

UNIT- I
PART A

1. Define Ecosystem.

Ecosystem has been defined as a system of interaction of organisms with their surroundings. Numerous dynamic interactions are occurring within an ecosystem and these are complex. Always alterations to the biotic and Abiotic components are happening within the ecosystems.

2. Enumerate some characteristics of an Ecosystem.

- Ecosystem is the major ecological unit.
- It contains both biotic and abiotic components.
- Through the biotic and abiotic components nutrient cycle and energy flow occur.
- The boundary of the ecosystem is not rigidly defined and it is flexible.
- The function of ecosystem is related to the cycling of materials and flow of energy.

3. Classify the Ecosystem.

The ecosystem can be generally classified into three types.

- Natural Ecosystem;
- Artificial Ecosystem;
- Incomplete Ecosystem

4. What are the functional components of ecosystem?

Biotic and Abiotic are the components of eco system

5. Define heterotrophs.

Those organisms which depend on others (Producers-Autotrophs) for their energy requirements are known as Consumers or Heterotrophs.

6. Name the types of consumers.

1.Herbivores (or) Primary Consumers; 2. Carnivores (or) Secondary Consumers 3.Omnivores (or) Tertiary Consumers

7. Define Food chain and Food web.

A food chain is a picture or model that shows the flow of energy from Autotrophs to a series of organisms in an environment. The energy that it flows can be different for each food chain. The relationships between the components of the food chain are very complex. The network like interaction of organisms is called as food web.

8. What are Decomposers?

The organisms which breakdown the complex compounds into simple products are called as decomposers or reducers.

9. What are the factors to be considered in Abiotic eco system?

Climatic factors, Physical factors and Chemical factors.

10. Define biogeochemical cycle.

Two types of biogeochemical cycles are 1. Gaseous Cycle (Eg. N₂ and O₂ cycles);
2. Sedimentry Cycle (Sulphur and Phosphorus cycles)

11. List some examples for Autotrophic succession.

Autotrophs are nothing but producers which synthesize their food through photosynthesis. E.g: All green plants and trees

12. What is Nitrogen fixation?

Hydrogen bonding of water molecule is defined as the bonding developed between the positive hydrogen end of one molecule and the negative lone pair of another water molecule. Four hydrogen bonds are formed around each and every water molecules.

13. Define the term Nitrification.

The process of converting the free nitrogen gas available in the atmosphere into compounds of nitrogen is called as nitrogen fixation.

14. What do you mean by Denitrification?

The process of converting ammonia into nitrites with the help of nitrosomonas bacteria, and nitrites into nitrates with the help of nitrobactor bacteria is called as nitrification.

15. Define Biome.

Biome is defined as a major ecological community of organisms occupying in a larger area.

16. What is a hazard? What are its types?

A hazard is something which causes a danger or risk to somebody. Its major types are physical hazard, chemical hazard, and biological hazard.

17. What is a biological hazard?

Biological hazards come from working with animals, people or infectious plant materials. Work in day care, hospitals, hotel laundry and room cleaning, laboratories, veterinary offices and nursing homes may expose you to biological hazards.

18. What are the methods by which nitrogen fixation takes place in the nature?

Natural nitrogen fixation can be obtained from lightening of clouds and bacteria and fungi present in soil and water. Artificial fixation of nitrogen is obtained with the help of fertilizer of fertilizer industries, which convert the atmosphere nitrogen into ammonia.

19. What are the two types of ecological succession?

- (i) Primary ecological succession comprising of Hydrarch (Hydrosere) and Xerarch (Xerosere) and
- (ii) Secondary succession involving establishment of biotic communities.

20. Define Primary and secondary succession.

(i) Primary ecological succession comprises of Hydrarch(Hydrosere – establishment starting in a watery area like pond and lake) and Xerarch (Xerosere – establishment starting in a dry area like, desert and rock) and (ii) Secondary succession involving establishment of biotic communities in an area, where some types of biotic community is already present.

21. What are the forces involved in succession?

Nudation, Invasion (Migration & Establishment), Competition, Reaction and Stabilization

22. What are the classifications of biotic components of ecosystems?

Producers, Consumer and Decomposers are the biotic components of an ecosystem

23. How does a Biome differ from an ecosystem?

Biome is defined as a major ecological community of organisms occupying in a larger area.

24. What are the types of grassland ecosystem?

- a) Savannah ecosystem, b) Forest ecosystem and c) Tundra ecosystem

25. Give the characteristic features of grassland ecosystem.

Plants(Producers) → Rat (Primary consumer) → Snakes(secondary consumer) → Eagles(Tertiary consumer)

26. What is the structure & function of grassland ecosystem?

Structure and function of grassland ecosystem.-Abiotic- C,H,O,N,P,S etc – supplied by rates, nitrates, phosphates and sulphates. Biotic- producers – grasses, forbs and shrubs, consumers–cows, cows, buffaloes, deer, sheep, decomposers – fungi and bacteria.

27. What are the different types of desert ecosystem?

Different types of desert ecosystem – Tropical – characterized by only few species, Temperate – characterized by hot summer and cool winter and cold – characterized by cold winters and warm summers

28. Give the characteristic features of desert ecosystem.

Characteristic of desert eco system: 1. Desert air is dry and the climate is hot, 2. Annual rainfall is less than 2.5 cm.; 3. The soil is very poor in nutrients and organic matter and 4. Vegetation is very poor.

29. What is the structure & function of desert ecosystem?

Structure & function of desert ecosystem- Abiotic – temperature, rainfall, sunlight, water, Biotic – producers – shrubs, bushes, grasses, consumers – squirrels, mice, foxes, decomposers – fungi and bacteria.

30. What are the different types of aquatic ecosystem?

Different types of aquatic ecosystem – Fresh water – pond, lake and river and salt water – ocean and estuarine.

31. What is the structure & function of aquatic ecosystem?

Structure and function of aquatic ecosystem

Pond – is temporary, only seasonal, stagnant Fresh water body, gets polluted easily due to limited amount of water. Abiotic – temperature, light, water, organic and inorganic compounds. Biotic – producers – green photosynthetic organisms, consumers – protozoa, small fish, ciliates, flagellates, decomposers – fungi, bacteria and flagellates.

Lakes–natural shallow water bodies, supplied with water from rainfall, snow and streams, helps in irrigation and drinking. Abiotic – temperature, light, proteins and lipids, turbidity, oxygen and carbon dioxide. Biotic – producers – phytoplankton, algae, flagellates, Consumers – protozoans, insects, small fishes, large fish, decomposers – bacteria, fungi and actinomycetes.

River – fresh and free flowing water system, deposits large amounts of nutrients, Abiotic –

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temperature, light, ph nutrients, organic and inorganic compounds, Biotic – producers – phytoplanktons, algae, grasses, consumers – insects, fishes, birds, mammals, decomposers–bacteria and fungi.

32. What are producers?

Producers are organisms, like green plants, that produce organic compounds from inorganic compounds. These are also a type of autotroph. Then green plants, for example, are eaten by consumers in this case, grazing animals like the zebra.

33. What are consumers?

Consumers are organisms, which cannot prepare their own food and depend directly or indirectly on the producers. E. g. Insects, rabbits, Fish, lions

34. Define decomposers and give their signification.

A decomposer is an organism of decay. These are also called saprobes. They break down the remains of dead animals and plants, releasing the substances that can be used by other members of the ecosystem.

35. What do you understand by Eutrophic lakes and Dystrophic lakes?

Eutrophic lakes are those lakes which are overnourished by nutrients like N and P

36. Give the characteristic features of an Estuarine system.

1. They are transition zones strongly affected by tides of the sea, 2. Water characteristics are periodically changing, 3. living organism have wide tolerance and 4. Salinity remains highest in summer and lowest during winter.

37. Name the 4 ecosystems.

Forest, grassland, desert and pond

38. What are the 4 kinds of diversity?

4 kinds of biodiversity – species, genetic, community or ecosystem

39. Write a note on measuring diversity.

Note on measuring diversity.- based on spatial distribution – 4 types – point richness, alpha, beta, gamma diversity.

40. Why is Biodiversity rich in tropics?

Biodiversity is rich in tropics.- more stable climate, warm temperatures and high humidity, opportunity for many species to coexist, rate of out crossing appear to be higher in tropics.

41. What is the significance of Biodiversity?

Significance of biodiversity. – very important for human life, as we depend on plants, microorganisms, animals for food, medicine and industrial products., protects fresh air, clean water and productive land., important for forestry, fisheries and agriculture.

42. What is species & Genetic diversity?

Species and genetic diversity- species – discrete group of organisms of the same kind – diversity between differed species., genetic – species with different genetic characteristics.

43. What are the values of biodiversity?

Values of biodiversity – consumptive, productive, social, ethical, aesthetic and optional

44. Give some medicinal values of biodiversity.

Medicinal values of biodiversity – around 70% are derived from plant and plant extracts. Egs – penicillin, quinine etc.

45. Give some commercial values of biodiversity.

Commercial values of biodiversity – these products are marketed and sold, derived from plants and animals. Egs – silk – silk worm, wool – sheep, leather – all animals, wood – pulp and paper industry, cotton – textile industry, etc.

46. What do you understand by α , β & γ diversity?

Alpha, beta and gamma diversity – alpha – refers to number of species found in a small homogeneous area, beta – refers to rate of change of species composition across different habitats, gamma – refers to rate of change across large landscape.

47. What steps can be taken to conserve biodiversity?

Steps to conserve biodiversity – adequate crop and cattle compensation, solar powered fencing, changes in cropping pattern, adequate food and water for all animals, developmental and constructional work in and around forest region must be stopped.

48. Define biodiversity.

Biodiversity is defined as ‘the variety and variability all groups of living organisms and the eco system in which they occur.

49. Enumerate human activities which destroy biodiversity.

Human activities destroy biodiversity – farmers prefer hybrid seeds – many plants become extinct, for production of drugs the pharma companies collect wild plants – become extinct, tropical forests – main source – disappearing due to agriculture, mining and logging.

50. What do you understand by habitat loss?

The loss of population of interbreeding organisms is caused by habitat loss. It threatens wide range of animals and plants.

51. What are the factors influencing habitat loss?

Factors influencing habitat loss- Deforestation, Destruction of wetlands, Habitat fragmentation, Usage of hybrid seeds, Usage of wild plants for medicinal productions without replenishing their growth, Illegal trade and developmental activities

52. What is poaching?

Poaching – killing of animals or commercial hunting – leads to loss of animal biodiversity.

53. What are the factors influencing poaching?

Factors influencing poaching – human population and commercial activities

54. Write a note on man – wild life conflict.

Man–wildlife conflict–arise when wild life starts causing immense damage and danger to man.

55. What are the factors influencing man – animal conflicts?

Factors influencing man–wild life conflict–shrinking of forest cover, human encroachment into forest, injured animals attacking man, of electric wiring around crop fields, etc.

56. What steps can be taken to conserve biodiversity?

1. In-situ conservation and 2. Ex-situ conservation

57. What do you understand by Global biodiversity?

Global biodiversity- total number of living species in the world is about 20 million, 1.5 million are found, tropical deforestation is reducing biodiversity by 0.5 % each year.

58. What are the hot spots of biodiversity?

Hotspots of biodiversity – geographic areas which possess high endemic species.

59. What are the threats to the Indian biodiversity?

Threats to Indian biodiversity- deforestation, destruction of wetlands, habitat fragmentation, raw material, production of drugs, illegal trade and developmental activities.

60. What do you understand by endangered species and endemic species?

Endangered and endemic species – Endemic - species which are found only in a particular region. species is said to be threatened or endangered when its number has been reduced to a critical level. Unless it is protected and conserved it is in immediate danger of extinction.

61. Explain threatened and endangered species.

Threatened and endangered species. –species is said to be threatened or endangered when its number has been reduced to a critical level. Unless it is protected and conserved it is in immediate danger of extinction.

62. Define Environment.

The physical, chemical and biological presence of living and non-living things outside an individual species is called as its environment.

63. Define the term Environment with reference to ISO 14001.

According to ISO 14001, environment can be defined as, "surroundings in which an organization operates- air, water, land, natural resources, flora, fauna, humans and inter relation".

64. What are the two categories of environments?

Biotic environment & Abiotic environment

65. Name the components of environment.

Air (Atmosphere), Land (Lithosphere) and Water (hydrosphere)

66. Write the composition of air in % by weight.

Nitrogen-75.54%; Oxygen-23.14%; Argon-1.27% ; CO₂ - 0.03%; Miscellaneous -0.02%

67. What are gases present in the air?

Nitrogen, oxygen, Argon, Carbon dioxide, hydrogen, helium, ozone, radon, neon, krypton, xenon, Sulphur dioxide, ammonia, methane, hydrogen sulphide, etc

68. Name the various layers of atmosphere.

Troposphere; Stratosphere (Ozonosphere); Mesosphere; Heterosphere (Thermosphere); Exosphere

69. Define the term Lithosphere.

The solid component of Earth is called lithosphere.

70. Explain Biosphere.

The biological environment where the living organisms live and interact with physical environment is called biosphere. It is the component of the earth which involves all the living constituents such as birds, animals, plants etc. It supports various eco systems

71. Define Environmental Science.

Environmental is the study of environment , its biotic and abiotic components and their interrelationship.

72. List the four conceptual spheres in the Earth's environment.

Crust, Mantle, Outer core and Inner core.

73. Differentiate between in-situ and ex-situ conservation of biodiversity.

In-situ conservation: wild life can be allowed to flourish in their own environment-promotes genetic diversity

Ex-situ conservation: animals would be properly taken care- food, shelter and water- help in the flourishing of endangered species- possible the gene pool could stagnate and result in no genetic diversity taking place.

74. Differentiate food chain and food web with suitable examples. (MAY/JUNE 2013) (NOV/DEC 2013)

Food Chain : A food chain is a picture or model that shows the flow of energy from Autotrophs to a series of organisms in an environment. A food chain only follows just one path as animals find food.eg: A hawk eats a snake, which has eaten a frog, which has eaten a grasshopper, which has eaten grass.

Grass ----> Grasshopper ----> Frog ----> Snake ----> Hawk

Food web : A food web is several food chains connected together. A food web shows the many different paths plants and animals are connected.
eg: A hawk might also eat a mouse, a squirrel, a frog or some other animal. The snake may eat a beetle, a caterpillar, or some other animal. And so on for all the other animals in the food chain.

75. Define Ecological succession. (NOV/DEC 2013)

"Ecological succession" is the observed process of change in the species structure of an ecological community over time. Within any community some species may become less abundant over some time interval, or they may even vanish from the ecosystem altogether. Similarly, over some time interval, other species within the community may become more abundant, or new species may even invade into the community from adjacent ecosystems. This observed change over time in what is living in a particular ecosystem is "ecological succession".

