at home include plastic bags, paper napkins, toiletries, kitchen wastes (such as peelings of vegetables and fruits, tea leaves), domestic sewage, glass, etc.

Wastes generated at school include waste paper, plastics, vegetable and fruit peels, food wrapping, 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 plastic 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 microorganisms 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?

Solution:

- Global warming is a rise in the mean temperature of the lower atmosphere and the earth's surface. Causes – increase in the quantity of radioactively active greenhouse gases CO_2, CH_4, N_2O, CFCs. They allow heat waves to reach the surface and prevent their escape.
- They are produced by combustion of fossil fuels, biomass [CO_2]; burning of nitrogen-rich fuels [N_2O]; paddy fields, fermentation in cattle and wetlands [CH_4]; refrigerators, aerosols, drying, cleaning [CFCs].
- Effects: Heating of earth surface [mean temperature is increased] Climatic changes e.g.: El Nino effect.
- Increased melting of polar ice caps and Himalayan snowcaps. Increased sea levels and coastal areas will submerge.
- Measures – Decreased use of fossil fuels, improve the efficiency of energy usage, Reduce deforestation, plant trees Control of man-made sources of greenhouse gases like vehicles, aerosol sprays.

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**

Solution:

(a) – (ii); (b) – (i); (c) – (iii); (d) – (iv).

Question 5.

Write critical notes on the following :

(a) Eutrophication

(b) Biological magnification

(c) Groundwater depletion and ways for its replenishment

Solution:

(a) Eutrophication: The natural aging process of lakes by nutrient enrichment of their water. In young lake water is cold and clear and supports only little life. With time, streams introduce nutrients into lake which increases lakes' fertility and encourages aquatic growth. Over centuries silts and organic debris pile up, and lake becomes shallow and warmer. It supports plants and later gets converted into land. Lakes span depends on the climate, size of lake.

(b) Biological magnification: Industrial wastes released into water contain toxic substances, such as arsenic, cadmium, lead, zinc, copper, mercury, and cyanides, besides some salts, acids, and alkalies. All these materials can prove harmful for our health.

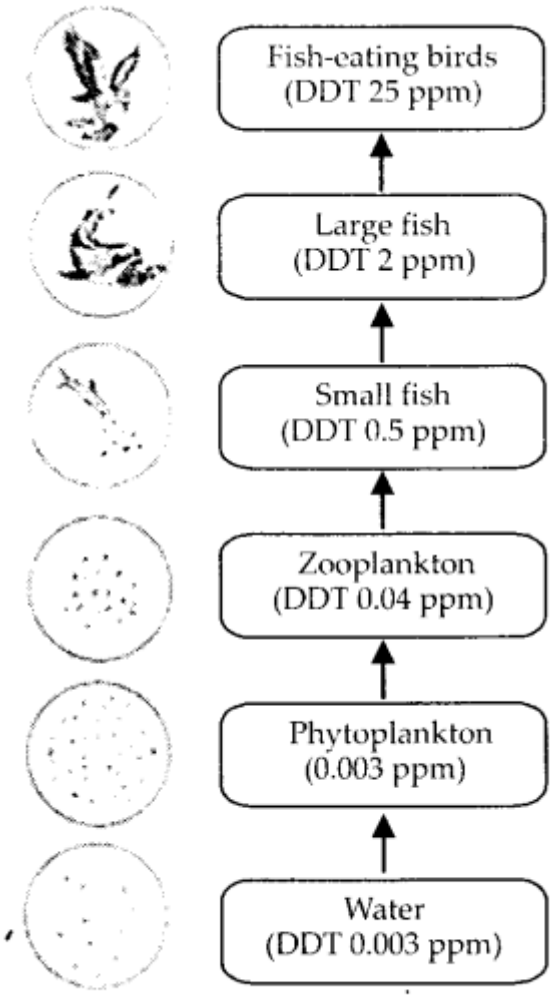

Fig. : Biomagnification of DDT in an aquatic food chain

They may reach the human body directly with contaminated food or indirectly by way of plants and other animals. The concentration of the toxic materials increases at each trophic level of a food chain. This is called biological magnification. River water may have a very low concentration of DDT, but the carnivorous fish in that river may contain a high concentration of DDT and become unfit for eating by man. Mercury discharged into rivers and lakes is changed by bacteria to the neurotoxic form called methyl mercury. The latter is highly poisonous and may be directly absorbed by fish.

(c) Groundwater depletion and ways for its replenishment: Groundwater depletion is defined as long-term water-level decline caused by sustained groundwater pumping. The volume of ground water in storage is decreasing in many areas of the world in response to pumping. Some of the negative effects of groundwater depletion include increased pumping costs, deterioration of water quality, reduction of water in streams and lakes.
Some ways for water replenishment are:

- Reduction in consumption: Sprinkler and subsurface irrigation techniques reduce the amount of water used in irrigation.
- Rain water harvesting: Rain water collected over roofs is allowed to pass into the ground through deep water pipes.

Question 6.

Why does the ozone hole form over Antarctica? How will enhanced ultraviolet radiation affect us?

Solution:

Ozone hole forms over Antarctica where no one lives and no pollution is present but not over Newyork, Bangalore etc., (polluted cities). It is because CFCs and ozone-depleting substances (ODS) released worldwide accumulates in the stratosphere and drifts towards, Antarctica in winters (July – August) when temperatures is -'85° C in Antarctica.

