POLLUTION

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◈ Introduction

The contamination of environment with harmful (toxic and poisonous) substances due to the certain natural phenomena and human activities is called environmental pollution or simply as pollution.

Any substance that cause pollution is called a pollutant. A substance becomes pollutant when its concentration increases beyond a crtain permissible limit in the environment.

Pollutants may belong to any of the following classes.

(A) Gaseous Pollutants : Such as Carbon monoxide, Oxides of Sulphur and Nitrogen, Chlorine gas etc.

(B) Particulate Pollutants : Such as Dust, Smoke, Fumes, Mist, Fly ash, Pesticides, Insecticides, Cement dust, etc.

Air Pollution

Our atmosphere contains many gases. Some of these gases are necessary for the existance of life on the earth. Due to urbanization and industrialization, many harmful compounds are released by the factories into the atmosphere. The presence of such undesirable substances in the air makes it unfit for breathing and is called as air pollution. Thus, the contamination of air with harmful toxic gases, smoke and dust, etc., is called air pollution.

The substance which cause pollution of the air are called air pollutants. Major air pollutants are:

(i) Carbon monoxide (ii) Carbon dioxide (iii) Sulphur dioxide

(iv) Nitrogen oxides (v) Smoke (vi) Dust

◆ Burning of Fossil Fuels :

The pollutants released during the burning of these fossil fuels are:

Fossil fuel	*Pollutants released on burning*
Wood	CO_2,CO, Smoke
Coal	CO_2,CO, SO_2 Smoke
Petrol and diesel	CO_2 CO, Oxides of nitrogen,Unburnt, Hydrocarbons, Lead compounds, Smoke
Kerosene	CO_2,CO, Smoke
LPG	CO_2, CO (traces)

All these pollutants released during the burning of fossil fuels cause air pollution. So, burning of fossil fuels causes air pollution.

◆ **Affect of Air Pollutants :** Pollutants in the air cause many diseases and reactions in human beings.

	Air pollutants	*Effects*
1	Dust	Allergic reactions
2	Smoke	Respiratory problems
3	CO	Respiratory problems, may even lead to death
4	CO_2 (excess)	Greenhouse effect— atmospheric temperature rises
5	SO_2 and SO_3	Damage lungs, produce acid rain and cause corrosion
6	Oxides of nitrogen	Lung congestion, produce smog

Water Pollution

For big cities, rivers or lakes are the source of water. In the last few decades, the quality of water in many rivers and lakes has deteriorated and has become unfit for human consumption. This is called water pollution.

The main reasons for the pollution of water in our rivers and lakes are :

◆ discharge of untreated domestic sewage into rivers and lakes.

◆ discharge of toxic industrial wastes into rivers and lakes.

◆ excessive use of fertilizers and pesticides in agriculture.

◆ contamination of water-bodies with toxic metals such as, lead, arsenic, cadmium, mercury, nickel etc.

The presence of pollutants such as acids, alkalies, dyes etc. make the water coloured, foul-smelling, and bad in taste.

◈ **Impact of water Pollution on the living organism :**

Harmful Effect of Water Pollution

Water is an integral part of all living organisms. So, any contamination in water will affect all living organisms. For example,

◆ Polluted water can cause many diseases like cholera, dysentery, typhoid, gastroentritis, hepatitis (jaundice), diarrhoea, and skin diseases in human beings.

◆ Contamination of rivers, lakes etc., with heavy metals like lead, mercury, copper, nickel etc., can harm both aquatic animals and human beings.

Washing away of the residual fertilizers into water-bodies by train causes faster growth of weeds. These weeds consume most of the dissolved oxygen from the water of such water-bodies. The deficiency of oxygen in the water may cause death of aquatic animals. This loss of dissolved oxygen from water in water-bodies is called eutrophication.

Such weeds also block sunlight and prevent the growth of aquatic plants.