76. Mention the abiotic components. (MAY/JUNE 2013)

Physical and Chemical components such as climatic factors, edaphic factors, geographical factors, energy, nutrients and toxic substances constitute the abiotic structure.

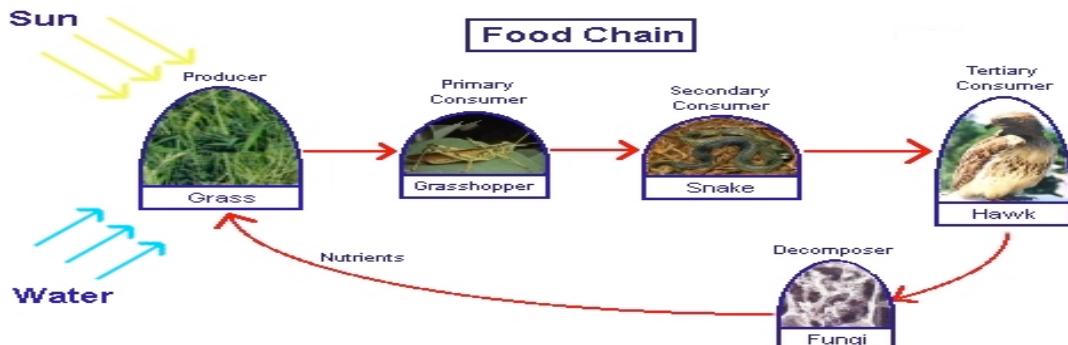
PART – B**1. (a) Explain food chain and food web (b) Explain briefly the structure of atmosphere.**

i) Food chain: The sequence of eating and being eaten in an echo system is known as food chain.

'Transfer of food energy from the plants through a series of organisms is referred to as food chain' is another definition.

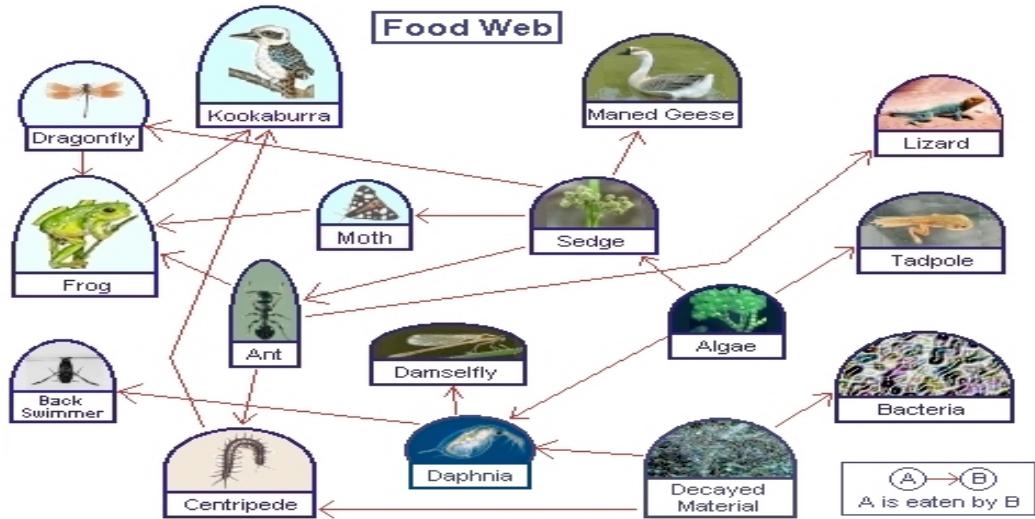
These food chains are present in a grass land, in a pond, in a forest.

Here is a figure showing one such food and energy chain:



Food Webs

In looking at the previous picture, the concept of food chain looks very simple, but in reality it is more complex. Think about it. How many different animals eat grass? And from the [Facts about Red-tailed Hawks](#) page, how many different foods does the hawk eat? One doesn't find simple independent food chains in an ecosystem, but many interdependent and complex food chains that look more like a web and are therefore called food webs. A food web that shows the energy transformations in an ecosystem looks like this:

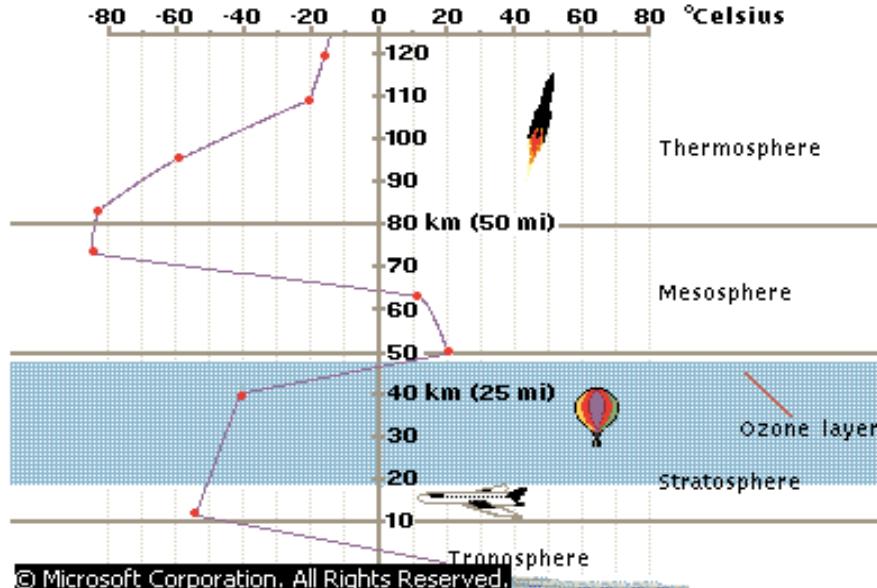


As you can see from this picture, food webs, with all their dependencies, can be very complex, but somehow nature balances things out so that food webs last a long time. Many species share the same habitat, their populations survive for many years, and they all live happily together.

(b) Explain briefly the structure of atmosphere

Atmosphere is the cover of air that envelopes the earth is known as the atmosphere. It extends up to 500 kms from the earth surface. The atmosphere is highly essential for all living organisms. It comprises of 78% of Nitrogen, 21% of Oxygen and 1% of other gases.

Structure of atmosphere can be classified into 3 types.



(a) Troposphere: It stretches between 10 - 18 kms from the earth surface. It contains 75% of the atmospheric air mass. Also contained in this is moisture.

(b) Stratosphere: Stretching between 18 - 25 Kms from the earth surface, it is rich in Ozone gas, free from moisture and clouds. It prevents Ultra Violet radiation from the sun.

(c) Mesosphere: It stretches between 50 - 85 Kms from the earth surface. It contains less Ozone but more nitrogen oxide.

2. (a) (i) Explain ecosystem.

(ii) Discuss the components of ecosystem.**(b) What is an ecosystem? Describe the structure and function of various components of an ecosystem.**

(a) i) Ecology is the study of interactions among organisms or group of organisms with their environment. The environment consists of both biotic components (living organisms) and abiotic components (non-living organisms). Or Ecology is the study of ecosystem. Ecosystem is the basic functional unit of ecology. A group of organisms interacting among themselves and with environment is known as ecosystem. Thus an ecosystem is a community of different species interacting with one another and with their non-living environment exchanging energy and matter.
 ii) Components of an ecosystem: biotic components; Plants, /Animals, Microorganisms; and Abiotic components: non-living components-Physical components: Define and examples: Air, water, soil, sunlight etc. and Chemical components: (i) Organic substances- Protein, lipids, carbohydrates etc. and (ii) Inorganic substances: All micro elements(Al, Co, Zn Cu) and macro elements(C, H, O, P, N, P, K) and few other elements.

ECOLOGY: All living organisms, whether, plant or animal or human being is surrounded by the environment, from which it derives its needs for its survival. Each living component interacts with non-living components for their basic requirements from different eco systems.

Definition: Ecology is the study of interactions among organisms or group of organisms with their environment. The environment consists of both biotic components (living organisms) and abiotic components (non-living organisms). (Or) Ecology is the study of eco systems.

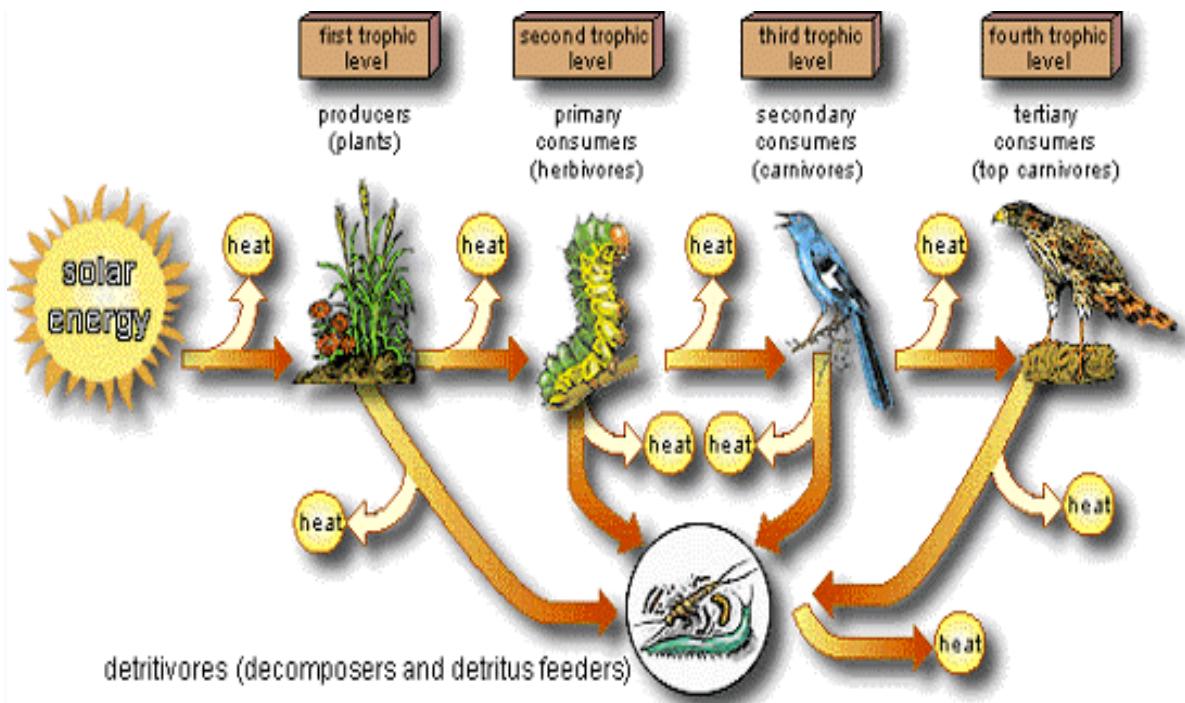
WHAT IS AN ECOSYSTEM?

An ecosystem is a natural unit consisting of all plants, animals and micro organisms in an area functioning together with all the non living physical factors of the environment. The term ecosystem has emanated from a Greek word meaning study of home.

Definition: A group of organisms interacting among themselves and with the environment is known as an ecosystem. Thus, n ecosystem is a community of different species interacting with one another and with their non-living environment exchanging energy and matter.

STRUCTURE AND FUNCTION OF AN ECOSYSTEM

The structure of an ecosystem consists of the following: 1] The first trophic level
 2] The second trophic level; 3] The third trophic level and 4] The fourth trophic level



The first trophic level consists of all the producers which are able to synthesize their own energy. (e.g.) green plants, chemosynthetic micro-organisms etc.

The second trophic level consists of the primary consumers i.e. the herbivores. (e.g.) horses, cows etc.

The third and fourth trophic levels consist of the secondary and tertiary consumers. (E.g.) hawk, tigers etc.

ii) Components of an ecosystem: biotic components; Plants, /Animals, Microorganisms; and Abiotic components: non-living components-Physical components: Define and examples: Air, water, soil, sunlight etc. and Chemical components: (i) Organic substances- Protein, lipids, carbohydrates etc. and (ii) Inorganic substances: All micro elements(Al, Co, Zn Cu) and macro elements(C, H, O, P, N, P, K) and few other elements.

3. Explain: Forest ecosystem & Ecological succession.

A forest ecosystem is the one in which tall and dense trees grow that support many animals and birds. The forests are found in undisturbed areas receiving moderate to high rainfall. The forest occupies nearly 40% of the world's land area. In India it occupies only 19% of its total land area.

The different types of forest eco system are:

- 1] Tropical rain forests: These are found near the equator and are characterized by high temperature. They have broad leafed trees like teak and sandal and the animals like lion, tiger and monkey.
- 2] Tropical deciduous forests: These are found a little away from the equator and are characterized by a warm climate with rain only during monsoon. They have different types of deciduous trees like maple, oak and hickory and animals like deer, fox, rabbit and rat.
- 3] Tropical scrub forests: These are characterized by a dry climate for longer time. They have small deciduous trees and shrubs and animals like deer, fox etc.
- 4] Temperate rain forests: They are found in temperate areas with adequate rainfall. They are characterized by coniferous trees like pines, firs, red wood etc., and animals like squirrels, fox, cats, bear.
- 5] Temperate deciduous forests: These are found in areas with moderate temperatures. They have major trees including broad leaf deciduous trees like oak, hickory and animals like deer, fox, bear etc.

Characteristics of Forest ecosystems:

1. Forests are characterized by warm temperature and adequate rainfall, which make the generation of number of ponds, lakes etc.
2. Forests maintain climate and rain fall,
3. Forests support many wild animals and protect biodiversity,
4. The forest soil is rich in organic matter and nutrients which support the growth of trees.
5. Since the penetration of light is so poor, the conversion of organic matter into nutrients is very fast.

Ecological succession: In an area one community may be replaced by another community or by a series of communities. Thus the progressive replacement of one community by another community till the development of stable community in a particular area is called ecological succession.

The first group of organism, which establish their community in the area is called 'Pioneer' community. The various developmental stages of a community is called 'series'. The group of plants or animals living in an area is called a community.

There are two types of ecological succession recognized by ecologists, based on the conditions present at the beginning of the process. Primary succession: It involves the gradual establishment of biotic communities on a lifeless ground. [Hydrarch or Hydrosere: Establishment starts in a watery area like pond and lake; Xerarch or Xerosere: Establishment starts in a dry area like, desert and rock.] Secondary succession: It involves the establishment of biotic communities in an area, where some type of biotic community is already present.

