

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

Solution:

The wastes generated from households – from the toilet, kitchen, laundry and other related sources are termed as domestic sewage. It contains contaminants in the form of disease-causing microbes, suspended solid (clay, salt, sand), colloidal matter (bacteria, plastic, cloth fibre, faecal matter), and dissolved matter (phosphate, nitrate, ammonia, sodium, calcium). The organic wastes from the sewage entering the water bodies serve as a source of food for microbes such as bacteria and algae, causing these microbes to multiply, and hence their population increase. Almost all of the dissolved oxygen is utilised by them for their metabolism leading to the Biological Oxygen Demand (BOD) levels in river water to increase, causing the death of aquatic entities. Additionally, the nutrients present in water cause planktonic algal growth, hence the algal bloom, which leads to a decline in the quality of water and fish mortality.

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:

Some of the wastes generated at different places are as given below:

At Home	At Schools	At Trips
Paper napkin	Plastics	Waste paper
Plastic covers	Waste paper	Plastic bags
Toiletries	Fruits & vegetable peels	Food wrappers
Wastes from the kitchen – fruits & vegetable peels, unwanted grains, perished food, glass, domestic sewage	Wrappers	Fruits & vegetable peels
	Sewage	Disposable plates and cups
	Dust from chalk, crayons, pencil sharpeners	

Yes, the use of these wastes can certainly be reduced easily. This can be achieved by cutting down the use of plastics and switching to other alternatives. Wastes generated from paper can be greatly minimised by using both sides of the paper and by recycling paper. Re-use and recycling glass waste and plastics can greatly help as well. Substituting the

use of plastic covers with biodegradable bags (jute) can cause less waste to be generated at schools, at home or even on trips. Optimised use of water during cooking, bathing and other household activities can greatly reduce domestic sewage. It is difficult to decompose non-biodegradable wastes such as metal, plastic and glass shards, as microbes cannot decompose them.

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

Solution:

An increase in the average temperature of the surface of the Earth is termed global warming. It can be caused due to the following reasons:

- (i) The increased concentration of greenhouse gases in the atmosphere of the Earth causes the phenomena of global warming. These gases are methane, carbon dioxide and water vapour, which trap solar rays that are given out by the Earth, helping to keep the planet warm, thus aiding human survival. The rise in the level of these greenhouse gases can cause a huge increase in the temperature of the Earth, resulting in global warming
- (ii) Global warming can also be caused due to burning of fossil fuels, industrialisation and the act of deforestation

The impact of global warming is listed below:

- (i) It has been observed over the past few decades that global warming has led the average temperature of the Earth to increase by 0.6 °C, causing a disturbance in the natural water cycle, hence fluctuations in the pattern of rainfall. These changes also have an impact on rainfall.
- (ii) Global warming has also caused the polar ice caps and mountain glaciers to melt, leading to an increase in the sea level, hence the inundation of coastal areas.

The following are the preventive measures:

- (i) Use of fossil fuels must be reduced
- (ii) Increase the usage of bio-fuels
- (iii) Switch to a renewable source of energy, such as CNG
- (iv) Promote reforestation
- (v) Encourage and carry out the recycling of materials
- (vi) Energy must be efficiently used

4. Match the items given in columns 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:

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

5. Write short notes on the following:

(a) Eutrophication

(b) Biological magnification

(c) Groundwater depletion and ways for its replenishment

Solution:

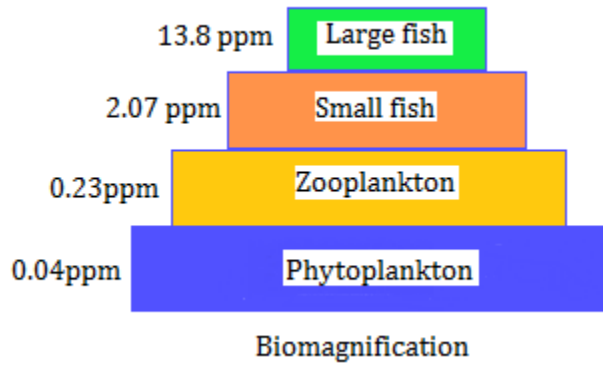
(a) Eutrophication

Eutrophication is referred to as the natural ageing process of a lake as a result of nutrient enrichment caused by the overflow of nutrients such as fertilisers, animal wastes and sewage from land, leading to increased fertility of the lake. Consequently, there is a huge increase in the primary productivity of the ecosystem bringing about an increased growth of algae, hence in algal blooms. After some time, the decomposition of these algae reduces the oxygen supply, resulting in the death of aquatic animal life.

