

B.Tech.

**SECOND SEMESTER EXAMINATION, 2009-10**

**ENVIRONMENT AND ECOLOGY**

Time : 2 Hours]

[Total Marks : 50

Note : The question paper contains three sections, Section A, Section B and Section C with the weightage of 10, 15 and 25 Marks respectively. Follow the instructions as given in each section.

**SECTION -A**

This question contains 10 questions of multiple choice/ Fill in the blanks/ True, False/ Matching correct answer type questions. Attempts all parts of this section.

**Q. 1. Fill in the following blanks with suitable words :**

(a) Troposphere is located \_\_\_\_ Stratosphere.

Ans. Above

(b) The term 'Ecology' was introduced by \_\_\_\_.

Ans. Haeckel

(c) The disease caused by excess of fluoride in water is known as \_\_\_\_.

Ans. Fluorosis

(d) Herbivores are \_\_\_\_ consumers.

Ans. Primary,

(e) \_\_\_\_ is related to Global warming.

Ans. CO<sub>2</sub>

(f) The best known substance responsible for ozone layer depletion \_\_\_\_.

Ans. CFCs

**Indicate True or False for the following statements :**

(g) Mosquito is an example of Bacteria.

(True/ False)

Ans. False

(h) Rain water does not create any land pollution.

(True / False)

Ans. False

(i) Only legislation is not sufficient for the control of environmental pollution.

(True / False)

Ans. True

**Tick one correct answer among the following given choices.**

(j) Biogas predominantly contains :

(i) CH<sub>4</sub>

(ii) NH<sub>3</sub>

(iii) SO<sub>2</sub>

(iv) Ethane

Ans. CH<sub>4</sub>

**Section -B**

**Q. 2. Attempt any three parts. All parts carry equal marks.**

**Q. 2. (a) How would environmental awareness help to protect our environment ?**

Ans. **Need for Public Awareness :** The unthoughtful and unabated, excessive consumption of natural resources for different purposes such as development of science and technology, agriculture and industry, transport and communication material and energy, comfort and pleasure has led to the

depletion of resources. It has degraded the vital life supporting systems like air, water and soil, and has distributed the delicate ecological balance. Hence to improve the deteriorated environment and to avoid further pollution, the human beings have to play a vital role. For that they have to be conscious about the environment friendly needs and should be involved in the process of improving the environment.

Due to vast capabilities, multi-activity performance and genuine of non genuine eagerness, mankind has been responsible for disturbing the environment. Sometimes, it may be for the sake of comfort by using air conditioners, and refrigerators, which caused ozone layer depletion, and sometimes for the sake of curiosity for excellence such as by developing rockets, missiles Aeroplanes etc. Now the people are to be awakened and made them aware to protect the global environment by exercising following actions : 1. By not extracting unnecessarily and exhaustively, the natural resources such as underground water, minerals etc. 2. By not harnessing too much energy such as firm burning fossil fuels (solids fuels, like coal, coke etc. in thermal power plants; liquid and gaseous fuels like petrol, diesel, LPG etc. in autovechiles etc). 3. By not cutting trees and using timber for the decoration of drawing-rooms and huses etc. 4. By obeying the moral codes meant for achieving a better environment. 5. By preserving the greenery on a vast areas of land. 6. By maintaining the conventional environmental within seas and oceans. Finally, the people should be approached to understand, conserve and manage the environment and its resources. In the end , we should not forget that preservation of environments is most necessary for survival of living beings on the earth.

**Q. 2. (b) Briefly discuss the various energy resources.**

**Ans. Use of Alternative Energy Sources:** The alternative energy resources are given as below.

1. Liquefied petroleum gas (LPG) 2. Alcohols 3. Compressed natural gas (CNG) 4. Hydrogen 5. Methane 6. Fuel cells of various kinds.

**Liquid Petroleum Gas (LPG) :** Liquefied petroleum gas is a gaseous hydrocarbon at room temperature and atmospheric pressure. It can be liquified by cooling or compressing. On liquefaction, its volume reduces to 1/250 of its gaseous form. It comprises of hydrocarbons having carbon numbers 3 to 4. Main components of L. P. G. are :

(i) propane, (ii) propene, (iii) butene, (iv) butane, or (v) mixture of propane and butane.

LPG has extremely high volatility under reduced pressure. Due to this, they are stored in sealed pressure vessels (tanks) and their flow to engine cylinder is controlled by special equipments.

**The Advantages of LPG are as follows :** (i) Better mixing with air due to complete vaporization. (ii) No carbon deposits. (iii) High octane rating. (iv) No need of fuel pump in fuel supply system. (v) Closer control of air fuel ratio. (vi) Uniform mixture supply to all the cylinders in a multi cylinder engine. (viii) No gum formation. (ix) No condensation of fuel on the way to the through carburetor. (x) High antiknock value.

**The Disadvantages of LPG are as follows :** (i) Heavy pressure cylinders are needed for storage. (ii) Vehicle's weight increases due to storage cylinders. (iii) A special fuel supply system has to be used. (iv) Calorific value lower than petrol. (v) Power generated is less than the generated in gasoline engine.

**Alcohols :** These are the oxygenated compounds which has shown future promising effects. Two main types of alcohol fuels are : 1. Methanol (or methyl alcohol), and 2. Ethanol (or ethyl alcohol).

Both these are well suited as fuels for spark ignition engines. Uses of alcohol fuels are : (i) Methanol or ethanol separately for SI engines. (ii) Aqueous alcohol *i.e.* methanol or ethanol mix with water, in SI engines. (iii) Methanol and ethanol mixed with diesel in CI engines.

Continued efforts are being made to use aqueous alcohol and also alcohol as a substitute for diesel. But methanol- fueled engines are a reality and are showing encouraging performance.

**Fuel Cell :** It is electrochemical energy source which can be used as an replacement to lead acid batteries for short run of auto vehicles. In it, the fuel is burnt in such a way that the fuel energy is directly converted to electrical energy. Several types of fuel cell are known to exist. These are  $H_2-O_2$  fuel cell, biochemical fuel cell, propane air fuel methyl alcohol  $O_2$  fuel cell etc., but the  $H_2-O_2$  is simplest and most successful fuel cell. In it, the hydrogen and oxygen are used to produce fuel cells by giving up their electrons to the fuel cell has been successfully used in Apollos spacecrafts and military vehicles as axially energy source. They resemble an engine rather than a battery, yet they do not operate as an engine. Their efficiency may be as high as 70% and they operate free of noise and vibrations. Although reasonable in cost, the use of fuel cell power is still unsafe due to explosive nature of hydrogen and oxygen. The refilling of autovehicles is also quite difficult. Availability of suitable auto catalysts to function efficiency for long durations has also restricted its commercial applications.

**I. Non- Renewable Energy Resources :** These include various fossils fuels and nuclear energy. The fossil fuels include coal, petroleum products and natural gas. The nuclear energy is mainly obtained from the nuclear fission of the uranium. The world's reserve of fossil fuel and uranium are limited and eventually be exhausted. With vast expansion of industry and agriculture sectors, the available fossil fuels and uranium, began to fall in their supply. Besides, the burning of fossil fuels is causing a number of negative environment consequences such as global warming, acid rain, air pollution and oil spills during transportation. It has, therefore, become necessary to minimize the use of fossil fuels and replace them with eco friendly renewable resources.

**II. Renewable Energy Resources :** These resources are regenerated by natural process so that, they can be used indefinitely. These include solar energy, hydro power, wind energy, geothermal energy, ocean waves and tidal energy. The renewable energy resources generally cause much less environmental impact than fossil fuels or nuclear energy. Presently the generation of renewable energy is often expensive than the energy produced by fossil fuels or nuclear energy.

The important renewable energy resources are described below :

(i) **Solar energy.** Sun is an inexhaustible and pollution free source of energy. Solar energy can be used human welfare in two ways : *directly or indirectly.*

(a) **Direct solar energy.** The direct solar energy is the radiant energy. It can be used for direct heating or sun's heat is converted into electricity. Photovoltaic cells converts directly solar energy into electricity. It is called thermal or photovoltaic conversion of solar energy.

(b) **Indirect solar energy.** It is the energy obtained from materials that have previously incorporated the sun's radiant energy. Among indirect solar energy, *biomass energy* is the most important one. Biomass is the term used for all materials originating from photosynthesis. It includes live plant materials and dried residual, fresh water and marine algae, agricultural and forest residues (e.g., straw, husks, bark, sawdust, roots, animals, wastes) and biodegradable organic wastes from industries like sugar mills and breweries etc. At least half of the world population uses biomass as their main source of energy for domestic purposes. In rural areas of our country, fuel wood is still a major source of energy for domestic purposes.

Biomass fuel, which is burned to release energy is of three types : solid, liquid, and gas. The *solid biomass* include wood charcoal, animal dung and peat. The biomass can also be used to obtain liquid fuels like *methanol and ethanol*. The *liquid biomass* fuels can be used in conventional gasoline engines. The biomass, particularly animal dung can be converted into gaseous fuel called biogas. The animal dung is decomposed anaerobically by bacteria (methanogen) in biogas digesters to obtain

biogas. Biogas is a mixture of two gases *i.e.*, about 60% methane and about 40% carbon dioxide. It is a clean anaerobic fuel which can be stored and transported easily. Its combustion procures fewer pollutants than other combustible energy resources.