The different steps in the process of ecological succession are: 1. Nudation – development of bare area without any life form, 2. Invasion – establishment of one or more species on a bare area through migration(migration of seeds is brought about by wind, water or birds) followed by establishment (Seeds after migration germinate and grow on the land and establishes their pioneer communities), 3. Competition – as the number of individual species grows, there is a competition with the same species and between different species for space, water and nutrients, 4. Reaction – Living organisms take water, nutrients and grow and modify the environment and it is known as reaction. Reaction may not suit the existing species but may favour new species which replace the existing species leading to seral communities, 5. Stabilizations – it leads to stable community, which is in equilibrium with the environment..

4. Write short notes on the following: Energy flow in eco-system; Pond eco-system & Threats to Biodiversity.

Energy flow in eco-system: In an ecosystem, plants capture the sun's energy and use it to convert inorganic compounds into energy-rich organic compounds¹. This process of using the sun's energy to convert minerals (such as magnesium or nitrogen) in the soil into green leaves, or carrots, or strawberries, is called photosynthesis.

Photosynthesis is only the beginning of a chain of energy conversions. There are many types of animals that will eat the products of the photosynthesis process. Examples are deer eating shrub leaves, rabbits eating carrots, or worms eating grass. When these animals eat these plant products, food energy and organic compounds are transferred from the plants to the animals. These animals are in turn eaten by other animals, again transferring energy and organic compounds from one animal to another. Examples would be lions eating deer, foxes eating rabbits, or birds eating worms.

This chain of energy transferring from one species to another can continue several more times, but it eventually ends. It ends with the dead animals that are broken down and used as food or nutrition by bacteria and fungi. As these organisms, referred to as decomposers, feed from the dead animals, they break down the complex organic compounds into simple nutrients. Decomposers play a very important role in this world because they take care of breaking down (cleaning) many dead material. There are more than 100,000 different types of decomposer organisms! These simpler nutrients are returned to the soil and can be used again by the plants. The energy transformation chain starts all over again.

Pond eco-system: A pond is a fresh water aquatic ecosystem, where water is stagnant. It receives water during rainy season. It contains several types of algae, aquatic plants, insects, fishes and birds. Pond is temporary- only seasonal- stagnat fresh water body-gets polluted easily due to limited amount of water. Abiotic components: Temperature, light, water, inorganic and organic compounds. Biotic components: Green photosynthetic organisms – a) Phytoplanton-microscopic aquatic plants which float freely on water surface – algae, small floating plants like volvox, pandorina, anabaena, cosmarium b) Macrophytes- Large floating plants explain Consumers, and decomposers of pond eco system

Biodiversity is the richness & varied species of different organisms contained in a particular ecosystem – Indian biodiversity is highly diverse and rich such that there are various hot spots. However there are numerous threats to our Biodiversity.

Threats to our Biodiversity:

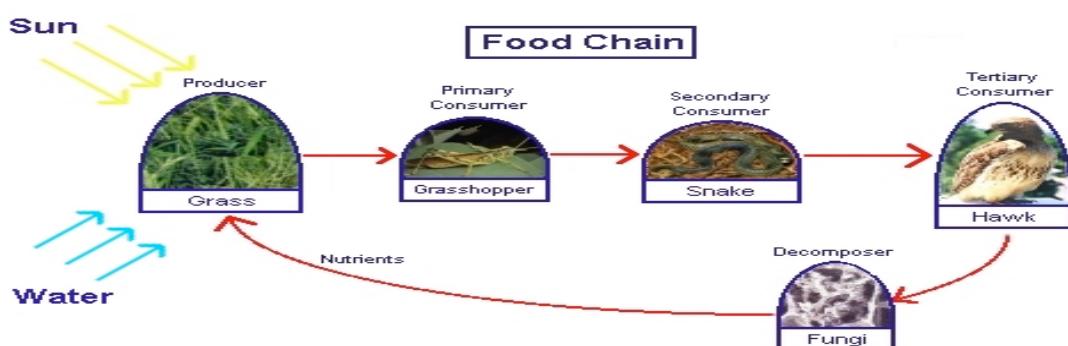
Poaching – illegal killing of animals for monetary gain and wild pleasure- though banned sale of animal skins and parts-high value – elephant tusks, leather. Snake skin etc. – numerous species becoming extinct.

Loss of Habitat: Wildlife, flora and Fauna of our country facing threat to their survival due to loss of habitat- increased urbanization and industrialization led to encroachment of wild life areas causing loss of habitat.

Population growth: many adverse effects – clearing wild life habitats for human occupation
Deforestation: Excessive clearing of forests for anthropogenic activity – population and diversity of birds greatly reduced – animals and the ecological balance disturbed – threatening the biodiversity.

5. With a neat sketch explain the flow of energy through the various components of the eco-system. (Producers, consumers & decomposers)

The following is a figure showing one such food and energy chain:



Producers. Organisms, such as plants, that produce their own food are called autotrophs. The autotrophs convert inorganic compounds into organic compounds. They are called producers because all of the species of the ecosystem depend on them.

Consumers. All the organisms that cannot make their own food (and need producers) are called heterotrophs. In an ecosystem heterotrophs are called consumers because they depend on others. They obtain food by eating other organisms. There are different levels of consumers. Those that feed directly from producers, i.e. organisms that eat plant or plant products are called primary consumers. In the figure above the grasshopper is a primary consumer.

Organisms that feed on primary consumers are called secondary consumers. Those who feed on secondary consumers are tertiary consumers. In the figure above the snake acts as a secondary consumer and the hawk as a tertiary consumer. Some organisms, like the squirrel are at different levels. When the squirrel eats acorns or fruits (which are plant product), it is a primary consumer; however, when it eats insects or nestling birds, is it a tertiary consumer.

Consumers are also classified depending on what they eat.

Herbivores are those that eat only plants or plant products. Example are grasshoppers, mice, rabbits, deer, beavers, moose, cows, sheep, goats and groundhogs.

Carnivores, on the other hand, are those that eat only other animals. Examples of carnivores are foxes, frogs, snakes, hawks, and spiders.

Omnivores are the last type and eat both plants (acting as primary consumers) and meat (acting as secondary or tertiary consumers). Examples of omnivores are:

- ♣ Bears --They eat insects, fish, moose, elk, deer, sheep as well as honey, grass, and sedges.
- ♣ Turtles -- They eat snails, crayfish, crickets, earthworms, but also lettuce, small plants, and algae.
- ♣ Monkeys -- They eat frogs and lizards as well as fruits, flowers, and leaves.
- ♣ Squirrels -- They eat insects, moths, bird eggs and nestling birds and also seeds, fruits, acorns, and nuts.

Trophic level. The last word that is worth mentioning in this section is trophic level, which corresponds to the different levels or steps in the food chain. In other words, the producers, the consumers, and the decomposers are the main trophic levels.

(b)Explain how fat-soluble pollutants like DDT get biomagnified?

Magnification of fat-soluble pollutants like DDT:

In order to improve the crop yield, a lot of pesticides are used in agriculture. These are expected to kill the crop harming pests.

One can classify the pesticides as first and second generation pesticides.

i) first generation pesticides: Sulphur; arsenic; lead; mercury are used to kill pests
ii) Second generation Pesticides: DDT(Dichlorodiphenyl Trichloromethane) This fat-soluble pesticide is used to kill pests. Although these pests protect our crops from huge losses from pests, they cause number of side effects:

- a) Death of non-target organisms: Many pesticides including DDT not only kill the crop harming target species, but also kill the several non-target species, which are useful to us in several other ways.
- b) Producing new pests: Some pests survive even after the spray of the pesticide, which generates highly resistant generations. They are then immune to all types of pesticides and are called superpests.
- c) Biomagnification: Many of the pesticides like fat soluble DDT are nonbiodegradable and keep on concentrating in the food chain. This process is called bio-magnification. These pesticides in a bio-magnified form is harmful to the human beings.
- d) Risk of cancer: Such pesticides enhance the risk of cancer in two ways: i) Directly act as caecinogens and ii) indirectly suppress the immune system in the body.

6. Give flow chart on ‘energy flow in a freshwater lake ecosystem’ and explain

Ans: The aquatic ecosystem deals with water bodies. The major types of organisms found in aquatic environments are determined by the water salinity.

Aquatic ecosystems are those ecosystems exist in the medium of water. Some of the aquatic ecosystems are : pond, lake, stream, river, wet land, estuary, sea and ocean ecosystems. The characteristic features of aquatic ecosystems are as follows :

- i) They may be lentic (ie, standing or non-flowing) or lotic (i.e flowing) systems.
- ii) Aquatic food chains are inter linked with terrestrial food – chains.

- iii) The medium contains moderate to less nutrients.
- iv) Much of the solar energy is fixed in ecosystems, and
- They are the reservoirs or exchange pools for hydrological cycle.

Lakes are large natural shallow water bodies and are used for various purposes. Lakes are supplied with water from rainfall, melting snow and streams.

Different types of Lakes are: Oligotrophic lake- having low nutrient concentrations, Eutrophic Lakes-over nourished by nutrients Nitrogen and Phosphorous, Dystrophic lakes- have low pH, high Humic acid content and brown waters, Volcanic lakes-receive water from magma after volcanic eruptions, meromictic lakes- rich in salts, artificial lake4s – created due to dam constructions.

Different zones of lake: Depending upon their depth and distance from the shore lakes consist of four distinct zones. Littoral Zones – top layer of a lake having shallow water; Limnetic Zone-next to the littoral – effective penetration of solar light takes place; Profundal zone –The deep open water, where it is too dark and /benthic zone-found at lake bottom.

Characteristic features of lake ecosystem: It is a shallow fresh water body; a permanent water body with large water resources helping in irrigation and drinking

Structure and function of Lake ecosystem:

I. Abiotic components: Temperature, light, proteins and lipids, turbidity, O₂ and CO₂.

II. Biotic components:

1. Producers: They are green plants, may be submerged, free floating and amphibious plants.

2. Consumers:

(a) Primary consumers (Zooplanktons): Ciliates, protozoans etc. They feed on phytoplankton

(b) Secondary consumers (carnivores): Insects and small fishes. They feed on Zooplankton.

(c) Large fishes like game fish. They feed on smaller fish

3. Decomposers: Bacteria, fungi and actinomycetes. They decompose dead plants and animals.

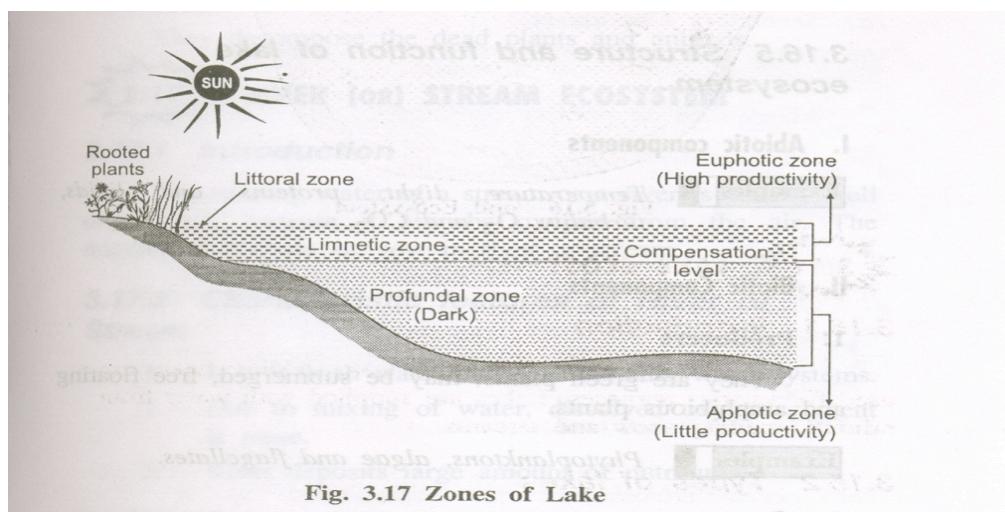


Fig. 3.17 Zones of Lake

7. Explain with illustration: i) Water cycle, ii) Oxygen cycle, iii) Nitrogen cycle, iv) Carbon cycle, v) Phosphate cycle and vi) Sulphur cycle

a) Water Cycle: Draw a pictorial representation of Water cycle as below.

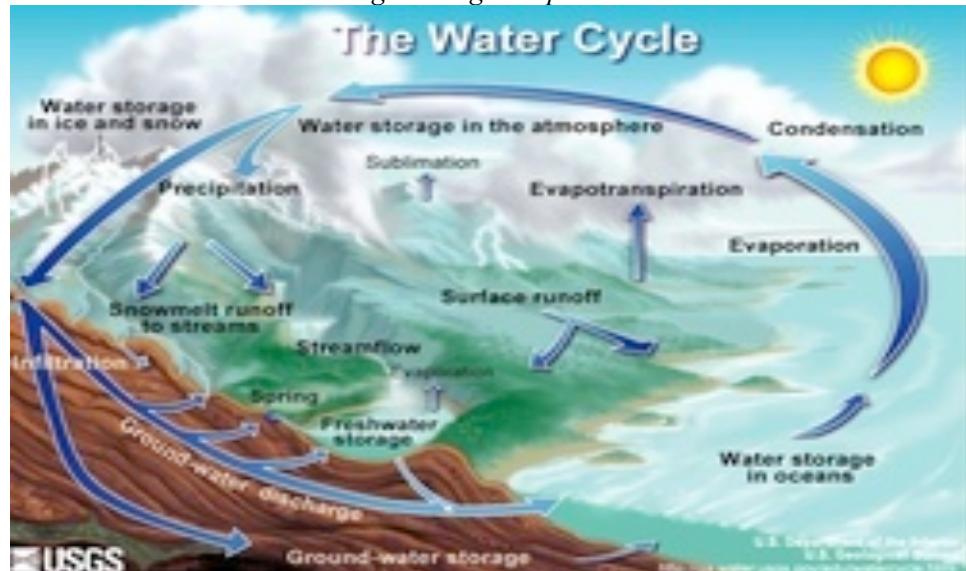
i) It is the flow of water from the hydrosphere to the atmosphere to the Lithosphere and back

ii) Water in water bodies like seas and rivers evaporates by the heat of the sun.

iii) As a result water becomes vapour and becomes clouds

iv) clouds become saturated, condense and precipitate as rain

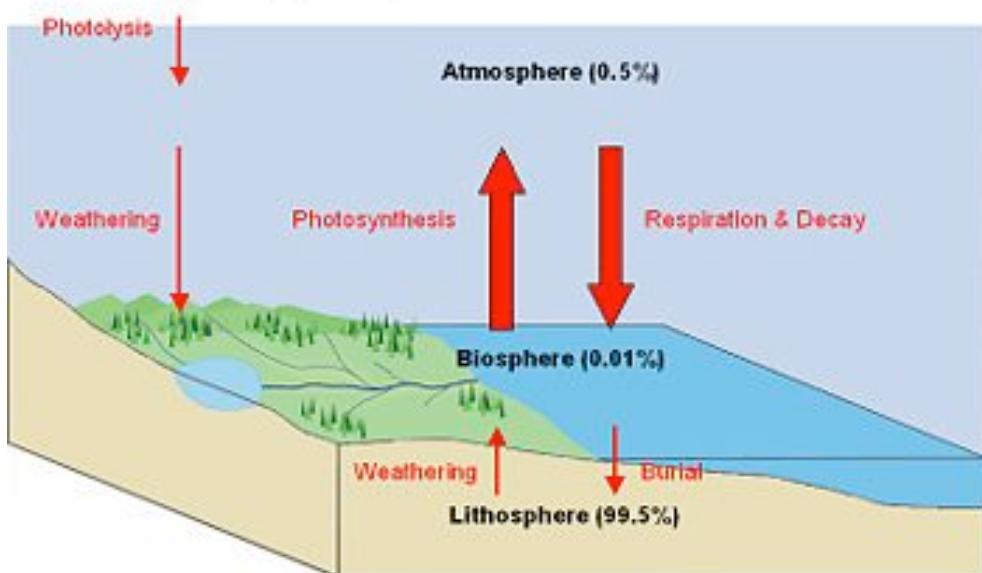
v) The rain percolates through land & flows into the seas and rivers



b) Oxygen Cycle: Draw a pictorial representation of Oxygen cycle as below.

