UNIT 1

INTRODUCTION

ENVIRONMENT:

The term Environment is derived from French word '*Environ'* which literally means 'surrounding'. *Anything and everything which surrounds us i.e. all living beings or biotic components (microbes, plants and animals) and non-living or abiotic components (air, water, sunlight etc.) present in the nature, form the environment*. The Environmental Protection Act, 1986 defines **Environment** as "*environment includes water, air and land and the inter relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property*".

Environmental education is indispensable to create environmental awareness which ultimately will lead to environmental conservation.

Environmental Studies: Environmental studies about various dimensions (scientific, social, cultural, economic, political etc.) of the environment, its issues and challenges and tangible solutions in a holistic way. Thus an environmental study is studies of the human-environment interaction and its results at micro and macro level.

Environmental Science *strictly deals with the scientific aspects of the environment, itscomplex problems and the tangible solutions* whereas ***Environmental Studies****, in addition to the scientific aspects, also deals with the socio-economic, cultural, traditional, legislative and historical dimensions of the environmental issues*. For example, suppose a river is getting polluted due to discharge of untreated wastewater into the river. The student of Environmental Science will observe the

causes, physico-chemical and biological changes within the river water, its effect on aquatic and adjoining ecosystem and scientific mitigation measures for the river pollution. In addition to the above dimensions, Environmental Studies will also observe the impact of the pollution on the nearby population, their livelihood and culture etc.

ECOLOGY:

The term '*Ecology*' was coined in 1869 by '*Earnst Haeckel*'. It is derived by combining two Greek words *Oikos* meaning Home and *Logos* meaning study. So, *Ecology is the study of organisms in their natural home and their interaction with their surroundings*.

ECOSYSTEM:

Ecosystem is the basic structural and functional unit of the environment. There is a constant exchange of something between living & non-livings component of the nature, when interact with each other to establish a stable living community, it is called an Ecosystem. Without the living component, establishment of an ecosystem is not possible and vice versa. Both are two sides of a coin.

The study of all the physical as well as biological processes including the distribution and abundance of living organisms and the interaction in between them with their surrounding environment is known as Ecosystem.

STRUCTURE OF ECOSYSTEM

It is very easy to study or understand the structure of ecosystem from the flow chart described below.

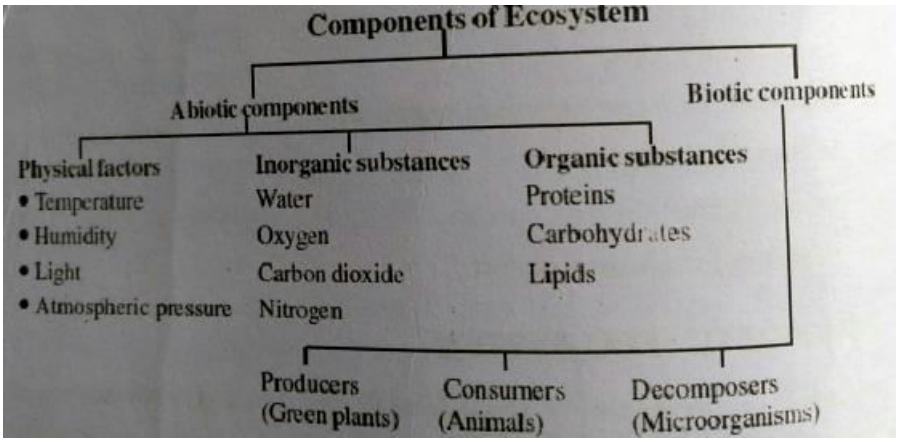


Fig.1.Schematic Representation of Structure of an Ecosystem

BIOTIC COMPONENTS

Biotic components are also divided into 3 categories based upon their food-fed relationships

PRODUCERS: Producers are the autotrophs (auto means self, troph means to nourish) of the ecosystem. *They are the green plants and green microorganisms who can make their own food material by using carbon dioxide and water in presence of sunlight with the help of chlorophyll present in them*.

All green plants, Algae, Cyanobacteria are examples of producers

CONSUMERS: Consumers are the heterotrophs (hetero-not self troph to nourish) of an ecosystem. *Consumers are those organisms which get their food from other organisms by feeding them.* They depend on the producers of the nature to get energy. Consumers are also different types like

a) **Herbivores**– *The organisms which get their food directly from plants are known as* ***herbivores.*** They are also known as primary consumers. They cannot eat any animals.

Some examples of herbivores are Grasshoppers, Rabbits, Goats, Cows and Dears.

b) **Carnivores**– *The organisms which eat other animals are known as carnivores*. Carnivores in nature mean they are the meat eaters. They cannot directly eat the

producers of the ecosystem that is the plants. They can eat only herbivores. They are also known as secondary consumers.

Frogs, Jackal, Snakes, Tigers and Wolves are some examples of carnivores.

c) **Tertiary Consumers Omnivores**– *The organisms which consume both animals and plants are known as omnivores*.

Humans, Bears and Cows are some examples of omnivores.

DECOMPOSERS: Decomposers are also to some extent heterotrophic in nature. They do not contain chlorophyll, so depend on other material for food and energy. *Decomposers are those organisms which derive their food (nutrients) by feeding on the dead and decay materials of the environment*. That is why they are known as the decomposers or saprophyte, or scavengers of the nature or they can be called as the ***detrivores*** (Detri means dead particulate organic material).*They can live in any type of soil with organic waste*. They play a very important role for the completion of the Biogeochemical Cycle in the environment.

Some examples of decomposer are Bacteria, Fungi, Earthworms.

ABIOTIC COMPONENTS:

These are the non-living factors in form of solid, liquid or gas found in the nature (ice, water,

moisture). They can be categorised into 2 types.

I) **Climatic factors or Physical components**:

Examples: Light, Temperature, Humidity, Rain etc.

II) **Edaphic factors or Chemical components:**

Examples : Soil, Organic and Inorganic components of the soil, Substratum etc.

SUSTAINABLE DEVELOPMENT:

The World Commission on Environment and development defined sustainable development as **"*Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs*."**

This definition emphasizes two important points. **One**, the natural resources are important for our present day survival as for the survival of our future generations. **Two**, any present developmental activity or programme must take into account, its future consequence.

To obtain sustainable development, the following strategies should be observed:

1. Population control.
2. Conservation of natural sources like water, forest, earth etc.
3. Reduction in wastage of energy and matter.
4. Control on all types of pollutions like water pollution, air pollution, soil pollution etc.
5. Shifting towards potentially renewables sources.
6. Green building construction.
7. Making and using the things that last longer and can be repaired, recycled and reused.
8. Protecting the lives of animals as it helps to sustain biodiversity.

SOURCES OF ENERGY:

Depending upon the availability of different sources of energy, it can be classified into two types:

- **Non-renewable sources of Energy or Conventional energy sources*:***
- **Renewable sources of Energy or Non-conventional energy sources**

Non-renewable sources of Energy or Conventional energy sources:

The resources which have accumulated in nature over a long span of time and cannot be quickly replenished when exhausted are known as Non-renewable energy sources.

or

The sources of energy that are limited and take over a millions of years to form are known as non-renewable sources of energy. These resources, once used cannot be replaced within a short period of time and can be lost forever. Petroleum, kerosene, coal natural gas, fossil fuel oil and nuclear fuels are some examples of non-renewable sources of energy.

Renewable sources of Energy or Non-conventional energy sources:

The sources of energy that are continuously replaced through number of natural phenomenon are called renewable sources of energy. Renewable sources of energy and include solar energy, wind energy, ocean energy, geothermal energy, urban waste, agricultural waste energy. These are non-polluting, environmentally clean and socially relevant

Advantages of Renewable sources of Energy:

1. Renewable energy is available in abundant quantity and free to use.
2. Renewable energy has low or zero carbon emissions, therefore they are considered as green and eco-friendly.
3. Renewable energy develops self- reliance and minimizes the reliance on any third country for the supply of energy.
4. Renewable sources can cost free than consuming the local electricity supply.
5. Renewable sources of energy help in economy simulations and creating job opportunities, through building such equipments, instruments or plants that provide jobs to many people.

Disadvantages of Renewable sources of Energy:

Though renewable energy has many benefits and advantages but it also has certain limitations

1. High cost of initial investment to set up plant.
2. Non-availability (Solar light only when days are sunny)

3. Loss of biodiversity and forest along with modification of local environment (Dam for hydroelectric energy).

Advantages of Non-renewable sources of Energy:

1. Non-renewable sources of energy are cheaper and easy to use.
2. Non-renewable sources release great amount of energy from small amount of resource use (uranium).

Disadvantages of Non-renewable sources of Energy:

1. Non-renewable sources of energy are limited and will end one day. Thus, their prices will keep rising and will not be accessible and available for everyone.
2. Their use is not eco-friendly as they release toxic gases that are creating serious environmental changes.

RAIN WATER HARVESTING :

Rain water harvesting is a technique of collecting rainwater and storing it by construction of water harvesting structures for later use. It not only increases water availability but also checks the declining water table.

Rainwater , wherever it falls, is captured and pollution of water is prevented. Rainwater harvesting is not only proving useful for poor and scanty rainfall regions but also for the rich ones. The ministry of water resources , is endeavouring to make rainwater harvesting a part of everybody life in our villages and cities as a people's movement.

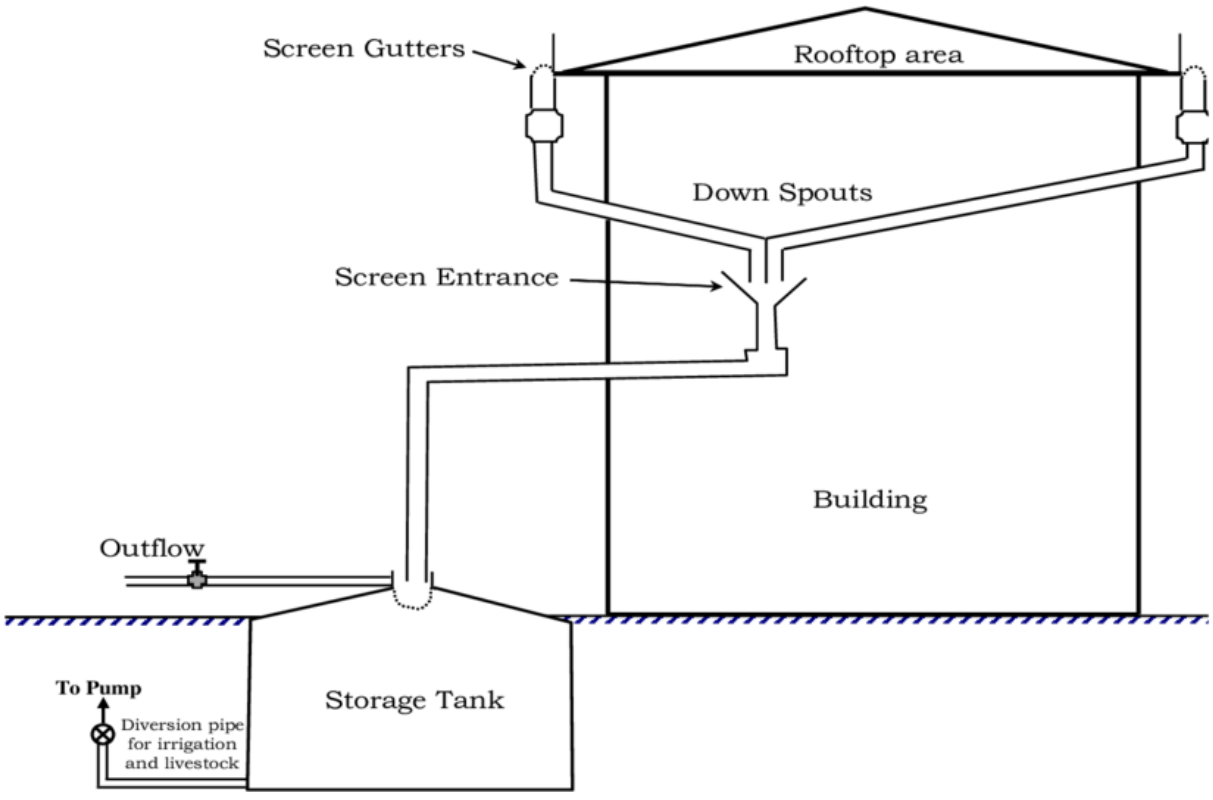
OBJECTIVES OF RAINWATER HARVESTING :

1. It reduces run off losses.
2. It avoids flooding.
3. It helps in meeting the increasing demand of water at subsequent time.
4. It helps in raising the water table by recharging the groundwater.