(ii) **Hydro power (Hydro electric energy).** Hydro electric energy is produced from the kinetic energy of water falling from a height. Hilly and high land areas are suitable for this purpose, where there is continuous flow of water in large amounts falling from high slopes. Water falling from a height turns turbines at the bottom of dams to generate electricity. Approximately one fourth of the world's electricity is produced by hydro power. It is cheaper than the electricity produced by thermal power plants.

(iii) **Geo- thermal energy.** In some places, the heated water comes to the earth's surface as hot springs. It can be used for heating water and building and for generating electricity.

(iv) **Wind power.** It has been used for centuries to run the wind-mills for grinding grains and pump water in certain areas. But the wind does not blow with required intensity all the year around and in all areas. Therefore, wind power can be used in certain areas and on certain days.

(v) **Tidal energy.** Tidal waves of the sea can be used to turn turbine and generate electricity.

**Q. 2. (c) What is solid waste? Discuss its sources and effects.**

**Ans. Solid Waste Management**

**Solid Waste And Their Sources :** The solid wastes are those solids which are discarded and rendered useless by human beings. It also includes the animal refuses. However, the human excreta is not included in it. Generally the following unwanted objects fall in the category of solid wastes :

1. Wastes materials arising out from construction
2. Wastes material arising out from demolition
3. Ashes from industries, thermal power plant and other sources
4. Rubbish which includes non-consumable combustible and non-combustible solids such as given below.

*Combustible rubbish* like rubber, plastic, paper, wood, textiles, cardboards, etc.

*Non-combustible rubbish* like metal scraps, metal containers, glass, ceramic crockeries, tin-cans, aluminium articles, etc.

5. Garbage which includes organic wastes like vegetable residues and food residues
6. Dead animals
7. Radioactive wastes

8. Sludge which is a domestic waste excluding human excreta

**Causes of Urban Solid Wastes :** Main causes of urban solid wastes are the following :

1. **Advances in technology :** leading to large scale production of consumable goods.
2. **Growth in consumption bases society :** Leading to enhancement of consumption items.
3. **Use and throw culture :** which has become possible due to availability of disposable items like containers, glass bottles, cans, etc.
4. **Advent of packaging technology :** due to which almost every items is packed before sale.
5. **Affluence :** With advancement of technology, the philosophy of 'obsolete goods' declared and consumers having high purchasing capacity is increasing.

6. **Increasing urbanization :** It has created new life styles such as development of new constructions at a mass scale. Following nature of constructions have immensely added to urban solid

Wastes : (i) construction of buildings, markets, shopping malls, etc. (ii) construction of roads, railways, airways (iii) construction of bridges, dams, etc. (iv) construction of water supply and sewage disposal systems, etc.

**7. Overpopulation** : It is responsible for increased generation of garbage from each house. According to estimates, the collected solid wastes for disposal at some places are as follows :

In USA in 2000, about 7 lakh tonne/day.

**Effects of Urban Solid Wastes** : The accumulation of solid wastes results in various health and environmental hazards. Main among them are given below :

1. Due to solid wastes, the rats may multiply in numbers and may cause plague, salmonellosis, trichinosis, endemic typhus diseases.

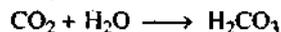
2. **Diseases** : The disease that spread primarily through contaminated solid wastes are the following types : (i) Diseases caused by bacterial infections such as Typhoid fever, Cholera, Paratyphoid fever, Bacillary dysentery, etc. (ii) Diseases caused by viral infections such as infections hepatitis (i.e., infectious jaundice), Polio myelitis, etc. (iii) Diseases caused by protozoal infections such as Amoebic dysentery. (iv) Solid wastes may also choke the drains and gully pits resulting in water logging. This may result in breeding of mosquitoes and thus danger of malaria and dengue. (v) Obnoxious odours also pollute the air due to decomposition of organic solid wastes. (vi) Percolation of decomposed garbage dumped on the soil may result into pollution of underground water and land. (vii) The crops and water supply may also get contaminated and may result in large scale epidemic of cholera, jaundice, gastro-intestinal diseases, hepatitis, etc. (viii) There is also aesthetic danger to the surrounding as the stray animals and scavengers (pigs, etc.) invade the garbage dumps on roadsides.

**Control Measure of Urban Solid Wastes** : Control on urban solid wastes can be accomplished in following ways : 1. By minimizing generation of domestic garbage and other wastes. 2. By throwing out the rubbish and other unwanted materials at a proper place, from where they may be easily taken for disposal. 3. By enforcing law in this regard. 4. By incorporating various methods of solid waste disposal.

Amongst these, the first two ideas demand a self-discipline. The law in this regard have been implemented here and there by various competent agencies (such as Nagar Nigam, etc.). However, its scope has to be extended and more strict vigil is also needed. The solid waste disposal, is of-course a very important issue.

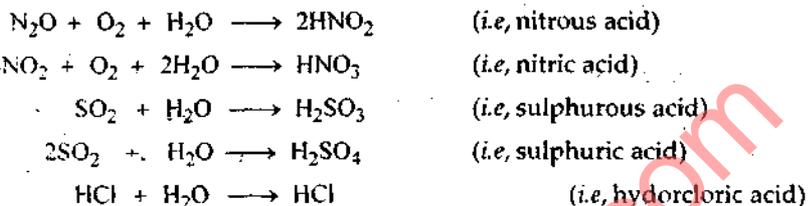
**Q. 2. (d) What is acid rain? What are the causes and effects of acid rain?**

**Ans. Acid Rain** : The natural rain is a clean water. It dissolves varying amounts of naturally occurring  $\text{CO}_2$  from atmosphere. It is only slightly acidic due to formation of carbonic acid  $\text{H}_2\text{CO}_3$  by the following chemical reaction.



But acid rain is different from it. It is caused when the  $\text{SO}_2$ ,  $\text{NO}_2$  etc, present in atmosphere, dissolve in natural rainwater and the rain falls. It is acidic because the pH value of natural rainwater is between 5.6 to 7, this value for acid rain is less than 6.5. The degree of acidity depends on the intensity of dissolved acidic ingredient.

**Mechanism of formation of acid rain.** The acid rains were unheard earlier. This name came into existence with growing industrialization. The exhaust emission of various industries, automobiles, aircrafts, power plants etc. contain acidic oxides such as  $\text{NO}_2$ ,  $\text{SO}_2$ ,  $\text{HCl}$  etc. When these oxides dissolve in rain water particles or the moisture present in atmosphere, they form acids; and when it falls on earth with rainwater, the fallout is called 'acid rain'. The mechanism of formation of acid rain undergoes the following chemical reactions.



**Causes of Acid Rains.** Main causes of acid rains are the sources that emit the acidic oxides. These are : (i) pollutants emitted by automobiles, aircrafts, ships etc. (ii) pollutants emitted by thermal power plants and other industries (iii) pollutants emitted by acid manufacturing and explosive industries

Other accountable sources in this regard are the dry-acid depositions like  $\text{SO}_2(\text{g})$ ,  $\text{HNO}_3(\text{g})$ ,  $\text{H}_2\text{SO}_4$  and  $\text{NH}_4\text{NSO}_4$ . Organic acids in dissolved form are also responsible for acidity.

**Effects of Acid Rains and Their Remedial Measures :** The harmful effects of acid-rains are the following :

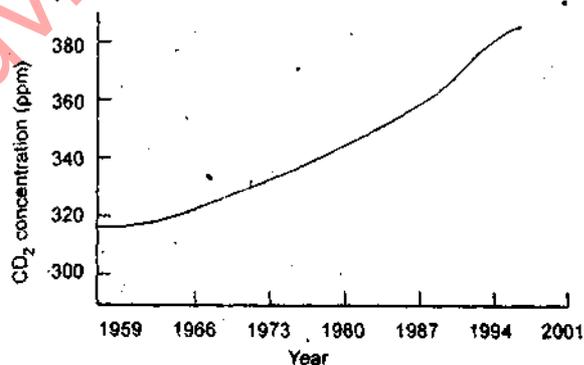
1. Fresh water is spoiled and the fish population in ponds, lakes and river is reduced.
2. Tree leaves and plantations are damaged.
3. The rate of metabolism of organisms is altered.
4. Causes irritation to mucus membrane and eyes.
5. Causes damage to structures and buildings, marbles etc.
6. The rate of corrosion of metals accelerates.

Although increased  $\text{CO}_2$  concentration in the atmosphere may have number of beneficial effect on plants, but these effects may not be realized because of negative effects of global warming.

**Q. 2. (e) Which are the Government organization/ Department responsible for the protection of the environment? Write brief details of these.**

**Ans.** This act was promulgated in 1986. It is therefore, known as the (Protection) Act, 1986. Salient features of this Act are briefly given below for appraisal and understanding.

**Objectives** of this Act are the following : (a) Protection and improvement of environment (water, air, land) (b) Prevention of hazards to all living creatures (humans, plants, animals) and property, and (c) Maintenance of harmonious relationship between human beings and their environment.