◈ **Prevention of Water Pollution**

Water pollution can be prevented or reduced by following the suggestions given below :

◆ Do not throw the garbage into rivers/lakes. The rivers/lakes should be cleaned from time to time.

◆ Trees and plants must be planted along the banks of rivers.

◆ Toxic industrial waste should be treated chemically to remove the harmful substances present in it. Only the treated waste should be discharged into rivers/lakes.

- ◆ The city sewage should be treated at the sewage treatment plant to remove all suspended impurities and organic matter before discharging it into water.
- ◆ Excessive use of fertilizers and pesticides should be discouraged.
- ◆ The use of synthetic detergents should be minimised. If possible use biodegradable detergents.
- ◆ We should not wash clothes, clean utensils and take bath near the source of water.
- ◆ Put a covering on the well.

◈ Drinking Water or Potable Water

Drinking water should be

- ◆ colourless
- ◆ odourless

It should also be free from

- ◆ any suspended impurities
- ◆ any harmful germs
- ◆ large quantity of salts
- ◆ any harmful salt such as nitrates, cyanides, urea etc.

◈ Water Treatment for City Supply

Water from natural sources contain many impurities. To make it fit for drinking, these impurities must be removed. The method used for purifying water depends upon the source of water. People in big cities get purified river or lake water through a network of water pipelines.

(i) **Removal of suspended impurities :** Water is pumped from a river or a lake into a large tank. Here, it is mixed with a small quantity of alum and allowed to stand for some time. The suspended particles of clay etc., settle down slowly at the bottom of the tank. The upper layer of water is then sent for filtration.

(ii) **Filtration :** The water after sedimenttion is filtered through thick layers of sand and gravel. Here, the fine suspended impurities get removed.

(iii)**Aeration :** Air under pressure is then blown into the filtered water. This process called aeration, kills harmful microorganisms present in the filtered water.

(iv) **Chlorination :** The filtered and aerated water is chlorinated by adding chlorine to it. Chlorine kills all harmful germs. Thus, chlorination of water is done to make if free from all harmful microorganisms.

The purified and chlorinated water is supplied to the users through a network of water pipes.

A flowsheet diagram showing various steps for the purification of river/lake water and its supply to the users is shown below.

◈ Purification of Water at Home

In villages and small towns, public water supply is not available. People in such places, get their water from wells, handpumps, springs or from rivers and lakes. Water from these sources may not be fit for drinking and cooking.

Small quantitiy of such water can be made fit for drinking and cooking as described below :

(i) **By filtration :** Any suspended impurities in the water from well, river or lake can be removed by filtering water through a fine muslin cloth.

(ii) **By boiling :** The filtered water can be made germ-free by boiling for 10-15 minutes and cooling it before use.

(iii) **By treating with some chemicals :** The filtered water can also be made germ-free by adding a small quantity of any of the chemicals, such as potassium permanganate, bleaching powder or chlorine tablets.

(iv) **By exposing water to ultraviolet radiation :** The filtered water can also be made germ-free by exposing it to ultraviolet radiation. Now-a-days, many water-purifiers available in market are based on this method.

At domestic level, water can be purified by filtering it through the layers of gravel, sand and char-coal and boiling it before use.

Soil Pollution and Erosion

The soil is one of the major resources for the sustenance of life on the earth. However, it is often being abused by the humans. The cutting down of forests whether for agriculture, construction of buildings, roads and dams often leads to soil erosion. The excessive use of chemical fertilisers and disposal of waste materials pollutes the soil. The floods and overgrazing by animals also result in erosion of nutrient materials from the soil, making it intertile and unproductive.

The erosion of soil is a natural process, which is as old as the earth itself. Erosion involves the movement of soil from one place to another. It may be due to flowing water (flood) or wind. Nowadays, the rate of soil erosion is very high due to increase in activities of humans. As a result, the rate of soil erosion has exceeded the rate of its formation in nature. Soil erosion is a matter of global concern as it is a matter of global concern as it is destroying our resource base very rapidly.