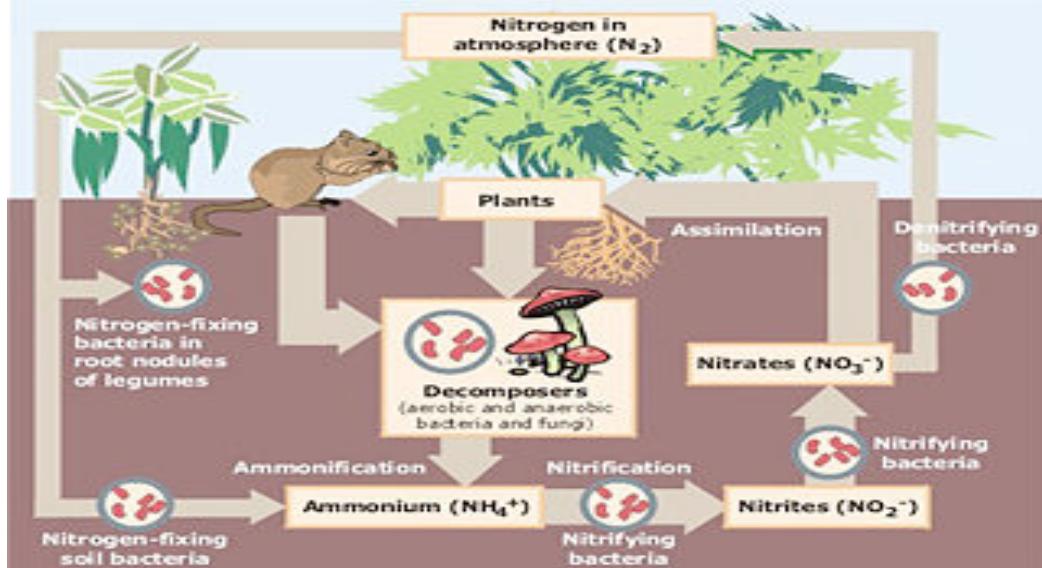
- i) Exchange of O₂ between the lithosphere and atmosphere and hydrosphere is known as the oxygen cycle.
- ii) Transpiration is the process by which plants take CO₂ and give out oxygen
- iii) This oxygen is released to the atmosphere
- iv) The atmosphere contains 21% of Oxygen
- v) Man then takes in O₂ from the environment by respiration
- vi) Water is made up of O₂ and Hydrogen
- vii) Rain is precipitated from clouds

Oxygen Cycle Reservoirs & Flux



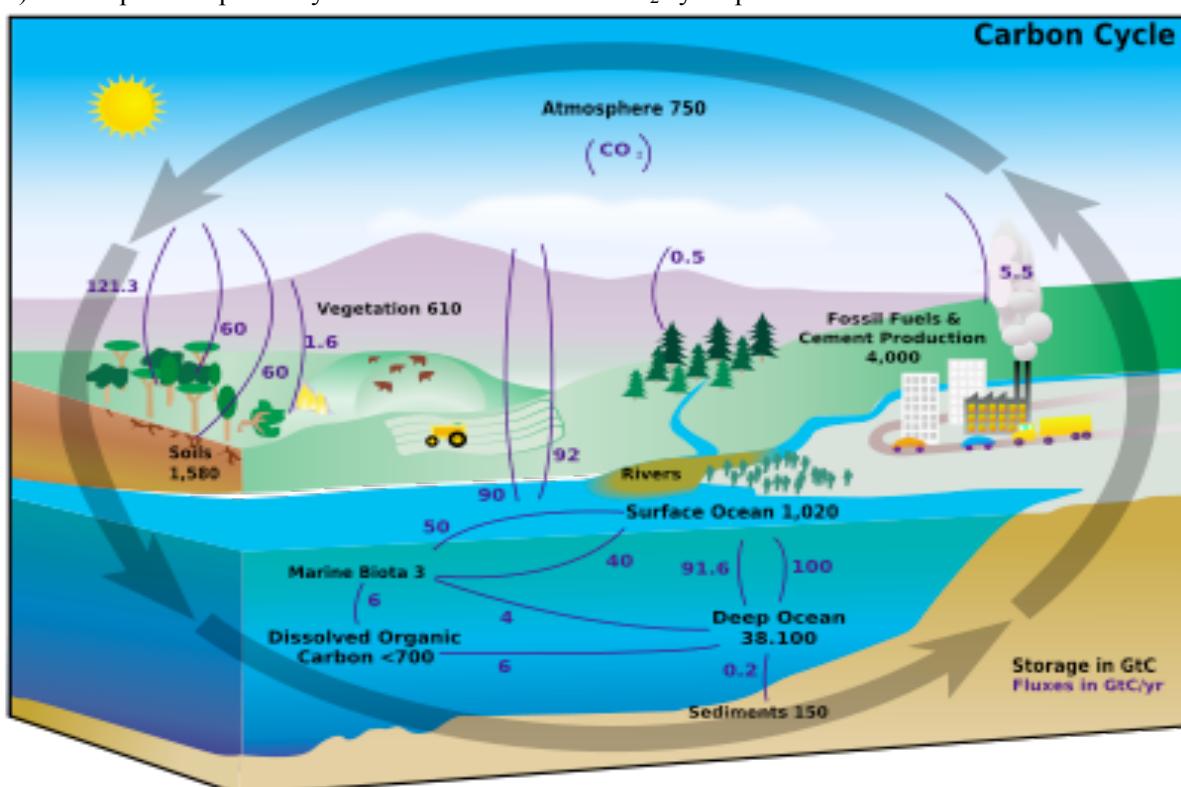
c) Nitrogen cycle: Draw a pictorial representation of Nitrogen cycle as below.

- i) The exchange of nitrogen between the lithosphere and atmosphere is nitrogen cycle.
- ii) Free nitrogen from atmosphere is taken up by plants as nitrates
- iii) These nitrates are denitrified to ammonia by anaerobic bacteria – denitrification
- iv) Nitrosomonas converts ammonia to nitrites.
- v) Nitrobacter converts nitrites to nitrates
- vi) These processes are called nitrification
- vii) Rhizobium is N₂ fixing bacteria in the roots.



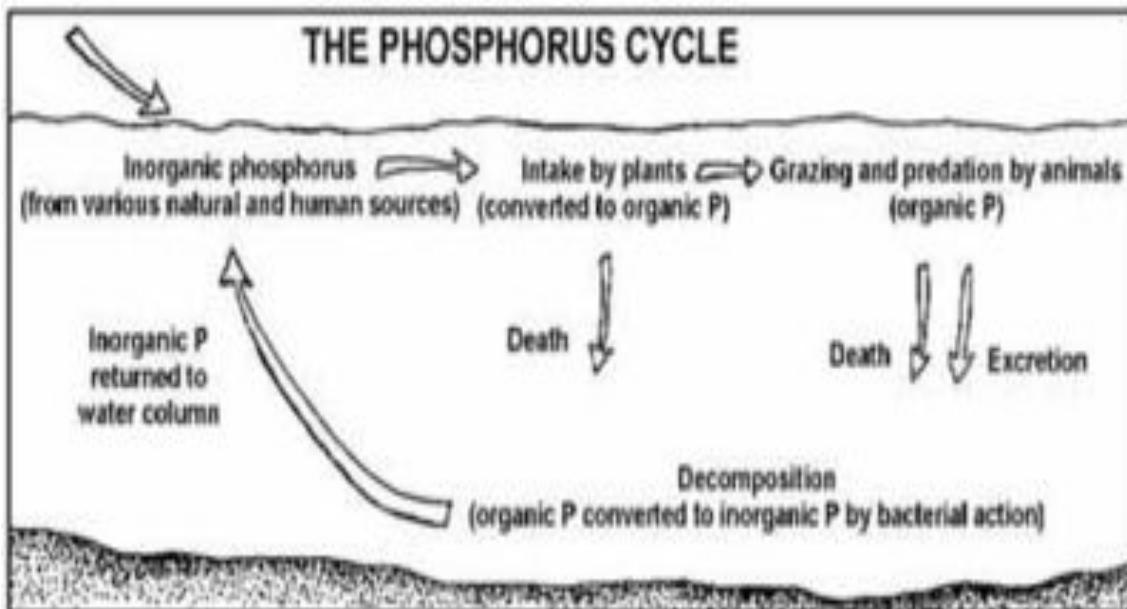
d) Carbon cycle: Draw a pictorial representation of Carbon cycle as below:

- i) The exchange of carbon between atmosphere & lithosphere and biosphere is carbon cycle
- ii) CO_2 in the atmosphere is the best source of carbon
- iii) It is taken in by plants by transpiration
- iv) The decay of plants & subsequent compaction over hundreds of years due to high temperature and pressure gives Fossil fuels
- v) Combustion of these fossil fuels release the CO_2 back into the atmosphere
- vi) consumption of plants by consumers also release CO_2 by respiration



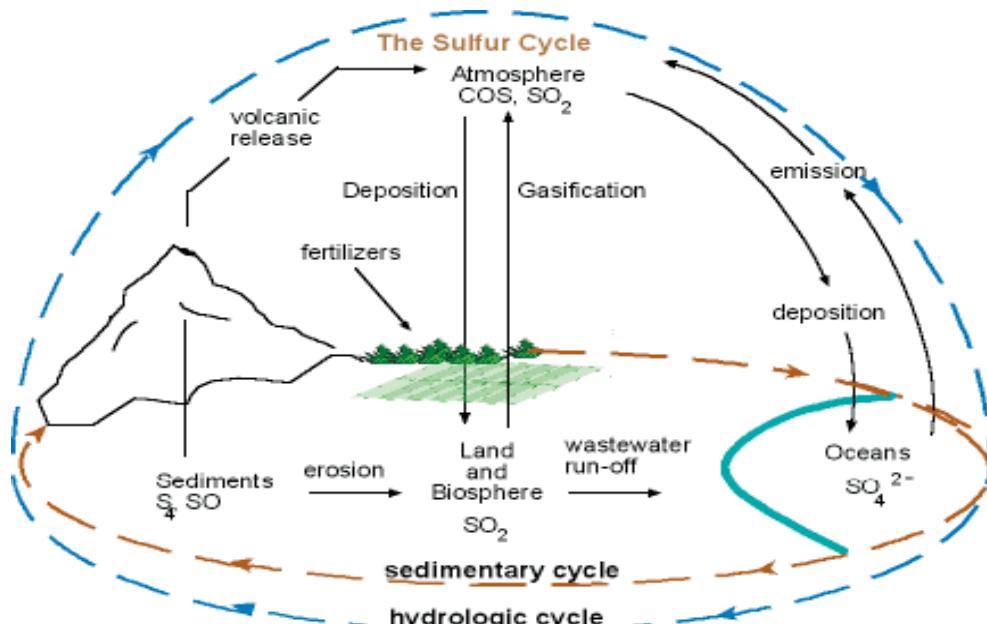
e) Phosphate cycle: Draw a pictorial representation of Phosphate cycle: as below

- i) It is the exchange of Phosphorous between lithosphere and biosphere
- ii) It involves the weathering of rocks containing mineral forms of phosphate
- iii) As a result, it is distributed in the soil.
- iv) It is then taken up by plants by means of roots
- v) The consumers of the plants thus have phosphate deposits in their bones
- vi) Due to decay the dead beings release phosphate into the earth.



f) Sulphur Cycle: Draw a pictorial representation of Sulphur cycle

- The exchange of Sulphur between the lithosphere, biosphere and the atmosphere is Sulphur cycle.
- Plants take up sulphur from atmosphere in the form of sulphates
- The sulphate is converted into H_2S by sulphur removing bacteria in the soil
- The sulphide is converted back into sulphates by bacteria like desulphovibrio bacteria.
- after decay the free sulphur is released back due to the action of microbes.



8. Describe the structure and function of the forest and grassland ecosystem.

Forest Structure Forests are habitats in which the trees are the dominant form of vegetation. They occur in many regions and climates around the globe—the tropical rainforests of the Amazon basin, the temperate forests of eastern North America, and the boreal forests of northern Europe are just a few examples.

The species composition of a forest is often unique to that forest, with some forests consisting of many hundreds of species of trees while others consist of just a handful of species. Forests are constantly changing and progress through a series of successional stages during which species composition changes within the forest.

Thus, making general statements about forest habitats can be difficult. Yet despite the variability of our planet's forests, there are some basic structural characteristics that many forests share—

characteristics that can help us to better understand both forests and the animals and wildlife that inhabit them.

Mature forests often have several distinct vertical layers. These include:

- forest floor
- herb layer
- shrub layer
- understory
- canopy
- emergents
- The **forest floor** is often blanketed with decaying leaves, twigs, fallen trees, animal scat, moss, and other detritus. The forest floor is where recycling occurs, fungi, insects, bacteria, and earthworms are among the many organisms that break down waste materials and ready them for reuse and recycling throughout the forest system.
- The **herb layer** of the forest is dominated by herbaceous (or soft-stemmed) plants such as grasses, ferns, wildflowers, and other ground cover. Vegetation in the herb layer often gets little light and in forests with thick canopies, shade tolerant species are predominant in the herb layer.
- The **shrub layer** is characterized by woody vegetation that grows relatively close to the ground. Bushes and brambles grow where enough light passes through the canopy to support shrub growth.
- The **understory** of a forest consists of immature trees and small trees that are shorter than the main canopy level of the tree. Understory trees provide shelter for a wide range of animals. When gaps form in the canopy, often times understory trees take advantage of the opening and grow to fill in the canopy.
- The **canopy** is the layer where the crowns of most of the forest's trees meet and form a thick layer.
- **Emergents** are trees whose crowns emerge above the rest of the canopy.