**Fig. The increase in mean carbon dioxide concentration in troposphere from 1959 to 2001**

**Definition of important terms.** Some of these are : (a) *Environment*. It includes water, air and land and the inter relationship which exists among them and property. (b) *Environmental Pollutant*. It includes any solid, liquid or gaseous substance present in such concentration as may be injurious to environment. (c) *Hazardous Substance*. It means any substance which is liable to cause harm to human beings, other living creatures and property or environment by reason of this chemical or physio-chemical properties or handling.

**General Powers of the Central Government.** For the protection and improvement of environment and for the prevention, control and abatement of pollution, the Central Govt. has the power to take the following measures under section 3.1 :

(a) Coordination of actions by the State Govts. officers and other authorities under this Act and under an other related law. (b) Planning and execution of a nationwide programme to prevent control and abate environmental pollution. (c) Laying down the standards for different aspects of environmental quality. (d) Laying down the standards for emission or discharge of environmental pollutions from various sources. (e) Restricting the areas in which industries, operations of processes shall not be carried out. (f) Laying down procedures and safeguards for handling of hazardous substances for prevention of accidents causing environmental pollution and remedial measures. (g) Examination of manufacturing, process, materials and substances likely to cause environmental pollution. (h) Carrying out and sponsoring investigations and research in environmental pollution problems. (i) Inspection of any premises, plant, manufacturing process, equipment or machinery and giving directions to prevent, control and abate environmental pollution. (j) Establishment and recognition of environmental laboratories and institutes. (k) Preparation of manuals, codes or guides to disseminate collected information in matters relating to environmental pollution and its prevention, control and abatement. (l) Any matter, necessary or expedient for the implementation of the provisions of this Act. (m) If necessary, the Cental Govt, any constitute an authority for the purpose of performing such functions and powers for Central Government under Section 4.2 of this Act.

**Penalties for violating the provision in this Act.** According to Section 15.5, any person failing to comply with any of the provisions of the Act shall be punishable with imprisonment for a term which may extend upto five years or with fine which may extend to one lakh rupees or both.

#### SECTION-C

**Attempt any two parts from each question/ All questions are compulsory.**

**Q. 3. (a) Discuss in brief four segments of environment?**

**Ans.** Environment can be simply defined as the one's surroundings in which organisms lives, which includes every thing around the organisms i.e., abiotic (non-living) and biotic (living) environment. Abiotic environment consist of soil, water and air while biotic environment consists of mankind, birds, animals etc.

The various components of environment are as listed below :

- (i) Abiotic (non-living) component
- (ii) Biotic (living) components.

**Abiotic Components :** It includes the climate and edaphic factors. The climate factors includes temperature, humidity, rain and snow fall. The biotic components factors includes plants animals and micro organisms. Some of the most important abiotic are as listed below :

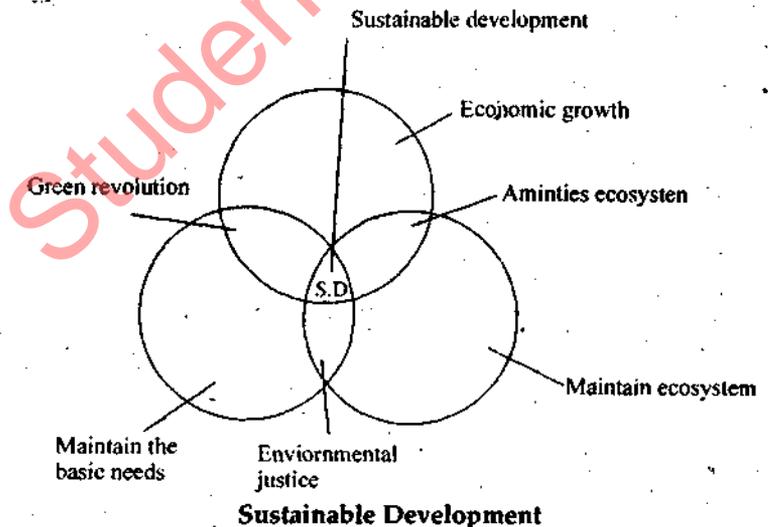
The various segments (or elements) of environment are as follows : (i) Atmosphere (ii) Hydrosphere (iii) Lithosphere (iv) Biosphere

**(i) Atmosphere :** It is a blanket of gases, liquids and solids that entirely envelops the earth. It extends outwards beyond the earth surface upto several thousands kilometers. It is transparent to many types of radiation and can absorb others. It provides protection to the earth from solar effects cosmic effects, excessive cold at night. It absorbs major portion of the electromagnetic radiation from the sun and transmits only near ultraviolet, visible and near infrared radiation. It maintains the balance of heat on the earth.

**Composition :** It comprises of many gases and water vapour. In its upper most reaches it is charged with sub atomic particles and in the lower atmosphere (near to earth surface) it consists of main gases like nitrogen, oxygen, argon, carbon dioxide and traces of neon, helium methane, ozone etc. These gases are found in varying amounts at different heights in atmosphere. They are mainly dense up to 1 km elevation. The four major gases, (i.e.,  $N_2$ ,  $O_2$ , Ar,  $CO_2$ ) accounts for more than 99% of the dry air and on the other hand the total of all the trace gases does not exceed by 0.02%.

**Structure of Atmosphere :** The atmosphere extends vertically upto several thousand kilometers in space. It has no sharp boundary with outer space. Various ecological factors like temperature, pressure, moisture, light etc. go on changing as move up vertically in atmosphere. Accordingly, the structure of atmosphere is classified in to four major layers i.e.

- \* Troposphere
- \* Stratosphere
- \* Mesosphere
- \* Thermosphere.



**Troposphere :** It is the lowest portion of the atmosphere, extending upto and 8 km 0 at the poles and 16 km at the equator. It is most dense and contains about 75% of total atmosphere mass. Formation of clouds, storms and thermal convection occurs in this layer. Thermal convection is

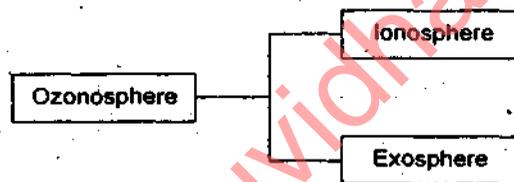
responsible for the greater height of the troposphere in summer than that in winter. The temperature fall is almost at a uniform rate of  $6^{\circ}\text{C}/\text{Km}$ . The range of temperature varies from a global average surface temperature value of  $17^{\circ}\text{C}$  at the earth surface to about  $-55^{\circ}\text{C}$  at its farthest altitude i.e., tropopause.

**Stratosphere** : It extends upto mean altitude of 50 km. The main activity in this zone is the absorption of ultraviolet radiation by ozone. Temperature rises with rise in altitude and it becomes  $0^{\circ}\text{C}$  near stratopause.

**Mesosphere** : It extends up to 80 Km and lies above the stratosphere. The main activity in this region is the burning of meteoroids and their disintegration. The temperature variation shows a fall of about  $2.5^{\circ}\text{C}$  per Km. with increase in altitude. Minimum temperature reaches to about  $75^{\circ}\text{C}$  near mesopause.

**Thermosphere** : It extends up to about 400 Km. The main activity in this layer is the high kinetic energy of gas molecules and due to this, the temperature is high in this layer. It depicts an increase in temperature with increase in altitude.

**Ionosphere and Exosphere** : The structure of atmosphere can be divided on the basis of chemical composition as follows :



The ionosphere extends from 100 km to 400 Km and contains the ionized charged particles whose effect is to reflect the radio waves. The exosphere is the region lying above ionosphere and extending theoretically up to hyper space.

(ii) **Hydrosphere** : It consists of the oceans, seas, rivers, stream, polaric resistors, glaciers etc. It is estimated that the hydrosphere consists of about  $1.36 \times 10^9 \text{ km}^3$  of water. Of this, about 97% is contained in ocean and seas, about 2% of the water resources are locked in glaciers and icecaps and the rest about % in lakes stream, rivers and underground resource effectively, less than 1% waters only is available as fresh water for human consumption.

(iii) **Lithosphere** : It is the top crust of the earth on which the continents and ocean basins lies. It is the thickest in continental regions (about 40 km) and thinner in the ocean basins (about 10 km to 12 km). The upper most layers of soil on crust is most important because all the biological activities occur on it. The lithosphere forms  $3/10$ th of the total surface of the earth and it contains organic matter and also produces food for animals and human beings. It carries out the decomposition of organic wastes by a host of micro organisms in soil.

**Biosphere** : The biosphere is not one of the segments of environment but infact it is a thin shell that envelops the earth and is made up of the lithosphere, hydrosphere and atmosphere. The all life forms of earth including man lives in the biosphere and the life sustaining resources (air, water and food) are withdrawn from the biosphere. The waste products in solid, liquid and gaseous forms too are discharged into the biosphere.

**Q. 3. (b) Define the concept of ecosystem.**

**Ans. Concept of an Ecosystem** : A biotic community cannot live in isolation. It lives and flourish in an environment which is full of the food, nutrients, energy and their continuous flow. The

biotic community and its physical (non-living) environment in which matter (chemical elements) cycles and energy flows is called the 'Ecosystem'.

The term 'Ecosystem' was first proposed by A. G. Tansley in 1935. He defined it as 'the system resulting from the integration of all the living and non-living factors of the environment.'

