CHAPTER 16

ENVIRONMENTAL ISSUES

Topics Discussed

1. Introduction

Human require food, shelter and other basic needs for their survival. Human population has grown enormously in terms of number which is further increasing the demand for food, home, water, electricity, etc. Thus, there is increased work, use of fuels in cars, vehicles, electricity, cooking, which increases pollution. These are just examples for the fuel usage, there are several other resources which are used by human for their benefit. The end result is pollution in some way or other.

There are major issues in environmental pollution and depletion of valuable natural resources which change with location. It is high in urban areas whereas low in rural areas. The depletion of natural resources and its use has to be monitored in order to check the pollution.

Objectives of this Chapter

At the end of this chapter, you will be able to:

- Realize the effect of pollution on environment.
- Evaluate the seriousness to deal with pollution.
- Analyse the methods that can be used for the pollution reduction.

2. Pollution

- Any undesirable change in physical, chemical or biological characteristic of air, water and land which is harmful to the man directly or indirectly through the animals, plants, industrial units or raw materials is called as pollution.
- Pollutants: Any material or act on the part of man, or nature which leads to pollution is called pollutants.
- Pollutants are divided into the following categories:

On the basis of their degradation:

- **Non-biodegradable pollutants:** The pollutants which are usually not degraded or even if degraded are partially degraded in the environment. Aluminium pecks, BHC pesticides, iron, Glass, DDT benzene, mercury compounds, phenolic compounds, etc. are few examples. Such pollutants are accumulated in the environment which cause pollution. These pollutants even in low concentration are harmful and as their concentration increases, the level of harm caused also increases. There are no treatments yet discovered which can completely recycle or destroy such pollutants. However there are two possible methods which can stop the pollution which is caused by such pollutants. They are chemicals or substances usage should be banned by law or if it is essential to be used, use their alternative substances.
- **Biodegradable pollutants:** The pollutants created from domestic sewage, papers, woods, garbage, livestock wastes, etc. are easily degraded completely in presence of microorganisms. This degraded material becomes useful for other purposes. However when these wastes are in high amounts in the environment, they cannot be degraded completely by microorganisms and cause foul smell, mosquito and rodents to dwell in them which causes diseases and pollution.

On the basis of their occurrence in nature:

- **Primary pollutants:** They continue to exist in a form which is similar to the form they entered the environment. E.g., DDT, CO etc.
- **Secondary pollutants:** They are produced from the chemical reaction between the primary pollutants. The formation of secondary pollutants is called as synergism. Secondary pollutants cause more harm than the primary pollutants. E.g., Photochemical smog, London smog, PAN, O_3

On the basis of their existence in nature:

- **Quantitative pollutants:** They are the molecules which occur naturally however they turn into pollutant when their concentration reaches above a threshold or tolerable value in the environment. E.g. CO_2, nitrogen oxide.

- **Qualitative pollutants:** They are the molecules which do not occur naturally in the environment and are passed in it through various human activities. E.g., fungicides, herbicides, DDT etc.

On the basis of their origin:

- **Natural pollution:** It is caused by natural sources. E.g., CH_4 from paddy fields and cattle, marsh, forest fire.
- **Anthropogenic pollution:** It is **caused** by **human activities.** E.g., CO from automobiles, SO_2 from manufacturing industries of plastic, rubber, etc.

On the basis of their effect on environment:

- **Negative pollution:** They affect the environment in negative ways. Loss of soil productivity. The removal or absence of any desirable substance from the right place which results in loss of nature in some way. E.g., Overgrazing, Soil erosion.
- **Positive pollution:** They affect the environment in positive ways. The presence or addition of undesirable compounds at wrong place which result in reduction of soil fertility. E.g., more use of bio fertilizer, land filling by wastes.

Point source pollution is the effluent discharge that takes place at a specific site. E.g., factory outlet and municipal sewage.

2.1 Air Pollution

The air pollution is caused due to addition of unwanted substances or gases in the air directly or indirectly. The atmospheric pollution is mainly caused by the human activities which are concentrated in the inhabited and the industrial complexes in urban areas and are present in low concentrations in rural areas.

2.1.1 Causes of Air Pollution

- The chimney in the thermal power plants, smelters, and other industries emit particulate and gaseous pollutants mixed with harmless gases like nitrogen and oxygen.
- The fuels used in automobiles, cylinders, and electronics produce pollutants which constitute major part of air pollution.
- The fossil fuels are used domestically and industrially where they are incompletely combusted. This produces CO instead of CO_2.
- The nature also contributes to air pollution which includes pollen, smoke, and dust.

2.1.2 Types of Air Pollution

The two main categories of air pollutants are Gases and Particulates.

- **Gases:** The gaseous materials consists of various gases and also the vapours of volatile substances or the compound with a boiling point below 200 ^{o}C.

- **Particulate matter:** Particulate matter consists of solid particles or liquid droplets (aerosols) which are so small that they can remain suspended in air e.g., soot, smoke, dust, asbestos, fibres, pesticides, some metals (including Hg, Pb, Cu and Fe). Even biological agents like tiny dust, mites and flower pollen grains.

Major air pollutants and their effects:

- **Carbon monoxide (CO)**

  Source: The major air pollutant which is released from the smoke of automobile due to incomplete combustion of fuels.

  Effect: Carbon monoxide is a highly toxic gas, it enters organism's body and it combines with the haemoglobin in the blood which blocks the oxygen transportation. Thus, it impairs the respiration and it causes death due to asphyxiation when it is inhaled in high quantities.

- **Incompletely combusted Hydrocarbons (3, 4 Benzopyrine, Benzene)**

  Source: The pollutants which are mainly released from the automobiles and burning of fossil fuels (petrol, diesel). The most abundant hydrocarbon is methane (CH_4) in the atmosphere emitted from marshy areas and paddy fields.

  Effect: Hydrocarbons causes lung cancer.

- **Ethylene**

  Source: Ethylene is released in the air during the fruit ripening.

  Effect: The leaves fall even when they are healthy and flowering buds fall before time.

- **Nitrogen oxide (NO, NO_2)**

  Source: Burning or combustion of fossil fuels in automobiles.

  Effect: NO form the photochemical smog in atmosphere, cause acid rains. These nitrogen oxide enter the respiratory system and cause disorders like emphysema, bronchitis, swelling of lungs and lungs cancer etc.

- **Sulphur oxide (SO_2, SO_3)**

  Source: The most hazardous gaseous pollutants, emitted mainly from coal burning, smelters, oil refineries.

  Effect: Lichen and mosses do not grow in SO_2 polluted areas thus are the natural indicators of SO_2 pollution. Sulphur oxides destruct the chlorophyll which affects the plants in that area. Taj mahal also gets effected.

- **Smoke (SO_2, SO_3, NO_2, NO, CO, CO_2)**

  Source: The combustion or burning of organic matter emit carbon and other molecules.

  Effect: Smoke affects clear visibility of the nature, roads, etc.

Knowledge Builder

Secondary pollutants

Smog (Smoke + Fog):

Dr. Des Voeux named smog (smoke) is measured with Ringlmann method. Smog is of these two types:

- **Los Angeles Smog or Photo Chemical smog:**

  Source: First observed in Los Angeles. The smoke, fog nitrogen oxide, hydrocarbons, oxygen, UV light and high temperature are combined to form smog. These components react among themselves and produce reddish brown smog (PAN + O_3 + Nitrogen oxides) or brown haze or brown air. Los Angeles smog is a light induced smog.

  Effect: It causes eye irritation and affects the lungs. Also it affects elastic substances (rubber or tyers). When there is smog, peroxyacetyl nitrate (PAN) is formed. PAN stops or inhibits the photolysis of water in hill reaction of the photosynthesis which affects or inhibits the photosystem II. PAN also inhibits the chlorophyll production in plants.

- **London smog or sulphur smog:**

  Source: It was first observed in London. The coal, smoke, fog, sulphur oxide and low temperature combined together to produce London smog. These components react among themselves and produce vapors (fog) of H_2SO_4 which is termed as London smog.

  Effect: The inhalation of H_2SO_4 vapor mixed in fog affected 4000 people which died in London in 1952.

Acid rains:

Robert August named acid rains.

Source: NO_2 and SO_2 which is released from different sources form smoke and gets dissolved in atmospheric water vapour. This water vapour condense to form sulphuric acid and nitric acid (H_2SO_4 + HNO_3). These acids mix with the rain water which is called as acid rain.

Wet deposition: When the acid comes down on earth's surface mixed with rain, fog and smog, it is called as wet deposition. Dry deposition: When acid gets settled on the earth surface through solid dust particles along with nitrate or sulphate, it is called as dry deposition.

Note:

The pH of acid rain is less than 5.6. In acid rain the ratio of H_2SO_4 and HNO_3 is 7 : 3 (70% H_2SO_4 + 30% HNO_3). Effect: The acid rain causes increased acidity in the soil and water. Acid rain also damages historical monuments. E.g. Tajmahal, Red fort.

2.1.3 Control of Air Pollution

(i) Control of particulate matter:

Two devices used to remove particulate air pollutants from air are Arresters and Scrubbers

(a) Arresters: They separate the particulate matters from the contaminated air. Arresters are of different types:

- **Cyclonic separators and Trajectory separators:** They commonly separate out the particulate matter which is emitted from the industrial wastes with minimum moisture content. These separators work on the principle of centrifugation separation of dust.
- **Electrostatic precipitator:** The most efficient device which removes finer particulate pollutants. This device works on the principle of electrical charging of the dust particles and collecting it on a differently charged base or platform.
- There are many other ways of removing the particulate matter; however the most widely used is the electrostatic precipitator. It can remove over 99 % particulate matter which is present in the exhaust from a thermal power plant. There are electrode wires which are required to be maintained at several thousand volts, to produce a corona to release electrons. These electrons are attached to dust particles giving them a net negative charge. The collecting plates or base attracts the charged dust particles. The velocity of air between the plates must be low which can allow the dust to fall.

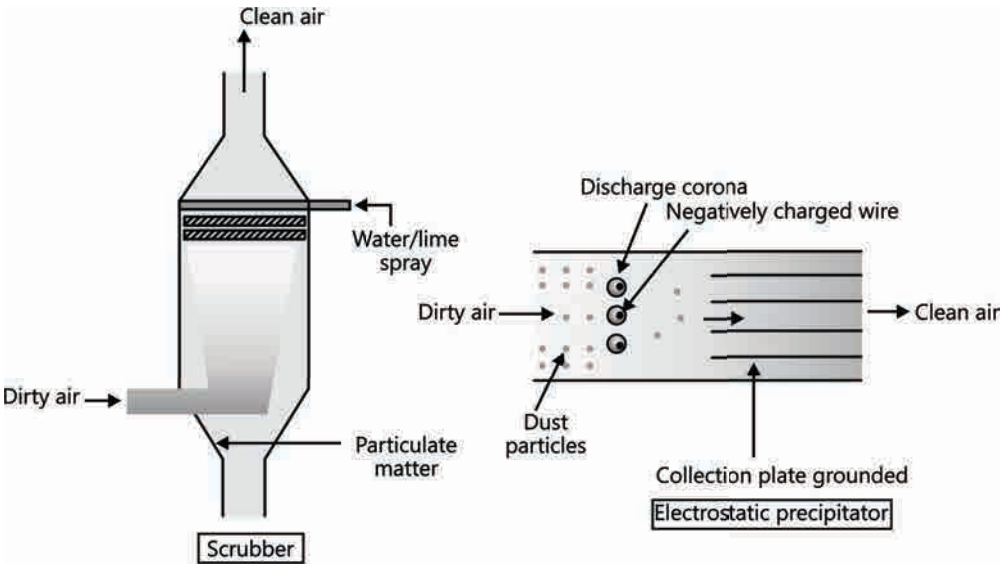

Figure 16.1: Electrostatic precipitator

(b) Scrubbers:

They are used to clean air for both - dust and gases. There are wet and dry scrubbers which are used for dust separation. A scrubber can remove gases like sulphur dioxide. The exhaust is passed through a spray of water which separates the pollutants.