5. It also reduces groundwater contamination.
6. It helps in reducing soil erosion.

METHODS OF RAINWATER HARVESTING :

1. The rain water that falls on the roofs of buildings or courtyards is collected and stored in underground tanks or diverted to some abandoned well. The collected water may be drawn from well by using hand pump or motor pump for future use.
2. In foothills water flowing from spring is collected in embankment type water storage. The collected water can be supplied to the nearby population through pipelines.
3. Artificial recharging is an indigenous technique of harvesting rain water by collecting the rain water level in wells and tube wells. It helps in protecting water resources and assures a constant supply of clean water during the lean season.



DEFORESTATION

Deforestation is defined as the reckless felling of trees by human beings for their selfish needs.the forests are burnt or cut down for various reasons,like clearing of land for agriculture,for mining, for expansion of cities or for harvesting of timber and many more. The only motive of deforestation is 'economic gains'. But we forget that these economic gains are short lived while the long terms damaging effects of deforestation are disastrous and irreversible.

EFFECTS OF DEFORESTATION

Deforestation has far reaching consequences,which may be outlined as follows:

1. Decrease in rainfall : forest bring rain due to high rate of transpiration and precipation. In the absence of forests, rainfall declines considerably.
2. Loss of fertile land : due to less rainfall, natural vegetation growth decreases which result in loss of fertile land.
3. Soil erosion : in the absence of forests, especially on slopes,the soil gets washed away with rain water. Due to the washing away of nutrients of soil with rainwater, large tracks of land is rendered permanently improvised.
4. Expansion of deserts : in the absence of forests the land mass gradully gets converted into sand deserts due to action of strong winds laden by fragmented rock dust.
5. Lowering of water table : in the absence of forests, rainfall is reduced which results in less collection of underground reservoirs. Hence water table is lowered.
6. Loss of flora and fauna : certain species of flora and fauna are getting extinct from he face of the earth, mainly due to deforestation.
7. Loss of biodiversity : Loss of flora and fauna has resulted into loss of biodiversity, leading to disturbances into the ecological balance.
8. Flooding and drought : one of the vital functions of the forests is to absorb and store great amount of water quickly when there are heavy rains. In the absence of forests, the regulation of flow of water gets disrupted , which leads to alternating periods of floods and then drought in the affected area.
9. Effect on climate : the climate of a region is mainly controlled by rainfall. Deforestation causes decrease in rainfall , which in turn increase the climatuic temperature.
10. Loss of medicinal plants : there are many species of plants which have medicinal value which have been used in india for centuries as insecticides ,

fungicides, in medicines and in biofertilisers.deforestation may lead to the extinction of these valuable plants.

11. Economic loss : deforestation may lead in loss of industrial timber and non – timber products and loss of long – term productivity.
12. Environmental changes : It is laregly known that global warming is increasng due to the emission of green house gases,like carbon die oxide into the atmosphere.
13. Social and cultural effects : indigenous people may be forced into a new way of life for which they are not prepared.shortage of firewood may cause serious misery among the tribal womanfolk because they have to travel a lot to collrct firewood.

CONTROL MEASURES OF DEFORSTATION :

1. Reduction of emission from deforestation and forest degradation : under this plan, united nations and the world bank, have encouraged developing countries to limit deforestation. In the some countries, the landholders are paid incentives for conservation of trees and enhancsement of biodversity
2. Incerse of the reserved forest area : the protected forest area for biodiversity and timber production should be increased. Vacant amd unused lands and wastelands should be converted into forest area.
3. Forest management : it is concerned with the protection and regulation of forest related aspects. It includes management and conservation of forests for wildlife and wood products etc.
4. Afforestation and reforestation : afforestation refers to the conversion of a non-forest area into forest area. While reforestation refers to the recreation a forest area depleted by deforestation.
5. Public awareness : people should be provided environmental education and awareness regarding the devastating effects of deforestation, because can be controlled with public help.
6. Legislative actions : strong legislative and regulatory measures should be effectively enforced to protect forest in both formal and informal ways. Strict warnings , notices of violation , work cancellation orders and fines should be imposed in case of non-compliance.

IMPORTANT QUESTIONS

MCQ

1. What can be visualized as a functional unit of nature?
   a) Humans
   b) Ecosystem
   c) Vehicles
   d) Plants
2. What is the characteristic of each type of ecosystem?
   a) Interaction between living things
   b) Interaction between biotic and abiotic factors
   c) Interaction between abiotic factors
   d) Fights among individuals
3. Which of the following is not a type of primary resource?
   a) Crude Oil
   b) Coal
   c) Hydrogen Energy
   d) Sunlight
4. Energy Resources which are being used for many decades are known as _____
   a) conventional energy sources
   b) non-conventional energy sources
   c) primary energy sources
   d) fuel cells
5. What is called for the collection of rainwater for use?
   a) Rain collection
   b) Rainwater harvesting
   c) Rain digging
   d) Rain water pumping
6. Why should people implement rainwater harvesting?
   a) In order to play with the water
   b) In order to use during scarcity of water
   c) In order to pour the rain water directly to the sewage
   d) In order to time pass

2 MARK QUESTIONS

1. Define ecology
2. Define the following terms----- herbivores, carnivores, decomposers, detritivores,
3. What are abiotic components of ecosystem
4. Define rain water harvesting?

5. Define deforestation
6. Define renewable sources of energy
7. What do you mean by conventional sources of energy?

4 MARKS QUESTIONS

1. Write a short note on sustainable development.
2. Describe the structure of ecosystem
3. What are non renewable sources of energy? What are the advantages of non renewable sources of energy?
4. Define rain water harvesting. Describe the method of rain water harvesting
5. Define deforestation. How can it be controlled?

UNIT 2

Air and Noise Pollution

Pollution: *Pollution is an alteration in the physico-chemical and biological nature of air, water and soil that ultimately affects the whole environment*. It also specifies its hazardous impacts on living organisms, other environmental systems and non-living material. *The substances which adversely affect the environment by decreasing the growth rate of species or cause interference the food chain and affect the human comfort and health are known as environment pollutants or simply pollutants*.

Pollution is caused by natural activities or (man-made) anthropogenic. Examples of natural pollutions are volcanic eruptions, forest fires, floods caused etc. Incomplete technology lacking close integrated systems is the main cause of man-made pollution.

Type of Pollution

Pollution has been classified on the basis of particular component of the environment being polluted, such as:

- Air Pollution
- Water Pollution
- Soil Pollution
- Radioactive Pollution
- Noise Pollution
- Thermal Pollution

Types of Pollutants:

Agents or carriers which cause air pollution are known as air pollutants.

Pollutants can be classified in various ways based on different factors such as on the basis of:

1. **Nature of Pollutants (Eco-point of view):**

   Their ore two categories of pollutants on the basis of degradability of pollutants:

   (i) Biodegradable Pollutants: *Those substances (Pollutants) which can be decomposed naturally in the presence of microorganisms*

are known as biodegradable pollutants. For example, any organic waste, leaf litter etc.

(ii) **Non-biodegradable Pollutants:** *Those substances which cannot be decomposed or break down into simpler substances by any natural process are known as non-biodegradable pollutants*. For example, plastic waste, metallurgical waste etc.

2. **Depending on Existence of Pollutants in the Nature**:

Two categories are recognized on the basis of Existence of Pollutants in the Nature

(i) **Qualitative Pollutants:** *Those substances (Pollutants) which not normally occur in nature but are added in nature or environment by man are known as qualitative pollutants*. For example, pesticides, insecticides etc.

(ii) **Quantitative Pollutants:** *Those substances which already present in environment but not pollute but acquire the status of pollutants when their concentration increased due to activities of man are known as quantitative pollutants*. For example CO_2 is already present in environment but their concentration is continuously increasing due to its emission from industries and automobiles exhaust. When its concentration become greater than normal value, it cause harmful effects on environment (human, animals, plants) then it acquire the status of pollutant.

3. **Depending on the form they remains in the environment after they enter or release in the Environment**:

According to this pollutants are of two types:

(i) **Primary Pollutants**: The pollutants which remains as such in the environment (or remains in the form in which they are added) after being released from source are known as primary pollutants. Some examples of primary pollutants are ash, dust, smoke, fumes etc.

(ii) **Secondary Pollutants**: The pollutants which are produced from primary pollutants by chemical interaction with the substances present in the environment are known as secondary pollutants. Sulphur- trioxde, nitrogen dioxide, epoxide, ozone, PAN are some examples of secondary pollutants.

Air Pollution

Pollution that is caused by anthropogenic and natural agents that degrades the quality of air and having adverse impact on living and non-living systems is termed as air pollution.

Rainfall acts as the best scavenging agent for removal of air pollutants.

Sources/ Causes of Air Pollution:

The following are the main sources which cause air pollution**:**

A. ***Natural Sources****:*

The natural sources can be thunderstorms, emissions of gases and particulates from forest fires, methane emissions from marshy lands, bio-aerosols from pollen grains, volatile organic compounds emissions from trees and plant species, volcanic eruptions generates sulphur dioxides emissions and decomposition of organic matter emits carbon dioxide and methane.

B. ***Anthropogenic Sources****:*

Along with natural pollutants, there are pollutants of anthropogenic origin too. The main anthropogenic sources are gasoline exhaust emissions, industrial emissions, mining activities, cooking fuels, construction works, fireworks etc. The details of each emission source categories are as follows:

i. Household works: Coal combustion generates enormous amount of smoke, soot, dust, CO, SO_2, NOx. However, burning of LPG releases fewer amounts of pollutants comparatively.

ii. Gasoline Exhaust: Different categories of vehicles like 2 wheelers, 4 wheelers, heavy duty vehicles, etc. release a number of gaseous air pollutants and particulate matter. They mainly includes NOx, SOx, VOCs, CO, O_3, PM_{10}, $PM_{2.5}$ and sometimes lead. Vehicles contribute approximately 70% of air pollution as they are major source of primary and secondary airpollutants.

iii. Industries:

a. Chemical Industries: They generate SOx, NOx, VOCs andPM.

b. Coal Powered Plants: SO_2, CO, NOx andPM.

c. Electroplating and metallurgical Industries: CO, CO2, NOx, PM, cooper, lead etc.

d. Gasoline-fuel industries: They include petroleum, diesel which emits VOCs, NOx, SOx, CO, PM, O_3etc.

e. Paper manufacturing industries: PM10, PM2.5, SO_2etc.

iv. Agricultural Practices: agriculturally based chemical fertilizers which include pesticides and herbicides like chlorinated hydrocarbons ,etc.