An ecosystem, thus, is the smallest unit of biosphere that has all the characteristics to sustain life. An ecosystem is a natural grouping of nutrients, minerals, plants animals and their wastes linked together by flow of food, nutrients and energy from one part of the system to another part. Ponds, streams, seas, deserts, grasslands, cities etc. are all examples of ecosystems. The ecosystems can vary in sizes. an ecosystem can be only a few centimeters square in size, like microbat mats, or its size can be in kilometers, like tropical forests.

It is important to note here that, what is common to all ecosystem is not physical structure (i.e., size, shape, variations of borders etc) but the existence of the processes the flow of energy and the cycling of chemical elements.

**Types of Ecosystems :** On earth, there are sets of ecosystem within a geographical region which are exposed to same climatic conditions within and having dominant species with a similar life cycle, climatic adaptations and physical structure. This set of ecosystems is called a Biome. In the biosphere, there are natural artificial biome (ecosystems).

**(1) Natural Ecosystem (Biomes) :** Natural ecosystem operate by themselves under natural condition without any interference by man. Natural ecosystems carry out many public service functions for us. Waste water from houses and industries is often converted to drinkable water by filtration through natural ecosystems, such as soils. Air pollutants from industries and automobiles are often trapped on leaves or converted to harmless compounds by forests. On the basis of particular type of habitat, they are further sub-divided as :

**(a) Terrestrial Biomes (Ecosystems) :** They are often defined by the vegetation types that dominate the community. The types of vegetation affect the climate and soil structure and this characterize the particular biome. Terrestrial vegetation has a rapid exchange of oxygen, water and carbon dioxide. The carbon dioxide concentration is affected by terrestrial vegetation seasonably and annually. Terrestrial biomes include tropical rain forests, grasslands, deserts, cultivated lands, etc.

**(b) Aquatic Biomes (Ecosystem) :** They fall into two categories, viz., fresh water and marine.

Freshwater biomes may be lotic (running water) such as streams, rivers and springs, or lentic (standing water) such as lakes, ponds, and swamps. Whereas, marine biomes include deep sea and oceans.

**(2) Artificial Ecosystems (Biomes) :** They are created artificially by man. A pond constructed as part of a waste water treatment plant is example of artificial ecosystem. In artificial ecosystems, the management can vary over a wide range of actions. Here, natural balance is disturbed regularly by addition of energy and planned manipulations.

Some examples of artificial ecosystems are : (i) A water filtration tank/pond which purifies the water before supplying it for drinking. (ii) Agricultural fields filled with water for irrigation. (iii) Agricultural fields sprinkled with pesticides. (iv) Home aquarium or an exhibition aquarium.

**Q. 3. (c) What is sustainable development? Discuss the concept of sustainable development.**

**Ans. Sustainable Development :** The term 'sustainability' refers to 'keeping an effort going continuously' or 'the ability to last out and keep from falling'. It denotes the characteristics of a process or state that can be maintained indefinitely. In the context of development, sustainability can be treated

as a dynamics concept. Thus, sustainable development may be defined as 'the changing human needs' while maintaining or enhancing the ability of environment and conserving natural resources.

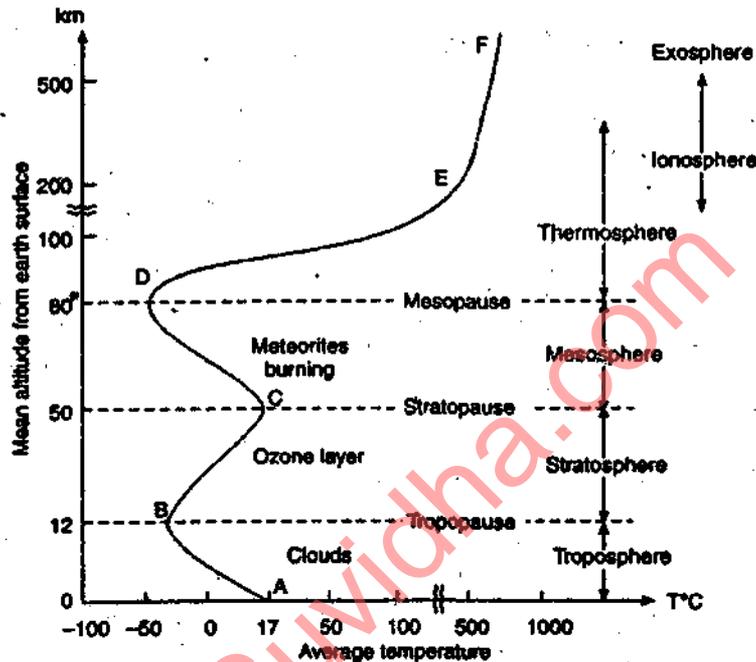


Fig. Classification of different zones of atmosphere on the basis of temperature variation.

Though, India has made a lot of progress since independence, yet the increasing needs and aspirations of expanding human population have forced a change in land use and imposed excessive demand on the natural resources. If the current practice of utilising natural resources continue, the coming generation will have less chance of getting sufficient food to eat, space to live and pure air to breathe. Thus, beside increase in production, the protection of environment and conservation of natural resources are equally essential.

**Q. 4. (a) Name and explain the various steps involved in Nitrogen cycle.**

**Ans. Nitrogen cycle in nature :** The cyclic process by those nitrogen elements is circulated continuously by the living and non-living components of the biosphere such as atmosphere, soil, water, plants and animals is known nitrogen cycle in nature. That is the circulation of nitrogen in nature is known the nitrogen cycle. Nitrogen gas of the atmosphere is fixed to get nitrogen compounds such as nitrates which go into soil and water. From the soil and water, these nitrogen compounds are absorbed by plants those are convert them into plant proteins. Animals eat these plants as food and convert plant proteins into animal proteins. Decay of dead plants and animals produces ammonia. Ammonia is oxidised to nitrites and finally to nitrates those go into the soil and water. Some of these nitrates are decomposed to form nitrogen gas which goes back into the atmosphere and the cycle is completed. The rest of nitrates in soil and water are again absorbed through plants and the cycle is repeated.

The nitrogen cycle in nature contains following steps:

**1. Fixation of Atmospheric  $N_2$  :** The atmospheric nitrogen gas is fixed into nitrogen compounds such as nitrates. The fixation of nitrogen takes place in the soil with the help of the non-leguminous

plants like **Alnus** and **Ginkgo** also fix atmospheric nitrogen. (2) The atmospheric phenomenon like **lightening** also fixes the nitrogen gas of air to form nitrates in the soil. (3) The **Rhizobium bacteria** present in root modules of leguminous plants fix atmospheric nitrogen. (4) The nitrogen is also fixed by the blue-green algae. (5) The artificial methods or industrial methods or **Haber's process** are also used to fix nitrogen gas and form nitrogen compounds those are used as fertilizers in the soil.

2. **Fixation of Organic  $N_2$**  : The plant absorb the nitrogen compounds such as nitrates from the soil and water, and convert them into plant proteins and other organic compounds which form the protoplasm of plants.

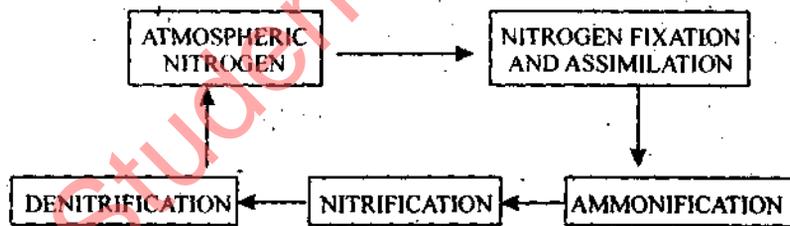
3. **The plants are eaten up by animals as food** .(i) A part of the plant proteins is used in making the flesh of animals or animal proteins the plant protoplasm is converted into animal protoplasm. (ii) The rest part of plant proteins consumed by animals is excreted as **urea** in urine which goes back into the soil.

4. **Ammonification** : If the plants and animals die, then the purifying bacteria and fungi present in the soil, decompose the proteins of dead plants and animals into ammonia. This process is known as **ammonification**. The urea present in animal urine is also changed by micro-organisms into ammonia.

5. **Nitrification** : Ammonia is converted first into nitrites and then into nitrates by the action of nitrifying bacteria. The nitrifying bacteria have two components : **Nitrosomonas** and **Nitrobacter** (i) **Nitrosomonas** bacteria oxidise ammonia to nitrites ( $NO_2^-$ ) and the (ii) **Nitrobacter** bacteria further oxidise nitrites ( $NO_2^-$ ) into nitrates ( $NO_3^-$ ). This process is called nitrification.

The nitrates formed by the oxidation of ammonia go into the soil. These nitrates are again absorbed by the plants and this cycle is repeated.

6. **Denitrification** : The soil consists denitrifying bacteria known **Pseudomonas**. Some of the nitrates formed by the nitrification process and present in the soil are converted by the denitrifying bacteria of soil into free nitrogen gas those goes back into the atmosphere . And the nitrogen cycle is repeated again and again.