(ii) Control of gaseous pollutants:

Combustion, absorption and adsorption methods are used to control gaseous pollutants.

(a) **Combustion:**

The oxidisable gaseous pollutants are combusted completely at a high temperatures. Petrochemical, fertilizer, paints and varnish industries and combustion control of gaseous pollutants.

(b) **Absorption:**

The gaseous pollutants are absorbed in suitable (liquid) absorbent materials.

(c) **Adsorption:**

The method is used to control toxic gases, vapour and inflammable compounds that could not be efficiently removed or transferred by other methods. Such air pollutants are adsorbed on large solid surface.

Table 16.1: Details of the most polluted cities in India

Year	II most polluted cities in India	Rest of India
Before 1-4-2005	Euro- II (Bharat stage – II)	X
1 April 2005 to 31 march 2010	Euro - III	Euro – II
1 April 2010 to 1 April 2015	Euro - IV	Euro - III

2.1.4 A Case Study of Delhi

There was huge vehicular air pollution in Delhi. The city leads in air pollution levels. In the 1990s, Delhi ranked fourth among the 41 most polluted cities of the world. It was so serious that Public Interest Litigation (PIL) was filed in Supreme Court. Then the government had to take ways and methods which will take care of the pollution. The result was to switch from diesel or petrol to compressed natural gas (CNG). All the buses were immediately converted to CNG.

Advantages of CNG (compressed natural gas)

CNG is the better than diesel because CNG burn most efficiently as compare to diesel or petrol in the automobiles and very little of it is left unburnt. CNG is cheaper than petrol or diesel.

According to a study, there is a substantial fall in CO_2 and SO_2 level in Delhi between 1997 and 2005.

Disadvantage

The government faced problem for CNG delivery and its pipelines through distribution points.

Other measures taken:

Use of unleaded petrol, use of low sulphur, petrol and diesel, use of catalytic converters in vehicles, application of stringent pollution level norms for vehicles. The government of India established a new auto fuel policy which will cut down vehicular pollution in Indian cities. More stringent concern for fuels is steadily reducing the sulphur and aromatics content in petrol and diesel fuels.

Euro II norms: For example, it stipulates that sulphur can be controlled at 350 parts per million (ppm) in diesel and 150 ppm in petrol. Aromatic hydrocarbons contain 42 % of diesel. The goal, according to the roadmap, is to reduce sulphur to 50 ppm in petrol and diesel and bring down the level to 35 percent. As the fuel is upgraded, the vehicle engines also need to be upgraded.

Eleven most polluted cities of India: Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad, Pune, Surat, Kanpur and Agra.

TRY IT YOURSELF

State True or False:

1. Motor vehicles are equipped with electrostatic precipitators to reduce pollution.
2. According to Central Pollution Central Board particulate size 2.5 m or less diameter are responsible for causing greatest harm to human health.
3. All the buses of Delhi were converted to run on CNG by the end of 2002.
4. A scrubber can remove gaseous pollutants like sulphur dioxide.
5. As the exhaust passes through the catalytic converter, unburnt hydrocarbons are converted into carbon monoxide and water.

2.2 Noise Pollution

The noise or sound levels increased in the atmosphere is called noise pollution or sound pollution. Noise is loud, disturbing, irritating, unwanted or unpleasant sound.

Intensity: The intensity of sound is measured in bel or decibel (1 bel = 10 decibel). 25 decibel is the level at which the atmosphere may be peaceful. However sound above 80 decibel intensity is called as noise pollution.

Note: In India, the air (Prevention and control of pollution) act came into action in 1981 which was later amended in 1987 to also include noise as an air pollutant.

2.2.1 Causes of Noise Pollution

It can be natural like thundering, or man-made like stereo or loud speakers. The main sources are:

- Irritating, unwanted and damaging sounds of various mills and industries.
- Defence materials like guns, infantry weapons, explosive rockets, helicopters, etc.
- Entertainment sources like stereo, loud speakers, radios, cassettes.
- Transport automobiles, honking sound, engines of buses, trucks, trains, etc.

2.2.2 Effects of Noise Pollution

A brief exposure to extremely high sound level, 150 dB or more generated during the take-off of a jet plane or rocket may damage ear drums which can permanently impair the hearing ability. Even chronic exposure to a relatively lower noise level of cities may permanently damage hearing abilities of humans. Noise also results in sleeplessness, increased heart beating, altered breathing pattern, which creates stress in humans.

Note: Reduction in noise in our industries can be affected by use of sound absorbent materials or by muffling noise.

2.2.3 Control of Noise Pollution

- Use of sound absorbent substances.
- Try to follow the permissible sound level of crackers, loudspeakers.
- Delimitation of horn-free zones around hospitals and schools.
- Using ear plugs and ear muffs by traffic police personnel and factory workers who are constantly exposed to loud noise.
- Green muffler scheme: Trees such as neem and ashoka absorb sound to a great extent, when planted along the road side, gardens, and societies.

DID YOU KNOW

Table 16.2: Levels of sound which are named as per their effect on human ears

Very Quiet	20 – 30 dB	Sound quiet place is – 20 dB Motion picture studio, broadcasting studio
Silence/Quiet	30/35 – 50 dB	Hospitals (30 – 35), Schools (45 – 50), Libraries (45 – 50), Offices (40 – 50)
Normal voice	55 dB	
Conversational speech	60 dB	
Moderately loud	70 dB – 90 dB	Average traffic – 70 dB Heavy city traffic – 90 dB
Uncomfortable	Above 100 dB	Air craft (120 dB)
Painful	Above 130 dB	Rocket (180 dB) Jet plane (150 dB)

2.3 Water Pollution

The addition of organic and inorganic chemicals as well as the biological materials which tends to change the physical and chemical properties of the water which is a harmful process is called as water pollution.

2.3.1 Causes of Water Pollution

Domestic Sewage: Sewage matter, industrial wastage, agricultural wastage, domestic wastage, hotwater of thermal plant and nuclear reactors, etc. are major causes of water pollution.

Note: Even 0.1 % impurities makes domestic sewage unfit for human use (figure).

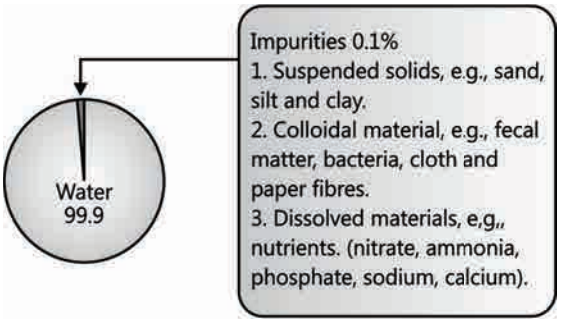

Figure 16.2: Composition of waste water

The water at home is used for several purposes like cleaning, rinsing, bathing, etc. which creates various kinds of impurities in sewage. Domestic sewage mainly includes biodegradable organic matter (carbohydrates, proteins, fats, urea, inorganic salts, etc.), human faecal matter, animal wastes, etc. Also it includes huge bacterial load from vegetables, cooked food, skin, faecal matter, etc.

All these impurities are well classified as: Suspended solids, Colloidal particles, Dissolved materials.

Household Detergents: include the phosphate, nitrate, ammonium and alkyl-benzene sulphonate etc. compounds which are harmful substances that gather in water.

Inorganic phosphorus and nitrogen: Such molecules in high concentration speeds the growth of algae. The death of algae increases the organic matter. The presence of large amounts of organic material leads to eutrophication because of this, amount of oxygen in water decreases. Some of the algae also secretes toxic materials. This water used for drinking causes death of the cattle.

In order to control this pollution, phosphate salts are precipitated with lime ferric chloride, etc. Zirconium is considered as the best precipitation agent.

BOD and COD are linked with sewage. This relationship is mentioned below:

- **Biochemical oxygen demand (B.O.D):** The organic wastes in the water is measured as its biochemical oxygen demand. The amount of dissolved oxygen (D.O = Dissolved oxygen) which is required by the microorganisms to decompose the organic wastes of the water. The BOD level in a given water sample indicates the impurity level in it. Higher the BOD requirement, higher is the contamination level in the

water. BOD also helps to determine or calculate the biodegradable organic matter in the water. B.O.D increased = high impurity level in water. When the B.O.D amount is increased, the dissolved oxygen amount is decreased in water. The rates of decomposition is increased with higher amount of organic waste in water. O_2 (dissolved) is rapidly used by microbes for degradation, which drops the D.O content in water.

- Daphnia is the indicator of B.O.D

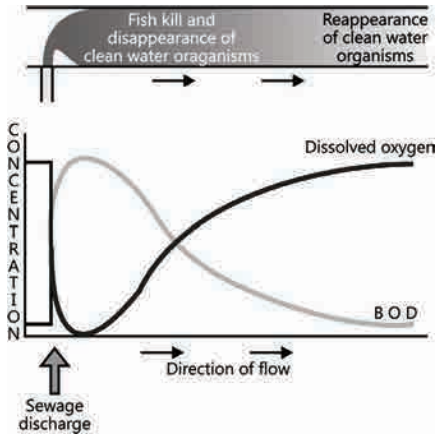

Figure 16.3: Effect of sewage discharge on some important characters

Note:

The above figure is an indication of changes in sewage water discharged in water. The microbes present in water start the degradation which reduces the D.O rapidly. This decrease affects the aquatic fish and other animals and plants. There are several organic matter in water which causes increase in water algae or algal bloom, imparting distinct colour to the water. This algal growth causes water quality deterioration. The bloom has algae which affects the animals and plants. There are bright coloured flowers growing or floating on water bodies which look beautiful. However these flowers grow or spread along the water surface which interrupts the water ways. Their growth speed is fast and thus difficult to remove them. Water hyacinth (*Eichhorina crassipes*), is an aquatic weed which creates water problems in the whole world, also called as 'Terror of Bengal'. Domestic, industrial and hospital sewage contain several harmful chemicals and pathogenic organisms which if not treated properly can cause various diseases, like cholera, jaundice, typhoid, etc.

- **Chemical oxygen demand (C.O.D):** The oxygen required by chemicals in the sewage for the oxidation of total organic matter (biodegradable + non-biodegradable).

Note: C.O.D value is always higher than the B.O.D value

- **Biological magnification:** There are non-biodegradable pollutant in water which microbes are unable to degrade like Al, Hg, Fe, D.D.T., pesticides, phenolic compound ABS (Alkyl benzene sulphonate). Such chemicals are accumulated in the body tissue in increasing concentration once they enter the food chain. This is called as biological magnification. The highest concentration of these chemicals is found in top consumers.