Grassland -Grasslands are areas where the vegetation is dominated by grasses (Poaceae), however sedge (Cyperaceae) and rush (Juncaceae) families can also be found. Grasslands occur naturally on all continents except Antarctica.

Types

- Different types of grasslands, such as prairies, savannahs, rangelands, agricultural grasslands, and coastal grasslands, serve a variety of purposes.

Features

- "Rangelands are complex ecosystems," states the U.S. Geological Survey (USGS). Healthy rangelands "capture, store, and safely release water from rainfall, run-on, and snowmelt," according to the USGS.

Biotic Functions of Grasslands

- According to the Grasslands Conservation Council of British Columbia, grasslands function as a habitat for biotic components or living organisms "classified as producers, consumers or decomposers." For example, trees and plants produce nutrients through the process of photosynthesis, whereas consumers such as animals eat plants and other animals to get energy.

Function of Rangeland Grasslands

- Grasslands composed of grasses, such as wheat, provide grazing for livestock, as well as insect herbivores such as grasshoppers, locusts, and Mormon crickets.

Grasslands Provide Food

- "Grasslands have been the seedbeds for the ancestors of major cereal crops, including wheat, rice, rye, barley, sorghum, and millet," states the World Resources Institute (WRI).

Grasslands Are Breeding Areas

- Twenty-three Endemic Bird Areas include grasslands, which are important breeding grounds for thousands of bird species. The Andes in Peru, Central Chile, and southern Patagonia "rank highest for biological importance," states the WRI.

9. Elucidate the role of organisms in environment. Define Producers, consumers and decomposers in an eco-system.

(i) Role of Organisms in Environment and Producers, Consumers & decomposers in Environment:

Producers. Organisms, such as plants, that produce their own food are called autotrophs. The autotrophs, as mentioned before, convert inorganic compounds into organic compounds. They are called producers because all of the species of the ecosystem depend on them.

Consumers. All the organisms that can not make their own food (and need producers) are called heterotrophs. In an ecosystem heterotrophs are called consumers because they depend on others. They obtain food by eating other organisms. There are different levels of consumers. Those that feed directly from producers, i.e. organisms that eat plant or plant products are called primary consumers. In the figure above the grasshopper is a primary consumer.

Organisms that feed on primary consumers are called secondary consumers. Those who feed on secondary consumers are tertiary consumers. In the figure above the snake acts as a secondary consumer and the hawk as a tertiary consumer. Some organisms, like the squirrel are at different levels. When the squirrel eats acorns or fruits (which are plant product), it is a primary consumer; however, when it eats insects or nestling birds, is it a tertiary consumer.

Consumers are also classified depending on what they eat.

Herbivores are those that eat only plants or plant products. Example are grasshoppers, mice, rabbits, deer, beavers, moose, cows, sheep, goats and groundhogs.

Carnivores, on the other hand, are those that eat only other animals. Examples of carnivores are foxes, frogs, snakes, hawks, and spiders.

Omnivores are the last type and eat both plants (acting a primary consumers) and meat (acting as secondary or tertiary consumers). Examples of omnivores are:

- ♣ Bears --They eat insects, fish, moose, elk, deer, sheep as well as honey, grass, and sedges.
- ♣ Turtles -- They eat snails, crayfish, crickets, earthworms, but also lettuce, small plants, and algae.
- ♣ Monkeys -- They eat frogs and lizards as well as fruits, flowers, and leaves.
- ♣ Squirrels -- They eat insects, moths, bird eggs and nestling birds and also seeds, fruits, acorns, and nuts.

Trophic level. The last word that is worth mentioning in this section is trophic level, which corresponds to the different levels or steps in the food chain. In other words, the producers, the consumers, and the decomposers are the main trophic levels.

10. (i) What are the types of forests? How is forest ecosystem important for environment?

(ii)What is fresh water ecosystem? Give the sources of fresh water.

(i) Types of Forests and Importance of forest ecosystem for environment:

A forest eco system is the one in which tall and dense trees grow and support many animals and birds. The forests are found in undisturbed areas receiving moderate to high rainfall. The forest occupies nearly 40% of the world's land area. In India it occupies only 19% of its total land area.

Types of forest ecosystems: 1. Tropical Rain forests; 2. Tropical deciduous forests; 3. Tropical scrub forests; 4. Temperate rain forests and 5. Temperate deciduous forests [describe them as given in Q3] Forests are characterized by: warm temperature and adequate rainfall making the generation of number of ponds, lakes etc.; maintain climate and rainfall; support many wild animals and protect biodiversity; forest soil is rich in organic matter and nutrients supporting the growth of trees Light penetration is so poor that the conversion of organic matter into nutrients is very fast.

(ii)What is fresh water ecosystem? Give the sources of fresh water.

Aquatic ecosystems are those ecosystems exist in the medium of water. Some of the aquatic ecosystems are : pond, lake, stream, river, wet land, estuary, sea and ocean ecosystems. The characteristic features of aquatic ecosystems are as follows :

- i) They may be lentic (ie, standing or non-flowing) or lotic (i.e flowing) systems.
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Lakes are large natural shallow water bodies and are used for various purposes. Lakes are supplied with water from rainfall, melting snow and streams.

Different types of Lakes are: Oligotrophic lake- having low nutrient concentrations, Eutrophic Lakes-over nourished by nutrients Nitrogen and Phosphorous, Dystrophic lakes- have low pH, high Humic acid content and brown waters, Volcanic lakes-receive water from magma after volcanic eruptions, meromictic lakes- rich in salts, artificial lake4s – created due to dam constructions.

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Draw flow chart here.

Sources of fresh water are: Rain water, melting snow etc.

11.(i) Explain in-situ and ex-situ conservation along with their merits and limitations (ii) What do you understand by hot spots of biodiversity? Name and briefly describe two such hot spots that extend in India. [Describe the term hotspot in Biodiversity.]

(i) Explain in-situ and ex-situ conservation along with their merits and limitations

Conservation of Biodiversity: Biodiversity faces threat of extinction – due human activities – to salvage situation – conservation of biodiversity need of the hour- to preserve biodiversity to prevent their extinction and future flourishing – conservation of Biodiversity required

In-situ conservation: Involves allocating large areas of the land mass for wild life development- such areas can be closed to the public for tourism – wild life can be allowed to flourish in their own environment-promotes genetic diversity- does not stagnate the gene pool

Advantages: cheap and convenient methodSpecies gets adjusted the natural disasters like drought, floods, forest fires.

Limitations: Large surface area of the earth required – shortage of staff and pollution may lead to improper maintenance of the habitat.

Ex-situ conservation: Involves conservation of wild life in zoos, botanical gardens-human supervision- wildlife can grow under controlled conditions - animals would be properly taken care-food, shelter and water- help in the flourishing of endangered species- possible the gene pool could stagnate and result in no genetic diversity taking place.

Advantages: Special care and attention lead to survival of endangered species-In captive breeding, animals are assured food, water, shelter and security - hence longer life span- it is carried out for the endangered species, which do not have any chances of survival in the wild.

Limitations: Expensive method- freedom of wild life is lost – animals cannot survive in such environments

(ii) What do you understand by hot spots of biodiversity? Name and briefly describe two such hot spots that extend in India. [Describe the term hotspot in Biodiversity.]

Hot spots of Biodiversity: The hot spots of biodiversity are the geographic areas which possess the high endemic species. At the global level these are the areas of high conservation priority, if these species are lost they can never be replaced or regenerated.

Criteria for recognizing Hotspots: The richness of the endemic species is the primary criterion; they should have a significant % of specialized species; The site should be under threat and should contain important gene pools of plants of potential use.

Two hot spots of mention in India are 1. Eastern Himalayas (Indo-Burma region) and 2. Western Ghats (Srilanka region)

Eastern Himalayas: comprises of Nepal, Bhutan and neighbouring states of Northern India- 35,000 plant species are found here and 30 % are endemic – also rich in wild plants of economic value eg. Rice, banana, citrus, ginger, chilli, jute and sugarcane – Taxal yielding plant also sparsely distributed – 63% mammals are from this region- 60% of Indian Birds- huge wealth of fungi, insects, mammals and birds found in this region

Western Ghats: Comprises of parts of Maharashtra, Karnataka, Tamilnadu and Kerala – nearly 1500 endemic, dicotyledones 62% amphibians and 50% lizards are endemic here- Ternstroemia, Japonica, Rhododendron and Hypericum common plants- Blue Bird and Lizard hawk are common animals.

12) Explain: the grass land eco system in detail.

Grass land occupies about 20% of earth's surface. In addition to grass species, some shrubs and trees are also present in grasslands. Limited grazing helps to improve the net primary production of the grasslands. Overgrazing leads to their degradation.

Types of Grassland ecosystems: (i) Tropical grasslands, (ii) Temperate grasslands & (iii) Polar grasslands

Tropical grass lands: Found near the borders of tropical rain forests are characterized by high temperature and moderate rainfall. (also known as Savanna type). They have tall grasses with scattered shrubs and shunted trees and animals like zebras, giraffes, antelopes etc.

Temperate grass lands: Usually found in the centres of continents, on flat, sloped hills characterized by very cold winters and hot summers. Intense grazing and summer fires do not allow growth of shrubs and trees.

Polar grasslands: Found in arctic polar regions are characterized by severe cold and strong winds with ice and snow. In summer several small annual plants grow and inhabited by animals like arctic wolf, weasel, arctic fox etc.

Characteristics of grassland ecosystem: plain land occupied by grasses; Soil very rich in nutrients and organic matter; tall grass facilitates grazing of animals and low or uneven rain fall are encountered.

Structure and function of the grassland ecosystem:

I. Abiotic components: Nutrients, C, H, O, N, P, S etc. These abiotic components are supplied by CO₂, H₂O, nitrates, phosphates and sulphates.

II. Biotic components:

(1) Producers: Grasses, forbs and shrubs. (They produce food)

(2) Consumers (a) Primary consumers (herbivores): Cows, buffaloes, deer, sheep etc. They depend on grasses for food. (b) Secondary consumers (Carnivores) Snakes, lizards, birds, Jackals, fox etc.

They feed on herbivores. (c) Tertiary consumers: Hawks, eagles, etc. The feed on secondary consumers.

(3) Decomposers: Fungi and bacteria. They decompose the dead organic matter.

13. a) Justify the need for environmental education.(b) Write briefly on the community participation in environmental management programmes.

a) Justify the need for environmental education.

Environmental Education: Environmental study is an important tool to educate the people for preserving quality environment. The main scope for main environmental studies comprise of: 1. for awareness and sensitivity to the total environment and the related problems; 2. motivate for active participation in environmental protection and improvement; 3. develop skills for identifying and solving environmental problems; 4. know the necessity of conservation of natural resources; 5. evaluate environmental programmes in terms of social, economic, ecological and aesthetic factors.

The air we breathe, the water we drink, the food consume and the land we live on are all contaminated by the industrial activities. There is no zero pollution industry. Due to lack of self discipline and not worrying about our future generation, the valuable resources are polluted. To solve these problems the knowledge of environmental studies is very important. By these studies – People will understand the concept of 'need for development without destruction of the environment'; can gain the knowledge of different types of environment and environmental hazards; to inform the people about their effective role in protecting the environment by demanding changes in laws and enforcement systems; to have a direct relation to the quality of life we live and develop a concern and respect for environment.

(b) Write briefly on the community participation in environmental management programmes.

Need for Public awareness: Increasing population - particularly in the thickly populated developing countries - urbanization and poverty have generated pressure on the natural resources and lead to a degradation of the environment. To protect and prevent the environment from pollution, the Supreme Court of India has ordered and initiated the environmental awareness to the public through Government and non-Governmental agencies to take part to protect our environment.

Importance of Public (community) Participation: Law alone can not itself do everything for removing pollution. Proper implementation of laws together with committed co-operation and participation by the people are the important aspects. These should be given importance and stress.

Public participation is useful in law making process and in the activities resulting in pollution control. Thus the public participation plays a major role in the effective environmental management.

Types of Public Participation: Public participation in the decision making process can be at any stage and can be of various forms.

(i) **Pressure Group:** The public 'pressure group' may be formed to influence the government on one hand and the industries on the other hand.

(ii) **Watch Dog:** The public can act as 'watch dog' to protect the interests of public against environmental hazardous activities.

(iii) **Advisory Council:** the public can also act as advisory council and agencies, which is constituted to keep environment suitable for living.

(iv) **Enforcing the environmental Laws:** The services of public can be utilized to enforce the environmental laws. If necessary members of the public should initiate or institute Public Interest Litigations. (exnora). Thus many countries have accepted the concept of Public Participation in environmental management.

14. What are the components of environment? Explain their role.

COMPONENTS OF THE ENVIRONMENT

There are three major and important components comprising the environment.

(i) Abiotic or non-living component; (ii) Biotic or living component & (iii) Energy component

Abiotic (non-living) component or Physical component: The non-living components of the environment are called 'abiotic components'.

Eg: Air, water, soil and minerals.

These abiotic components interact (enter) the body of living organisms directly or indirectly, take part in metabolic activities and then return to the environment. (Air is breathed in by human beings and exhaled after oxygenation of the blood)

Abiotic components are subdivided into three categories: (1) Atmosphere; (2) Lithosphere and (3) Hydrosphere.

(1) Atmosphere: the cover of air that envelopes the earth is known as the atmosphere. It extends up to 500 kms from the earth surface. The atmosphere is highly essential for all living organisms. It comprises of 78% of Nitrogen, 21% of Oxygen and 1% of other gases.

Structure of atmosphere can be classified into 3 types.

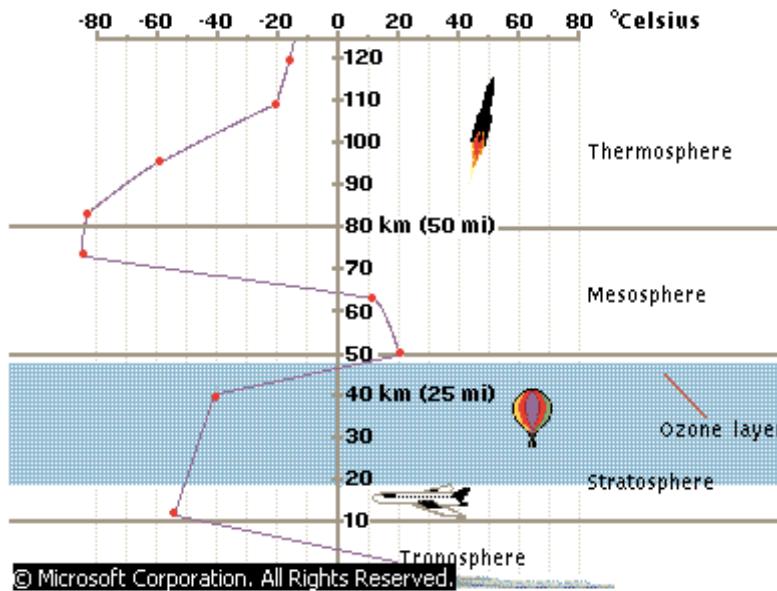
(a) **Troposphere:** It stretches between 10 - 18 kms from the earth surface. It contains 75% of the atmospheric air mass. Also contained in this is moisture.