Flow diagram of nitrogen cycle

Q. 4. (b) Give a brief account of non-renewable energy resources.

Ans. **Equitable Use of Resources for Sustainable Life Styles** : Human life style is changing at a rapid pace. In the past few decades, major changes in life style have come. For example

- \* **In transportation.** Number of automobiles, aeroplanes, ships etc increased considerably. Consequently, the consumption of fuels increased many folds.
- \* **In power generation.** Thermal, nuclear and many other types of power stations are installed. Consequently, there is a sharp hike in consumption of fuels of different kinds. Similarly, other sectors can also be quoted in this regard.

From the above discussion, we notice that the resources are being consumed at a very high rate. Such high consumption has to slowed down and the resources should be used equitably, otherwise

stocks of natural resources will deplete soon. This will be a suicidal situation for us and the future generations. Therefore, the natural resources have to be preserved and consumed judiciously. The following measures may be taken in this regard :

**For renewable natural resources.** One should be aware of that : 1. The rate of consumption should not exceed the rate of regeneration. 2. It should be exploited at a sustainable rate such that the production does not exceed the rate of growth.

**For non-renewable natural resources.** Since these resources are available in finite quantity, a well-timed decision has to be taken for : whether these resources should be exploited now or later.

The following measures are suggested for a sustainable consumption : 1. The rates of consumption of non-renewable resources should not exceed the rates of development of renewable substitutes. 2. Closed cyclic processes should be adopted so as to achieve recycle and reuse of the resources. 3. The use of fossil fuels should be minimized. 4. The quantity of materials should be improved to get highly durable products, so that the reuse of such products is delayed for a longer period.

**Q. 4. (c) Briefly discuss the fluoride problem in drinking water.**

**Ans. Fluoride in Water :** Fluoride is main water quality parameter. It is a unique substances for which there are upper and lower concentrations permitted for drinking water. A minimum of 1.00 mg/ l of fluorides is needed to be maintained to prevent dental caries. Excessive concentration of fluoride in drinking water caused dental fluorosis referred to as mottling of teeth. Indian standards specify an upper limit of 1.5 mg/l regular consumption of water with very high fluoride concentrations causes deformity in bones leading to crippling of the human limbs are not just health problems that can be remedied they are also social problems.

Fluoride problem is not limited only to human being. Bovine population also get affected. Cattle in fluoride rich areas are present to have worn out teeth. They cannot pluck and chew the grass properly and become weak resulting in reduced productivity.

**Measurement of Fluoride Content of Water :** Because of the public health significance of fluorides in water supplies intended for human consumption accurate determination of fluoride content is important Measurement of fluoride concentration can be done by using an Ion Selective Electrode (ISE) meter or spectrophotometer using SPADNS reagent.

**Removal of Fluoride from Water :** Removal of excessive fluoride from public water supplies or individual sources is very important from its public health significance various methods have been developed for fluoride removal like :

- (i) Fluoride exchanges using : (a) An non exchange resins (b) Bone charcoal
- (ii) Treatment with lime and magnesium salts (iii) Nalgonda technique (iv) Activated carbon treatment (v) Treatment with aluminium salts and coagulant aids.

**The Nalgonda technique** is recommended in India. Nalgonda method involves the use of aluminium salts. It is a simple method of treatment using alum with lime or sodium carbonate to provide essential alkalinity. Simultaneous disinfection is achieved by adding bleaching powder so that the system is free from micro-organisms and undesirable biological growth.

The Nalgonda technique of defluoridation has tried in different versions : (i) Fill and draw type- Electrically operated (ii) Fill and draw type for small population - manually operated (iii) Domestic type- in which alum lime and bleaching powder are added to water collected in a bucket. Contents are stirred and the floc is allowed to settle. Clear water is drawn for consumption.

The defluoridation methods are not successful as rural water sources are scattered. Sometimes there are only one or two tube wells in a small village making installations and maintenance of facilities difficult. Several times it is advisable to abandon the affected wells and go for alternative

safe source. In a big village or in a cluster of villages it is advisable to homogenize water from many sources to achieve desired levels to fluoride.

**Q. 5. (a) What is Pollution? Discuss the natural and man made (synthetic) pollutant that cause air pollution.**

**Ans. Pollution :** Any change in physical, chemical or biological property of air/water/soil which disturb the quality of air/water/soil and show harmful effects on living organisms is called pollution.

**Pollutants :** They can be defined as the substances that cause pollution.

**Classification :** Pollutants are classified from different point of view as follows :

**I. According to the form in which they persist after release into the environment, the pollutants may be primary or secondary.**

**1. Primary pollutants :** These persist in the same form in which they are added to the environment, e.g., DDT, plastic.

**2. Secondary Pollutants :** These are formed by interaction among the primary pollutants and atmospheric constituents. For example, peroxyacetyl nitrate (PAN) is formed by the reaction of two primary pollutants, namely nitrogen oxides and hydrocarbons released from motor vehicle, in presence of sunlight.

**II. According to their existence in nature, the pollutants may be quantitative or qualitative.**

**1. Quantitative Pollutants :** These are the substances, which occur in nature but become pollutant when their concentration reaches beyond a threshold value in the environment, e.g., carbon dioxide, nitrogen oxide.

**2. Qualitative Pollutants :** These are the substances which do not occur in the environment but are passed into it through human activity, e.g., fungicides, herbicides, DDT, etc.

**III. According to their natural disposal, the pollutants may be biodegradable and nondegradable.**

**1. Biodegradable (Degradable) Pollutants :** They are actually waste products, which are slowly degraded by microbial action. They cause pollution when their production exceeds the capacity of the environment to degrade them, e.g., sewage.

**2. Non-degradable (Non-biodegradable) Pollutants :** They are pollutants, which are not decomposed or are decomposed very slowly. They include wastes, (e.g., plastics, glass-plastic bottles, polythene bags, used soft drink cans, etc.) or poisons (e.g., pesticides like DDT, salts of heavy metals, radioactive substances, etc.). The non-biodegradable pollutants are difficult to manage and in most cases, there is no treatment process to handle the anthropogenic input of such materials in the ecosystem.

**IV. In terms of origin pollution may be natural and anthropogenic.**

**1. Natural :** Volcanic eruptions add tons of toxic gases and particulate mater in the environment.

**2. Anthropogenic :** It is a man-made pollution, such as industrial pollution, agricultural pollution, etc.

While the green house gases and the CFCs may be considered global pollutants (because they potentially harm the climate system and the stratospheric ozone layer worldwide), the term "air pollution" generally refers to substances that on local and regional scales directly harm animals, plants, and people and their artifacts. There have been complaints about air quality for centuries, especially in cities. But the steady expansion of pollution and industrial civilization has changed the nature of air pollution. The pervasive effects of emissions are increasingly manifest, and the need to control them is influencing to a greater degree the development of technology, particularly in the energy and transportation sectors.

**The causes of air pollution :**

- 1. Carbon compounds :** These are mainly  $\text{CO}_2$  and CO.  $\text{CO}_2$  is released by complete combustion of fossil fuels and CO by automobile exhausts. CO is a poisonous gas.

- 2. Sulphur compounds :** These include  $\text{SO}_2$ ,  $\text{H}_2\text{S}$  and  $\text{H}_2\text{SO}_4$ . These are mostly released by fossil fuel (coal, etc.) based at thermal power plants and industrial units such as oil refineries.

- 3. Nitrogen oxides :** These include chiefly, NO,  $\text{NO}_2$ ,  $\text{HNO}_3$ . These are mostly released by automobiles, power plants and industries.

- 4. Ozone ( $\text{O}_3$ ) :** Its level may rise in atmosphere due to human activities.

- 5. Fluorides :** These come from industries, insecticides spray, etc.

- 6. Hydrocarbons :** These are chiefly benzene, benzopyrene, etc., which are mostly discharged by automobiles and industries.

- 7. Metals :** These mainly include lead, nickel, arsenic, beryllium, tin, vanadium, titanium, cadmium, etc., which are present in air as solid particles, liquid droplets or gases. They are produced mostly by metallurgical processes, automobiles, spray, etc.

- 8. Photochemical products :** These are the photochemical smog such as PAN,  $\text{PB}_2\text{N}$ , etc., and released mostly by automobiles.

- 9. Particulate matter :** These are fly ash, dust, grit and other suspended particulate matter (SPM) released from power plants and industries like stone crushers, etc.

- 10.** There are bacterial cells, fungal spores and pollens in air as biological particulate pollutants.

- 11. Toxicants other than heavy metals :** These are complex chemical substances released during manufacture of other goods.

**Effect of Air Pollution :** Air pollution affects everyone : human beings, plants, animals, materials, etc. It also affects the aesthetic beauty of nature and the climate. A brief account of all these effects are enumerated as follows :

**Effects of air pollution of human health :** Air pollutants have many effects on human health. These are : (i) Irritation of eye, nose that throat. (ii) Irritation of the respiratory system. (iii) Nickel particulates in tobacco smoke result in respiratory damage. (iv) Lead particulates from automobile exhausts cause lead poisoning resulting in convulsions, delirium, coma and even death. (v) Cadmium particulates through cigarette smoking cause cardio vascular disease, kidney and liver damage and even death. (vi) Radioactive fallout has somatic and genetic effects on future generations. (vii) Mercury from combustion of fossil fuels and plants result in nerve, brain and kidney damage.

**Effects of pollutants on plants :** Spraying of pesticides, and other agricultural practices causes exposure of the plants to a large number of air pollutants. These adversely affect their growth and metabolism by destroying chlorophyll and disrupting photosynthesis.