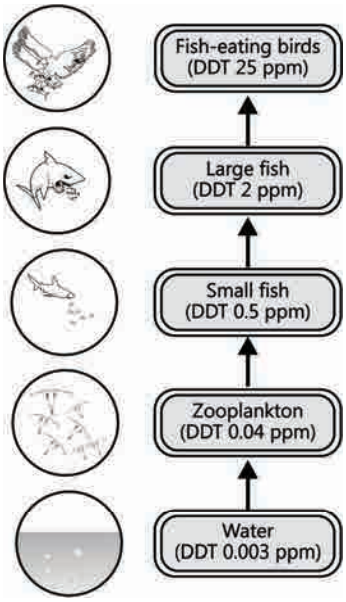

Figure 16.4: Biomagnification of DDT in aquatic world

Note: High concentration of DDT disturbs the calcium metabolism in birds. This affects the egg shell formation thinning of egg shell) and their premature breaking that eventually declines the bird populations.

- **Eutrophication:** The excessive growth of organisms (algae, plants and animals) in water as there is high nutrient content in water. The process of nutrient enrichment of water can be due to the sewage contents, run-off fertilizers and microorganisms in it. There is consequent loss of species (or death of aquatic animals) as the organisms increase causing them to compete for food, oxygen and sunlight. The lake which is showing the eutrophication is called as eutrophic lake. In this process presence of nutrients in lake stimulates growth of algae (algae bloom) increase organic loading and bring about reduction in the oxygen content of water causing death of aquatic animals.
    - Natural Eutrophication: Eutrophication is the natural aging of a lake by the biological enrichment or growth of its water. This natural aging of a lake does not occur in a day and may take a span of thousands of years. The lake may finally get converted into land due to the deposition of silt.
    - Accelerated or artificial Eutrophication: The pollutants that are due to human activities like the industrial or domestic effluents can radically accelerate the aging process, this phenomenon is called as accelerated eutrophication. The lakes now become shallow and warmer due to its organic matter. This warming of lake water stops the growth of cold water organisms while enhances the growth of warm organisms. B.O.D of eutrophic lake is very high.
- **Industrial waste:** The industrial wastes are discharged into the running water of the rivers and canals. Such effluents mainly contain the inert suspended particles like dust, coal, toxins (acid, base phenols cyanides, mercury, zinc etc.) inorganic reduced material like ferrous salts sulphide, oils and other residues of organic material and hot water. The water which is polluted with heavy metals like mercury,

lead,etc. causes the disorganization of nervous system in animals when used for drinking or cooking. Japan was affected (many people died) with Mina Mata disease which was caused by consumption of polluted fishes grown in mercury polluted water.

The industrial wastes and toxic components should be purified before it is drained into rivers, lakes, sea and ponds. Thus the water of the industrial effluents can be treated by suitable method to remove the pollutants.

The waste water from industries like petroleum, paper manufacturing, metal extraction and processing, paper manufacturing, metal extraction and processing, chemical manufacturing, etc., are observed to contain toxic substance,heavy metals (defined as elements with density > 5 g/cm^3 such as mercury, cadmium, copper, lead etc.) and a variety of organic compounds.

Water having D.O content below 8.0 mgL^{-1} may be considered as contaminated and below 4.0 mgL^{-1} heavily polluted. D.O. is measured by oximeter.

KNOWLEDGE BUILDER

Indication of pollution level

Heavy metal	Range
Low	1500 µg/g
Medium	1500 µg/g - 4000 µg/g
High	Above 4000 µg/g

Water having dissolved oxygen (DO) content below 8.0 mg/L is considered as polluted. Heavily pollutes water have DO content below 4.0 mg/L.

- **Sewage:** Sewage contains highest amount of carbonic materials and biological material, as pollutants. These carbonic materials increase the number of decomposers like bacteria and fungus. The acceleration of microbial activity increases BOD of water.

  BOD is very less in pure water. The higher BOD is the indication of water pollution and the water of polluted reservoir cannot be utilized.

- **Heated (thermal) wastewaters:** The water flowing out of electricity generating units e.g., thermal power plants, constitute another important category of water pollutants. Thermal waste water eliminates or reduces the number of organisms sensitive to high temperature. This may enhance the growth of plants and fishes, which grow in high temperature water in cold areas. However they grow after causing damage to the indigenous flora and fauna.

2.3.2 Types of Water Pollution

The water released from the agricultural, household and industrial use have these major pollutants:

- **Biological:** Microorganisms like bacteria, virus, protozoa, worms, etc. The major cause is organic waste disposal in water.
- **Chemical:** Inorganic (phosphates, fluorides, chlorides, nitrates, etc.), organic (phenols, alcohols, dyes, pesticides, etc.) and heavy metals (lead, mercury, cadmium, zinc, etc.)
- **Physical:** Temperature, viscosity, density of water.

2.3.3 Sewage Treatment

- **Primary treatment:** It is physical removal of large and small particles from the sewage through filtration and sedimentation. Filtration stages are employed. Initially, floating debris is removed by sequential filtration. Then the smaller ones (soil and small pebbles) are removed by sedimentation. All the solid particles that settle, form the primary sludge, while the supernatant liquid forms the effluent or primary effluent. The primary effluent from the primary settling tank is now ready for secondary treatment.
- **Secondary treatment or biological treatment:** The primary effluent is passed into large aeration tanks and constantly agitated (mix) mechanically with the air pumped into it. This air and mixing allows vigorous growth of degrading aerobic microbes into flocks (masses of bacteria associated with fungal filaments to form mesh like structures). These microbes consume the major part of the organic matter in the effluent. This significantly reduces the BOD of the effluent.

  After the sewage BOD is reduced significantly, the secondary effluent is then passed into a secondary settling tank where the bacterial 'flocks' form sediments. This sediment is called as activated sludge. The sludge is pumped into large tanks called as anaerobic sludge digesters. Here, other kinds of bacteria, which grow anaerobically, digest the aerobic bacteria and the fungi in the sludge. In this process, the bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide. These gases are called as biogas as they can be used as source of energy due to its inflammable nature. The effluent from the secondary treatment plant is generally released into natural water bodies like rivers and streams.

  Daphnia, trout fishes and larva of stone fly when start growing in water, indicate the water purity as they are the clear indicators and *Tubifex* (an annelid), ***Chironomous*** larva, *E. coli*, sewage fungus, sludge worms, blood worms are the polluted water indicators.

2.3.4 A Case Study of Integrated Waste Water Treatment

Wastewater including sewage can be treated in an integrated manner, by utilizing a mix of artificial and natural processes. An example of such an initiative is the town of Arcata, situated along the northern coast of California. Collaborating with biologists from the Humboldt state university. The towns people created an integrated waste water treatment process within a natural system.

The cleaning occurs in two stages:

- The conventional sedimentation, filtering and chlorine treatment are given. After this stage, lots of dangerous pollutants like dissolved heavy metals still remain. To combat this, an innovative approach was taken and the biologists developed a series of six connected marshes over 60 hectares of marsh

land. Appropriate plants, algae, fungi and bacteria were seeded into this area, which neutralize, absorb and assimilate the pollutants. Hence, as the water flows through the marshes, it gets purified naturally.

The marshes also constitute a sanctuary, with a high level of biodiversity in the form of fishes, animals and birds that now reside there. A citizens group called friends of the Arcata marsh (FOAM) are responsible for the upkeep and safeguarding of this wonderful project.

Ecological sanitation is a sustainable system for handling human excreta, using dry composting toilets. This is a practical, hygienic, efficient and cost-effective solution to human waste disposal. The key point to note here is that with this compositing method, human excreta can be recycled into a resource (as natural fertilizer), which reduces the need for chemical fertilisers. There are working 'EcoSan' toilets in many areas of Kerala and Sri lanka.

Try It Yourself

Fill in the blanks

1. Domestic sewage is a _____ pollutant.
2. Bio magnification is well known for _____ and _____.
3. The Government of India has passed the water (Prevention and Control of Pollution) act, _____ to safeguard our water resources.
4. The Marshes also constitute a sanctuary, with a _____ of diversity.

2.4 Solid Wastes

The wastes that are discarded or goes out in trash or left over solids produced from human activities.

2.4.1 Sources of Solid Wastes

Hospitals

Household

Agriculture

Industries (plastic, paper, rubber)

2.4.2 Types of Solid Wastes

Municipal solid wastes: Wastes collected as well as disposed from homes, offices, stores, schools, hospitals, etc., by the municipality. The municipal solid wastes generally include paper, food wastes, plastics, glass, metals, rubber, leather, textile, etc. Such wastes are increasing as there is an increase in non-biodegradable wastes. The covers or packets of food packages are made of several polymeric layers (aluminium, plastic, paper) which are not easily degraded. Also the carry bags and cartons are plastics which are not easily degraded.

2.4.3 Disposal of Solid Wastes

The collection and categorisation of wastes, its transport to the disposal area, and its appropriate disposal are the processes which are involved in wastes management. The simpler method is to divide the wastes as biodegradable, recyclable and non-biodegradable. The biodegradable wastes are put in pits where they are degraded. The recycled ones are collected and transported to the industries where it is recycled. The non-degradable ones create problems.

The methods involved are:

- **Burning: it reduces the volume of the wastes in two ways:**
  - **Incineration** – Solid wastes burning in presence of oxygen at 850 – 1000^0C. The use of incinerators is crucial for the disposal of hospital waste.
  - **Pyrolysis** – Solid wastes burning (combustion) in the absence of oxygen at 1650^0C.
  - Although waste is generally not burnt completely and open dumps which often are the breeding ground for rats and flies.
- **Landfilling or dumping:**
  - **Sanitary landfills:** They were the substitute for open burning dumps. Here the wastes are dumped in a depression or trench, and covered with dirt every day.
  - **Open landfills:** Dumping the wastes in dump without covering it. The wastes is pressed to reduce it.
  - Landfills are also not really much of a solution since the amount of garbage generation especially in the metros has increased so much that these sites are getting filled too. Also there is danger of seepage of chemicals, etc., from these landfills polluting the underground water resources.
- **Source being reduced:** There is lot of refused groceries, vegetables, fruits, etc. from kitchen which can be fed to animals and reduce the wastes load.
- **Recovery and recycling:** The wastes which can be recycled (tins, cans, glass, plastic, paper, cardboard, etc.) are taken by rag pickers (kabadiwallahs) and dropped to the recycling centre by various steps.

2.4.4 Hospital Wastes

The wastes created by the hospitals, contain disinfectants, syringes, gloves, blood samples, tubes, and other harmful chemicals, including pathogenic organisms. These wastes require special treatment before their disposal. The incinerators are commonly used.

2.4.5 Electronic Wastes (E-Wastes)

The spares or parts of computers, mobiles, electronic goods, called as e wastes. The developing countries like India, China import such wastes to extract the metals through recycling. Recycling is the only means of such wastes treatment.