(b) **Stratosphere:** Stretching between 18 - 25 Kms from the earth surface, it is rich in Ozone gas, free from moisture and clouds. It prevents Ultra Violet radiation from the sun.

(c) **Mesosphere:** It stretches between 50 - 85 Kms from the earth surface. It contains less Ozone but more nitrogen oxide.

Functions of Atmosphere:

1. It maintains the thermal (heat) balance on the earth by absorbing the Infra Red radiations.
2. The gaseous constituents play an important role in sustaining life on earth.



| Gaseous Constituents | Functions |
|----------------------|--|
| Oxygen | It supports life of living organisms |
| CO ₂ | Essential for photosynthesis activity of plants |
| N ₂ | Essential nutrient for plant growth |

The second category of the Abiotic component of the environment is, as stated earlier, **Lithosphere**.

Lithosphere: The soil and rock components of the earth is referred to as Lithosphere, the functions of which may be stated as:

- It is a home for human beings and wild life.
- It is a store house of minerals minerals and organic matters.

The third category is the **Hydrosphere**.

The aqueous envelope of the earth (75% of the earth surface) is called the hydrosphere. Oceans, lakes, streams, rivers and water vapour constitute hydrosphere. approximately 97% of earth water is in its oceans and hence salty and unfit for potable purposes.

Functions of Hydrosphere:

- Used for drinking purposes and also as support to aquatic life.
- It is also used for irrigation, power production, industries and transport.

BIOTIC (or) LIVING COMPONENT OF ENVIRONMENT:

The living components of the environment are called Biotic Components.

eg.: Animals, plants and micro organisms.

Biosphere: The biological environment, where the living organisms live and interact with physical environment (soil, water and air) is called Biosphere

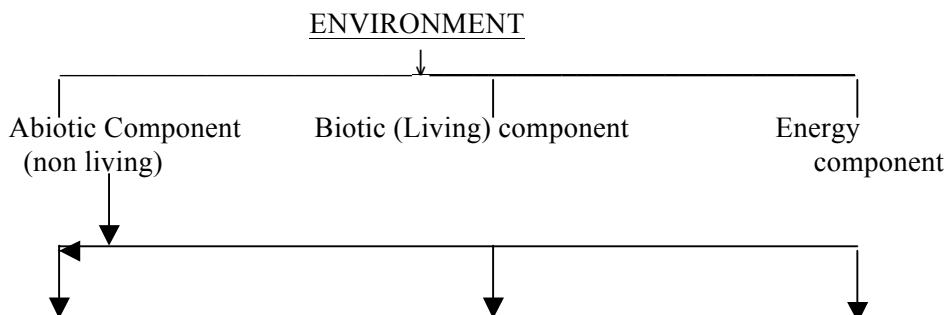
Functions of Biosphere:

Plants through photosynthesis produce oxygen in the atmosphere. Animals inhale oxygen during respiration and give out CO₂, which is again used by plants during photosynthesis.

ENERGY COMPONENTS:

The components of energy flow across Biotic and abiotic components and play an important role in maintaining the life of living organisms.

eg.: Solar energy, nuclear energy, geochemical energy, thermal electro energy.



- |
1. Troposphere (10-18 km) 75% atmospheric Air mass & moisture
 2. Stratosphere (18-50 km) Ozone gas- no moisture reduces Ultra Violet radiation
 3. Mesosphere (50-85 km) Less of ozone More of Nitrogen oxide.

15. What is ecological succession? How is it classified? Explain various aspects with examples. (MAY/JUNE 2013)

"Ecological succession" is the observed process of change in the species structure of an ecological community over time. Within any community some species may become less abundant over some time interval, or they may even vanish from the ecosystem altogether. Similarly, over some time interval, other species within the community may become more abundant, or new species may even invade into the community from adjacent ecosystems. This observed change over time in what is living in a particular ecosystem is "ecological succession". Stages of ecological succession: Pioneer community and seral stage – Community is the group of plants or animals living in an area.

Types of ecological succession: Primary succession – Hydrarch(Hydrosere) & Xerarch(Xerosere) and Secondary succession (elaborate with definitions)

Process of Ecological Succession: i) Nudation, ii) Invasion–migration and establishment iii) competition, Reaction and Stabilization (elaborate with definitions)

Food chains; forest ecosystem; Grassland ecosystem; desert ecosystem; aquatic ecosystem; river ecosystem; ocean ecosystem; estuarine ecosystem- explain briefly.

16. i) Give the various hot spots of biodiversity.(ii) Explain the various threats to biodiversity along with the means to conserve them. (MAY/JUNE 2013)

Hotspots

A **biodiversity hotspot** is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans. To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must meet two strict criteria:

1. it must contain at least 0.5% or 1,500 species of vascular plants as endemics, and
2. it has to have lost at least 70% of its primary vegetation.^[14]

Around the world, at least 25 areas qualify under this definition, with nine others possible candidates. These sites support nearly 60% of the world's plant, bird, mammal, reptile, and amphibian species, with a very high share of endemic species. Three regions that satisfy these criteria exist in India and are described below.

Threats to biodiversity

Threats

In 2006 many species were formally classified as rare or endangered or threatened; moreover, scientists have estimated that millions more species are at risk which have not been formally recognized. About 40 percent of the 40,177 species assessed using the IUCN Red List criteria are now listed as threatened with extinction.

Habitat destruction

Habitat destruction has played a key role in extinctions, especially related to tropical forest destruction.^[125] Factors contributing to habitat loss are: overpopulation, deforestation,^[126] pollution (air pollution, water pollution, soil contamination) and global warming or climate change.^[citation needed]

Habitat size and numbers of species are systematically related. Physically larger species and those living at lower latitudes or in forests or oceans are more sensitive to reduction in habitat area.^[127]

Introduced and invasive species

Barriers such as large rivers, seas, oceans, mountains and deserts encourage diversity by enabling independent evolution on either side of the barrier, via the process of allopatric speciation. The term invasive species is applied to species that breach the natural barriers that would normally keep them constrained. Without barriers, such species occupy new territory, often supplanting native species by occupying their niches, or by using resources that would normally sustain native species.

Genetic pollution

Endemic species can be threatened with extinction through the process of genetic pollution, i.e. uncontrolled hybridization, introgression and genetic swamping. Genetic pollution leads to homogenization or replacement of local genomes as a result of either a numerical and/or fitness

advantage of an introduced species. Hybridization and introgression are side-effects of introduction and invasion.

Overexploitation

Overexploitation occurs when a resource is consumed at an unsustainable rate. This occurs on land in the form of overhunting, excessive logging, poor soil conservation in agriculture and the illegal wildlife trade. Joe Walston, director of the Wildlife Conservation Society's Asian programs, called the latter the "single largest threat" to biodiversity in Asia. The international trade of endangered species is second in size only to drug trafficking

Hybridization, genetic pollution/erosion and food security

In agriculture and animal husbandry, the Green Revolution popularized the use of conventional hybridization to increase yield. Often hybridized breeds originated in developed countries and were further hybridized with local varieties in the developing world to create high yield strains resistant to local climate and diseases. Local governments and industry have been pushing hybridization. Formerly huge gene pools of various wild and indigenous breeds have collapsed causing widespread genetic erosion and genetic pollution. This has resulted in loss of genetic diversity and biodiversity as a whole.

Climate change

Global warming is also considered to be a major potential threat to global biodiversity in the future. Climate change has seen many claims about potential to affect biodiversity but evidence supporting the statement is tenuous. Increasing atmospheric carbon dioxide certainly affects plant morphology and is acidifying oceans, and temperature affects species ranges, phenology, and weather, but the major impacts that have been predicted are still just *potential* impacts. We have not documented major extinctions yet, even as climate change drastically alters the biology of many species.

17. i) Identify and explain the major threats to biodiversity in India. (NOV/DEC 2013)

(ii) What is the importance of protecting the biodiversity of Earth? (NOV/DEC 2013)

i) Identify and explain the major threats to biodiversity in India.

Discuss the threat faced by Indian Biodiversity

Biodiversity is the richness & varied species of different organisms contained in a particular ecosystem – Indian biodiversity is highly diverse and rich such that there are various hot spots. However there are numerous threats to our Biodiversity.

Threats to our Biodiversity:

Poaching – illegal killing of animals for monetary gain and wild pleasure- though banned sale of animal skins and parts-high value – elephant tusks, leather. Snake skin etc. – numerous species becoming extinct.

Loss of Habitat: Wildlife, flora and Fauna of our country facing threat to their survival due to loss of habitat- increased urbanization and industrialization led to encroachment of wild life areas causing loss of habitat.

Population growth: many adverse effects – clearing wild life habitats for human occupation

Deforestation: Excessive clearing of forests for anthropogenic activity – population and diversity of birds greatly reduced – animals and the ecological balance disturbed – threatening the biodiversity.

2) Conservation of Biodiversity: Biodiversity faces threat of extinction – due human activities – to salvage situation – conservation of biodiversity need of the hour- to preserve biodiversity to prevent their extinction and future flourishing – conservation of Biodiversity required

In-situ conservation: Involves allocating large areas of the land mass for wild life development- such areas can be closed to the public for tourism – wild life can be allowed to flourish in their own environment-promotes genetic diversity- does not stagnate the gene pool

Ex-situ conservation: Involves conservation of wild life in zoos, botanical gardens-human supervision- wildlife can grow under controlled conditions - animals would be properly taken care-food, shelter and water- help in the flourishing of endangered species- possible the gene pool could stagnate and result in no genetic diversity taking place.

Other conservation methods: conservation of germplasm in seed banks – can be used in future-passing of authoritative legislations promoting wildlife- restriction of human population explosion – Banning encroaching of forests and deforestations

(ii) What is the importance of protecting the biodiversity of Earth?

Bio means ‘life’ and diversity means ‘variety’, hence Biodiversity refers to variety of life on the earth. Planet earth (biosphere) contains more than 20 million species of organisms. They differ widely from one another. Diversification in the species is influenced by various physical and climatic factors, resulting in the production of new sub-species. Biodiversity is defined as, “ the variety and variability among all groups of living organisms and the ecosystem in which they occur”

The importance of biodiversity: Biodiversity is often used to draw attention to issues related to the environment. It can be closely related to

- the health of ecosystems.

For example, the loss of just one species can have different effects ranging from the disappearance of the species to complete collapse of the ecosystem itself. This is due to every species having a certain role within an ecosystem and being interlinked with other species.

- the health of mankind.

Experiencing nature is of great importance to humans and teaches us different values. It is good to take a walk in the forest, to smell flowers and breath fresh air. More specifically, natural food and medicine can be linked to biodiversity.

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UNIT- II PART A

1. Define Environmental Pollution.

Environmental Pollution is defined as any undesirable change in the physical, chemical, or biological characteristics of any component of the environment (air,water,soil)which can cause harmful effects on various forms of property.

2. What do you mean by indoor air pollution?

Houses in the under-developed & developing countries use fuels like wood kerosene in their kitchens & incomplete combustion produces toxic gas like CO. The most important indoor radioactive material is radon gas that can be emitted from building materials like bricks, concrete etc. which are derived from soil containing radium. This is called indoor air pollution.

3. What are the effects of various air pollutants on human health?

| | |
|-----------------------|----------------------|
| Name of the Pollutant | Name of the Diseases |
|-----------------------|----------------------|

| | |
|-----------------------|--|
| NO ₂ | Chronic Bronchitis, Emphysema |
| CO | Suffocation ,dizziness, Unconsciousness, Long Exposure lead to death |
| Benzene, PCB, dioxins | Mutations, reproductive problems, cancer |

4. Give any 4 steps to control air pollution.

- Siting of Industries after proper EIA (Environmental Impact Assessment) studies.
- Using low sulphur coal in industries
- Using mass transport system
- Planting more trees

5. What is the effect of air pollution on plant life?

Air pollutants affect plants by entering through stomata destroy chlorophyll and affect photosynthesis. Damage to leaf structure causes necrosis (dead areas of leaf), chlorosis (loss or reduction of chlorophyll causing yellowing of leaf), epinasty (downward curling of leaf), abscission (dropping of leaves).

6. Define SPL.

The noise measurements are expressed as Sound Pressure Level (SPL) which is the logarithmic ratio of the sound pressure to a reference pressure. It is expressed in decibels. The international reference pressure is 2×10^{-5} Pa which is the average threshold of hearing for a healthy ear.

7. Give noise standards recommended by CPCB committee.

| Area code | Category of Area | Noise Level during day (dB) | Noise Level during night (dB) |
|-----------|------------------|-----------------------------|-------------------------------|
| A | Industrial | 75 | 70 |
| B | Commercial | 65 | 55 |
| C | Residential | 55 | 45 |
| D | Silence Zone | 50 | 40 |

8. Give the directions of Supreme Court to reduce the noise pollution during Diwali.

- The manufacture, sale or use of fire crackers generating noise level exceeding 125 db at 4 m distance from the point of bursting shall be prohibited.
- The above limit is reduced by $5 \log N$ db ($N =$ No of crackers joined together) for individual fire crackers constituting the series.
- The fire crackers should not be used in silence zones.
- Giving Environmental education & awareness to the masses.

9. Define water pollution & give the sources of water pollution.

Water pollution can be defined as alteration in physical, chemical or biological characteristics of water making it unsuitable for designated use in its natural state.

There are 2 sources of water pollution. They are point sources – specific sites near water which directly discharge effluents into them & non point sources – sources are scattered and individually collect pollute water.

10. What do you mean by DO & BOD?

Dissolved Oxygen (DO) is the amount of O₂ dissolved in a given quantity of water at a particular temperature & atmospheric pressure. Biological Oxygen Demand (BOD) is defined as the amount of DO required to aerobically decompose biodegradable organic matter over a period of 5 days at 20°C.

11. Define bioaccumulation.

The non-biodegradable substances do not undergo any degradation and they tend to accumulate in the organism's body. This is known as bioaccumulation.