In winters polar ice clouds are formed over Antarctica. It provides a catalytic surface for (CFCs and other ODS to release CL and other free radicals that breakdown ozone layer forming an ozone hole during spring in presence of sunlight. In summer, the ozone hole disappears due to mixing of air worldwide.

Ozone holes allow UV radiations (UV_A & UV_B) to reach earth's surface. Which was earlier reflected by the ozone layer. UV_B damages DNA, skin cells and causes mutations and skin cancers respectively. UV_B even causes corneal damage (Snow Blindness).

Question 7.

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

Solution:

Forest Conservation and Management:

It is time to think deeply and act seriously in order to protect this vital natural resource. Some of the measures of conservation are

1. Social forestry programme: It was started in 1976 and involves the afforestation on public and common lands for fuel, fodder, timber for agricultural equipment and fruits. These are mainly meant for rural people.
2. Agroforestry programme: It involves the multiple use of same land for agriculture, forestry and animal husbandary. Taungya System and Jhum are examples.
    - Taungya System: It involves growing agricultural crops between planted trees.
    - Jhum (Slash and burn agriculture): It involves felling and burning of forests, followed by the cultivation of crops for a few years. Later the cultivation is abandoned for the growth of forests. It is a traditional agroforestry system.

3. Urban forestry programme: It involves afforestation in urban land areas e.g. along the roads, big parks, big compounds etc. with ornamental and fruit trees.
4. Commercial forestry: It involves planting of fast-growing trees on available land to fulfill commercial demand.
5. Conservation forestry: It involves protection of degraded forest to allow recoupment of their flora and fauna.

Reforestation: It is the process of restoring a forest that once existed, but was removed at some point of time in the past. Reforestation may occur naturally in a deforested area. The above-said methods speed up the reforestation programme.

Question 8.

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

Solution:

To reduce environmental pollution, we should change our habits and lifestyle so as to reduce the use of disposable materials. We should use preferably those items which can easily be recycled and also minimise the use of fossil fuels. We should also take measures to improve the quality of air by using CNG gases wherever possible instead of using diesel or petrol. We should also use the catalytic converter in our vehicles.

Question 9.

Discuss briefly the following:

(a) Radioactive wastes

(b) Defunct ships and e-wastes

(c) Municipal solid wastes

Solution:

a. Radioactive waste materials are released from thermonuclear explosions. Radioactive isotopes, such as radium-226, thorium- 232, potassium-40, uranium-235, carbon-14, etc. are spread all over the world and contaminate air, soil, water, vegetation and animals.

b. Irrepairble electronic goods and computers are called electronic wastes (e-waste). Ships that are no longer in use or that are to be dismantled are called defunct ships. Asbestos, Polychlorinated Biphenyl (PCB) produced during dismantling defunct ship cause serious health hazards especially cancer.

c. Municipal solid wastes are wastes from homes, offices, stores, schools, hospitals, etc., that are collected and disposed of by the municipality.

Question 10.

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

Solution:

Under the direction of Supreme Court of India, the State Government of Delhi took the following measures to improve the quality of air:

- Switching over the entire fleet of public transport buses from diesel to CNG (Compressed Natural Gas) by the end of 2002.
- Phasing out of old vehicles.
- Use of unleaded petrol.
- Use of low sulphur petrol and diesel.
- Use of catalytic converters in vehicles.
- Application of Euro II norms for vehicles.

Because of above mentioned measures adopted by the Government the air quality of Delhi has improved with a substantial fall in $S0_2$, CO, No_x level between 1997-2005.

Question 11.

Discuss in brief the following:

(a) Green house gases

(b) Catalytic converter

(c) Ultraviolet B

Solution:

(a) Green house gases: The gases which are transparent to solar radiation but retain and partially reflect back long wave heat radiations are called greenhouse gases. Green house gases are essential for keeping the earth warm and hospitable. They are also called radiatively active gases. They prevent a substantial part of long wave radiations emitted by earth to escape into space. Rather green house gases radiate a part of this energy back to the earth. The phenomenon is called greenhouse flux. Because of greenhouse flux, the mean annual temperature of the earth is 15°C. In its absence, it will fall to – 18°C.

However, recently the concentration of greenhouse gases has started rising to result in an enhanced greenhouse effect that is resulting in increasing the mean global temperature. It is called global warming. A regular assessment of the abundance of greenhouse gases and their impact on the global environment is being made by IPCC (Intergovernmental Panel on Climate Change). The various green house gases are CO_2 (warming effect 60%), CH_4 (effect 20%) , chlorofluorocarbons or CFCs (14%) andT nitrous oxide (N_2O, 6%). Others of minor significance are water vapors and ozone.

(b) Catalytic converter: Catalytic converters are devices that are fitted into automobiles for reducing the emission of gases. These have expensive metals (platinum – palladium, and rhodium) as catalysts. As the exhaust passes through the catalytic converters, unburnt hydrocarbons are converted into CO_2 and H_2O and carbon monoxide and nitric oxide are changed to CO_2 and N_2 respectively. Vehicles fitted with catalytic converters should be run on unleaded petrol as leaded petrol would inactivate the catalyst in the converters.

(c) Ultraviolet B – UV-B having 280-320nm wavelength. Their harmful radiations penetrate through the ozone hole to strike the earth. On earth, these can affect human beings and other animals by causing :

- Skin cancer
- Blindness and increased incidence of cataract in eyes, and
- Malfunctioning of the immune system.
- Higher number of mutations.