2.4.6 A Case Study of Remedy for Plastic Waste

A plastic sack manufacturer in Bangalore has reached on the plastics and thus concluded the ideal solution

to the ever-increasing problem of the accumulating plastic waste. Ahmed khan, aged 57 years old, has been producing plastic sacks for 20 years. Around 8 years ago, he realized that the plastic wastes was a real problem as it was impossible to recycle or destroy it. He developed Polyblend, which is a fine powder of recycled modified plastic. This is mixed with the bitumen that is used to lay roads.

In collaboration with R.V. College of Engineering and the Bangalore City Corporation, Ahmad Khan proved that mixture of polyblend and bitumen enhanced the bitumen's water repellent properties, and helped to increase the road lifeby three times than normal when it is used to lay roads. The raw material for creating polyblend is any plastic film waste. So, against the price of Rs. 0.40 per kg that rag pickers had been getting for plastic waste, Khan now offers Rs 6. Using Khan's technique by the year 2002, more than 40 kms of road in Bangalore has already been laid. At this rate, Khan will soon be running short of plastic waste in Bangalore, to produce polyblend.

2.5 Agricultural Wastes

The green revolution initiated which increased the use of inorganic fertilizers and pesticides to enhance the crop production. Pesticides and weedicides are being increasingly used in order to control pests and weeds. They also destroy soil diversity and prove harmful to birds, fishes in biomagnification. This leads to the soil along with fertilizers run-off in water. This water then shows growth of excess of organisms as in eutrofication.

2.5.1 A Case Study of Organic Farming

Integrated organic farming is a cyclical, zero waste product procedure, as the waste products from one process are recycled as the nutrients for other processes. This allows the maximum utilization of resource and increases the efficiency of production. Ramesh Chandra Dagar, a farmer in Sonipat, Haryana, is doing just this. He includes bee-keeping, dairy management, water harvesting, compositing and agriculture in a chain of processes, which support each other and allow an extremely economical and sustainable venture. The chemical fertilisers are not used for crops, instead cattle excreta (dung) are used as manure. The natural gas produced from biogas is used for satisfying the energy needs of the farm. Enthusiastic about spreading information and help on the practice of integrated organic farming, Dagar has created the Haryana Kisan Walfare club, with a current membership of 5,000 farmers.

2.6 Radioactive Pollution

The physical pollution of air, water and soil with radioactive elements.

Radioactivity is defined as the element's capability to emit radiations (protons or alpha rays, electrons or beta rays and gamma rays) spontaneously from their disintegrating nuclei. Elements that have radioactivity are called as radioactive elements.

2.6.1 Sources of Radioactive Materials

- **Natural sources** – Cosmic rays, earth's radiation such as radium – 224, Uranium 235, Uranium 238,

Thorium 232, Radon 222.

- **Man made Radiation** – The radiations are released in the atmosphere during mining and purification of Thorium and plutonium, and in producing nuclear weapons etc.
- Nuclear reactor and nuclear fuel causes pollution by radioactive radiation. The nuclear fuel and coolants are the sources of radioactive radiation. Radioactive waste is also most important radioactive pollutants because these wastes are not dumped at particular or right place.
- **Other sources** – Some of the radioactive elements (isotopes) are used in experimental laboratories for scientific researches which causes radioactive pollution. X-rays are also proved to have harmful effects.

  The first is accidental leakage of radiation occurred in the Three Mile Island and Chernobyl.

  It has been recommended that storage of nuclear waste, after sufficient per-treatment, should be done in suitably in shielded containers which is buried within the rocks, about 500 m deep below the earth's surface.

TRY IT YOURSELF

Fill in the blanks

1. e-waste includes _____ and _____
2. The use of _____ is crucial for disposal waste.
3. _____ is adapted as substitute for open burning dumps.
4. _____ is the only solution for the treatment of e-wastes.
5. State Governments across the country are trying to push for reduction in the use of _____ and use of ecofriendly packaging.

2.7 Greenhouse Effect

Carbon dioxide is not considered as pollutant in its natural levels. However its higher concentration forms a thick layer above the earth's surface. The radiation of the heat from the earth's surface is increased now a days. This, increases the temperature of the earth's surface, and is called as ''green-house effect'' or global warming. The name greenhouse comes from the effects of such gases in the greenhouse where the plants are grown. The greenhouse effect is natural where the earth's surface is heated along with the atmosphere.

2.7.1. Types of Gases

Main greenhouse gases are CO_2, CH_4, CFC, N_2O, excluding this SO_2, O_3, water vapour which are also released from industries and NO_2 released from agriculture. All these gases are responsible for the increase in the greenhouse effect.

Greenhouse affect Mechanisms

The clouds and gases reflect one fourth of the received solar rays and absorbs some part. However half of incoming solar radiation falls on earth's surface which heats it and just small portion is reflected back. The reflection is in infrared ray form which is absorbed back by these gases on earth. These molecules radiate heat which comes to earth again. This downward flux of radiation is called as greenhouse flux. This is a repeated cycle which increases the earth's temperature.

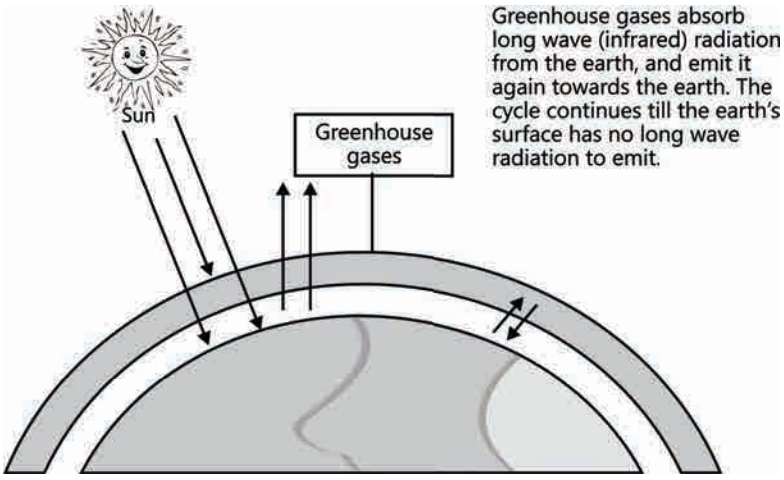

Figure 16.5: Sunlight energy at outer atmospheric layer

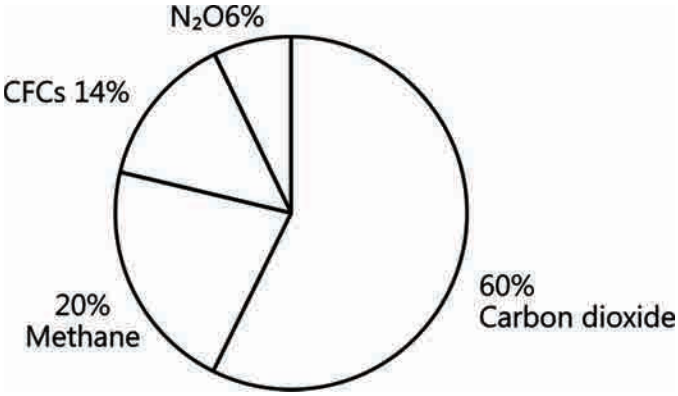

Figure 16.6: Relative contribution of various greenhouse gases to total global warming

In this phenomenon cover of CO_2 layer around the earth, allows the short wavelength incoming solar radiation to come in but does not allow the long wavelength of outgoing heat radiation from warm surface of earth and surface keep the earth warm. The consequent increase in the global mean temperature is

referred to as global warming.

2.7.2. Effects

- It has been observed that in the recent past, the level of CO_2 in the atmosphere has increased from 280 ppm to 368 ppm in 1956 to 2002. If present growth rate is continued then the amount of CO_2 will be doubled up to 2020 century. Even 2-3 ^oC rise in temperature will lead to melting of glaciers and ice caps of polar region and consequently the floods in rivers, rise in sea level and changes in cycle of rain. Islands may be submerged in sea water.
- Carbon dioxide fertilization effect – Due to increased CO_2 concentration the rate of photosynthesis will increase (up to a few year). The response of the plants to elevated concentration of CO_2 is known as the CO_2 fertilisation effect.
- The global mean temperature has increased by 0.6 ^oC in 20th century.
- Sea level has been raised by 1 to 2 mm per year during 20th century.
- Without greenhouse effect the average temperature at surface of earth would have been a chilly – 18 ^oC rather than the present average of 15 ^oC.
- Increase in the level of greenhouse gases has led to considerable heating of Earth leading to global warming. During the past century, the temperature of earth has increased by 0.6 ^oC, most of it during the last three decades.

2.7.3 Control Measures

Reducing deforestation, reducing use of fossil fuel, planting trees, developing substitutes for CFC and other harmful gases.

2.8 Ozone Depletion

Ozone is present in less quantity in atmosphere. But at the height of 16 km to 25 km on earth, concentration ozone is maximum in stratosphere.

At normal temperature and pressure thickness of ozone layer is 3 mm. (But at poles thickness of ozone layer is 4 mm). Ozone hole was first discovered in 1985 over Antarctica by Nimbus – 7 satellite.

Due to depletion of ozone layer harmful UV radiation are penetrating to the earth which causes skin cancer (Melanoma) and also acts as strong mutagens. UV radiation of wavelengths shorter than UV-B, are almost completely absorbed by Earth's atmosphere. Given that the ozone layer is intact. But UV-B damages DNA and mutation may occur. It causes aging of skin, damage to skin cells and various types of skin cancers. In human eye, cornea absorbs UV-B radiation, and a high dose of UV-B causes inflammation of cornea, called snow-blindness cataract, etc. Such exposure may permanently damage the cornea. UV radiation causes a diseases, xeroderma pigmentosum.

The aerosols like C.F.C. (Chloro flouro carbon) release into the atmosphere from the refrigerators air conditioners and jet planes deplete or reduce the ozone layer. This is called ozone depletion and these

substances are called O.D.S (ozone depleting substances). This thin layer ozone is also known as ozone holes.

Number of pollutants like CFCs (14% of total depletion), nitrogen oxide (3.5%), CH_4 and halogens (chlorine) cause depletion of ozone layer. Maximum ODP (ozone depleting potential) is of CFCs due to release of chlorine.

KNOWLEDGE BUILDER

Ozone-depleting substances are Chlorofluoro carbon's, CH_4, CCl_4, Halons and N_2O.

CFC's are most damaging and efforts are being made to replace CFC by HFC's (Hydrofluorocarbons).

Note:

- In this process one chlorine atom convert one lakh O_3 molecules into O_2 photodissociation.
- The life time of CF_2Cl_2 (CFC-12) is 139 year while that for $CFCl_3$ (CFC = 11) is about 77 years.
- Chemical process of ozone depletion – chain reaction. Thickness of ozone layer is measured in Dobson unit (1Du = 1 ppb)
- The ozone hole over Antarctica develops each year between late august and early October and in general Ozone hole occurs mainly during spring time (Feb – Apr) and lowest during (July- October).

2.9 Degradation by Improper Resource Utilisation and Maintenance

The natural resources are degraded by pollutants and improper resources:

2.9.1 Soil Erosion and Desertification

The fertile top soil is developed in centuries of years which can be easily removed due to human activities like over cultivation, unrestricted grazing, deforestation and also poor irrigation techniques. The land is then converted to an arid patch. When a large barren patch is extended to acres of area, a desert is created. Main affecting reason for desertification is urbanisation.