Effects of Air Pollution:

Air pollution has both direct and indirect effects on human, plants, animals, buildings and eco-system

1. **Effects of Air Pollution on Human Health**: The main effects of air pollution on human health are:

(i) **Premature death:** Science shows that both short-term and long-term exposure to unhealthy air can shorten your life and lead to premature death.
(ii) **Asthma attacks:** Breathing ozone and particle pollution can lead to increased asthma attacks, which can result in visits to the emergency room and hospital admissions.
(iii) **Cardiovascular disease:** Air pollution can increase the risk of both heart attacks and stroke.
(iv) **Lung cancer:** Particle pollution can cause lung cancer, which is the leading cause of cancer-related death.
(v) **Developmental damage:** Exposure to air pollution can slow and stunt lung development in growing children, harming their health now and reducing their lung function as adults.
(vi) **Susceptibility to infections:** Air pollution increases the risk of lung infections, especially in children.
(vii) **Worsened COPD symptoms:** Exposure to air pollution can make it even harder for people with chronic obstructive pulmonary disease (COPD) to breathe. Severe symptoms can lead to hospitalization and even death.
(viii) **Lung tissue swelling and irritation:** Even people with healthy lungs are susceptible to irritation and swelling. For those living with chronic lung diseases, such as asthma and COPD, these effects can be especially harmful.
(ix) **Low infant birth weight:** Some studies show exposure to air pollution may increase the risk of low infant birth weight and infant mortality.
(x) **Wheezing, coughing and shortness of breath:** Like many of the other conditions in this list, these can be caused by both long-term exposure and short-term exposure to high levels of air pollutants.

2. **Effects of Air Pollution on Economy:**
Air pollution tolls on the economy in several ways
   (i) It costs human lives.
   (ii) Air pollution damages historical and cultural monuments.
   (iii) The RCC structure of building get damaged due to attack of acidic gases or acid rain
   (iv) It adversely effects on the people's ability to work.
   (v) It damages materials mainly by corrosion of materials.

(vi) It causes damages to paint and protective covering of surfaces of substances.

(vii) Cracking in rubber and various types of electrical insulation is caused by pollutants like ozone and PAN present in air.

(viii) Acidic gases present in air adversely effect on the strength and life of leather and paper products.

(ix) Synthetic and natural fibers and their color (dyes) deteriorate due to the pollutants of air.

(x) It costs money in remediation and restoration.

Table 1: Summary of air pollutants, sources and impacts

S.No.	Pollutant	Source/Cause	Effect
1.	Carbon monoxide (CO)	Vehicular emissions, wood burning, coal burning, incomplete combustion etc.	Nausea, dizziness, severe headache, cardiac arrests, brain stroke, low blood pressure and CO poisoning. After inhalation due to incomplete combustion, CO inhales deep into the lungs and combine with haemoglobin as it has high affinity than oxygen. The resultant is Carboxy haemoglobin. When a large number of carboxy haemoglobin molecules increases in the human body then it decreases the oxygen

			level. Due to high decrease in O2 levels, the condition becomes fatal and leads to death.
2.	Carbon dioxide (CO2), declared as pollutants only at elevated levels.	Biomass burning	Global warming, greenhouse effect and climate change.
3.	Sulphur dioxide (SO_2)	Industrial processes, fossil fuel combustion, wild fire, thermal power plants, smelters and volcanic eruptions	Repiratory ailments, diziness, bronchitis, reduced plant production, yellowing, necrosis and corrosion to marble, spoiling of leather, corrosion.
4.	Polynuclear Aromatic Hydrocarbons (PAHs)	Gasoline exhaust emissions, emissions from garbage sites, coal tar lining.	Nausea, dizziness, lung cancer, respiratory disorders, eye irritation etc.

5.	Chlorofluorocarbons (CFCs)	Refrigerators, ACs, cleaning solvents, disinfectants.	Ozone layer depletion, formation of ozone hole.
6.	Nitrogen Oxides	Biomass burning, forest fires, gasoline exhaust emissions, mining etc.	Nausea, dizziness, cardiovascular disorders, photochemical smog, acid rain etc.
8.	Peroxy Acetyl Nitrate (PAN)	Vehicular emissions, Chemical industrial emissions, domestic activities etc.	Irritation of eye, throat and trachea, damages clothing, paints and rubber etc.
9.	Particulate matter	Vehicular emissions, construction based activities, industrial emissions, wood burning etc.	Respiratory disorders, bronchitis, emphysema, asthma; some are carcinogenic.

Air PollutionControl:

Air pollution cannot be fully controlled but can be controlled.

(a) Preventive Measures

(b) **Control Measures using equipment**.

(a) Preventive Measures:

A. *Source Emissions -Industries*

- Low-sulphur fuels should be encouraged to use to reduce the emission of sulphur dioxide and reduction in benzene in gasoline fuels (petrol) from 10% to 1% is implemented as per central pollution control board norms.
- Exhaust hoods are the latest modifications in industrial ovens which have good efficiency to recover the solvents that have the possibility to become air pollutants.
- Cost effective instruments are implemented to reduce the air pollutant concentrations.

B. *Source Emissions - Vehicles*

- Eradication of Old Vintage Vehicles. The vehicles, particularly cars, which are older than 15 years, should be discarded due to their low efficiency and malfunctioning of engines. These vehicles are also one of the main reasons for emissions of air pollutants in theatmosphere.
- Catalytic converters are efficient devices fitted in engines of different set of vehicles and play an important role in converting noxious gases in to less harmful gases through chemical reaction.
- Improvement in quality of vehicular fuel which will reduce the tail-pipe emissions and further betters the air quality. For e.g. sulphur content was reduced from 0.5to

  0.2 percent in diesel to reduce the emission of SO_2 from tail-pipe. Methyl tert-

  butyl ether (MTBE) should be added as a gasoline additive for increasing the octane number and reducing knocking of engine
- Unleaded petrol is recommended to use especially in Delhi to reduce the lead emissions from gasoline fuels.
- Alternative fuels should be used in place of gasoline fuels like CNG, LPG, biodiesel, vegetable oils, ethanol etc to curb the emission of air pollutants..
- To promote the use of electric vehicles

C. *Legal and Policy Measures*

For the control of air pollution, two main acts are implemented, The Air Pollution prevention and Control Act, 1981 and Environmental Protection Act, 1986.

D. *Greenbelt Development/Landscape Green Planning*

- Toplanttolerantspecieswhicharegoodabsorbersofdifferentairpollutants. These types of plant species are called as sinks and help in purifying the air.
- These tolerant plant species will be screened by a biological method called as Air Pollution Tolerance Index (APTI) and planted around the periphery of the affected area.

E. *Emission Norms and Emission Standards*

Emission norms are the threshold or permissible limit set by nodal agency for a particular category of vehicle. These limits are for those air pollutants which are emitted usually from tail-pipe of vehicles like CO, NOx, VOCs, PM etc. If any vehicle has emission of these air pollutants above the set permissible limit, it is considered as unfit vehicle. The Automobile Research Institute, Pune is the certifying authority for the vehicles fulfilling the standards.

(b)*Air Pollution Control Equipment or* Control Measures using equipment:

Control for Particulate Matter

(a) **Gravitational Settling Chamber**: It consists of rectangular chamber fitted with large number of horizontal trays.

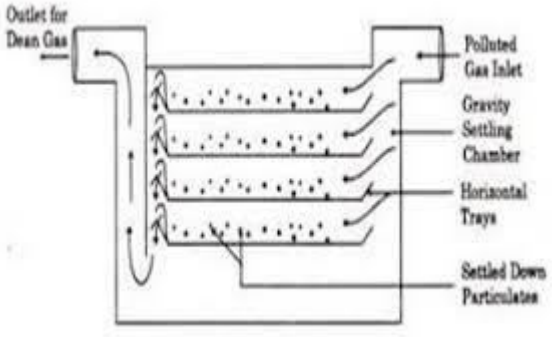


Fig: GRAVITATIONAL SETTLING CHAMBER

- Used to remove particles of size greater than 50 μm.
- Gas stream (polluted) is allowed to enter from one end.
- Velocity of flue gas is reduced in large chamber.

- Particles settled under the influence of gravitational force.

Advantages:

- Low initial cost.
- Easy to design.
- Dry and continuous disposal of solid waste.
- Low maintenance cost.

Disadvantages:

- Require large space.
- Only large sized particles can be removed.
- Less collection efficiency.

(b) Cyclone Separator:

It consists of a vertical cylinder with conical base. Near the top it is fitted with tangential inlet for entry of polluted gas and outlet at the base to discharge (remove) particulate matter.

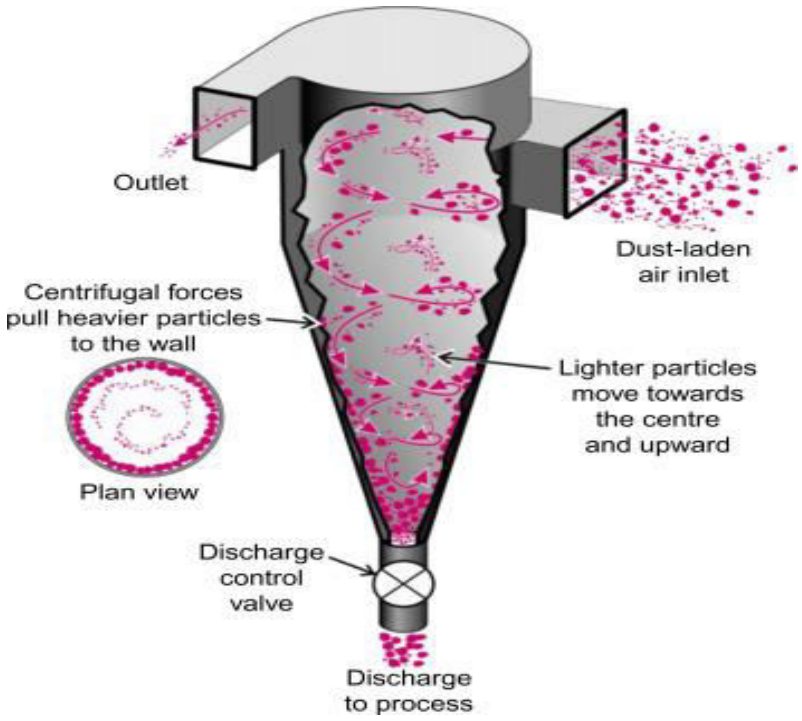


Fig: CYCLONE SEPARATOR

- Centrifugal force is utilized to remove particulate matter.
- It is used to remove particles of size from 10 -50 μm.
- Used mostly in industries.

Advantages:

- Less initial cost.
- Require less floor area.
- Simple construction and maintenance.
- Can handle large volume of gas at high temperature.

Disadvantages:

- Less efficient for small particles (less than10 μm).
- Sensitive to variable dust load and flow rate.

(iii) **Fabric Filter**:

It consists of tubular bags and closed at upper end. It has a Hooper at

lower end to collect the particulates. The filter bags must be cleaned regularly for efficient filtration.

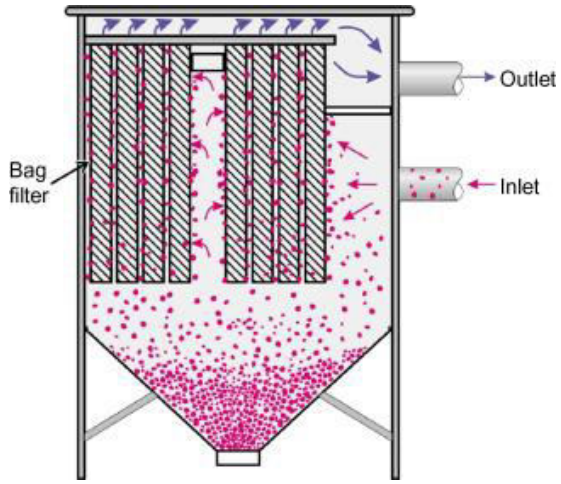


Fig: FABRIC FILTER

- Flue gases are allowed to pass through woven fabric, which filter out particulate matter.
- Small particles are retained on the fabric.
- Removes particle having size less than 1 μm.
- It has efficiency up to 99%

Advantages:

- Higher collecting efficiency for smaller particles.
- Normal power consumption.
- Performance become visible

Disadvantages:

- High cost of maintenance and fabric replacement.
- Large size equipment.
- Fabric is liable to chemical attack.