(i) Ozone causes necrosis, (i.e., dead areas on a leaf structure) and damages the leaves. (ii)  $\text{NO}_2$  causes premature leaf fall (i.e., abscission) and suppressed growth of plants resulting in reduced yields of crop plants. (iii)  $\text{SO}_2$  bleaches the leaf surfaces and causes chlorosis (i.e., loss of chlorophyll and yellowing of the leaf), especially in leafy vegetables. (iv) PAN (peroxyacetyl nitrate) damages leafy vegetables causing this premature fall, discoloration and curling of sepals.

**Effects of pollutants on animals :** When the animals feed upon the particulate coated plants (especially with Fluorine, Lead, Arsenic) they get affected with Arsenic poisoning (cattle and sheep are main victims). Lead poisoning results in bronchitis and lack of appetite in pet animals.

**Q. 5. (b) How can the solid waste be managed ?**

**Ans. Solid Waste Management**

**Solid Waste And Their Sources :** The solid wastes are those solids which are discarded and rendered useless by human beings. It also includes the animal refuses. However, the human excreta is not included in it. Generally the following unwanted objects fall in the category of solid wastes :

1. Wastes materials arising out from construction.
2. Wastes material arising out from demolition
3. Ashes from industries, thermal power plant and other sources.
4. Rubbish which includes non-consumable combustible and non-combustible solids such as given below :

**Combustible rubbish** like rubber, plastic, paper, wood, textiles, cardboards, etc.

**Non-combustible rubbish** like metal scraps, metal containers, glass, ceramic crockeries, tin-cans, aluminium articles, etc.

5. Garbage which includes organic wastes like vegetable residues and food residues.
  6. Dead animals.
  7. Radioactive wastes
  8. Sludge which is a domestic waste excluding human excreta
- Causes of Urban Solid Wastes :** Main causes of urban solid wastes are the following :
1. **Advances in technology :** Leading to large scale production of consumable goods.
  2. **Growth in consumption bases society :** Leading to enhancement of consumption items.
  3. **Use and throw culture :** Which has become possible due to availability of disposable items like containers, glass bottles, cans, etc.
  4. **Advent of packaging technology :** due to which almost every items is packed before sale.
  5. **Affluence :** With advancement of technology, the philosophy of 'obsolete goods' declared and consumers having high purchasing capacity is increasing.

6. **Increasing urbanization :** It has created new life styles such as development of new constructions at a mass scale. Following nature of constructions have immensely added to urban solid wastes : (i) construction of buildings, markets, shopping malls, etc. (ii) construction of roads, railways, airways (iii) construction of bridges, dams, etc. (iv) construction of water supply and sewage disposal systems, etc.

**7. Overpopulation :** It is responsible for increased generation of garbage from each house. According to estimates, the collected solid wastes for disposal at some places are as follows :

In USA in 2000, about 7 lakh tonne/day.

**Effects of Urban Solid Wastes :** The accumulation of solid wastes results in various health and environmental hazards. Main among them are given below :

1. Due to solid wastes, the rats may multiply in numbers and may cause plague, salmonellosis, trichinosis, endemic typhus diseases.

2. **Diseases :** The disease that spread primarily through contaminated solid wastes are the following types : (i) Diseases caused by bacterial infections such as Typhoid fever, Cholera, Paratyphoid fever, Bacillary dysentery, etc. (ii) Diseases caused by viral infections such as infections hepatitis (i.e., infectious jaundice), Polio myelitis, etc. (iii) Diseases caused by protozoal infections such as Amoebic dysentery. (iv) Solid wastes may also choke the drains and gully pits resulting in water logging. This may result in breeding of mosquitoes and thus danger of malaria and dengue. (v) Obnoxious odours also pollute the air due to decomposition of organic solid wastes. (vi) Percolation of decomposed garbage dumped on the soil may result into pollution of underground water and land. (vii) The crops and water supply may also get contaminated and may result in large scale epidemic of cholera, jaundice, gastro-intestinal diseases, hepatitis, etc. (viii) There is also aesthetic danger to the surrounding as the stray animals and scavengers (pigs, etc.) invade the garbage dumps on roadsides.

**Control Measure of Urban Solid Wastes :** Control on urban solid wastes can be accomplished in following ways : 1. By minimizing generation of domestic garbage and other wastes. 2. By throwing out the rubbish and other unwanted materials at a proper place, from where they may be easily taken for disposal. 3. By enforcing law in this regard. 4. By incorporating various methods of solid waste disposal.

Amongst these, the first two ideas demand a self-discipline. The law in this regard have been implemented here and there by various competent agencies (such as Nagar Nigam, etc.). However, its scope has to be extended and more strict vigil is also needed. The solid waste disposal, is of-course a very important issue.

**Q. 5. (c) Enumerate with examples the major sources of water pollution.**

**Ans. Water Pollution**

**Definition And Introduction :** Water pollution may be defined as 'the presence of impurities and foreign substances in water in such a quantity that lowers its quality, makes unfit for use and becomes a health hazard'.

The water quality for human consumption should be pure, i.e., without impurities. It needs to have some minerals in order to give it some taste. Pure water should conform to the water quality standards set for human consumption. These are : (i) It should be odourless. (ii) It should be free of pathogenic organisms. (iii) The dissolved inorganic solids should be in moderate quantities. (iv) It should be free of suspended solids and turbidity. (v) Drinking water should be moderately soft (50–100 ppm), even slight hardness of 100 to 150 ppm is acceptable but excessive hardness above this level is unacceptable. (vi) It should be free of toxic substances that may have serious long term effects. (vii) It should be non-corrosive. (viii) The pH value should be preferable between 7 and 8.5.

**Causes (or Sources) of Water Pollution :** Major sources of water pollution are the following :

1. **Sewage and other waste.** It comes from home, animals and food processing plants. It includes human and animal excreta, paper, soap, detergents, dust, DPTs, oils, clothes, rotten vegetables, etc.

2. **Industrial effluents**

3. **Agricultural discharges :**

(i) Artificial fertilizers (ii) pesticides (iii) herbicides (iv) toxicants, etc.

4. **Industrial wastes.** These come from chemical industries, petrochemical industries, tanneries, thermal power plants, nuclear power plants, etc. Besides other things, these also include :

(i) mercury (ii) lead (iii) other metals

**Sewage and other wastes :** Sewage is the waterborne waste derived from home animal, and food processing plants. It includes human excreta, paper, cloth, soap detergents, etc. These constitute a major proportion of water pollutants. There is uncontrolled dumping of wastes of rural areas, towns and cities into ponds, lakes, stream or rivers. Due to accumulation of sewage and other wastes in these bodies, they are not able to recycle them and their self-regulatory capability is lost. The decomposition of these wastes by aerobic microbes decreases due to higher levels of pollution. The self-purifying ability of the water is lost and water becomes unfit for drinking and other domestic uses. Since decomposition of sewage and other wastes is largely an aerobic process, accumulation of these in water increases its oxygen requirements (BOD).

Phosphates are the major ingredient of most detergents. They favour luxuriant growth of algae which form water blooms. This extensive algae growth also consumes most of the available oxygen from water. This decrease in  $O_2$  level becomes detrimental to growth of other organisms which produces a foul smell upon decay. Some decomposing plants are known to produce toxins as strychnine which kills animals including cattle.

**Industrial Effluents :** A wide variety of inorganic pollutants remains present in effluents from breweries, taneries, dyeing, textiles, paper and pulp mills, steel industries, mining operations, etc. These include oils, greases.

**Effects of Water Pollution :** As we know, water is a vital resource essential for sustaining life; therefore, its contamination has immediately as well as far reaching effects on the health and environment of living beings. The adverse effects of water pollution can be studied under the following heads : (i) Physical effects, (ii) Oxidation effects, (iii) Toxic chemical effects, (iv) Chemical nutrient effects, (v) Micro-organism effects, (vi) Radionuclide effects.

(i) **Physical Effects :** These will be due to suspended particle solids, cooling water from power stations and oily surface of films. Solids may be inert material wastes or insoluble finely divided organic solids. Inert material in water may slowly accumulate on vegetation foliage, and produce a deposit on the river bed. These may also cause reduction in solar energy absorption thereby decreasing rate of photosynthesis causing low oxygen conditions on the river bed. Suspended materials may cause turbidity which reduces light penetration, reduces plant synthesis and restricts plant growth. Turbidity also reduces food gathering capacity and respiratory efficiency of animals. Finely divided organic solids will be biodegraded and will cause reduction of the dissolved oxygen in water. All these physical effects will cause a disturbance of the balanced ecosystem.

Cooling water from power stations can cause a rise in water temperature and bring about thermal pollution. Variations in temperature will affect the metabolic rate of physiological processes. Increased temperature will cause decrease in fresh water fauna population and increase in flora

population. At higher temperatures, blue-green algae and sewage fungus will grow more which will result in plant death. The oxygen saturation percentage will be reduced and biodegradation will be increased. Both these factors will cause oxygen-deficiency in water.