2.9.2 Water logging and Soil Salinity

Irrigation with improper drainage of water is a reason for water logging in the soil. A water logged soil has poor aeration on the surface which results in poor plant growth. The salts in the water is deposited as thin crust on land surface or starts collecting at plant roots which is not good or healthy for plants and damages it. This is an observed problem along with water logging in green revolution.

2.10 Deforestation

The conversion of forest area to non-forest areas. Major forest areas are now lost in tropical areas of the

planet which is now affecting the climate there. 30% of land is covered with forest in India. Now it has decreased to 19.4% while the recommended area of forest cover in India is 33 %.

2.10.1 Causes of Deforestation

- Conversion of forest area into residential or commercial area.
- Trees cutting down into timber, firewood or cattle grazing.
- Slash and burn cultivation: common practice in north eastern states. The farmers cut down trees of forest and burn rest of plants. This ash is a fertiliser for several plants and land is used for grazing and farming. Post farming, it is left for long duration till it is recovered. This is repeated in other areas as well. The time gap is for the land to recover from agriculture but used for houses. This is a cause for the deforestation.

2.10.2 Effect of Deforestation

Enhanced CO_2 concentration in the atmosphere results in heat production on the surface. The trees if present hold the gas and convert it into O_2.

There is loss of biodiversity due to habitat destruction of animals, birds, reptiles, etc. soil erosion, and loss of rains also.

2.10.3 Control of deforestation

Law should be passed to not cut the trees. The forest areas should be strictly under observance to not allow the tree cutting.

Reforestation: The process of growth of trees on areas which was once forests. This can be natural in deforested areas while it can be enforced by human. There is Van Mahotosava practiced in major parts of India since 1950. The plants are planted by government and private agencies both during February and July each year.

2.10.4 A Case Study of Conversation of Plants

- **King of Jodhpur** in 1731, wanted to make a palace. He asked his minister to arrange the wood to construct his new palace. The ministers along with the workers went to a forest which was connected to a forest, Bishnoi. There were people inhabiting near Bishnoi area. Bishnoi women, Amrita Devi showed exemplary courage as she hugged the tree and dared the King's men to cut her first and then the tree. The tree was of more importance than her life. The King's men did cut the tree along with Amrita Devi. This was followed by her three daughters and several hundreds of other women in the village who lost their lives to save the tree. There are no such sacrifices anywhere when the person has sacrificed his life for a tree.
- **Chipko movement:** In 1974, Gopeshwar in Chamoli district was headed by Chandi Prasad Bhaat from Gopeshwar and Sunder lal Bahuguna from Silyara in Tehri region activated the movement. The movement was for tree protection. Local women showed enormous bravery as they protected trees

from the contractors axe to cut it down.

- **Joint Forest management:** It was initiated by Indian Government in 1980 which will work with local communities to protect the forest and manage it for best products. In return of their services to the forest the communal health benefit of various forest products.

TRY IT YOURSELF

Fill in the blanks:

1. Without greenhouse effect the average temperature at surface of Earth would have been a chilly _____ ^{0}C rather than the present average of _____ ^{0}C.
2. Ozone gas is continuously formed by the action of _____ on molecular oxygen in the stratosphere.
3. _____ radiation damages DNA.
4. _____ and soil salinity are some of the problem that have come in the waste of the green revolution.

True/False:

1. According to an estimate, almost 40 percent forests have been lost in the topics, compared to only 10 percent in the temperate region.
2. Reforestation cannot occur naturally in a deforested area.
3. During Chipko Movement of Garhwal Himalayas, local men showed enormous bravery in protecting trees from the axe of contractors by hugging them.

Important information

- Air pollution: According to central pollution control board (CPCB), particulate size 2.5 micrometers or less in diameter are responsible for causing the greatest harm to human health. These fine particulates can be inhaled deep into the lungs and can cause breathing and respiratory symptoms, irritation, inflammations and damage due to the lung and premature deaths.
- Catalytic converters: Automobiles are a major cause for atmospheric pollution in the metro cities. Proper maintenance of automobiles along use of lead free petrol or diesel can reduce the pollutants they emit.
- Catalytic converters, having expensive metals namely platinum – palladium and rhodium as the catalysts, are fitted into automobiles for reducing emission of poisonous gases. As the exhaust passes the catalytic converter, unburnt hydrocarbons are converted into CO_2 and water, and CO and nitric oxide are changed into CO_2 and nitrogen gas respectively.

- Motor vehicles equipped with catalytic converter should use unleaded petrol because lead in the petrol inactivates the catalyst.
- MIC (Methyl Isocyanine) was released in Bhopal gas tragedy on 3rd December 1984. Which is used in the production of ''Savin'' insecticide in Union Carbide.
- Tetraethyl lead and tetra methyl lead are formed by combustion of petroleum. They are known to hamper haemoglobin formation.
    - The disease produced by use of lead polluted water is called as plumbism
    - Lead causes nervousness anaemia in human beings. It also damages kidney
    - Lead concentration in blood is considered alarming if it is 10 ug/100 ml.
- Common dust disease is known as Pneumoconiosis.
    - Disease due to cotton dust in textile workers is – Lung fibrosis or Byssinosis
    - Disease due to coal dust – Anthracosis
    - Disease due to asbestos dust – Asbestosis
    - In stone grinders disease due to silica dust – Silicosis
    - In Iron mill disease due to iron dust – Siderosis
- Stone leprosy is caused due to acid rain because due to acid rain outer surface of metals, marbles, and stone destroyed.
- Blue baby disease – This disease is caused by the high amount of nitrate in water. It is also known as methaemoglobinaemia or cyanosis.
- Hypertension and uremia – Caused by Copper
- Arsenic – It causes black-foot disease and poisoning in fodder plants which are eaten by livestock and causes their death.
    - Cadmium causes anemia, hypertension, and damage to liver and kidneys. In Japan it caused bone softening or skeleton deformiticis called Itai-Itai disease or Ouch-Ouch
- Fluorides – The higher concentration of fluorides causes chlorosis or necrosis in tips and margin of leaf (leaf lamina). The compounds of fluorine reach in the animals through the fodder and causes abnormal calcification of teeth, this is called Fluorosis.

  Note: The experts hold that the maximum levelof fluoride which the human body can tolerate is 1.5 parts per million (ppm). When ingested in excess over a long period of time causes ''Fluorosis''.
- ELNino effect – It is the process in which water of Pacific Ocean get warm, in this process warm water current flows to equator and Peru in between 5 to 8 year at Christmas time. Effect of ELNino is flood, drought and monsoon damage in India. On the other hand when cold water comes in effect in Pacific Ocean it is called La-Nina effect.

- Conference on human environment in 1972 held at Stockholm
- Recognizing the deleterious effect of ozone depletion, an international treaty, known as the Montreal protocol was signed. In 1987, 27 industrialized countries signed the Montreal protocol at to protect stratospheric ozone. Montreal (Canada) It's effective in 1989. To, date more than 175 countries signed the Montreal protocol.
- UNCED (United Nations Conference on Environment and Development) Earth Summit held at Rio-de Jenerio (Brazil) in 1992 for reducing greenhouse gases and biodiversity conservation and make Agenda 21
- Kyoto protocol conference held in Kyoto (japan) for climate change (1997). This protocol requires countries to take appropriate measures to reduce their overall greenhouse gas emission to a level at 5 percent below the 1990 level by the commitment period 2008-2012.
- Earth Summit or world summit on sustainable development (2002) was held in Johannesburg (S. Africa).
- The 2009 United Nations Climate change Conference, commonly known as the Copenhagen Summit, was held at the Bella center in Copenhagen, Denmark, between 7 December and 18 December. The Conference included the 15th conference of Parties (COP 15) to the United nations Framework convention on Climate change and the 5th meeting of the parties (COP/MOP 5) to the Kyoto Protocol.

DID YOU KNOW

Environment law for controlling pollution

- The National Environment (Protection) Act (NEPA) 1986: This act clearly brings the protection of water and soil quality, and the control environmental pollutants.
- The insecticide Act. 1968 – The act deals with the regulation of import, manufacture, sale, transport distribution and use of insecticides with a view of preventing risk to human health and other organisms.
- The water (Prevention and control of pollution) Act 1974 – This act deals with the preservation of water quality and the control of water pollution with a concern for the detrimental effects of water pollutants on human health.
- The air (Prevention and control of pollution) Act, 1981 – This act deals with the preservation of air quality and the control of air pollution with a concern for the detrimental effect of air pollutants on human health and also on the biological world
- In 1987, important amendments to the air Act 1981 were made and noise was recognized as an air pollutants.

Knowledge Builder

Full forms:

CEPHERI – An institution established in India to center radioactive pollution i.e. ''Central Environmental and Public Health Engineering research institute'' (CEPHERI).

This institution submits the measures on the basis of results of detailed survey

NEERI – National Environmental Engineering Research Institute – Nagpur, (Environmental planning organization is related with NEERI)

IPCC – The ''Intergovermental Panel on Climate Change''

I.A.P – Index of atmospheric pollution prepared with the help of lichens

I.W.P. – Index of water pollution, prepared by *Daphnia*, *E.coli*, *Trout*.

M.P.N – Most probable number of *E.coli* in water.

Additional Information

- Third pollution or land scape pollution – To make Fertile-land barren by dumping wastes
- e.g. ash, industrial waste
- Incineration – Solid wastes burning in presence of oxygen. The use of incinerators is crucial to disposal of hospital waste.
- Pyrolysis – Solid wastes burning (combustion) in the absence of oxygen
- Flu gas – Gas which release of from chimneys.
- Plume – Smoke which release from chimneys.
- Hydro thermal vents – These are hot water springs in the deep ocean having high concentration of H_2S, ocean water oxidized H_2S producing energy which is used by bacteria, filter-Feeders (clams) eat the bacteria so that this food chain based on chemical energy.
- Phytotrons – A such type of house where plants are grown in controlled environment
- Hydrocarbon – Are also known as volatile organic carbon (VOC).
- Electronic wastes is also called e-wastes.
    - Irreparable computers and other electric goods are known as electronic wastes (e-wastes). E-wastes are buried in landfills or incinerated.
    - Eventually recycling is the only solution for the treatment of e-wastes.
- Ganga Action plan for controlling pollution in Ganga (1985) included city: (i) Kolkata (ii) Kanpur.
- At 50 ppm. CO converts 7.5% of haemoglobin in to carboxy haemoglobin within 8 hours.
- Maximum greenhouse gas released by – USA
- Cotton dust is an important pollution in Ahmedabad.