Loss of top soil in relation to total land area is high in our country. The rate of this loss is higher in regions with high population density, mainly due to increase in the agricultural activities. Continuous cultivation of land by only one type of crop further adds to the loss of soil fertility. Once the of top soil (about 20 cm thick) is lost, the sub-soil becomes a part of the layer for cultivation. This layer has less nutrient retention power, organic matter and aeration. The soil, as a living organic system, gets disturbed due to this, which in turn has a negative impact on the soil fertility and crop productivity. Deforestation, floods and overgrazing are some other main causes for the erosion of soil. You know that chemical rertilisers contain elements, like nitrogen, phosphorus, potassium, zinc and magnesium. The excess of these elements in the soil changes its composition.

The forest fires and even deep ploughing of land for crops also lead to soil erosion. You know that the water and wind take away the top layer of the soil where there is no vegetation or poor vegetation. The trees, grasses and hedges hold the soil in place.

EXERCISE

FILL IN THE BLANKS :

Q.1 ..... is a gaseous pollutant.

Q.2 DDT is a ..... Pollutant.

Q.3 Particles of dust, cement and carbon particles in smoke may cause .....

Q.4 Air pollution can be reduced by using ..... in place of wood, coal etc.

Q.5 Major source of water pollution is .....

Q.6 ..... is added to the filtered river water to kill harmful germs present in it.

Q.7 The technique used for replenshing the ground water is called .....

Q.8 Drinking water should be ..... and .....

True or False:

Q.9 Particulates in the air may cause scarring or fibrosis of the lung lining.

Q.10 The unburnt hydrocarbons present in the air are mainly due to incomplete combustion of petrol and diesel.

Q.11 Oxides of sulphur and nitrogen give rise to greenhouse effect.

Q.12 Underground water is generally free from suspended impurities.

Q.13 Sewage and industrial wastes are the major pollutants of water.

Q.14 To kill any germs present in water, chlorine is commonly added to it.

Q.15 Check-dams are constructed to prevent the rain water flowing down into rivers and finally to sea/ ocean.

Q.16 Water having high salt content can be prified by domestic water filter.

Long Answer Type Questions :

Q.17 How are the pollutants classified ? Give one example of each type.

Q.18 Name various air pollutants and their sources.

Q.19 Describe the greenhouse effect.

Q.20 Suggest a few methods to prevent / control air pollution.

Multiple Choice Type Questions :

Q.21 Which of the following is a non-biodegradable pollutant ?

(A) DDT (B) Sulphur dioxide

(C) oxides of nitrogen

(D) Smoke

Q.22 Which of the following is most dangerous?

(A) oxygen (B) nitrogen

(C) carbon monoxide (D) carbon dioxide

Q.23 Which of the following, in river/sea water, is harmful to the aquatic animals and human beings ?

(A) chloride ion (B) potassium ions

(C) heavy metal ions (D) sodium ions

Q.24 Which of the following techniques of irrigation should be used to save water ?

(A) canal irrigation (B) drip irrigation

(C) water-wheel (D) lift irrigation

Q.25 Water containing high salt concentration can be purified by

(A) boiling (B) filtration

(C) UV radiation (D) reverse osmosis

ANSWER KEY

EXERCISE

Fill in the Blanks :

Sol.1 Carbon monoxide

Sol.2 nonbiodegradable

Sol.3 bronchitis

Sol.4 LPG

Sol.5 untreated sewage

Sol.6 Chlorine

Sol.7 Water-harvesting

Sol.8 Colourless, odourless

Sol.9 True

Sol.10 True

Sol.11 False

Sol.12 True

Sol.13 True

Sol.14 True

Sol.15 True

Sol.16 False

Sol.21 (A)

Sol.22 (C)

Sol.23 (C)

Sol.24 (B)

Sol.25 (D)