(iv) Electrostatic Precipitator: It consists of thick cylinder with inlet for polluted gas near the base and outlet near the top for exit of clean gas.

Electrode is inserted in it and connected to high voltage cable.

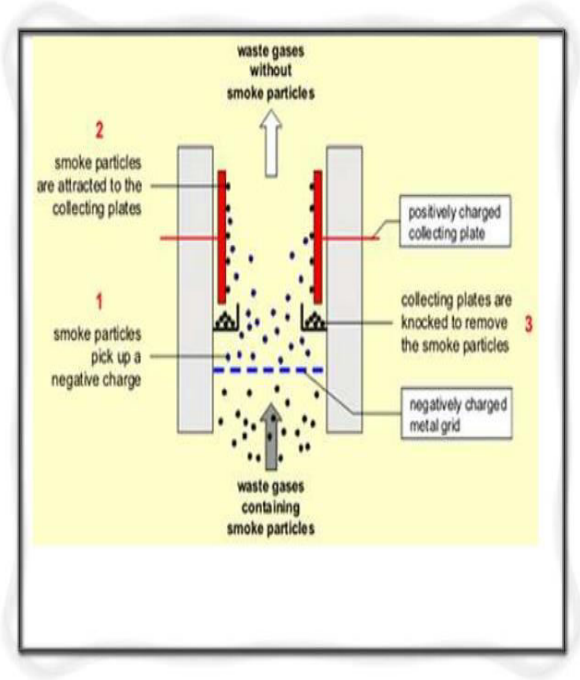


Fig: ELECTROSTATIC PRECIPITATOR

- It works on the principle of electrostatic precipitation.
- Can remove the particles of size range 0.1 – 1 μm.

Advantages:

- High efficiency.
- Both types of particles (dry or wet) can be collected.
- Maintenance cost is normal.

Disadvantages:

- High initial cost.
- Require high voltage.
- Collection efficiency reduces with time.
- Chances of explosion during collection of combustible gases or particulate matter.

- Require more space.

(v) Wet Collector or Scrubbers: It may be rectangular or cylindrical in shape. It is used to remove toxic gases (gaseous pollutants) as well as particulate matter present in smoke.

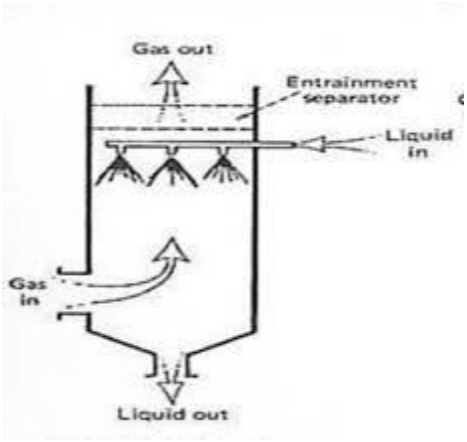


Fig: WET COLLECTOR

Advantages:

- Simultaneously removes particulate matter and gaseous pollutants.
- Corrosive gases can be recovered and neutralize.
- Cooled down the gases.

Disadvantages:

- Lot of waste water produced.
- High maintenance cost.
- Material (waste) collected is highly corrosive.

NOISE POLLUTION

Noise pollution, is also known as environmental noise or sound pollution,

A loud, unpleasant sound that causes discomfort is called noise.

The release of unwanted sound in the atmosphere is called noise pollution

Sources of noise pollution

There are many sources of noise pollution, but here are some of the main ones:

1. Traffic noise

Traffic noise accounts for most polluting noise in cities. For example, a car horn produces 90 dB and a bus produces 100 dB.

2. Air traffic noise

There are fewer aircraft flying over cities than there are cars on the roads, but the impact is greater: a single aircraft produces 130 dB.

3. Construction sites

Building and road construction works are very noisy.

4. Catering and night life

This includes noise from pubs and clubs.

5. Drivers honking the horn,

6. groups of workers drilling the road surface

7. various industries like textile mills, printing press, defence equipments etc.

8. domestic gadgets like mixer, coolers, exhaust fans etc

9. entertaining equipments eg radio, tv sets

10. use of crackers on festivals etc

UNIT OF SOUND

The unit of sound level is decibel(dB).

Noise level can range from 0 to more than 120 dB.

The intensity of normal sound is 35-60 dB.

A noise of 80dB or more may lead to hearing impairment whereas a noise above 140 dB becomes painful

ACCEPTABLE NOISE LEVEL

Acccording to CENTRAL POLLUTION CONTROL BOARD(CPCB) the acceptable noise levels for different locations are as follows----

Area code	**Type of area**	**Noise Level(dB)**	
		Day	**Night**
A	INDUSTRIAL	75	70
B	COMMERCIAL	65	55
C	RESIDENTIAL	55	45
D	SILENCE ZONE	50	40

EFFECTS OF NOISE POLLUTION

constant loud noise can damage human health in many ways, particularly in the very young and the very old. Here are some of the main ones:

Physical

Respiratory agitation, racing pulse, high blood pressure, headaches and, in case of extremely loud, constant noise, gastritis, colitis and even heart attacks.

Psychological

Noise can cause attacks of stress, fatigue, depression, anxiety and hysteria in both humans and animals.

Sleep and behavioural disorders

Noise above 45 dB stops you from falling asleep or sleeping properly. Loud noise can have latent effects on our behaviour, causing aggressive behaviour and irritability.

Memory and concentration

Noise may affect people's ability to focus, which can lead to low performance over time.

It is also bad for the memory, making it hard to study.

Sudden and high intensity sound level affects the nervous system.

CONTROL

Noise pollution can be effectively controlled by taking the following measures:

1. For people working in noisy installations, ear-protection aids like ear-plugs, ear-muffs, noise helmets, headphones etc. must be provided to reduce occupational exposure.

2. Designing, fabricating and using quieter machines to replace the noisy ones.

3. Proper lubrication and better maintenance of machines.

4. Installing noisy machines in sound proof chambers.

5. Covering noise-producing machine parts with sound-absorbing materials to reduce the noise production.

6. Using silencers to control noise from automobiles, ducts, exhausts etc. and convey systems with ends opening into the atmosphere.

7. Sound travels through the cracks that get left between the door and the wall. For reducing noise, this space (jamb frame gap) should be packed with sound absorbing material.

8. Planting green trees and shrubs along roads, hospitals, educational institutions etc. help in noise reduction to a considerable extent.

9. Strict legislative measures need to be enforced to curb the menace of noise pollution. Some of these measures could be:
(a) Minimum use of loudspeakers and amplifiers especially near silence zones.
(b) Banning pressure horns in automobiles.
(c) Framing a separate Noise Pollution Act.

IMPORTANT QUESTIONS

MCQ

1. What are the agents that bring about such an undesirable change (pollution) are called?
   a) Pollutants
   b) Haptens
   c) Adjuvants
   d) Vaccine
2. Which is the most widely used technique for removing particulate matter?
   a) Loudspeakers
   b) Growing trees
   c) Electrostatic precipitator
   d) Magnets
3. What is an undesired high level of sound called?
   a) Air

b) Music
c) Noise
d) Speakers

4. What amount of noise may damage eardrums thus permanently impairing hearing ability?
   a) 10 dB
   b) 150 dB
   c) 15 dB
   d) 50 Db

5. Why is CNG (Compressed Natural Gas) preferred over petrol?
   a) Burns most efficiently
   b) It is expensive
   c) Burns less efficiently
   d) Can be adulterated

6. Which of the following are sources to air pollution?
   a) Coal combustion
   b) Steel industries
   c) fertiliser manufacturing
   d) All of the mentioned

2 MARKS QUESTIONS

1. Define air pollution
2. Define noise pollution
3. Name some sources of air pollution
4. What is the audible range of sound?
5. Unit of sound is ----------.
6. Write 2 methods to control air pollution
7. What are biodegradable pollutants?

4 MARKS QUESTIONS

1. State some methods ro control noise pollution
2. What are the effects of air pollution on human health?
3. Explain The working of cyclone separator with diagram
4. Discuss the construction and working of electrostatic precipitator.

UNIT 3
WATER AND SOIL POLLUTION

Water pollution is defined as the presence of undesirable substances in water in such a quantity so as to constituted health hazard by lowering the water quality for making water unfit for use

IMPURITIES IN WATER :

1. Physical Impurities : Temperature, turbidity ,colour, suspended and floating matter
2. Organic Impurities
3. Inorganic Impurities
4. Pathogenic Impurities

SOURCES/CAUSES OF WATER POLLUTION

1. ***COMMUNITY WASTE WATER:*** It includes discharge from houses, industrial establishment to public sewage system. It is rich in organic matter. With increase in organic waste in water, bacteria multiply rapidly and use available oxygen. Lack of oxygen kills aquatic life and causes anaerobic bacteria to produce foul smelling gases.

2. ***INDUSTRIAL WASTE WATER***: It is the major source of water pollution. It includes the discharge from Industries like chemical industry, food processing industry, textile mills, Paper Mills, sugar mills, plastic industries oil refineries etc.
3. ***AGRICULTURAL SOURCES:*** Artificial fertilizers and pesticides are very common for the present day high yielding variety of crops. They also have become a potential source of water pollution. Many pesticides are non-degradable. They are absorbed by lower organism and are passed to higher organisms through food chain. At each stage of food chain, the concentration of these pesticides goes on increasing. This process is called Biological magnification.
4. ***UNDERGROUND WATER POLLUTION:*** Underground water is considered the safest source of water but now a days it is also becoming polluted in India at many places.The groundwater is contaminated due to the seepage from the industries, municipal waste effluents and agricultural waste water.

5. ***THERMAL POLLUTION*** : Thermal pollution of water is caused by the increase in temperature of water. Main sources of thermal pollution are thermal and nuclear power plants. In these plants, water is used as coolant. These plants

release hot water to the water sources. Sudden increase in the temperature is harmful for the fish and other aquatic life.

6. ***MARINE POLLUTION*** : Oceans are the ultimate sink of all types of pollutants. Rivers discharge their pollutants into the sea. The garbage of the coastal cities is also dumped into the sea. Other sources of marine pollution are discharge of oil from the oil refineries.

EFFECTS OF WATER POLLUTION ON HUMAN HEALTH

1.Water pollution contains pathogens like virus bacteria parasitic protozoans which are responsible for various water borne disease like typhoid Cholera
2. The consumption of highly contaminated water causes injury to the heart and kidney.
3. The heavy metals like lead and mercury present in contaminated water causes serious health problems.
4. Nitrates present in drinking water causes Blue baby syndrome.
5. Excess of fluoride in drinking water causes defects in teeth and bones.
6. Over exploitation of groundwater lead to leaching of arsenic from soil into the ground water. It causes diarrhoea and lung and skin cancer.

SOME IMPORTANT TERMS

DISSOLVED OXYGEN (DO): It is defined as the amount of oxygen present in the aquatic system that is available for aquatic life.

BIOCHEMICAL OXYGEN DEMAND(BOD): It is defined as the amount of oxygen required by aerobic microorganisms to oxidize the organic matter present in the water. Its unit is milligrams of oxygen per litre of water

CHEMICAL OXYGEN DEMAND (COD): It is defined as the amount of oxygen required by chemical oxidants to oxidize the organic matter present in water chemical. Generally COD of water is higher than BOD. so COD is a better way to measure water pollution.