Waste oil, fats and grease can enter water from several sources. These will form a thin film on the water surface which prevents the exchange of oxygen with the atmosphere causing reduction of water oxygen saturation. Spillage from oil tankers in sea will cause marine pollution and shore contamination. Oil slicks are responsible for the death of many birds. Oil reduces the thermal insulation and resistance to cold, irritates digestive system and produces toxic effects. A badly oiled shore can be largely denuded of animal life and sea weeds are also affected.

(ii) **Oxidation Effects** : There are two types of oxidation namely : (a) Oxidation by the action of bacteria upon organic pollutants. (b) Chemical oxidation of other pollutants.

Both types of oxidation involves the use of dissolved oxygen. It will cause increase in Biological Oxygen Demand (BOD) resulting in deficiency of oxygen in water. In bacteriological oxidation, sulphides are converted into sulphates, ammonia into nitrite and then to nitrate.

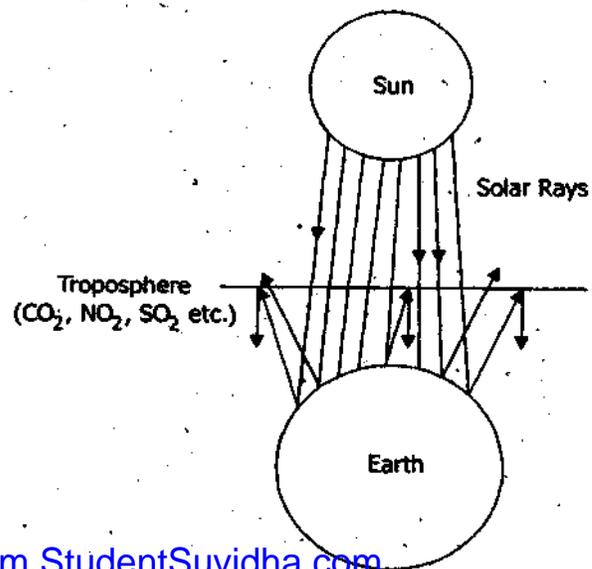
In chemical oxidation, ferrous salts are converted into ferric salts which are deposited as rusty red gelatinous masses associated with filamentous bacteria which are toxic to biological life.

(iii) **Toxic Chemical Effects** : Some organic and inorganic chemical substances are toxic to plants, animals and humans. These toxic substances are absorbed into the tissues from polluted water. They can cause injury leading to death of living organisms. The effects will depend upon the concentration, period of action and the metabolism of the organism.

In brief, water pollution can lead to spread to epidemics like cholera, jaundice, dysentery, typhoid, etc., can cause nervous disorder due to the presence of metals like mercury, lead, copper, etc., discharged from industrial effluents; can affect biological processes of humans and animals if they consume water contaminated by the release of dyes, etc., and, last but not the least, increased water treatment costs.

**Q. 6. (a) What are the major impacts of enhanced global warming?**

**Ans. Effects of Global Warming and Their Remedial Measures** : The effects of global warming are detrimental to environment and living beings. Main amongst these are the following : 1. Average temperature of earth will go on rising above the normal temperature causing tremendous change in climate and weather, forestation, natural resources etc. 2. The existing eco-systems will be imbalanced. 3. This may lead to melting of glaciers and polar ice caps which consequently, will result into flooding of many coastal low lying areas, submergence of many islands and cities nearby the ocean. 4. The excess of  $\text{CO}_2$  will result into respiratory disorders and suffocation. 5. Warming may be more in higher latitudes than in tropics. The temperature rise in temperate regions is anticipated to be more than the average global temperature but less in tropics. 6. Increase in global average



temperature will adversely affect the food production. The fertile lands will shift towards poles. For example, the wheat production in India will drop as the fertile northern belt will shift towards less fertile but further northern regions. 7. There may be more storms of severe intensity. 8. Some ecosystems and biological species may either be dislocated or extincted. 9. There may be alteration in hydrological cycle also.

**Remedial Measures (i.e control) of global warming.** Since  $\text{CO}_2$  is main source of greenhouse gases, mainly it is responsible for global warming. Therefore, use of such energy sources should be avoided or minimized, which produce  $\text{CO}_2$ . Hence the remedial measures to control the global warming may be suggested as follows : 1. Use should be made of energy sources such as hydro, geothermal, wind, solar, tidal, biomass, nuclear etc. 2. Technology should be developed to prevent release of greenhouse gases into atmosphere. 3. Afforestation and reforestation should be undertaken at large scale. 4. Refrigerators and air-conditioners should be used for limited durations.

**Q. 6. (b) What are the agents responsible for Ozone depletion?**

**Ans. Depletion of ozone layer in the stratosphere :** Stratospheric ozone plays a vital role by protecting the living organism from the harmful effects of ultraviolet radiations. The UV radiation causes photo dissociation of ozone into  $\text{O}_2$  and  $\text{O}$  in the stratosphere. But  $\text{O}_2$  and  $\text{O}$  quickly recombine to form  $\text{O}_3$ . This ozone dynamics dissipates the energy of UV as heat. There is an equilibrium between generation and destruction of  $\text{O}_3$ , which leads to a steady state concentration of ozone layer in the stratosphere between 20 and 26 km above the sea level. If this stratospheric ozone layer is condensed vertically to standard temperature and pressure, its thickness averages 0.29 cm above the equator and may exceed 0.40 cm above the poles at the end of winter seasons. The concentration of  $\text{O}_3$  in the stratosphere changes with season. It is highest during the spring season (February – April) and lowest during the fall season (July-October). The ozone layer acts as ozone shield and protect the earth's organisms from harmful effects of strong UV radiations. The absorption of UV radiation by ozone layer increase exponentially with its thickness. Therefore, maximum amount of UV radiations are absorbed in the tropics (i.e, near the equator) and this amount decreases towards poles.

**Ozone hole (ozone depletion) :** Ozone hole refers to the thinning of stratospheric ozone layer during the spring time. It was first discovered in 1985 over Antarctica. The existence of ozone hole was confirmed above Arctic in 1990. During the spring time, in the year 1956-1970, the thickness of  $\text{O}_3$  layer above Antarctica varied from 280-235 Dobson unit (1 DU = 1 ppb). It reduced sharply to 225 DU in 1979 and 136 DU in 1985. It continued to decline to about 94 DU in 1994. This decline was termed as *ozone hole*. During the period 1997-2001, the global average total ozone column was about 3 percent below the pre 1980 average value.

A number of pollutants enter into the stratosphere and deplete the ozone layer. These include CFCs,  $\text{CH}_4$  and  $\text{N}_2\text{O}$ . Among these CFCs are the most damaging agents of ozone layer. They produce 'active chlorine'. (Cl and ClO radicals) in the presence of UV radiation. The active chlorine catalytically destroy ozone by converting it into oxygen.  $\text{CH}_4$  and  $\text{N}_2\text{O}$  also destroy ozone through a complicated series of reactions. The discoveries related to ozone destruction were made by *Sherwood Rowland, Mario Molina and Paul Crutzen*. They were honoured with Nobel Prize for chemistry in 1995.

**Effect of ozone depletion.** The depletion of ozone layer, allows more UV-B radiation reaching the earth surface. It has been estimated that a 5 percent loss of ozone results in a 10 percent increase in UV-B radiation. Some of the important effects of ozone depletion are as follows : (a) In humans, the increased UV radiation increases the incidence of cataract, skin cancer (including melanoma) and decline in the functioning of the immune system. (b) The elevated level of UV radiation damages

nucleic acids in the living organism. (c) UV radiation inhibit photosynthesis in plants and phytoplankton, which in turn affect the whole food chain.

**Q. 6. (c) How human activities are likely to change the global climate ?**

**Ans. Green House Effect :** Carbon-dioxide ( $\text{CO}_2$ ) is released into atmosphere in different forms such as smoke, respirations of plants, animals and human beings. It interacts with sun-rays. The sun-rays consist of ultraviolet (UV), visible, and also the nonvisible infrared (IR) radiations. The ozone layer, present in natural form in upper region of atmosphere, absorbs most of the UV radiations and allows only visible and IR radiations to pass through towards the earth. Since the IR radiations are of shorter wavelength, they easily pass through the  $\text{CO}_2$  layer in atmosphere. These IR-rays induced heating effect in atmosphere and other objects on earth. In the description given so far, nothing is abnormal as this is a natural phenomenon.

**Abnormal phenomenon.** But if a larger amount of  $\text{CO}_2$  remains present in atmosphere, it causes greater heating of earth's atmosphere and objects. The industrialization, urbanization, and population explosion etc. have made it so. A very large amount of release of  $\text{CO}_2$  into atmosphere, has caused excess, (abnormal) heating of atmosphere to an alarming state. Consequently, the temperature of earth's atmosphere has gone up. The temperature is increasing at a rate of approximately  $0.05^\circ\text{C}/\text{year}$ . This phenomenon of temperature rise is causing warming all around. This is called 'global warming'. It is the effect of 'greenhouse phenomenon'.

**Causes of Greenhouse Phenomenon :** The concentration of  $\text{CO}_2$  is increasing in earth's atmosphere at a rate of approximately 0.75 ppm (parts per million). Main causes of additional increase  $\text{CO}_2$  (other than due to natural reasons such as respiration of plants, animals and human population) are the following :

1. **Burning of fossil fuels** such as coal, petroleum products, gaseous fuels, woods etc. The  $\text{CO}_2$  is released into atmosphere in the form of smoke by : automobiles, aircrafts, ships and other marine vessels, thermal power plants, various industrial units etc.