Summary

- There are major issues which relate to the environmental pollution and depletion of valuable natural resources that are different in dimension from local, regional to global levels.
- The main causes of air pollution is the burning of fossil fuel in industries and automobiles.
- The most common source of pollution in the water bodies is domestic sewage which reduces the dissolved oxygen and increases the BOD.
- Domestic sewage has high N_2 and P content which causes eutrophication and algal blooms.
- Industrial waste waters are often rich in toxic chemicals, especially heavy metals and organic compounds.
- Municipal solid wastes are filled in the land fills after they are divided as per their degradation ability.
- Disposal of hazardous wastes like dysfunctional ships, radioactive wastes and e-wastes require additional efforts like treatment before their disposal.
- Soil pollution primarily results from agricultural chemicals (e.g. pesticides) and leachates from solid wastes is deposited over it.
- The major global environmental issues that are responsible for increasing greenhouse effect, is warming-up of the planet Earth and ozone depletion in the stratosphere.
- Enhanced greenhouse effect is mainly due to the increase demission of carbon dioxide, methane, nitrous oxide and CFCs and also due to deforestation.
- Ozone in the stratosphere, which protects the organisms on earth from harmful effects of ultraviolet radiation, is now depleting fast due to emission of CFCs thus increasing the risks of skin cancer, mutation and other disorders.
- The degradation of natural resources occur, by the action of pollutants and by the improper resources being used.
- Deforestation is the conversion of forested areas to non-forested ones by cutting the trees.

EXERCISE

Objective Questions

Q.1 Bloom occurs in -

(A) Oligotrophic lake (B) Eutrophic lake

(C) Fast flowing river (D) Rain water

Q.2 Rhododendron is characteristic vegetation of -

(A) Tropical region (B) Mangrove (C) Alpine region (D) Epiphytes

Q.3 Which of the following plant has become a water weed in this country?

(A) Typha (B) Trapa (C) Cyperus (D) Eichornia

Q.4 What is not useful to increase agriculture production?

(A) Mechanization of agriculture (B) Enhanced irrigation facilities

(C) Use of fertilizers (D) Deforestation

Q.5 Environmental planning organization is -

(A) CSIR (B) CEPHERI (C) ICAR (D) NEERI

Q.6 Which is normally not an air pollutant?

(A) CO (B) SO_2 (C) Hydrocarbons (D) CO_2

Q.7 Acidic rains are due to -

(A) O_3 (B) $SO_2 + NO_2$ (C) CO (D) CO_2

Q.8 What is found in photochemical smog?

(A) CO (B) NO_2 (C) Ozone (D) Both (B) and (C)

Q.9 Lichens in habitat indicate -

(A) Zinc in soil (B) Copper in soil

(C) Carbon monoxide in air (D) Lack of air pollution

Q.10 Greenhouse effect mainly due to

(A) SO_2 (B) CO_2 (C) CO (D) O_2

Q.11 Which pollutant exhibits biomagnification in food chain?

(A) DDT (B) SO_2 (C) CO (D) PAN

Q.12 Which will not cause any atmospheric pollution?

(A) Hydrogen (B) Sulphur dioxide (C) Carbon dioxide (D) Carbon monoxide

Q.13 Which of the following is the main factor of waste pollution?

(A) Smoke (B) Industrial waste (C) Detergent (D) Ammonia

Q.14 Main air pollutant among the following is -

(A) CO (B) CO_2 (B) Detergent (D) Sulphur

Q.15 Which is more important for water pollution?

(A) Sound (B) SO_2 (C) Salts of arsenic (D) Sewage

Q.16 Which of the following atmospheric pollutants is not produced by the exhaust of motor vehicle in Delhi?

(A) SO_2 (B) Hydrocarbon gases (C) Fly ash (D) CO

Q.17 Pollution can be controlled by -

(A) Sewage treatment
(B) Checking atomic blasts
(C) Manufacturing electrically operated vehicles
(D) All of the above

Q.18 If water pollution continues at its present rate, the condition will eventually-

(A) Stop water cycle
(B) Prevent precipitation
(C) Make oxygen molecules unavailable to water plants.
(D) Make nitrate molecules unavailable to water plant

Q.19 Exposure of plants to high fluoride concentration results in necrosis or chlorosis characteristically in-

(A) Petiole but not in lamina (B) Only mid rib in lamina
(C) Leaf tip and leaf margins (D) Stem tips only

Q.20 In cities like Bombay and Calcutta the major air pollutants are -

(A) Ozone
(B) Carbon monoxide and oxides of sulphur
(C) Hydrocarbons and air
(D) Algal spores and marsh gas

Q.21 Recent reports of acid rains industrial cities are due to the effect of atmospheric Pollution by

(A) Excessive release of NO_2 and SO_2 by burning of fossil fuels.

(B) Excessive release of CO_2 by burning of fuel like wood and charcoal, cutting of forests and increased animal population.

(C) Excessive release of NH_2 by industrial by plants and coal gas

(D) Excessive release of CO in atmosphere by incomplete combustion of coke, charcoal and other carbonaceous fuels in pancity of oxygen.

Q.22 Which is the greatest air pollutant these days?

(A) Factories
(B) Motor vehicles
(C) Domestic appliances
(D) animals

Q.23 Removal of the soil by the action of wind and water is known as -

(A) Erosion
(B) Fossilization
(C) Leaching
(D) Calcification

Q.24 Eutrophication refers to -

(A) High production in an aquatic ecosystem
(B) Low production in an aquatic ecosystem
(C) Low production in a terrestrial
(D) Stable production in a terrestrial ecosystem

Q.25 Photochemical smog was first observed in -

(A) London
(B) Los Angeles
(C) Paris
(D) Tokyo

Q.26 Domestic waste will lead to

(A) Biodegradable pollution
(B) Non-degradable pollution
(C) Thermal pollution of soil
(D) Air pollution

Q.27 The major source of BOD in the river Ganga is

(A) Leaf litter
(B) Fishes
(C) Human waste
(D) Aquatic plants

Q.28 If a lake is contaminated with DDT, its highest concentration would be found in-

(A) Primary consumer
(B) Secondary consumer
(C) Tertiary consumer
(D) None of these

Q.29 The most harmful air pollutant produced by automobiles is -

(A) HNO_2 (B) NO (C) SO_2 (D) CO

Q.30 Sewage water can be purified by -

(A) Aquatic plant (B) Micro organism (C) Penicillin (D) Fishes

Q.31 Major pollutant in jet plane emission is -

(A) SO_2 (B) CFC (C) CO (D) CCl_4

Q.32 It is said that Taj mahal may be destroyed due to -

(A) Flood in Yamuna River

(B) Air pollutants released from oil refinery of Mathura

(C) Decomposition of marble as a result of high temperature

(D) All the above

Q.33 Melting of the ice caps might result from -

(A) Depletion of ozone layer (B) Excess CFC in atmosphere

(C) Excess CO_2 in the atmosphere (D) Excess water rain

Q.34 Cotton dust is an important pollutant in -

(A) Delhi (B) Ahmedabad (C) Madras (D) Calcutta

Q.35 Some effects of SO_2 and its transformation products on plant include -

(A) Chlorophyll destruction (B) Plasmolysis

(C) Golgi body destruction (D) None

Q.36 All the following contribute to pollution except -

(A) Thermal power plant (B) Automobiles

(C) Nuclear power plant (D) Hydroelectric power project

Q.37 The molecular action of ultraviolet light is mainly reflected through -

(A) Destruction of hydrogen bond in DNA (B) Photodynamic action

(C) Formation of pyrimidine (D) Formation of sticky metaphase

Q.38 Spraying of DDT on crops produces pollution of -

(A) Soil and water only
(B) Air and soil only
(C) Air, soil and water
(D) Air and water only

Q.39 Non ionizing radiations damaging to DNA are -

(A) X-rays (B) U.V.rays (C) Gamma rays (D) Beta rays

Q.40 Radiation is health hazard because it causes -

(A) Pneumonia (B) Leukemia (C) Hemophilia (D) Anemia

Q.41 What is B.O.D.?

(A) The amount of O_2 utilized by organisms in water
(B) The amount of O_2 utilized by microorganisms for decomposition
(C) The total amount of O_2 present in water
(D) All of the above

Q.42 What is the intensity of sound in normal conversation?

(A) 10 - 20 decibel (B) 30 - 60 decibel (C) 70 - 90 decibel (D) 120 - 150 decibel

Q.43 Which of the following is absent in polluted water?

(A) Hydrilla (B) Water hyacinth (C) Larva of stone fly (D) Blue green algae

Q.44 Maximum greenhouse gas released by which country?

(A) India (B) France (C) U.S.A. (D) Britain

Q.45 Ozone layer is being destroyed by:

(A) Sulphur dioxide
(B) Carbon dioxide
(C) Chlorofluorocarbon
(D) Smog

Q.46 Most hazardous metal pollutant of automobile exhaust is:

(A) Hg (B) Cd (C) Pb (D) Cu

Q.47 B.O.D. is connected with -

(A) Organic matter (B) Microbes (C) Both (D) None

Q.48 Compressed Natural Gas (CNG) is-

(A) Butane (B) Ethane (C) Methane (D) Propane

Q.49 The electrostatic precipitator can remove over _____ % particulate matter.

(A) 99 (B) 100 (C) 89 (D) 45

Q.50 Find incorrect statement w.r.t catalytic converter.

(A) Platinum – palladium and rthodium as catalysts

(B) Lead in petrol activates the catalysts

(C) Reduced the emissionof poisonous gases

(D) CO and CO_x changed CO_2 and N_2 gas

Q.51 World's most problematic aquatic weed is -

(A) *Trapa* (B) *Azolla* (C) *Wolffia* (D) *Eichhornia*

Q.52 Among the 41 most polluted cities of the world, Delhi is ranked -

(A) First (B) Fourth (C) Second (D) Third

Q.53 By the end of 2002 in Delhi which step is completed for reducing vehicular pollution?

(A) Phasing out of old vehicles (B) Uses of unleaded petrol

(C) Buses were converted to run on CNG (D) Use of catalytic converters

Q.54 According to the Central Pollution Control Board, particle that are responsible for causing great harm to human health are of diameter

(A) 5.0 micrometers (B) 2.5 micrometers

(C) 7.5 micrometers (D) 0.5 micrometers

Q.55 Which incident disproves that nuclear energy was a non-polluting way for generating electricity?

(A) Bhopal gas disaster (B) Three Mile Island and Chernobyl incidents

(C) Hiroshima and Nagasaki aromic blasts (D) Both (A) & (C)

Q.56 Ramesh Chandra Dagar includes _____ for case study of organic family

(A) Bee-Keeping (B) Dairy management

(C) Water harvesting (D) All of these

Q.57 The domestic sewage in large cities

(A) Has a high BOD as it contains both aerobic and anaerobic bacteria

(B) Is processed by aerobic and then anaerobic bacteria in the secondary treatment in Sewage Treatment Plants (STPs)

(C) When treated in STPs does not really require the aeration step as the sewage contains adequate oxygen.