STANDARDS OF WATER QUALITY FOR DOMESTIC USE

1.Temperature should be 10 degree Celsius to 15 degree Celsius
2. odourless
3. colourLes
4. There should not be any turbidity.
5. There should not be any objectionable taste.
6. Water should be free from micro organism.
7.Water should be free from E coli bacteria.

8.The total solids of water should be less than 500 PPM .
9. Hardness of water should be less than 350 PPM
10.PH value of water should be between 6.5 to 8.

STANDARDS OF WATER QUALITY FOR INDUSTRIAL SUPPLY

The quality of water required for industries depends upon the requirement of a particular industry but in general the industrial water is used for cooling purpose .So it need not to be of high quality.

The dissolved solids in cooling water may be up to 30 500 milligram per litre but it should be free from pollutants like bacteria and other microorganism and the pH of water should not be less than 7 so as to reduce the corrosion.

WATER TREATMENT water available by various sources contain impurities raw water found cannot be directly used for various purpose. so water must be treated before supplying it for domestic use. The removal of impurities of water for domestic and industrial use is known as water treatment.

OBJECTIVES OF WATER TREATMENT: The main objectives of water treatment are removal of various impurities from water so as to make the water of good quality.

1. The colour of water should be removed before applying it to public use.
2. To make water Pure by making it free from pathogenic germs.
3. To remove the objectionable odour and taste from water.
4. To make water fit for domestic use like cooking bathing washing
5. To remove the undesirable properties of water.
6. To give correct and adequate amount of dissolved oxygen to water.
7. To make water cool
8. To give a sparkling appearance to water

TREATMENT OF WATER

The treatment process depend on the impurities present in water for removing various types of impurities. Different treatment processes are used

1. ***SCREENING*** : Screening is used to remove the floating matter as leaves, dead animals from water. A protective device provided in front of pumps is called screen . The process of excluding the large sized particles with the help of screen is called screening. There are two types of screening
   coarse screening used to remove Very large sized materials from water
   fine screening used to remove small sized particles materials from water

2. ***PLAIN SEDIMENTATION*** : The process is used to remove the suspended particles from water by the action of gravity for example slit clay sand

3. ***SEDIMENTATION WITH COAGULATION :*** It is a process in which insoluble gelatinous precipitate is formed by adding some Chemicals known as coagulants for the removal of fine suspended matter from water.

4. ***FILTRATION*** : The process by which water is passed through the thick layers of sand and other granular matter for removing the microorganism and colloidal matter is known as filtration.

5. ***AERATION:*** The process of bringing the water in contact with air so as to remove carbon dioxide gas, its unpleasant taste and odour and adding oxygen to water is known as aeration.
6. ***WATER SOFTENING:*** This process is used to remove the hardness causing substances from water. for example, the Ion exchange method, lime soda method and reverse osmosis are used for the softening of water.
7. ***CHEMICAL TREATMENT***: This method is used to remove the harmful Chemicals both organic and inorganic from water. for example by adding potassium permanganate or chlorine into water.
8. ***DISINFECTION*** : The treatment of water with certain Chemicals to kill the pathogenic bacteria to make the water safe for use is called disinfection example, chlorination, ozonisation

SEWAGE TREATMENT

It is the artificial process by which the objectionable constituents of sewage can be removed to make the water soft.

It is of two types

1.primary treatment of sewage 2. secondary treatment of sewage

PRIMARY TREATMENT OF SEWAGE WATER: The treatment in which the mechanical principles are used for treatment is called primary treatment. The process can be described as

1. The sewage water taken for treatment is called influent
2. This influence is passed through the screens so as to remove large substances from the water.
3. It is passed through the grit chamber where the grit from water is removed.
4. Then the water is passed through the sedimentation tank. In this tank, suspended particles are separated from water. These suspended particles are called sludge.

5. The sludge is passed into the sludge digestion tank where it is digested by following process---- aerobic digestion, anaerobic digestion, incineration, composting
6. After this,Sludge is taken to the sludge drying tank.
7. Here, dried sludge is now disposed off
8. The water from the sedimentation tank is passed into the chlorine tank where chlorine is passed through water to remove the pathogenic microorganisms.
9. Now the water is known as Effluent and is passed into the rivers.

The benefits of primary treatment process are
i)disposal of the sewage is easy.
ii) removal of impurities does not cost much
iii) the process is highly efficient

SECONDARY TREATMENT OF SEWAGE WATER:

The treatment of water in which both mechanical and biological principles are used for water treatment is called secondary treatment of water.

The process involves following steps

1. Water taken for the treatment is known as influent.
2. The influent is passed through the screens so as to remove the large sized material from the influent.
3. It is then passed through the grit chamber where the grit from the influent is removed. Grit is the sand and gravel found in the influent.
4. Now it is passed through the primary sedimentation tank where the water is allowed to remain undisturbed for a few days. By this the insoluble impurities of water settle down.
5. Then the water is passed into the dosing tank. Here water is treated with the Chemicals so as to remove the microorganisms from it
6. Then the water is passed into the trickling filters. These filters are made up of the layers of stones, sand and gravel and also the cultures for biological media if any microorganisms present in water then it is removed here.
7. Now water is passed into the secondary sedimentation tank so as to remove any sludge particles present in water.

8. The sludge removed from primary and secondary sedimentation tank is taken to the sludge digestion tank where the sludge is digested by any of the the four methods aerobic digestion, anaerobic digestion, incineration, composting
9. Now this digested sludge is taken to the sludge digestion drying tank where with the help of air the sludge is dried. This dried sludge can be disposed off.
10. From the secondary sedimentation tank, water is taken into chlorine tank. In this tank, chlorine is passed into water to make the water was infected
11. Finally the water coming out of chlorine tank is known as Effluent. This Effluent is passed into the rivers.

SOIL POLLUTION

It is defined as

the build-up in soils of persistent toxic compounds, chemicals, salts, radioactive materials, or disease causing agents, which have adverse effects on plant growth and animal health.

Soil pollution is also caused by means other than the direct addition of man-made chemicals such as agricultural runoff waters, industrial waste materials, acidic precipitates, and radioactive fallout.

SOURCES OF SOIL POLLUTION

The major sources of soil pollution are as follow:

Industrial Wastes: Disposal of industrial wastes is the important source of soil pollution. Industrial pollutants are mainly discharged from chemical industries, sugar factories, tanneries, textile mills, steel industries, distilleries, pulp and paper mills, oil refineries, petroleum industries etc.

Thermal and atomic power plants also add pollutants to the soil.

Agricultural Wastes: Agricultural wastes are the common pollutants of soil pollution. Fertilizers, pesticides, insecticides, weedicides etc. cause soil pollution and adversely affect the physical, chemical and biological properties of soil.

Urban Wastes: Urban wastes consist of both commercial as well as domestic wastes which include plastics, glass, metallic cans, fibers, paper, street sweepings, leaves, rubbles etc. and contribute to soil pollution.

Radioactive Materials: Radioactive materials resulting from explosion in nuclear devices penetrate into soil and enter the food chain which cause detrimental effect on the body tissues. Hiroshima and Nagasaki, which were bombarded in Second World War, are good examples of radioactive soil pollution.

Biological Agents : Other important soil pollutants are biological agents which include biological organisms from human and animal excreta.

In addition to this, ***faulty sanitation and disposal of waste water*** cause soil pollution.

SOLID WASTE

Solid waste or refuse is the solid and semi solid waste arising from human and animal activities discarded as useless.

Higher standards of living of ever increasing population has resulted in the increase in quantity of solid waste. Solid waste has a great impact on the environment. Solid waste management aims at minimizing the adverse effect of solid waste.

TYPES OF SOLID WASTE:

(i) Municipal Solid Waste: Municipal solid waste consists of household waste, waste from streets and roads, sanitation residue, construction and demolition debris etc. With rising urbanization and standards of living, the amount of municipal solid waste is increasing rapidly. More than 70% of Indian cities lack adequate capacity to transport municipal solid waste and there are n sanitary landfills to dispose of the waste.

(ii)Household solid waste: Certain types of household wastes are hazardous which include expired medicines, medicine bottles, shoe polish, old batteries, paint tins etc

(iii) Industrial Solid Waste : Industrial solid waste may be defined as the solid waste generated by manufacturing processes. Industrial waste is generally considered hazardous as it may contain toxic substances. The major sources of industrial waste are thermal power plants which produce coal ash, sugar industries which produce mud, pulp

and paper, industries producing lime and fertilizer, intergrated iron and steel mills, metal industries etc.

(iv) Biomedical Solid Waste : Biomedical solid waste consists of waste released by hospitals, clinics, diagnostic centers etc. This type of waste includes cotton, syringes, bandage, glass bottles, plastic bottles, discarded medicines, anatomical and pathological waste etc

EFFECTS OF SOLID WASTE

Improper handling and transfer of solid waste cause ill effects on the environment and human health which are as follow:

1. Files breed on the refuse dump and solid waste which contaminate water and food. Contaminated water and food cause diseases like diarrhea bacillary dysentery etc.
2. Depending upon the solid wastes, rats may cause diseases like plague, trichinosis, salmonellosis, endemic typhus etc.
3. Perlocation of decomposed garbage dumps into soil cause pollution of land and underground water.
4. Smoke due to the burning of waste pollutes air.
5. Bad odour due to the decomposition of organic solid waste pollutes air.
6. Contaminated water supply may spread large scale epidemic of jaundice, cholera, gastroinstentinal diseases etc.

CONTROL OF SOLID WASTE

The main objective of solid waste control is to minimize the adverse effects of solid waste on the environment. The various steps involved are as follow:

1. ***Collection of solid waste*** : Collection of waste includes collection the waste, transporting it centralized location and then moving it to the of disposal.
2. ***Disposal of solid waste***: Before the final disposal of the solid waste, it is processed to recover the usable material and to improve the efficiency of the solid waste disposal system.
3. ***Utilization of Solid Waste*** : The solid waste can be properly utilized to obtain the benefits such As

(i) Conservation of natural resources.
(ii) Economic development.
(iii) Control of air pollution

SOLID WASTE DISPOSAL

The following methods may be adopted for disposing of the solid waste: 1. Landfilling, 2. Incineration, 3. Composting, 4. Pulverization, 5. Pyrolysis , 6.Disposal into sea

1. ***LANDFILLING*** : Landfilling is the most popular solid waste disposal method used today. Garbage is basically spreas out in thin layers, compresses and covered with soil or plastic foam.
   Advantages: (i) It is simple and economical.
   (ii) Segregation of waste is not required.
   (iii) Landfilled areas can be reclaimed and used for other purpose.

   Disadvantages : (i) Large area is required.

   (ii) Land availability is away from town, therefore, transportation costs are high.
   (iii) It causes fire hazard due to formation of methane in wet weather.

2. ***INCINERATION*** : In this method, solid waste is burnt in a furnace called incinerator.
   Advantages : (i) Residue is only 20-25% of the original solid waste and can be used as clinker after treatment.
   (ii) It requires very little space.
   (iii) An incinerator plant of 3000 tonnes capacity per day can generate 3MW of power.

   Disadvantages: (i) Its capital and operating cost is high.

   (ii) Operation needs skilled personnel.
   (iii) Formation of smoke, dust and ashes may cause air pollution and need further disposal .

3. ***COMPOSTING***: Due to lack of adequate space for landfills, bio-degradable waste is allowed to decompose in a medium designed for the purpose. Only bio-degradable waste materials are used in composting.
   Advantages: (i) Manure added to soil increases water retention and ion-exchange capacity of soil.
   (ii) This method can be used to treat several industrial solid wastes.
   Disadvantages : (i) Non- consumable materials have to be disposed off separately
   (ii) The technology has not caught farmers and hence does not has an assured market.