12. Explain thermal pollution.

Thermal pollution can be defined as the presence of waste heat in the water which can cause undesirable changes in the environment.

13. What are the effects of thermal pollution?

- a. The solubility of O₂ is decreased at high temperature.
- b. Toxicity of pesticides increases with increase in temperature
- c. Discharge of heated water can even kill young fishes.

d. Fish migration is affected.

14. How cooling ponds are used to reduce the thermal pollution?

Water from condensers is stored in ponds where natural evaporation cools the water which can then be recirculated or discharged in nearby water body

15. What are the sources of marine pollution?

The sources here are

- Rivers – bring pollutants from their drainage basins
- Coastline settlements in the form of hotels, industries.
- Oil drilling & shipment
- Radioactive disposal into deep sea

16. What do you mean by ballast water & what is the effect of it in marine ecosystem?

After delivering oil through sea-route, earlier empty tankers used to be filled with water called ballast water to maintain balance. The ballast water containing residual oil from tankers was released into sea on completion of return journey. Oil in sea water spread over a large area & affects sensitive flora & fauna.

17. What are the effects of radioactive waste in soil pollution?

Radioactive waste accumulates in food chain that leads to bioaccumulation & biomagnification. Radioisotopes which attach with the clay become a source of radiations in the environment. They replace essential elements in the body.

18. Define nuclear pollution.

Radioactive substances undergo natural radioactive decay in which unstable isotopes spontaneously give out fast moving particles, high energy radiations or both, at a fixed rate until a new stable isotope is formed.

19. What are the damages caused by the nuclear radiations?

Genetic damages – The damage is caused by radiations, which induce mutations in DNA. The damage is often seen in the offsprings and may be transmitted upto several generations.

Somatic damage – This includes burns, miscarriages, eye cataract, bone cancer etc

20. What is called inversion & how it affected the people of donora?

The condition when cold layer is trapped below the warm layer is called as inversion. The top fog layer reflected the solar radiations during the day time. During night the top layer had been loosing heat which further cooled the layer to stabilize.

21. What is love canal tragedy?

The love canal in a suburb of Niagara falls, New York was built by William love which was later dug up & was used to bump sealed steel drums of chemical waste. The site was later covered with clay & top soil and was later sold to the city board of education in 1953. In 1976 the children playing in the canal area received chemical burns & the residents started complaining of foul smell.

22. How arsenic contaminates the water?

Excess use of lead arsenate & copper arsenate as pesticides in high yielding varieties of summer paddy & jute crop percolate into the top soil and contaminates the ground water.

23. Define Solid Waste.

It is defined as the waste, arising from human and animal activities that are discarded as useless or unwanted one.

24. What are the types of solid waste?

The types are: * Urban solid waste; * Industrial solid waste

25. What are the sources of urban and industrial solid waste?

Urban solid waste – Residential area, commercial area open area waste, constructional waste, biomedical waste.

Industrial solid waste- Chemical industry, paint industry petroleum refinery industry, paper industry, metal industry.

26. Mention the effects of solid waste.

*Spreading of fungal diseases; *Bad odours; *Burning of waste produce chemicals which are harmful to human life; *Contaminates water & *Affects the characteristics of soil

27. How we can control solid wastes?

Reuse and recycling of waste, proper treatment of the waste, neutralize hazardous characteristics, using innovation technology.

28. Mention the activities involved in solid waste management.

- Waste generation,

- onsite handling ,storage and processing
- collection
- transfer and transport
- processing and recovery and disposal

29. What do you meant by commercial/industrial collection services?

The use of large movable and stationary containers and also large stationary compactors can be done by this method. Compactors are used to compress the material directly into the large containers or in the form of balls which are then placed in the large containers

30. What is known as hauled container system?

Collection system in which containers used for storage of waste are hauled to the processing, transfer, emptied and returned to either their original location or some other location are defined as hauled container system.

31. What is known as stationary container system?

The collection system in which the containers are used for storage of waste remains at the point of waste generation expect when moved for collection are defined as stationary container system.

32. What are the factors should be investigated before adopting the indirect method of transportation?

Efficiency of the system overall cost analysis, distance, time of travel to the site, suitability of transfer operations to the disposal area.

33. What is land filling?

A method of disposing off the refuse on land without creating nuisances or hazards to public health or safety by utilizing the principles of engineering.

34. Mention the advantages of land filling.

The advantages are

- Simple method
- Natural resources are returned to the soil and it is to be recycled
- Converts wasteland into the useful area.

35. What is meant by incineration?

In this method high temperature is created in the combustion chamber of the incinerator with the use of an auxiliary fuel. The municipal solid wastes are burnt in a furnace called incinerator.

36. What is composting?

The entire process involving both the separation and bacterial conversion of the organic solid waste is called composting.

37. Mention the advantages of composting.

- Compost contains nitrogen essential for plant growth
- Used for agricultural field
- Used for recycling
- Increasing water retention
- Increasing ion exchange capacity of soil

38. What is meant by hazardous waste?

The useless, unwanted, discarded material that may threat to human health and environment.

39. How to manage hazardous waste?

- Dispose the waste as early as possible
- Prevent illegal, international traffic in hazardous waste
- Strengthening the institutional capacities in hazardous waste management
- Promoting the prevention and minimization of using hazardous waste

40. What is Photochemical Smog?

A photochemical reaction is any reaction activated by light. Air pollution known as photochemical smog is a mixture of more than 100 primary and secondary pollutants formed under the influence of sunlight. Its formation begins inside automobile engines and the boilers in coal-burning power and industrial plants.

Health Effects: Breathing problems, cough, eye, nose and throat irritation, heart ailments, reduces resistance to colds and pneumonia.

Environmental effects: Ozone can cause damage to plants and trees, Smog can affect visibility.

41. Define the terms Climate and Climate Change.

Climate is the long-term average of a region's weather events grouped together. Climate change is the representation of change in these long-term weather patterns.

42. What are the effects of Global warning?

- a) More heat waves
- b) Expansion of desert area
- c) Natural fires in forestlands
- d) More evaporation of water from oceans and water bodies
- e) Melting of ice caps in Arctic and Antarctica regions
- f) More cloud formation in the atmosphere.
- g) Shorter and warmer winters and longer and shorter summer.
- h) Changes in pattern of rainfall i) Rise in sea level
- j) Flooding and submergence of low lying coastal areas

43. Name some green house gases present in the atmosphere.

Carbon dioxide (CO₂); methane (CH₄); nitrous oxide (N₂O); chlorofluorocarbons (CFC); water vapour (H₂O) and troposphere ozone (O₃) are some of the green house gases present in the atmosphere

44. Mention the sources of soil pollution. (MAY/JUNE 2013)

Domestic wastes include garbage, rubbish material like glass, plastics, metallic cans, paper, fibers, cloth rags, containers, paints, varnishes etc.

Industrial wastes are the effluents discharged from chemical industries, paper and pulp mills, tanneries, textile mills, steel industries, distilleries, refineries, pesticides and fertilizer industries, pharmaceutical industries, food processing industries, cement industries, thermal and nuclear power plants, mining industries etc.

45. Define green house effect. (MAY/JUNE 2013)

The greenhouse effect is a naturally occurring process that makes the earth warmer by trapping more energy in the atmosphere. The green house gases absorb and hold heat from the sun, preventing it from escaping back into the space; much like a green house absorbs and holds the sun's heat

46. List the ozone depleting chemicals. (MAY/JUNE 2013)

Chlorofluorocarbons (CFC) are responsible for ozone layer depletion.

47. Define the term Noise Pollution. (NOV/DEC 2013)

Noise pollution is the disturbing or excessive noise that may harm the activity or balance of human or animal life. The source of most outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles, aircraft, and trains.

48. Define biological oxygen demand and chemical oxygen demand. Write its environmental impacts. (NOV/DEC 2013)

Biological Oxygen Demand (BOD) is defined as the amount of DO required to aerobically decompose biodegradable organic matter over a period of 5 days at 20°C.

Chemical oxygen demand (COD) is commonly used to indirectly measure the amount of organic compounds in water.

Increase in BOD and COD values degrades the quality of water. It is harmful to aquatic organisms and causes toxic effects at various levels of food chain.

PART – B**1. Describe briefly environmental pollution and pollutant.**

Pollution: Pollution is any change in physical, chemical or biological characteristics of the environment that has the potentiality to harm human life, life of other desirable species, natural resources, cultural assets and industries. Contamination is presence of harmful organisms or their toxins that cause discomfort or disease.

Natural pollution is pollution caused by natural sources, e.g., volcanic eruptions, release of methane by paddy fields and cattle, release of carbon monoxide by plants and animals, emission of natural gas, ozone, nitrogen oxides, soil erosion, dust storms, cosmic rays, ultra-violet rays, etc.

Man-made pollution is pollution resulting from human activities like burning of fossil fuels, deforestation, mining, sewage, industrial effluents, pesticides, fertilizers, etc. Amount of man made atmospheric pollution is hardly 0.05% of total but is more dangerous because of its concentration in certain localities,

Pollutant: It is a substance (e.g. dust, smoke), chemical (e.g. SO₂) or factor (e.g. heat, noise) that on release into the environment has an actual or potential adverse effect on human interests. Pollutant can also be defined as a constituent in the wrong amount, at a wrong place or at a wrong time.

Types of pollutants :

Pollutants can be of following types :

- (a) Biodegradable pollutants :The pollutants which are degraded by natural factors and are decomposed by natural activities are biodegradable pollutants.
- (b) Non-biodegradable pollutants :There are pollutants which cannot be purified by natural methods. Plastic products, many chemicals, long chain detergents, glass, aluminium and many other artificial synthetic products manufactured by man come under this category.

Pollution according to physical nature of pollutants:

According to the physical nature of the pollutants, the categories include : gases, particulate matter, temperature, noise, radioactivity, etc. These categories can be named as gaseous pollution, dust pollution, thermal pollution, noise pollution, radioactive pollution, etc.

Types of pollution according to the part of environment:

1. Air pollution (Atmosphere)
2. Water pollution (Hydrosphere)
3. Soil pollution (Lithosphere)

Types of pollution on the basis of origin

1. Natural e.g. volcanic eruption.
2. Anthropogenic e.g. Man made such as industrial pollution.

Air pollution: Release of harmful materials into the air is called air or atmospheric pollution. It is the degradation of air quality and atmosphere condition. Air pollutants include gaseous materials, suspended particles and radioactive substances.

Water pollution: Pollutants in surface run off (and storm water) vary according to the nature of land over which it flows. The run off from agricultural land is contaminated with pesticide residues and residues of inorganic fertilizers. The run off from urban areas mainly contains biodegradable organic pollutants. Industrial sites may contribute to varied types of pollutants like heavy metals, acids and various inorganic compounds. All these pollutants in the run off heavily contaminate our surface water and groundwater resources.

Soil pollution: Alteration in soil leading to reduced productivity is called soil pollution. The soil pollutants include chemicals, fertilizers, organic manure, pesticides, radioactive wastes and discarded, household materials. Contamination of soil with human and animal excreta is a serious health hazard. Air and water pollutants also reach the soil and pollute it too.

Noise pollution: Unbearable sound is called noise. When sound takes the form of noise then it is called as noise pollution. Sound above 60-70 decibels comes in the noise category. Noise pollution is the' contribution of metropolitan culture and industrial development. The main sources of noise pollution are loudspeakers, pressure horns, supersonic jets etc.

Noise pollution causes mental tensions, physical tiredness, loss in learning capacity or complete deafness. To help protect against sound pollution formation of green belts in metropolitan cities and one of the sound proof materials come in use.

2. (a) What are reasons for depletion of ozone layer?

(b) List the adverse effects of depletion of ozone layer. Suggest measures to prevent it.

(a) Ozone Depletion. Ozone layer or shield is present in the stratosphere. It protects the earth from short-wave ultra-violet rays (below 300 nm) by changing the same into infra-red rays. A large hole has appeared in ozone shield over Antarctica (first detected by Farman, 1982) and a smaller one over North Pole. Size of the holes varies with the seasons.

Ozone hole. During the period 1956-1970 the spring time 03 layer thickness above Antarctica varied from 280-325 Dobson unit. Thickness was sharply reduced to 225 DU in 1979 and 136 DU in 1985. Antarctic air is completely isolated from rest of world by natural circulation of wind called as polar vortex. The decline in spring time, ozone layer thickness is called ozone hole. It was first noted in 1985 over Antarctica. Thinning of ozone shield has also been reported elsewhere (e.g., 8% between 30°—50°NP).

Depletion of ozone layer allows harmful ultra-violet radiations to reach earth. It is the major cause of skin cancer, cataract, dimming of eye sight, decrease in immune system and increased susceptibility to herpes.

Thinning of ozone shield is being caused by a number of pollutants like chlorofluorocarbons (14% of total depletion), nitrogen oxides (3.5% depletion), sulphur dioxide, halon, carbon tetrachloride, methyl chloroform, chlorine, etc. Many of these are being released by jets flying in the stratosphere and rockets being fired into space. Others are persistent in the troposphere and gradually pass into stratosphere.

(b) Ozone layer as protective layer. The ozone layer in the stratosphere is very useful to human beings because it absorbs the major part of harmful ultraviolet radiation coming from the sun. Therefore, it is called protective layer. However, it has been observed that the ozone layer is getting depleted. One of the reasons for depletion of ozone layer is action of aerosols spray propellants. These are the chemicals such as fluorocarbons and chlorofluorocarbons. These compounds react with ozone gas in the atmosphere thereby depleting it. Scientists all over the world are worried at the destruction of ozone layer. If the ozone layer in the atmosphere is significantly decreased, these harmful radiations would reach the earth and would cause many damages such as skin cancer genetic disorders in man and other living forms. Efforts are being made to find substitutes of these chemicals which do not react with ozone.

Effects of UV radiations on human:

1. In humans, the increased UV radiation increases the incidence in cancer (including melanoma).
2. Reduces the functioning of immune system.
3. Cornea absorbs UV-B radiations, and a high dose of UV-B causes inflammation of cornea called snow blindness, cataract etc. Exposure may permanently damage cornea and cause cataract.

Measures to prevent ozone layer depletion

- Cut down the use of CFCs
- Do not use polystyrene cups that have chlorofluorocarbon molecules in them which destroy ozone layer.
- Use CFC free refrigerators.
- Use the chemicals derived from peaches and plums to clean computer chips and circuit boards instead of CFCs.