2. **Deforestation.** Since the plants use  $\text{CO}_2$  for photosynthesis and release oxygen, therefore by cutting-down the forests : (i) lesser plants/trees are available to absorb  $\text{CO}_2$ ; and, (ii) reduced quantity of  $\text{O}_2$  is released into atmosphere.

Hence the environment becomes unhealthy due to decreased concentration of oxygen.

3. **Population explosion.** Due to much increased population, there is a greater release of  $\text{CO}_2$  in atmosphere.

4. Release of greenhouse gases other than  $\text{CO}_2$  such as methane ( $\text{CH}_4$ ), nitrous oxide (NO), chloro-fluoro-carbons (CFCs),  $\text{SO}_2$ ,  $\text{O}_3$  etc. These are emitted gases and their sources are listed in the following table

**Various greenhouse gases and their sources**

	Gases	Major Sources
1.	$\text{N}_2\text{O}$	Combustion fossil fuels and natural soils
2.	$\text{O}_3$	Photochemical reactions (in troposphere), diffusion from stratosphere.
3.	$\text{CH}_4$	Anaerobic decomposition of organic wastes, wet lands, termites
4.	Freon-11	Industrial refrigeration, aerosol propellant, manufacturing of foams

5.	Freon-12	Domestic refrigerators, aerosol propellant, manufacturing of foams
6.	Freon-22	Refrigeration, manufacturing of fluoro polymers
7.	Freon-113	Large air-conditioning systems, electronic solvents
8.	CH <sub>2</sub> CCl <sub>3</sub>	Degreasing solvents
9.	CCl <sub>4</sub>	Solvent intermediary in production of Freon-1 and Freon-12

**Q. 7. (a) What is animal husbandry? Explain the environmental concerns of animal husbandry.**

**Ans. Animal husbandry :** Animal husbandry is a science in which we study the domestic/pet animals, their types, behavior, and their management. It also deals with their utilities for mankind, environments, consumable products and by products produced by them.

Animal husbandry play very important role in agriculture. Animal husbandry and dairying play very important role in human life as well as for the development of any nation

" The greatness of a nation and its moral progress can be judged by the way its animals are treated" Mahatma Gandhi-

According to an survey – India's milk output in 1997-98 was 70.5 million tones and it is targeted to reach the level of 75 million tones in 1998-99 .

The animal husbandry can be sub classified into following major areas-

1. **Animal petting :** It deals with their utilization, reproduction and so many other uses.
2. **Vetenary Science :** It deals with the medical part of the animals.
3. **Dairy technology :** It deals with the milk products such as milk, cheese, butter and ghee etc.

**Types of animals :** 1. **Milk giving animals-** such as cows buffaloes and goat gives us milk.

2. **Meat and egg giving animals**—such as pigs, sheep, ducks, cattle etc are the main source of meat by hen and ducks we get eggs.

3. **Working animals**—bulls, buffaloes, camels and horses are used in field for doing work.

Mules are also used epically by army to take thing from one place to another place.

We also get horns, feathers and leather from some of these animals which can be used for making various things.

Their urine are also used in medicines

4. **Security purpose animals**—Dogs of different types are used for security purpose

**Needs for animal husbandry :** We have a large number of animals in our country. Yet we do not get as much food from these animals as we possibly can and need for our large population. Besides the , food, which we get from animals, we need them to do a lot of our work.

In India, we have about 80.6 million cattle, which work in the fields, if we take the ration of working cattle to the area of land, which is being used for cultivation we find that only two individuals of cattle are available to plough 3.9 hectare of land. We all know that cattle wastes like urine and faeces are natural manure which enrich our soil. Unfortunately, in India we do not use all the cow dung available and a lot of it goes waste. Gobar gas plants have been developed so that we can make use of the cattle dung both for fuel as well as to make manure. Thus we find that animal husbandry is a very important field which helps us to improve our livestock and other useful animals and make the maximum use of them.

**Management of live stock :** When we study about improving our live stock , we learn how they must be sheltered, fed, mated. What kind of drinking water should be given to them and how they should be protected from the diseases

1. **Feeding of animals :** All animals should be feed properly. Their food should contain required nutrition's such as carbohydrates, protein, fats, minerals, vitamin and water.

2. **Housing of animals :** We must protect our animals from the more heat, rain and cold, we should provide appropriate house to animals. Their house should have proper sanitation and ventilation. Too many animals should never be kept in a small space.

Different different animals require different types of houses. Hen and cock are kept in cages while sheep and goats stay in open yard which is partially covered with straw mated roof.

3. **Water :** Neat and clean water in sufficient quantity should be provided to animals to maintain their health.

4. **Animal breeding :** Breeding means reproduce, breeding is done to obtain animals of desired characters. Two individuals of desirable character can be selected as parents . These are then cross to obtain new breeds of animals.

**Common diseases of animals :** Some times domestic animals may be affected by some diseases. Some common disease are :

Viral diseases- pox in cattle, goats, sheeps and cocks

Dermatitis in goats and sheep

Foot and mouth diseases in cattle

Bacterial diseases—such as Tuberculosis, Cholera, Diptheria, Diarrhea.

**Q. 7. (b) Discuss the Role of NGO's in environmental protections.**

**Ans. What is NGO :** A non-government organization( NGO) is an organization that is not part of a government and was not founded by states. NGO are therefore typically independent of government. NGO are usually non-profit organizations that gain at least a portion of their funding form private sources. Current usage of the term is generally associated with the United nations and authentic NGOs are those that are so designated by the UN.

Many NGOs now prefer the term private voluntary organization ( PVO).

A 1995 UN report on global governance estimated that there are nearly 29,000 international NGOs. National numbers are even higher. The United States has an estimated 2 million NGOs , most of them formed in the past 30 years.

The International Red Cross and Red Crescent Movement is the world's largest group of humanitarian NGOs.

The phrase non-governmental organization came into use with the establishment of the United Nations in 1945 with provisions in Article 71 of Chapter 10 of the United Nations Charter (1).

**Types of NGOs :** There are numerous possibilities to classify NGOs.

**Operational NGOs :** Their primary purpose is the design and implementation of development-related projects. One categorization that is frequently used is the division into relief oriented or development oriented organizations. The operational NGOs can be community based, national or international.

**Advocacy NGOs :** Their primary purpose is to defend or promote a specific cause. These organizations typically try to raise awareness, acceptance and knowledge by lobbying, press work and activist events.

**Acronyms :** Non governmental organization are an heterogeneous group. A long list of acronyms has developed around the term NGO

These include :

**ENGO** : Environmental NGO such as Global 2000, CSE

**INGO**- International NGO such as CARE

**BINGO**- Business oriented international NGO

**RINGO**- Religious International NGO such as Catholic Relief services

**GONGOs**- Government operated NGOs

**QUANGOs**- Quasi autonomous non governmental organization such as W3C and the international Organization for Standardization (ISO) which is actually not purely an NGO

**Works of NGO's** : 1. Primary purpose is the design and implementation of development-related projects, 2. Spread awareness among people, 3. Involved in research, investigative and educational work in the field of pollution, 4. Create environmental awareness in the communities, conduct widespread environmental education and training programmes, 5. Its aims are to encourage forest conservation and the use of forest products, 6. Rescue, feed and medicate all injured, abused and ownerless animals, 7. To run mobile clinics in slum areas., 8. To organize workshops and seminars for environmental protection, 9. Afforestation in the wasteland areas, 10. To conduct research in environmental problems.

**Some Indian NGOs Working For Saving the Environment** : 1. Centre for Science and Environment (CSE), 2. Centre for Environmental Education (CEE), 3. Dasholi Gram Swarajya Mandal, 4. Gandhi Peace Foundation – Environment Cell, 5. Kalpavriksh, 6. Nilgiri Wildlife and Environment Association, 7. The Energy and Resources Institute (TERI), 8. Uttarkhand Seva Nidhi was set up in 1967. 9. World Wide Fund for Nature, 10. Rajiv Gandhi Foundation.

**Q. 7. (c) How women's education helps in environment preservation?**

**Women and Education** : Conservation and protection of the environment are indispensable components of sustainable development . It is not possible without the empowerment and active participation of women. A women as a mother grooms the child and is influential in making him becoming a responsible citizen. The mother has the power to instil environmental awareness in the child. When women are more informed about the basic issues related to the environment environmental rejuvenation becomes easier and meaningful. The role of a women is not restricted to the home only. She can play a main role in the neighbourhood at bigger platforms. The benefits of women power can be derived only through providing women education. The present scenario in India is very dismal. Although women from urban backgrounds and financially sound families get education, a vast majority of rural women are not fortunate in this regard. The dismal rural economic conditions and grossly inadequate education facilities do not permit them to reach beyond school education :

In fact the ecosystem stands to benefit through providing proper education to rural womenfolk as they are a part of it. Although the crucial roles of women in environmental protection have been recognized over the ages a concerted effort began with the Beijing platform for action (1995) the World Summit on sustainable development for achieving millennium development goals. Drawing inspiration from this declaration many schemes have been launched in India and other developing countries where the environment is threatened the most.