4. PULVERISATION: In this method, solid waste is pulverized in grinding machine to reduce its volume and physical character.

5. PYROLYSIS : In pyrolysis, chemical energy of some organic wastes is recovered by destructive distillation.

6. DISPOSAL INTO SEA : This method is used in coastal areas having deep sea water (>30m) at a reasonable distance (<10 to 20 km). It is a simple and cheap method , but has following ***disadvantages:***

(i) Light components of solid waste float on the water surface and tend to return to

shores during high tides.

(ii) Some portion of solid waste may return to the beaches despite all necessary

precautions.

E WASTE(ELECTRONIC WASTE)

E-waste means discarded electronic products such as computers, televisions, stereos, copiers, fax machines, cell phones etc.

E-waste, if not disposed off properly, can leach lead and other substances into soil and ground water. Many of these products can be reused, or recycled in an environmental friendly manner so that they are less harmful to the eco-system. Disposal of e-waste is a big problem across the globe.

Source of E-waste	Constituent	Health Effect
Mother-board	Beryllium (Be)	Lung, cancer, skin diseases such as warts.
Computer housing	PVC	Damage of immune system, reproductive and developmental problems
switches, PCBs	Mercury (Hg)	damage to brain, respiratory and skin disorders.
Chip resistors and semiconductors	Cadmium (Cd)	Toxic irreversible effect on human health, damage to kidney and liver.
Solder in PCBs, glass panels and computer monitors	Lead (Pb)	Damage to central and peripheral nervous system, blood system and kidney

IMPORTANT QUESTIONS

MCQ

1. What is the main reason for thermal pollution?
   a) Increase in the temperature of the ecosystem
   b) Increase in the chemical contains in water
   c) Hot water released by power plants and industries
   d) Pollution causing by vehicles
2. Which sewage contains biodegradable waste such as organic matter?
   a) Medical waste
   b) Plastic waste
   c) Domestic waste
   d) Wild waste

3. How is the amount of biodegradable organic matter in sewage water estimated?
   a) Chemical Oxygen Demand
   b) Physical Oxygen Demand
   c) Biological Oxygen Demand
   d) Mathematical Oxygen Demand
4. What do BOD and COD stand for?
   a) Biological Oxygen Demand and Chemical Oxygen Demand respectively
   b) Chemical Oxygen Demand and Biological Oxygen Demand respectively
   c) Botanical Oxygen Demand and Chemical Oxygen Demand respectively
   d) Basic Oxygen Demand and Chemical Oxygen Demand respectively
5. Which of the following undesirable and waste material is neither gas nor liquid?
   a) Water waste
   b) Oxygen
   c) Liquid waste
   d) Solid waste
6. Which of the following methods cannot be used for waste disposal?
   a) Dumping
   b) Gasification
   c) Incineration
   d) Open sea disposal

SHORT QUESTIONS (2 MARKS)

1. Give 2 examples of biodegradable waste.
2. Give 2 examples of non-biodegradable waste.
3. The process of burning the soild waste is called----------
4. The process of decomposing the bio degradable solid waste is called -----
5. The process of grinding the solid waste in a grinding machine to reduce its volume is called----------
6. The process of recovering the chemical energy of organic waste by destructive distillation is called----------
7. E waste means----------
8. Define solid waste
9. What are 2 types of solid waste on the basis of-------a. source b. nature
10. Define bio degradable solid waste
11. Define non-biodegradable solid waste

12. Define municipal solid waste
13. Define biomedical solid waste
14. State 2 examples of biomedical solid waste
15. Define E waste
16. Name some methods of solid waste disposal.(only name)

4 MARKS QUESTIONS

1. Explain incineration
2. Explain composting
3. Explain land filling
4. Explain pulverization
5. Write a short note on “Disposal into Sea”
6. What are the advantages of incineration?
7. Explain the disadvantages of incineration
8. Explain the advantages of land filling
9. Discuss the disadvantages of land filling
10. Write a short note on municipal solid waste
11. Discuss in brief – biomedical solid waste
12. What do you mean by industrial solid waste? Explain
13. Explain the ill effects of solid waste
14. What do you mean by E waste? What are the effects of e waste on human health? Explain
15. Explain the control measures of solid waste

UNIT 4

IMPACT OF ENERGY USAGE ON ENVIRONMENT

Global warming:

The phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries. Climate scientists have since the mid-20th century gathered detailed observations of various weather phenomena (such as temperatures, precipitation, and storms) and of related influences on climate (such as ocean currents and the atmosphere's chemical composition). These data indicate that Earth's climate has changed over almost every conceivable timescale since the beginning of geologic time and that the influence of human activities since at least the beginning of the Industrial Revolution has been deeply woven into the very fabric of climate change.

Causes Of Global Warming

Global warming occurs when carbon dioxide (CO2) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Normally, this radiation would escape into space—but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. That's what's known as the greenhouse effect.

Effects of global warming

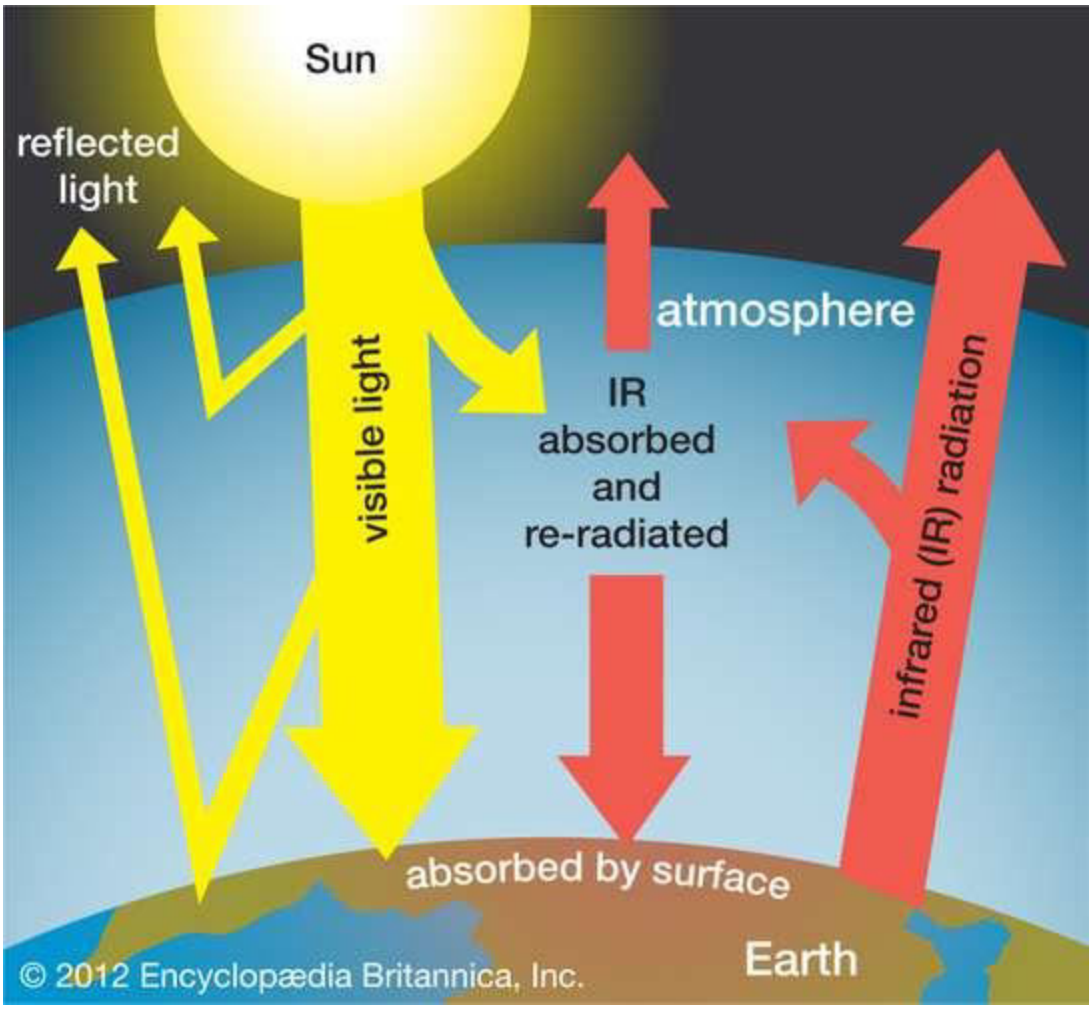
Following are the effects of global warming:

1. Melting glaciers, early snow melt, and severe droughts
2. more dramatic water shortages and increase the risk of wildfires

- Rising sea levels lead to coastal flooding on the Eastern Seaboard
- Forests, farms, and cities face troublesome new pests, heat waves, heavy downpours, and increased flooding.
- All these factors damage or destroy agriculture and fisheries.
- Disruption of habitats such as coral reefs drive many plant and animal species to extinction.
- Allergies, asthma, and infectious disease become more common

GREENHOUSE EFFECT

Greenhouse effect, a warming of Earth's surface and troposphere (the lowest layer of the atmosphere) caused by the presence of water vapour, carbon dioxide, methane, and certain other gases in the air. Of those gases, known as greenhouse gases, water vapour has the largest effect.



Greenhouse effect on Earth

Some incoming sunlight is reflected by Earth's atmosphere and surface, but most is absorbed by the surface, which is warmed. Infrared (IR) radiation is then emitted from the surface. Some IR radiation escapes to space, but some is absorbed by the atmosphere's greenhouse gases (especially water vapour, carbon dioxide, and methane) and reradiated in all directions, some to space and some back toward the surface, where it further warms the surface and the lower atmosphere.

The atmosphere allows most of the visible light from the Sun to pass through and reach Earth’s surface. As Earth’s surface is heated by sunlight, it radiates part of this energy

back toward space as infrared radiation. This radiation, unlike visible light, tends to be absorbed by the greenhouse gases in the atmosphere, raising its temperature. The heated atmosphere in turn radiates infrared radiation back toward Earth's surface. (Despite its name, the greenhouse effect is different from the warming in a greenhouse, where panes of glass transmit visible sunlight but hold heat inside the building by trapping warmed air.)

Although the greenhouse effect is a naturally occurring phenomenon, it is possible that the effect could be intensified by the emission of greenhouse gases into the atmosphere as the result of human activity.

From the beginning of the Industrial Revolution through the end of the 20th century, the amount of carbon dioxide in the atmosphere increased by roughly 30 percent and the amount of methane more than doubled.

This global warming could alter Earth's climates and thereby produce new patterns and extremes of drought and rainfall and possibly disrupt food production in certain regions.

DEPLETION OF OZONE LAYER

Ozone depletion consists of two related events observed since the late 1970s: a steady lowering of about four percent in the total amount of ozone in Earth's atmosphere (the ozone layer), and a much larger springtime decrease in stratospheric ozone around Earth's polar regions. The latter phenomenon is referred to as the **ozone hole**.

CAUSES: The main cause of ozone depletion and the ozone hole is manufactured chemicals, especially manufactured halocarbon refrigerants, solvents, propellants, and foam- blowing agents (chlorofluorocarbons (CFCs), HCFCs, halons), referred to as **ozone-depleting substances** (**ODS**). These compounds are transported into the stratosphere by turbulent mixing after being emitted from the surface, mixing much faster than the molecules can settle. Once in the stratosphere, they release halogen atoms

through photodissociation, which catalyze the breakdown of ozone (O_3) into oxygen (O_2). Both types of ozone depletion were observed to increase as emissions of halocarbons increased.