(b) Biological magnification

Pesticides are used on a large scale to protect crops from various diseases and pests. When these pesticides enter the soil, they are absorbed by plant parts with minerals and water from the soil. These chemicals can enter water sources as a result of rains, furthermore into the bodies of aquatic animals and plants, hence into the food chain. As these chemicals cannot be disintegrated at each of the trophic levels, they keep getting accumulated, wherein most of the accumulation occurs at the top carnivore's level. This is termed biological magnification, where there is an increase in the concentration of harmful pollutants with each increasing trophic level.

For instance, high DDT concentrations were built in a pond. The producers (phytoplankton) have a DDT concentration of 0.04 ppm. As this phytoplankton was consumed by zooplankton – the consumers, the concentration of DDT in the bodies of zooplankton was noted to be 0.23 ppm. When this, in turn, is consumed by small fish, more DDT gets collected in their bodies. Consequently, the large fish (top carnivores) feeding on different small fish tend to have a maximum concentration of DDT.



(c) Groundwater depletion and ways for its replenishment

In the past years, the level of groundwater has decreased. Water supply from sources is declining rapidly with each passing year due to an increase in water pollution and population explosion. In order to meet the demand for water, water is being taken out from water bodies such as rivers, ponds etc., and hence, the source of groundwater is fast depleting as the quantity of groundwater that is withdrawn for human utilisation is more than the quantity that is being replaced by rainfall. Small quantities of water penetrate through the ground due to a lack of vegetation cover. Another factor that has caused a decline in the availability of groundwater is an increase in water pollution.

Measures to replenish groundwater are as follows:

- (i) Over-exploitation of groundwater must be prevented
- (ii) Water use must be optimised, and water demand must be reduced
- (iii) Promote and encourage rainwater harvesting
- (iv) Prevent deforestation
- (v) Promote afforestation, plant more trees

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

Solution:

Ozone holes are more apparent in the region of Antarctica. They are formed as a result of an increased concentration of chlorine in the atmosphere. The release of chlorine is mainly from Chlorofluorocarbons (CFCs) which are extensively used as a refrigerant. The CFCs migrate from different layers of the atmosphere – troposphere to the stratosphere, where chlorine atoms are released by the action of UV radiations on them. The liberation of chlorine atoms leads to the conversion of ozone into molecular oxygen. One chlorine atom can destroy 10,000 ozone molecules, causing ozone depletion. Ozone hole formation will result in an increased concentration of UV-B radiations on the surface of the Earth. UV-B is known to damage DNA, activating the process of skin ageing. Also, it causes darkening of the skin and skin cancer. In humans, high levels of UV-B cause corneal cataracts.

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

The role of communities and women in protecting and conserving forests has been significant.

(i) The Chipko Movement

This movement was started in the Garhwal region of the Himalayas in 1974, wherein the women of the village opposed the contractors from chopping forest trees. They did so by embracing the trees in the forest.

(ii) Case study of the Bishnoi community

In Rajasthan, the Bishnoi community has a strict belief in the concept of peacefully co-existing with nature. The King of Jodhpur, in 1731, ordered his ministers to organise wood to construct his new palace, for which the King and his people visited the Bishnoi village where a Bishnoi woman known as Amrita Devi, along with her daughter and hundreds of other Bishnois were courageous enough to take a step and stop them from chopping trees. They embraced the trees, losing their lives at the hands of soldiers. This conflict among the villagers forced the King to give up on the idea of chopping trees.

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

Listed below are some measures that can be taken to prevent environmental pollution:

To prevent air pollution

- (i) Clean and renewable energy sources to be used, such as bio-fuels and CNG
- (ii) Afforestation – promote planting
- (iii) Limit usage of fossil fuels
- (iv) Catalytic converters to be used in automobiles

To prevent water pollution

- (i) Use of water to be optimised
- (ii) For gardening and other related chores, switch to using kitchen wastewater

To prevent noise pollution

- (i) Plant more trees
- (ii) Reduce/avoid bursting of crackers

Measures to decrease solid waste generation

- (i) Different types of wastes to be separated
- (ii) Reuse and recycle paper and plastic
- (iii) Plastic usage must be reduced and eventually avoided completely
- (iv) Biodegradable kitchen waste must be composted

9. Discuss briefly the following:

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

Solution:

- (a) Radioactive wastes

These are the wastes produced when nuclear energy is generated from radioactive materials. This nuclear waste is rich in radioactive materials that generate large quantities of ionising radiation, like gamma rays causing mutation in entities resulting in ailments such as skin cancer. These rays can be lethal at high dosages. Harmless disposal of radioactive wastes is a huge challenge. Ideally, nuclear wastes should be stored after pre-treatment in appropriate shielded containers and later buried in rocks.