(D) Has very low amounts of suspended solids and dissolved salts

Q.58 Prime contaminates leading to cultural or accelerated eutrophication are:

(A) Fecal matter and paper fibres

(B) Sand and clay

(C) Phosphates and nitrates

(D) Nitrates and sulphates

Q.59 Euro – II emission norms for reducing

(A) O_3 and CO

(B) NO_2 and N_2O

(C) Sulphur and aromatic hydrocarbons

(D) CO_2 and particulate matter

Q.60 Ecosanitation is:

(A) Sustainable system for handling human excreta

(B) Sustainable system for handling agricultural wastes

(C) Sustainable system for handling industrial effluents

(D) Sustainable system for handling biomagnification

Q.61 Phosphate pollution is caused by:

(A) Agriculture fertilizers only

(B) Phosphate rocks only

(C) Sewage and agriculture fertilizers

(D) Sewage and phosphorus cycle

Q.62 Hospital wastes are:

(A) Hazardous and disposed by incinerator

(B) Non- hazardous and disposed by incinerator

(C) Hazardous and disposed into water

(D) Non-hazardous and disposed into water

Q.63 In an aquatic food chain, if water body is having 0.003 ppb of DDT, its maximum concentration can be observed in:

(A) Large fish (B) Phytoplanktons (C) Fish eating birds (D) Small fish

Q.64 The raw material for making polyblend is:

(A) Bitumen
(B) Plastic film waste
(C) Recycled plastic
(D) Any biodegradable waste

Q.65 Recognizing the deleterious effects of ozone depletion, an international treaty known as _____ was signed at _____

(A) Montreal Protocol, Canada
(B) Kyoto Protocol, Brazil
(C) Earth Summit, Montreal
(D) World Summit, South Africa

Q.66 Find the odd one w.r.t. e-waste:

(A) India (B) China (C) Pakistan (D) France

Q.67 Match the column

a. Ozone thickness	i. UV – rays
b. CFC	ii. Refrigerator
c. El Nino effect	iii. Temperature increase
d. Skin cancer	iv. Dobson unit

(A) a (i), b (ii), c (iii), d (iv)
(B) a (ii), b (iii), c (iv), d (i)
(C) a (iv), b (ii), c (ii), d (i)
(D) a (iii), b (iv), c (ii), d (i)

Q.68 Over cultivation and unrestricted grazing are examples of:

(A) Improper resource utilization
(B) Deforestation
(C) Jhum cultivation
(D) Greenhouse effect

Q.69 Algal bloom in a lake:

(A) Increases CO_2 level
(B) Leads to oxygen depletion
(C) Kills fishes
(C) All of these

Q.70 High concentration of DDT is found in:

(A) Phytoplankton (B) Small fish (C) Zooplanktons (D) Birds

Q.71 Thermal pollution is more prevalent near:

(A) Hot water springs
(B) Coal based power plants
(C) Temperate zones
(D) Tropical zones

Q.72 Ozone hole is maximum over:

(A) Europe (B) Antarctica (C) India (D) Africa

Q.73 DDT is:

(A) Biodegradable insecticide (B) Non-biodegradable insecticide

(B) Biodegradable fertilizer (C) Non-biodegradable fertilizer

Q.74 Match the followings

Column – I	Column – II
a. UV – rays	i. Biomagnification
b. Biodegradable organic matter	ii. Eutrophication
c. DDT	iii. Snow blindbess
d. Phosphates	iv. BOD

(A) a (iii), b (iv), c (i), d (ii) (B) a (iii), b (i), c (iv), d (ii)

(C) a (i), b (ii), c (iii), d (iv) (D) a (iv), b (ii), c (i), d (iii)

Q.75 The major source of noise pollution, worldwide is due to:

(A) Transport system

(B) Oil refineries and thermal power plants

(C) Sugar, textile and paper industries

(D) Office equipment

Q.76 Which of the following is not an effect of deforestation?

(A) Desertification (B) Habitat destruction

(C) Soil erosion (D) Biomagnification

Q.77 Pollutants which can be removed by a scrubber are?

(A) Particulate matter (B) Unburnt hydrocarbon

(C) SO_2 (D) Sewage

Q.78 A substantial fall of which two gases has been found in Delhi between 1997 and 2005?

(A) CO_2 and SO_2 (B) SO_2 and CO

(C) CFC and SO_2 (D) N_2O and CO_2

Q.79 Consider the following statements

i. 40% of the forest has been lost in tropics

ii. JFM was introduced in 1965 by the UNCED

iii. Bishnoi community belongs to Odisha who played a major role in conservation of forest.

iv. Chipko movement started in Garhwal Himalayas.

(A) i and iii are correct
(B) ii and iii are incorrect
(C) iii is correct
(D) iii and iv are correct

Q.80 In a polluted lake:

(A) BOD and DO are high
(B) BOD is high and DO is low
(C) Both are low
(D) BOD is low and DO is high

Q.81 In automobiles catalytic converters change unburnt hydrocarbons into:

(A) CH_4 (B) CO_2 and CH_4 (C) CO (D) CO_2 and H_2O

Q.82 Which of the following is correct?

(A) CFC is discharged in the lower part of the atmosphere, move upward and reach stratosphere

(B) Montreal protocol was signed to reduce CO_2

(C) Ozone hole is a small pore created in tropospheric ozone layer

(D) Jhum cultivation is a method of afforestation

Q.83 According to Central Pollution Control Board (CPCB), size of particulate matters which is responsible for greatest harm to human health, is

(A) 5.2 – 3.5 μm (B) 2.5 μm or less (C) 3.5 μm or less (D) 1.0 mm or less

Q.84 The Taj Mahal is threatened due to the effect of:

(A) Oxygen (B) Hydrogen (C) Chlorine (D) Sulphur dioxide

Q.85 UV – B damages DNA and mutation may occur which causes:

(A) Ageing of skin
(B) Various types of skin cancer
(C) Snow – blindness
(D) All of these

Q.86 Main motto of Chipko movement was for the protection of:

(A) Wet lands (B) Grasslands (C) Forests (D) Livestock

Q.87 BOD represents:

(A) The amount of O_2 utilities by organisms in water

(B) The amount of O_2 utilized by microorganisms for decomposition

(C) The total amount of O_2 present in eater

(D) All of these

Q.88 Biochemical Oxygen Demand (BOD) in a river water:

(A) Increases when sewage gets mixed with river water

(B) Remains unchanged when algal bloom occurs

(C) Has no relationship with concentration of oxygen in the water

(D) Gives a measure of Salmonella in the water

Q.89 When domestic sewage mixes with river water:

(A) Small animals like rats will die after drinking river water

(B) The increased microbial activity releases micronutrients such as iron

(C) The increased microbial activity uses up dissolved oxygen

(D) The river water is still suitable for drinking as impurities are only about 0.1%

Q.90 Water pollution is best assessed by determining:

(A) Dissolved oxygen (B) BOD and turbidity

(C) DO and acidity (D) Hardness and alkalinity

Q.91 DO (dissolved O_2) of water _____ with an increase in temperature.

(A) Decreases (B) Increases

(C) Remains constant (D) First increases then decreases

Q.92 A lake near a village suffered heavy mortality of fishes within a few days. Consider the following reason for this

i. lot of urea and phosphate fertilizer were used in the crop in the vicinity

ii. The area was sprayed with DDT by an aircraft

iii. The lake water turned green and stinky

iv. Phytoplankton populations in the lake declined initially thereby greatly reducing photosynthesis

(A) i, ii (B) ii, iii (C) iii, iv (D) i, iii

Q.93 Which one of the following is a quantitative pollutant?

(A) DDT (B) BHC (C) CO_2 (D) Malathion

Q.94 The minamata disease in japan was caused through the pollution of water by

(A) Cyanide (B) Methyl Isocyanate (C) Lead (D) Mercury

Q.95 The most widely used method which can remove 99% of particulate matter from industrial exhaust is

(A) Cyclone (B) Scrubbers (C) Catalytic converters (D) ESP

Q.96 The maximum bio magnification would be in which of the following in case of aquatic ecosystem?

(A) Zooplanktons (B) Phytoplankton's (C) Fishes (D) Kelps

Q.97 D.D.T. is

(A) Not a pollutant (B) An antibiotic

(C) A non-biodegradable pollutant (D) A biodegradable pollutant

Q.98 In an area where DDT had been used extensively, the population of birds declined significantly because

(A) Cobras were feeding exclusively on birds

(B) Many of the birds eggs laid, did not hatch

(C) birds stopped laying eggs

(D) Earthworms in the area got eradicated

Q.99 DDT residues are rapidly passed through food chain causing bio magnification because DDT is

(A) Water soluble (B) Lipo soluble

(C) Moderately toxic (D) Non-toxic to aquatic animals

Q.100 Phosphate pollution is mainly caused by

(A) Detergents and fertilizers (B) Distilleries

(C) Refineries (D) Pesticides

Q.101 Catalytic converters are fitted into automobiles for reducing emission of poisonous gasses as it converts.

(A) Unburnt hydrocarbons into CO_2 and H_2O (B) CO_2 into CO

(C) Nitrogen has into nitric oxide (D) More than one option is correct

Q.102 Eutrophication is often seen on/in:

(A) Mountains (B) Deserts (C) Fresh water lakes (D) Ocean

Q.103 Which of the following is a wrong stamens?

(A) Greenhouse effect is a natural phenomenon

(B) Eutrophication is a natural phenomenon is freshwater bodies

(C) Most of the forests have been lost in tropical areas

(D) Ozone in upper part of atmosphere is harmful to animals

Q.104 Pure drinking water should have BOD:

(A) 1000 ppm

(B) > 100 ppm but < 500 ppm

(B) 10 ppm

(C) < 1 ppm

Q.105 Greenhouse effect lead to:

(A) Production of cereals

(B) Warming of earth

(C) Cooling of earth

(C) Trapping of UV rays

Q.106 Which one of the following is the correct percentage of the two (out of the total of 4) greenhouse gases that contribute to the total global warming?

(A) Methane 20%, N_2O 18%

(B) CFC 14%, Methane 20%

(C) CO_2 40%, CFSs 30%

(D) N_2O 6%, CO_2 86%

Q.107 Reduction of soil fertility due to loss of its top layer is called:

(A) Negative pollution

(B) Positive pollution

(C) Landscape pollution

(D) Third pollution

Q.108 Green muffler scheme involves growing green plants along road sides to reduce:

(A) Air pollution (B) Water pollution (C) Noise pollution (D) Soil pollution

Q.109 The two gases making highest relative contribution to the greenhouse gases are:

(A) CO_2 and N_2O (B) CO_2 and CH_4 (C) CH_4 and N_2O (D) CFCs and N_2O

Q.110 Which important greenhouse gas, other than methane, is being produced from the agricultural fields?

(A) Ammonia (B) Nitrous oxide (C) Arsenic (D) Sulphur dioxide

Q.111 Ozone in the stratosphere is

(A) Good ozone (B) Bad ozone (C) Chemical weed (D) Both (2) and (3)

Q.112 Formation of ozone hole is maximum over

(A) Europe (B) Africa (C) India (D) Antarctica

Q.113 In coming years, skin related disorders will be more common due to

(A) Water pollution (B) Depletion of ozone layer

(C) Pollutants in air (D) Use of detergents

Q.114 The supersonic jets cause pollution by the thinning of

(A) O_2 layer (B) O_3 layer (C) CO_2 layer (D) SO_2 layer

Q.115 Select incorrect statement.

(A) The nature ageing of a lake may span 100 to 200 years

(B) The water is cold, clear and supporting little life in a young lake

(C) As the lake's fertility increases, plants and animals life burgeons and organic remains begin to be deposited on the lake bottom

(D) Cultural eutrophication is caused by human's activities

Q.116 Select correct statement w.r.t. the e-wastes.

(A) Represent municipal solid

(B) Produced in developing countries and exported to developed countries

(C) Are buried in landfills or incinerated

(D) Does not involve recycling

Q.117 Which one of the following is most effective ODS?