EFECTS: Ozone depletion and the ozone hole have generated worldwide concern over increased cancer risks and other negative effects. The ozone layer prevents most harmful wavelengths of ultraviolet (UV) light from passing through the Earth's atmosphere. These wavelengths cause skin cancer, sunburn, permanent blindness, and cataracts, which were projected to increase dramatically as a result of thinning ozone, as well as harming plants and animals.

RECYCLING OF MATERIAL

Recycling is the process of converting waste materials into new materials and objects. Recycling can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing: energy usage, air pollution (from incineration), and water pollution (from landfilling).

Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy. Thus, recycling aims at environmental sustainability by substituting raw material inputs into and redirecting waste outputs out of the economic system.

Recyclable materials include many kinds of glass, paper, cardboard, metal, plastic, tires, textiles, batteries, and electronics. Materials to be recycled are either delivered to a household recycling center or picked up from curbside bins, then sorted, cleaned, and reprocessed into new materials destined for manufacturing new products.

Recycling of a material produce a fresh supply of the same material—for example, used office paper is converted into new office paper. However, this is often difficult or too

expensive (compared with producing the same product from raw materials or other sources), so "recycling" of many products or materials involves their *reuse* in producing different materials (for example, paperboard) instead.

Another form of recycling is the salvage of certain materials from complex products, either due to their intrinsic value (such as lead from car batteries, or gold from printed circuit boards), or due to their hazardous nature (e.g., removal and reuse of mercury from thermometers and thermostats).

The construction industry may recycle concrete and old road surface pavement, selling their waste materials for profit.

Plastic recycling

Plastic recycling is the process of recovering scrap or waste plastic and reprocessing the material into useful products, sometimes completely different in form from their original state.

Chemical recycling

For some polymers, it is possible to convert them back into monomers, for example, PET can be treated with an alcohol and a catalyst to form a dialkyl terephthalate. The terephthalate diester can be used with ethylene glycol to form a new polyester polymer, thus making it possible to use the pure polymer again.

GREEN BUILDING

A ‘green’ building is a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment. Green buildings preserve precious natural resources and improve our quality of life.

There are a number of features which can make a building ‘green’. These include:

- Efficient use of energy, water and other resources
- Use of renewable energy, such as solar energy
- Pollution and waste reduction measures, and the enabling of re-use and recycling
- Good indoor environmental air quality
- Use of materials that are non-toxic, ethical and sustainable
- Consideration of the environment in design, construction and operation
- Consideration of the quality of life of occupants in design, construction and operation

1. Green building brings together a vast array of practices, techniques, and skills to reduce and ultimately eliminate the impacts of buildings on the environment and human health.
2. It often emphasizes taking advantage of renewable resources, e.g., using sunlight through passive solar, active solar, and photovoltaic equipment, and using plants and trees through green roofs, rain gardens, and reduction of rainwater run-off.
3. Many other techniques are used, such as using low-impact building materials or using packed gravel or permeable concrete instead of conventional concrete or asphalt to enhance replenishment of ground water.

Energy efficiency

Green buildings often include measures to reduce energy consumption – both the embodied energy required to extract, process, transport and install building materials and operating energy to provide services such as heating and power for equipment.

As high-performance buildings use less operating energy, embodied energy has assumed much greater importance – and may make up as much as 30% of the overall life cycle energy consumption.

Onsite generation of renewable energy through solar power, wind power, hydro power, or biomass can significantly reduce the environmental impact of the building. Power generation is generally the most expensive feature to add to a building.

Water efficiency

Reducing water consumption and protecting water quality are key objectives in sustainable building.

The protection and conservation of water of a building may be accomplished by designing for dual plumbing that recycles water in toilet flushing or by using water for washing of the cars.

Waste-water may be minimized by utilizing water conserving fixtures such as ultra-low flush toilets and low-flow shower heads.

The use of non-sewage and greywater for on-site use such as site-irrigation will minimize demands on the local aquifer.

Materials efficiency

Building materials typically considered to be 'green' include lumber from forests

rapidly renewable plant materials like bamboo and straw, dimension stone, recycled stone, recycled metal and other products that are non-toxic, reusable, renewable, and/or recyclable.

For concrete a high performance or Roman self-healing concrete is available.

The EPA (Environmental Protection Agency) also suggests using recycled industrial goods, such as coal combustion products, foundry sand, and demolition debris in construction projects.

CARBON CREDIT

A carbon credit is a generic term for any tradable certificate or permit representing the right to emit one tonne of carbon dioxide or the mass of other greenhouse gases equivalent to one tonne of carbon dioxide.

Carbon credit are a component of national and international attempts to reduce the growth of concentration of greenhouse gases.

A carbon credit can also be defined as " A certificate showing that a government or company has paid to have a certain amount of carbon dioxide removed from the environment."

The concept of carbon credits came into existence as a result of increasing awareness of the need of controlling emissions.

ADVANTAGES OF CARBON CREDIT :

1. Carbon credits help in reducing the amount of GHGs emissions in the atmosphere.
2. It is a new trade which not only helps in keeping the environment clean but also generate revenue.
3. Carbon credits helps in lowering the cost of renewable and low carbon technologies.
4. Because of carbon credits, the developed countries are assisting developing countries for the transfer of technology.

CARBON FOOTPRINT

A **carbon footprint** is the total greenhouse gas (GHG) emissions caused by an individual, event, organization, service, place or product, expressed as carbon

dioxide equivalent (CO_2e). Greenhouse gases, including the carbon-containing gases carbon dioxide and methane, can be emitted through the burning of fossil fuels, manufactured goods, materials, wood, roads, buildings, transportation and other services.

A carbon footprint is defined as the total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide (CO2).

The carbon footprint is a very powerful tool to understand the impact of personal behaviour on global warming.

Reducing carbon footprint is important because it mitigates the effects of climate change, which has a positive effect on public health and plant and animal diversity. In addition, this boosts the global economy and leads to innovative, more environmental-friendly solutions.

IMPORTANT QUESTIONS

MCQ

1. Which one of the following cause global warming?
   a) Carbon dioxide
   b) Oxygen
   c) Nitrogen
   d) Hydrogen
2. Which one of the following result takes place due to global warming?
   a) Maintaining steady temperature
   b) Changes in the rainfall
   c) Pleasant environment
   d) Causing less pollution

3. What is the main reason for melting of ice sheets?
   a) Increase in the oxygen content
   b) Global warming
   c) Decrease in carbon dioxide content
   d) Noise pollution
4. Which of the following chemicals are responsible for the depletion of the stratospheric ozone layer?
   a) Refrigerants
   b) Propellants
   c) Foam-blowing agents
   d) All of the mentioned
5. Carbon footprint can be measured by:
   a) Carbon dating
   b) Instruments
   c) Carbon accounting
   d) Formula
6. Which of the following can be recycled many times?
   a) Plastic
   b) Wood
   c) Organic materials
   d) Aluminum

2 MARKS QUESTIONS

1. Ozone layer in stratosphere is destroyed by--------
2. The UV radiations in stratosphere are absorbed by----------
3. Increasing skin cancer and high mutation rate are the result of ----------
4. Name 2 green house gases
5. Ozone layer exists in --------
6. What is the formula of ozone?

7. State 2 effects of global warming
8. Ozone layer occurs about ----- km above the surface of earth
9. What is the full form of ODS?
10. Give 2 examples of ODS
11. The process of converting waste materials into new materials is called-----
12. Glass can be recycled --------
13. Green building means----------
14. The full form of IGBC is----------
15. Define global warming
16. Define Green house effect
17. Components of 3R's hierarchy are---------
18. Define recycling
19. Name the layers of atmosphere.
20. Name the most recyclable metal
21. Define glass phalt
22. What is full form of CFC, HCFC
23. The thickness of ozone layer is ----------
24. ---------- is the most abundant green house gas
25. ---------- radiations are absorbed by CO2 gas
26. Define ozone hole
27. What is a green building?
28. 3rd component of 3R's hierarchy is ----------
29. Name the 3rd most recyclable metal
30. Name the components of green building

4 MARKS QUESTIONS

1. Define ozone layer depletion
2. Write 5 advantages of recycling
3. Write 5 disadvantages of recycling
4. What are the types of acid rain?Define them
5. What are the effects of global warming?(any 5)
6. What are the benefits of green building?
7. What are the harmful effects of acid rain?

8. How can we control acid rain?
9. What are the effects of ozone layer depletion?
10. What is the solutions of ozone layer depletion?

UNIT 5

DISASTER MANAGEMENT

The term disaster owes its origin to the French word “Desastre” which is a combination oftwo words ‘des’ meaning bad and ‘aster’ meaning star. Thus the term refers to ‘Bad or Evilstar’.

Disaster is sudden events, such as floods, earthquakes, cyclones, accidents, droughts, epidemics and events of disruption or blasts caused by use of weapons of mass destruction that cause death and damage to property.

Examples of natural disasters are floods, earthquakes, cyclones and droughts which occur with little or no human intervention. *Human made disaster* include train accidents, plane crashes, industrial or nuclear accidents, biological disasters, terrorist attack and use of weapons of mass destruction.

TYPES OF DISASTER

Natural Disasters

Floods

Floods occur when a sudden influx of water submerge area of land, causing danger to life and property of people in that area. The most common types of a river overflow its banks and the water spreads on the surrounding land.

It is also being caused due to blocking of river channels due to landslides, strong tides and storms in sea, change in the course of river, deforestation, etc.

Floods may occur gradually, within a few hours or suddenly at times. Most floods are seasonal, occurring during the rainy seasons.

In India, floods frequently occur in Ganga plains, in the Brahmaputra basin in Assam and in deltas of the rivers Mahanadi, Godavari, Krishna and Kaveri.

Cyclones

A cyclone is a large rotating storm that forms over warm water. Strong winds blown from all directions towards the center, in a spiral motion.
When a cyclone hits, it brings along heavy rains winds and storm surges strong enough to destroy building and uproots trees.

Earthquakes

The sudden vibration of the Earth's crust, causing a part of the Earth's surface to shake, is called earthquake.

The point inside the earth from where the vibrations originate is called seismic focus.

The point on the Earth's surface that is directly above the focus is called the epicenter of the earthquake.

The instrument that records and measures the vibrations of an earthquake is called a seismograph.

The magnitude or intensity of earthquake is measured by the Richter Scale. Earthquake of magnitude 7 or above are very destructive and cause severe damage to life and property.

Earth's quake are caused by internal force of the earth , like the movement of molten rock beneath the earth's crust and movement of tectonic plates. They may also occur at the time of volcanic eruptions.

Landslide

The term 'landslide' includes all varieties of mass movements of hill slopes.

It can be defined as the downward and outward movement of slope forming materials such as rocks, soils, artificial fills .

Causes of Landslides:

There are several causes of landslide. Some of the major causes are as follows:

- Weakness in the composition and structure of rock or soil may cause landslides.
- Erosion: Erosion of slope due to cutting down of vegetation, construction of roads.
- Intense rainfall: Storms that produce intense rainfall for periods as short as several hours. Heavy melting of snow in the hilly terrains also results in landslide.
- Human Excavation of slope, loading of slope , mining, deforestation, irrigation, vibration/blast.
- Earthquake shaking has triggered landslides in many different topographic and geologic settings.

- Rock falls, soil slides and rockslides from steep slopes involving relatively thin or shallow disaggregated soils or rock.

- Volcanic eruption: Deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion

Man Made Disaster

Human-made disasters are a result of human action and cause immeasurable loss and suffering to human lives and destruction to the environment around them. These disasters are also called anthropogenic disaster.