- (b) Defunct ships and e-wastes

The dead ships that are no more used are referred to as defunct ships. These ships are dismantled for scrap materials in Pakistan and India. There are different toxicants in such ships, such as lead, mercury, asbestos etc. which lead to solid wastes that can be dangerous to health. E-waste or electronic waste includes electronic goods such as mobiles, computers and other gadgets that are rich in metals like iron, copper, gold, silicon etc. Such metals are extremely toxic, posing severe health hazards. Hence, people of developing countries who participate in the recycling process of such metals get exposed to toxic matter found in these wastes.

- (c) Municipal solid wastes

These are the wastes that are produced by offices, schools, stores and homes. It is typically rich in metal, glass, food, rubber, leather, paper waste and textiles. Municipal wastes are dumped in landfills and open dumps, which serve as breeding areas for mosquitoes, flies and other microbes that have the potential to cause diseases. Therefore, it is crucial to dispose of municipal solid wastes appropriately in order to prevent diseases from spreading. Some measures for the safe disposal of solid wastes are incineration and sanitary landfills.

10. What initiatives were taken to reduce vehicular air pollution in Delhi? Has air quality improved in Delhi?**Solution:**

In a list of 41 cities, Delhi has been characterised as the fourth most polluted city in the world. The pollution of air in Delhi is added by the burning of fossil fuels. Several measures have been taken to improve the air quality in Delhi, and they are as follows:

- (i) Introduction of CNG (Compressed Natural Gas) – CNG is a clean fuel-producing very little unburnt substance. The Supreme Court of India has ordered the use of CNG-powered vehicles that were introduced at the end of the year 2006 in order to reduce pollution levels in Delhi.
- (ii) Use of old vehicles is discontinued
- (iii) Use of catalytic converters
- (iv) Use of unleaded petrol
- (v) Use of diesel and low-sulphur petrol
- (vi) Applying strict pollution-level norms for vehicles
- (vii) Vehicles of major Indian cities have been implemented with Bharat Stage I, similar to Euro II norms

The air quality of Delhi has shown improvement due to the introduction of CNG-powered vehicles leading to a considerable dip in the level of SO_2 and CO_2 . But, the issue of Suspended Particulate Matter (SPM) and Respiratory Suspended Particulate Matter (RSPM) still exists.

11. Discuss briefly the following:

- (a) Greenhouse gases
- (b) Catalytic converter
- (c) Ultraviolet B

Solution:

(a) Greenhouse gases

The greenhouse gas effect refers to the global increase in the average temperature of the Earth as a result of greenhouse gases. These gases are methane, carbon dioxide and water vapour. When solar rays are incident on Earth, some of these are absorbed, which are released back into the atmosphere. The greenhouse gases present in the atmosphere trap these radiations, help in keeping Earth warm, hence suitable for humans to survive. Therefore, an increase in the level of greenhouse gases can lead to an increase in the temperature of Earth overall, resulting in global warming.

(b) Catalytic converter

These are devices fixed in automobiles to lessen vehicular pollution and contain expensive metals such as palladium, platinum and rhodium that serve as catalysts. When the vehicular discharge passes through the catalytic converter, the unburnt hydrocarbons found in it are converted into water and carbon dioxide. Nitric oxide and carbon monoxide liberated by catalytic converters are converted into nitrogen gas and carbon dioxide, respectively.

(c) Ultraviolet-B

Ultraviolet-B is electromagnetic radiation possessing a short wavelength compared to visible light. They are produced by Sun and are harmful rays which penetrate through the ozone hole on the surface of the Earth. UV-B poses many health hazards in humans, it damages DNA and activates the skin ageing process. These rays are also known to cause skin cancer and skin darkening. High levels of UV-B cause corneal cataracts in humans.