(A) CO_2 (B) CH_4 (C) CFCs (D) N_2O

Q.118 Prolonged water logging in an agricultural fields is likely to create the problem of

(A) Poor aeration and low salinity

(B) Poor aeration and high salinity

(C) Poor aeration and high acidity

(D) Metal toxicity and proper aeration

Q.119 According to Euro II norms, reduced sulphur content in fuels should be

(A) 350 ppm in diesel and 150 ppm in petrol (B) 150 ppm in diesel and 50 ppm in petrol

(C) 350 ppm in petrol and 150 ppm in diesel (D) 150 ppm in petrol and diesel both

Previous Years' Questions

Q.1 Anthracosis is caused ***[Orissa 2007]***

(A) Coal dust (B) Iron dust (C) Cane fibres (D) Silica

Q.2 Checking of reradiating heat by atmospheric dust O_3, CO_2 and water vapours is ***[Karnataka 2007]***

(A) Green house effect (B) Solar effect

(C) Ozone layer effect (D) Radioactive effect

Q.3 Chipko movement was launched for the protection of ***[CBSE Prelims 2009]***

(A) Livestock (B) Wet lands (C) Grasslands (D) Forests

Q.4 Steps taken by the Government of India to control air pollution include ***[CBSE Prelims 2009]***

(A Permission to use only pure diesel with a maximum of 500 ppm sulphur as fuel for vehicles

(B) Use of non-polluting Compressed Natural Gas (CNG) only as fuel by all buses and trucks.

(C) Compulsory mixing of 20% ethyl alcohol with petrol and 20% biodiesel with diesel

(D) Compulsory PUC (Pollution Under Control) certification of period driven vehicles which tests for carbon monoxide and hydrocarbons

Q.5 Biochemical Oxygen Demand (BOD) in a river water: ***[CBSE Prelims 2009]***

(A) Gives a measure of Salmonella in the water

(B) Increases when sewage gets mixed with river water

(C) Remains unchanged when algal bloom occurs

(D Has no relationship with concentration of oxygen in the water

Q.6 When domestic sewage mixes with river water: ***[CBSE Main PMT 2010]***

(A) Small animals like rats will die after drinking river water

(B) The increases microbial activity releases micro-nutrients such as iron

(C) The increases microbial activity uses up dissolved oxygen

(D) The river water is still suitable for drinking as impurities are only about 0.1%

Q.7 The two gases making highest relative contribution to the greenhouse gases are ***[CBSE Prelims 2010]***

(A) CO_2 and NO_2 (B) CO_2 and CH_4 (C) CH_4 and N_2O (D) CFC_5 and N_2O

Q.8 dB is a stranded abbreviation used for the quantitative expression of: ***[CBSE Prelims 2010]***

(A) A certain pesticide (B) The density of bacteria in a medium

(C) A particular pollutant (D) The dominant Bacillus in a culture

Q.9 Which of the following practices has caused maximum damage to the biodiversity of Indian forests? ***[Chandigarh CET 2010]***

(A) Selective harvesting (B) Block cutting

(C) Taungya cultivation (D) Jhoom cultivation

Q.10 BOD level in fresh water should not exceed beyond: ***[Chandigarh CET 2010]***

(A) 5 ppm (B) 10 ppm (C) 25 ppm (D) 50 ppm

Q.11 In human body, the chlorinated hydrocarbons keep on accumulating in: ***[Chandigarh CET 2010]***

(A) Bones (B) Brain (C) Skin (D) Fatty tissue

Q.12 Biomagnification of DDT causes decline in Bird population by: ***[HP PMT 2010]***

(A) Bringing disturbance in calcium metabolism

(B) Thinning of egg shell

(C) Premature breaking of eggs

(D) All the above

Q.13 Ecological sanitation is a sustainable system for handling human excreta, using dry composting toilets. Such "Eco Save" toilets are working in many areas of: ***[HP PMT 2010]***

(A) Assam and West Bengal (B) Maharashtra and Andhra Pradesh

(C) Kerala and Sri Lanka (D) Karnataka and Andhra Pradesh

Q.14 An international treaty: ***[HP PMT 2010]***

(A) Kyoto Protocol (B) Earth Summit

(C) Rio Conference (D) Montreal Protocol

Q.15 Which one of the following pairs of gases are the major cause of "Greenhouse effect"? ***[CBSE Prelims 2011]***

(A) CO_2 and O_3 (B) CO_2 and CO (C) CFSs and SO_2 (D) CO_2 and N_2O

Q.16 Which one of the following statements is wrong in case of Bhopal tragedy? ***[CBSE Prelims 2011]***

(A) Methyl Isocyanate gas leakage took place

(B) Thousands of human beings died

(C) Radioactive fall out engulfed Bhopal

(D) It took place in the night pf December 2/3, 1984

Q.17 "Good ozone" is found in the: ***[CBSE Main 2011]***

(A) Mesosphere (B) Troposphere (C) Stratosphere (D) Ionosphere

Q.18 In which year Air (Prevention and Control of Pollution) Act was emended to include noise as an air pollutant? ***[HP PMT 2011]***

(A) 1972 (B) 1981 (C) 1987 (D) 1990

Q.19 In an area where DDT had been used extensively, the population of birds declined significantly because: ***[CBSE Prelims 2012]***

(A) Earthworms in the area got eradicated

(B) Cobras were feeding exclusively on birds

(C) Many of the birds eggs laid, did not hatch

(D) Birds stopped laying eggs

Q.20 Match the items of column I with column II and select the correct option. ***[Kerala PMT 2011]***

Column – I		**Column – II**	
P	Electrostatic precipitator	1.	Removes gases like
Q	Scrubber	2.	Reduces automobile emission
R	Catalytic converter	3.	Removes particular matter

(A) P – 2, Q – C, R - 1 (B) P – 3 , Q – 2 , R – 1

(C) P – 1, Q – 2, R – 3 (D) P – 3, Q – 1, R – 2

(E) P – 1, Q – 3, R – 2

Q.21 Measuring Biochemical Oxygen Demand (BOD) is a method used for: ***[CBSE Prelims 2012]***

(A) Working out the efficiency of oil driven automobile engines

(B) Measuring the activity of Saccharomyces cerevisae in producing curd on a commercial scale

(C) Working out the efficiency of R.B.Cs about their capacity to carry oxygen

(D) Estimating the amount of organic matter in sewage water

Q.22 Which one of the following is a wrong statement? ***[CBSE Prelims 2012]***

(A) Ozone in upper part of atmosphere is harmful to animals

(B) Greenhouse effect is a natural phenomenon

(C) Eutrophication is a natural phenomenon in freshwater bodies

(D) Most of the forests have been lost in tropical areas

Q.23 The domestic sewage in large cities: ***[CBSE Main PMT 2012]***

(A) When treated in STPs, does not really require the aeration step as the sewage contains adequate oxygen

(B) Has very high amounts of suspended solids and dissolved salts.

(C) Has a high BOD as it contains both aerobic and anaerobic bacteria

(D) Is processed by aerobic and then anaerobic bacteria in the secondary treatment in Sewage Treatment plants (STPs)

Q.24 High amount of Escherichia coli in water indicates: ***[Chandigarh CET 2012]***

(A) Hardness of water

(B) Industrial pollution

(C) Sewage pollution

(D) Pollution due to electromagnetic radiations:

Q.25 Kyoto Protocol was endorsed at: ***[NEET 2013]***

(A) CoP – 6 (B) CoP – 4 (C) CoP – 3 (D) CoP – 5

Q.26 Global warming can be controlled by: ***[NEET 2013]***

(A) Increasing deforestation, slowing down the growth of human population.

(B) Increasing deforestation, reducing efficiency of energy usage.

(C) Reducing deforestation, cutting down use of fossil fuel

(D) Reducing reforestation, increasing the use of fossil fuel.

Q.27 The air Prevention and Control of Pollution Act came into force in: ***[NEET 2013]***

(A) 1985 (B) 1990 (C) 1975 (D) 1981

Q.28 The zone of atmosphere in which the ozone layer is present is called: ***[AIPMT 2014]***

(A) Troposphere (B) Ionosphere (C) Mesosphere (D) Stratosphere

Q.29 A scrubber in the exhaust of chemical industrial plant removes: ***[AIPMT 2014]***

(A) Particulate matter of the size 2.5 micrometer or less

(B) Gases like sulphur dioxide

(C) Particulate matter of the size 5 micrometer or above

(D) Gases like ozone and methane

ANSWER KEY

Objective Quetions

Q.1 B	**Q.2** C	**Q.3** D	**Q.4** D	**Q.5** D	**Q.6** D
Q.7 B	**Q.8** D	**Q.9** D	**Q.10** B	**Q.11** A	**Q.12** A
Q.13 B	**Q.14** A	**Q.15** D	**Q.16** C	**Q.17** D	**Q.18** C
Q.19 C	**Q.20** B	**Q.21** A	**Q.22** B	**Q.23** A	**Q.24** A
Q.25 B	**Q.26** A	**Q.27** C	**Q.28** C	**Q.29** D	**Q.30** B
Q.31 B	**Q.32** B	**Q.33** C	**Q.34** B	**Q.35** A	**Q.36** D
Q.37 A	**Q.38** C	**Q.39** B	**Q.40** B	**Q.41** B	**Q.42** B
Q.43 C	**Q.44** C	**Q.45** C	**Q.46** C	**Q.47** C	**Q.48** C
Q.49 A	**Q.50** B	**Q.51** D	**Q.52** B	**Q.53** C	**Q.54** B
Q.55 B	**Q.56** D	**Q.57** B	**Q.58** C	**Q.59** C	**Q.60** A
Q.61 C	**Q.62** A	**Q.63** C	**Q.64** B	**Q.65** A	**Q.66** D
Q.67 C	**Q.68** A	**Q.69** D	**Q.70** D	**Q.71** B	**Q.72** B
Q.73 B	**Q.74** A	**Q.75** A	**Q.76** D	**Q.77** C	**Q.78** A
Q.79 B	**Q.80** B	**Q.81** D	**Q.82** A	**Q.83** B	**Q.84** D
Q.85 D	**Q.86** C	**Q.87** B	**Q.88** A	**Q.89** C	**Q.90** B
Q.91 A	**Q.92** D	**Q.93** C	**Q.94** D	**Q.95** D	**Q.96** C
Q.97 C	**Q.98** B	**Q.99** B	**Q.100** A	**Q.101** A	**Q.102** C
Q.103 D	**Q.104** D	**Q.105** B	**Q.106** B	**Q.107** A	**Q.108** C
Q.109 B	**Q.110** B	**Q.111** A	**Q.112** D	**Q.113** B	**Q.114** B
Q.115 A	**Q.116** C	**Q.117**	**Q.118** B	**Q.119** A	

Previous Years' Questions

Q.1 A	**Q.2** A	**Q.3** D	**Q.4** D	**Q.5** B	**Q.6** C
Q.7 B	**Q.8** C	**Q.9** D	**Q.10** D	**Q.11** D	**Q.12** D
Q.13 C	**Q.14** D	**Q.15** D	**Q.16** C	Q.17 C	**Q.18** C
Q.19 C	Q.20 D	**Q.21** D	**Q.22** A	**Q.23** D	**Q24** C
Q.25 C	**Q.26** C	**Q.27** D	**Q.28** D	**Q.29** B	