Fire-Related Disaster

Fire accidents are mostly caused by faulty electrical wiring, gas leakage or human negligence. Electricity wires and gas pipelines in homes and building should be checked regularly to avoid short-circuit in case of wires and leakage in case of gas. Human negligence usually refers to carelessness on the part of humans to not get electrical switches or gas stoves checked, or most importantly , to carelessness throw matches and cigarettes without putting them off first.

Industrial Pollution

Any form of pollution that can trace its immediate source to industrial practices is known as industrial pollution. Most of the pollution on the planet can be traced back to industries of some kind.

Industrial pollution contaminates several sources of drinking water, releases unwanted toxins into the air and reduces the quality of soil all over the world.

Major environmental disaster has been caused due to industrial mishaps, which have yet to be brought under control.

Industrial pollution is wreaking havoc on Earth. The activities causing pollution include:

- Burning coal
- Burning fossil fuels like oil, natural gas, and petroleum
- Chemical solvents used in dyeing and tanning industries
- Untreated gas and liquid waste being released into the environment
- Improper disposal of radioactive material.

Nuclear Disaster

- Nuclear radiations are the energy released from radioactive element such as uranium and plutonium. While nuclear energy is used as resource to produce power and electricity, exposure to nuclear radiations can be extremely dangerous and can cause irreversible harm to body.
- It is considered as most devastating disaster as it causes widespread loss to life and property.
- Nuclear accidents occur when a nuclear core damaged and significant radiations are released into the atmosphere.
- In 1986, there was an explosion at the Chernobyl nuclear plant, releasing a large quantity of radioactive particles into the atmosphere, killing a large number of peoples- about thirty peoples died immediately inside the plant of Ukraine and more afterwards. More than 20,000 people had to be relocated, over half a millions peoples suffered from long –term effect of radiations, through diseases such as cancer, which is currently still being investigated. The area near the plant remains uninhabitable till date.

- ## Biological Disaster

  A biological disaster is a calamity that causes widespread illness and death among humans and animals when they come into contact with biological perils in the form of live microorganisms such as bacteria, viruses, fungus, and other microbes.
- Biological Disasters can take the following forms:
- Epidemic: Epidemics impact a disproportionately large number of persons within a group, community, or area at the same time. Examples include Cholera, Plague, Japanese Encephalitis (JE), and Acute Encephalitis Syndrome (AES).
- Pandemic: A pandemic is an outbreak of existing, new, or reemerging illnesses and pestilences that spreads across a broad territory, such as a continent or even the globe. Examples include Influenza H1N1 (Swine Flu) and COVID-19.

ACCIDENTS

Accident is any undesired event resulting in personal injury and/or property damage and/or equipment failure.

An Accident "An unplanned, uncontrolled event which has led to or could have led to injury to people, damage to plant, machinery or the environment and some other loss."

Direct Causal agents of accident are classified according to the following:

- Energy Sources includes Mechanical; Electrical; Thermal; Chemical; and Radiation
- Hazardous Materials: includes Compressed or Liquefied gas; Corrosive material; Flammable material; poison; oxidizing material; and dust.

IndirectCauses are

- Unsafe Acts: failure of PPE, secure protective gears; ignoring defects; improper positioning or handling/use; unauthorized operations; and drug/substance abuse.
- Unsafe conditions: congested space/area; defective tools/machines; inadequate/poor visualization, ventilation, illumination, support; and distraction.

Air Accident

An aviation Accident/Air Accident is defined an occurrence associated with the operation of an aircraft.

SeaAccident

Sea accidents can also be referred to as water accidents. In other words it means accidents that caused at sea by the action of the factors, rather than by the failure to exercise good handling, working or navigating of a ship.

RailAccident

Major classification of Rail Accident is

- Accidents caused by the Locomotive.
- Those resulting from bad condition of the track or of the rolling stock.
- Those which arise from neglects of the rules for running the train.
- Those due to imprudence on the part of passengers or employees.

RoadAccident

Road accidents are shockingly not mostly due to ignorance, but are due to carelessness, thoughtlessness and over confidence. Human, vehicle and environmental factors play roles before, during and after a trauma event.

Causes

- Human Factors(drivers, riders and Pedestrians):this includes attitude ;distracted driving; speeding; drunk driving; and reckless driving.
- Structural Factors: automobile faults; poor roads; and deadly curves
- Environmental factors

Structural Failure (Building and Bridge)

- Some of the biggest and most expensive transportation projects in the world have involved building bridges. Bridges are crucial links that carry cars, trucks and trains across bodies of water, mountain gorges or other roads. As a result, they are one of the most important aspects of civil engineering and are subject to intense scrutiny, especially when they collapse.

- Bridge collapses can be tragic events, leading to loss of life and serious property damage. That's why bridge engineers, designers and builders must always take their jobs very seriously. The best way for them to prevent these accidents is to understand why bridges collapse in the first place. Understanding bridge collapses can lead to major changes in the design, construction and safety of future building projects. The following are main reasons why bridges fall.

War

- War is an intense armed conflict between states, governments, societies, or paramilitary groups such as mercenaries, insurgents, and militias. It is generally characterized by extreme violence, aggression, destruction, and mortality, using regular or irregular military forces
- Major causes of war can be found in man's psychological nature. Such psychological approaches range from very general often merely intuitive assertions regarding human nature to complex analyses utilizing the concepts and techniques of modern psychology.

Terrorism

- Terrorism is a serious problem in the modern world. It has been defined as the illegal or unauthorized use of violence, intimidation an exploitation of human fear of political groups, which are driven by their own political, social and religious interests, to help them achieve these goals. Bomb blasts, mass shootings and use of sheer violence are their method of operations.

Disaster Preparedness Plan

- **Prediction And Warning**
- Good predictions and warnings save lives .With only a few minutes notice of a tornado or flash flood, people can act to protect themselves from injury and death. Predictions and warnings can also reduce damage and economic losses.
- A concerted effort is needed to improve networks and the content of warning

messages.

PREDICTION

A program for enhancing the nation's capability to predict atmospheric, hydrologic, and geological hazards should include:

1.Modernization of the weather prediction system.

2.Research to improve the prediction of atmospheric and hydrologic hazards.

3. Research on the impacts of disasters on natural resources.

4.Expanded earthquake monitoring and research.

5.Monitoring of volcanoes

WARNING

A program for enhancing the nation's capabilities for the dissemination of warnings should include:

1.Public private partnerships for dissemination of warnings.

2.New technologies for dissemination of warnings.

3.Research on behavioral response to warnings.

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4.Research on appropriate responses on warnings.

5.Improving the transmission of warning messages.

Safety Measures on Disaster Management

Geological effects such as earthquake, landslides, Floods and natural calamities such as cyclones, drought is widespread in today's earth. All of these natural disaster result in disastrous impact that affects not only the plants but on human civilization residing in it, Generating awareness and safety measure of disaster management is essential step that country and its people can take.

Preventive Measures of Disaster

Although natural disaster and calamities cannot be prevented, there are many ways by which one can be made aware of them. If a community starts spreading awareness of the disaster, then people will get an idea about the destruction.

- Talk with your local emergency response team. These people are aware of the effects of the disaster and can help the citizens of the local community of organize help and relief accordingly.

- Keep an emergency kit ready at all costs. Make sure the emergency kits supplied are large enough for every family member. Some families have more members than others. In such a case, it is best to keep different sets of emergency kits handy.

- Arrange workshop on preventive measures of disaster all year round. This will not only improve the planning process but also keep everyone ready for the main event.

- Make the citizens aware of the evacuation routes and gives them all the necessary emergency numbers. Get the local media and other news agencies to work for your cause. I kept updating the citizens every month about the different preventive measures of disaster.

- School radio stations can organize monthly workshops to make the children aware of the situation and spread sufficient awareness.

- Handing out leaflets and brochures that talk about disaster management is a must.

Safety Measure During Floods

Safety measures during floods that should be allowed by one and all are:

- Stay away from water clogged streets: Death due to drowning is a primary health hazard during floods. Without being sure of the depth of water, try not to walk through water clogged streets. During flash floods, make sure you use a stick before stepping into the water.

- Stay away from electrical wires: Electrocution is a significant killer during floods. As current can flow through water, several loose wires lying here and about during tides can cause death. It is best to shut down the main lines during heavy rainfall. Following these safety measures during floods will reduces harm to humans.

Safety Measures during Cyclones

Safety measures during cyclones that should be followed are:

- Keep your emergency kits ready and handy.
- Make sure you have kept your phones and other necessary electronic devices charged.
- Keep candles ready in case the electrical power is cut off.
- Repair your roof shed of tiles. Try not to keep any loose debris lying about.
- Tie loose poles and rods with ropes before the storm hits.

Psychological Response and Managment

Trauma:

Trauma is a Greek word, the original meaning of trauma is wound or damage to body tissue. Trauma is a powerful shock that may have long lasting effect. Accidents, explosion, fires, plane crashes, earthquakes, tornadoes etc.are such terrifying experiences that not only affect the people physically but mentally hurt them as well. Other events such as the sudden loss of loved ones, social disgrace or severe financial losses may also prove extremely traumatic. Trauma is a condition in which individual's physiological, psychological and emotional state get disturbed.

Stress

Stress is pressure or strain.

In other words, it is the body's response to a situation or an environment that is unwelcome, unwarranted, unconquerable and unplanned. Scientific evidences states that when one is experiencing stress, the brain produces high levels of two specific hormones–adrenalin and cortisol–produced by the hypothalamus.According to psychological viewpoint, stress refers to be in a state of imbalance within an organism.

Rumour

Rumour is a false story that is passed from mouth to mouth from one person to another. People used rumour as a tool in their own interest. Rumour may be related with a persons, incidence or group. Rumour is generally based on half truth floats from one person to another. As it travels from person to person its forms change completely. Everybody try to add something more as per his wishes, motives and interest. Emotiona lelements are there in rumour; therefore, people do not think logically and accept the heard story.

Panic

Panic is the situation when people feel that there may be a possibility for any disaster like - earthquake, flood, drought, their behaviour change completely. They become active for their future days. Behaviours such as shifting to safe places, storage of food etc. may be seen. People feel restless and panic. In panic external behaviour of the person changes as well as functions of internal organs also change. Sympathetic nervous

system becomes more active. But in panic people cannot stay longer. To maintain the mental equilibrium situation must be managed properly. Sotha tpeople may live healthy and happy life.

IMPORTANT QUESTIONS

MCQ

1. The Chernobyl disaster was a

a. Fire-related disaster b. Nucleardisaster c. Chemical disaster d. Biological disaster

2. The point inside the earth where vibrations originates is called

a. Epicentre b. Seismic focus c. Seismograph d. Magnitude

3. This can prevent drought.

a. Rainwater harvesting b. deforestation c. washing water d. none of the above

4. A large rotating storm

a. Cyclone b. Flood c. Earthquake d. Tsunami

5. The range of Richter Scale is

a. 0 to 5 b. 0 to 7 c. 0 to 9 d. 0 to 11

2 MARKS QUESTIONS

1. The most important cause of drought is scarcity of _____.
2. _____ are events of destructions that cause loss to life and damage to property.
3. The toxic gas released at the Bhopal gas tragedy occurred in the year_____.
4. The point on the Earth's surface, which is directly above the focus, is known as_____.
5. _____ is the proper and efficient handling of disaster –affecting regions.

4MARKS QUESTIONS

1. What are the possible consequences of chemical disaster?

2. What precautions need to be taken, when we are indoors during an earthquake?

3. What is nuclear disaster?

4. What are the causes of drought?

5. What is cyclone? Mention the steps of precautions required to minimize the impact of cyclone.

6. Prepare the chart showing 'do s' and don'ts's' at the time of earthquake.

7. Explain how human beings too are responsible in creating disaster like situations. Give examples.