3. Give a brief account of purification of water for public use.

Purification of Water for Public Use

The destruction of water-borne pathogens like bacteria, viruses and amoebic cysts by different methods is called disinfection. The process of disinfection involves the killing of those living organisms which can spread or transmit infection through or in water. There are several methods for disinfection of drinking water. The various processes are as follows

1. Disinfection by light. Sunlight is a natural disinfectant. The ultraviolet light is a good source for this purpose. The common source of UV light is a mercury lamp made of quartz.
2. Disinfection by heat. The drinking water can be disinfected by heating it to its boiling point. High temperature kill bacteria.
3. Disinfection by alkalies and acids. The bacteria die in a very short time in highly acidic or alkaline waters.
4. Disinfection by surface active chemicals. In this process, detergents, i.e., surface active substances are used.
5. Disinfection by gases. For routine disinfection and purification of drinking water, chlorine is generally used as it is both efficient and cheap. In India, generally chlorine gas or bleaching powder is used. Besides chlorine, other substances which can be used for disinfection are bromine and iodine. Ozone is used for disinfecting drinking water in countries like USA, West Germany, France and some African countries. It serves as a disinfectant, removes turbidity and colour producing substances. As ozone is a toxic substance, it is handled very carefully within certain limits.

6. Disinfection by metal ions. Silver ions are bactericidal (kill bacteria) and disinfection occurs even if 1 part of silver is present in one hundred million parts of water. Moreover, copper ions and zinc ions are also used, as they kill a number of viruses and other micro-organisms.

Leaves of tulsi are also responsible of killing viruses and other micro-organisms both in water and milk.

7. Purification by coagulation. Several coagulants like alum, ferric chloride, lime are used, whereby all colloidal particles present in drinking water coagulate. they settle down and thus water can be decanted.

8. Potassium permanganate is a good disinfectant and an oxidising agent. It is added to water of tube well etc. so that bacteria in water die. But being costlier than chlorine, it cannot be used on a commercial scale.

Sources of noise pollution

Noise pollution originates from a number of sources like: agriculture, industry, defence, vehicular traffic, community functions, domestic chorus and personal entertainments.

1. Domestic Gadgets. Mixers pressure cookers, washing machines, desert coolers, fans, exhaust fans, air conditioners, vacuum cleaners, telephones, etc.

2. Personal Entertainment. Transistor, radio, record/ cassette player, T.V.

3. Community Functions. Festivals, marriages, political social and religious functions, public announcements, crackers.

4. Defence Equipment. Tanks, artillery, practice firing, explosions, rocket launching.

5. Industries. Textile mills, rolling mills, printing presses, engineering establishments, shellers, expellers, stone crushers, saw mills.

6. Builders. Bull dozers, road rollers, dynamite blasting, concrete mixers, trolleys, concrete breakers, scrapers, etc.

4. Discuss the effects of noise pollution. Explain various measures to control noise pollution.

Effects of Noise Pollution. Noise affects man adversely in several ways, i.e., having ability to communicate, behaviour etc. Unlike smoke pollution, noise pollution is not visible. Normally, the people remain unaware of noise pollution, till it is too late to overcome it. The human ear has a safety mechanism to protect itself from the damage, provided the exposure to noise is not continuous or for a long period. Excessive noise causes loss of hearing and disturbs mental peace.

1. Impairment of Hearing. The city noise is generally more than the loudness. Therefore, city dwellers are prone to deafness with advancing age. Impairment of hearing is slow at a noise of 80 dB. It is rapid at 90 - 100 dB. An exposure to 90 dB noise for eight hours causes a temporary loss of hearing upto 35 dB. Workers engaged in noisy factories lose the ability to hear soft sounds and whispers within 2-3 years.

2. Damage to Ear Drum and Ear Bones. A sudden loud noise can damage ear drum and displace ear bones. This results in partial or complete deafness.

3. Interference in Conversation and Hearing. Noise of a passing truck or bus. Interferes in class room teaching if the class room happens to be near the road. You cannot have intimate conversation in a social gathering due to noise.

4. Anxiety and Stress. Long exposure to noise above 90 dB brings about stress and anxiety in many persons. It may lead to fright (sudden and extreme fear).

5. Hypertension. Sound pollution stimulates increased adrenaline hormone secretion resulting in narrowing of blood vessels of the body except brain.

This produces high blood pressure or hypertension, over working of heart and abnormal heart rhythm.

6. Eye Sight. Noise pollution causes dilation of eye pupil, impairment of night vision and colour perception. Unwanted light enters the eyes producing glare. The latter may lead to accident.

7. Insomnia. Constant high level noise (e.g., from a nearby function) or noisy interruption (e.g., flights from nearby airport) result in insomnia (sleeplessness), lack of concentration and headache.

Control of Noise Pollution

1. Construction of sound-proof rooms for noisy machines in industries.

2. Radios and transistors should be kept at low volume.

3. Use of horns with jarring sound should be banned.

4. Noise producing industries, aerodromes, railways stations, etc. should be shifted away from the inhabited areas.

5. Proper laws should be enforced to check the misuse of loudspeakers and public announcement systems.

6. Need to enforce silence zone around institutions like educational institutes, residential areas, hospitals, etc.
7. Sound absorbing techniques like acoustical furnishing should be extensively employed.
8. Noise should be deflected away from the receiver by using mechanical devices.
9. Green muffler scheme involves the growing green plants along roadsides to reduce noise pollution.

5. Explain the mechanism of acid rain formation.

"Acid rain" is a broad term used to describe several ways that acids fall out of the atmosphere. A more precise term is acid deposition, which has two parts: wet and dry. Wet deposition refers to acidic rain, fog, and snow. As this acidic water flows over and through the ground, it affects a variety of plants and animals. The strength of the effects depend on many factors, including how acidic the water is, the chemistry and buffering capacity of the soils involved, and the types of fish, trees, and other living things that rely on the water.

Dry deposition refers to acidic gases and particles. About half of the acidity in the atmosphere falls back to earth through dry deposition. The wind blows these acidic particles and gases onto buildings, cars, homes, and trees. Dry deposited gases and particles can also be washed from trees and other surfaces by rainstorms. When that happens, the runoff water adds those acids to the acid rain, making the combination more acidic than the falling rain alone.

Pervading winds blow the compounds that cause both wet and dry acid deposition across state and national borders, and sometimes over hundreds of miles. Scientists discovered, and have confirmed, that sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are the primary causes of acid rain. In the US, About 2/3 of all SO_2 and 1/4 of all NO_x comes from electric power generation that relies on burning fossil fuels like coal.

Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. Sunlight increases the rate of most of these reactions. The result is a mild solution of sulfuric acid and nitric acid.

Effects of Acid Rain:

Acid rain causes acidification of lakes and streams and contributes to damage of trees at high elevations (for example, red spruce trees above 2,000 feet) and many sensitive forest soils. In addition, acid rain accelerates the decay of building materials and paints, including irreplaceable buildings, statues, and sculptures that are part of our nation's cultural heritage. Prior to falling to the earth, SO_2 and NO_x gases and their particulate matter derivatives, sulfates and nitrates, contribute to visibility degradation and harm public health.

6. Give any seven air pollutant gases. Mention its source and effects on human health.

Sources of Air Pollution: 2 types

- (a) Natural sources: eg. Volcanic eruptions, forest fires, biological decay Pollen grains, marshes, radio active materials etc.
- (b) Man made activities: eg. Industrial chemical gaseous effluents, thermal power plants, vehicular emissions, fossil fuel burning, agricultural activities etc.

Classification of Air pollutants: Air pollutants can be classified depending upon the form in which they are present in the environment as:

- 1) Primary pollutants and 2) Secondary pollutants
- 1) Primary pollutants are those emitted directly into the atmosphere in the harmful form. eg. CO , NO , SO_2 etc.
- 2) Secondary pollutants: Some of the primary pollutants might react with one another or with the basic components of air to form new pollutants. These resultant new pollutants are called secondary pollutants.

Moisture

Eg. $\text{NO}/\text{NO}_2 \longrightarrow (\text{HNO}_3/\text{NO}_3)$ etc.

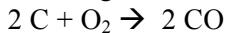
Indoor Air Pollutants: These are primary air pollutants. Important example is 'Radon Gas'

- (i) Radon gas emitted from the building materials like bricks. Concrete, tiles etc. – derived from soil containing Radium
- (ii) Also present in natural gas, ground water and is emitted during their usage indoors.
- (iii) Burning of fuels in the kitchen, smoking, - CO , SO_2 , formaldehyde,

WHO (World Health Organization) has made it known, that according to the statistics available to it, more than 1.1 billion people live in urban areas where outdoor air is unhealthy to breathe. With the ever increasing rate of urbanization the number of such affected presently may be much larger. Some of the air pollutants are detailed below:

(1) Carbon monoxide(CO):

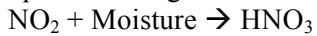
Description: It is a colourless, odourless gas (hence not perceived by the nose to get alerted about the lurking danger) that is poisonous to air breathing beings. It is formed during the incomplete combustion of carbon containing fuels:



Even in villages, people using fire wood and charcoal for their cooking purposes can cause this event. The general human sources for this dangerous pollutant are: Cigarette smoking, incomplete burning of fossil fuels. About 77% comes from motor vehicle exhaust. (Dogs get asphyxiated in the mine walkups due to the CO contamination

Health Effects: CO reacts with the Haemoglobin in red cells and reduces the ability of blood to bring Oxygen to body cells and tissues – causing headaches and anaemia. At high levels it causes coma, irreversible brain cell damage and death.

(2) Nitrogen Dioxide: It is a reddish brown irritating gas that gives photochemical smog. In the atmosphere it can get converted into Nitric Acid (HNO_3).



Human Sources: Fossil fuel burning motor vehicles (49%) and Industrial Power Plants (49%)

Health effects: Lung irritation and damage

Environmental effects: Acid deposition of HNO_3 could damage trees, soils and aquatic life in lakes. HNO_3 could corrode metals and eat away stone on the buildings, statues and monuments. NO_2 could damage fabrics.

(3) Sulphur Dioxide:

It is again an irritating gas that is also colourless. It is mostly formed from the combustion of Sulphur containing Fossil fuels such as coal and Oil. (Start up of the Sulphuric Acid plant). In the atmosphere it can be converted into Sulphurous and Sulphuric acids. These are the major components of acid deposition.

Human Sources: Coal combustion in Thermal Power Plants (88%) and other industrial processes (10%)

Health Effects: Breathing problems even for healthy people

Environmental effects: Reduces visibility, acid deposition of H_2SO_4 . It can cause damage to trees, soils and aquatic life in lakes.

(4) Suspended Particulate Matter (SPM)

These include a variety of particles and droplets (aerosols) They can be suspended in atmospheric air for short to long periods. (Room deodorizers)

Human Sources: Burning of coal in power and industrial plants (40%), burning diesel and other fuels in vehicles(17%), agriculture, unpaved roads, construction work etc.

Health Effects: Nose and throat irritation, lung damage, bronchitis, asthma, reproductive problems and cancer.

Environmental Effects: Reduces visibility, causes acid deposition and H_2SO_4 droplets. These could damage trees, soils and aquatic life in lakes.

(5) Ozone:

This is a highly reactive gas which possess an unpleasant odour and is irritative. As we have seen in the introduction chapter it forms a major portion of the troposphere. It is the major component of photochemical smog.

Human Sources: Chemical reaction with volatile organic compounds (emitted mostly by cars and industries) and nitrogen oxides.

Environmental Effect: Moderates the climate.

(6) Photochemical Smog:

A photochemical reaction is any reaction activated by light. Air pollution known as photochemical smog is a mixture of more than 100 primary and secondary pollutants formed under the influence of sunlight. Its formation begins inside automobile engines and the boilers in coal-burning power and industrial plants.

Health Effects: Breathing problems, cough, eye, nose and throat irritation, heart ailments, reduces resistance to colds and pneumonia.

Environmental effects: Ozone can cause damage to plants and trees, Smog can affect visibility

(7) Lead (Pb): This is a toxic solid metal. Even its compounds, emitted into the atmosphere as particulate matter is also a pollutant.

Human sources: Paint, smelters (Metal refineries), lead manufacture, storage batteries, leaded petrol

Health effects: accumulates in the body, brain and nervous system damage and possible mental retardation (especially in children); digestive and other problems. Some lead containing chemicals caused cancer in test animals.

Environmental effects: Can harm wildlife

7. Explain the water pollutants and their effects.

1. Infectious agents: eg.: Bacteria, viruses, protozoa, and parasitic worms

Human Sources: Human and animal wastes

Effects: Variety of diseases

2. Oxygen Demanding Wastes: eg.: Organic wastes such as animal manure and plant debris that can be decomposed by aerobic (oxygen-requiring) bacteria

Human Sources: Sewage, animal feedlots, paper mills and food processing facilities.

Effects: Large populations of bacteria decomposing these wastes can degrade water quality by depleting water of dissolved oxygen. This causes fish and other forms of Oxygen-consuming aquatic life to die.

3. Inorganic Chemicals: eg.: Water soluble inorganic chemicals.

(i) acids; (ii) Compound of toxic metals such as lead (Pb). Arsenic (As) and selenium (Se) and (iii) salts such as NaCl in ocean water and fluorides (F^-) found in some soils

Human Sources: surface runoff, industrial effluent and household cleansers.

Effects:

- (i) Can render fresh water non potable and unusable for irrigation
- (ii) Causes skin cancers and neck damage
- (iii) Damage the nervous system, liver and kidneys
- (iv) Harm fish and other aquatic life
- (v) Lower crop yields
- (vi) Accelerate corrosion of metals exposed to such water.

4. Organic Chemicals: eg.: Oil, gasoline, plastics, pesticides, cleaning solvents, detergents.

Human Sources: Industrial effluents, household cleaners, surface runoffs from farms

Effects: (i) Can threaten human health by causing nervous system damage and some cancers; (ii) Harm fish and wild life.

5. Plant Nutrients: eg.: Water soluble compounds containing nitrate (NO_4^{3-}), phosphate (PO_4^{3-}) and ammonium (NH_4^+) ions.

Human Sources: Sewage, manure, and runoff of agricultural and urban fertilizers.

Effects:

- (i) Can cause excessive growth of algae and other aquatic plants, which die, decay, deplete dissolved oxygen in water and kill fish.
- (ii) Drinking water with excessive level of nitrates lower the oxygen carrying capacity of the blood and can kill urban children and infants.

6. Sediment: eg.: Soil, silt, etc.

Human Sources: Land erosion

Effects:

- (i) Can cloud water and reduce photosynthesis
- (ii) Disrupt aquatic food webs
- (iii) Carry pesticides, bacteria, and other harmful substances.
- (iv) Settle out and destroy feeding and spawning grounds of fish

(v) Clog and fill lakes, artificial reservoirs, stream channels and harbours.

7. Radioactive Materials: eg.: Radioactive isotopes of Iodine, radon, uranium, cesium and thorium

Human Sources: Nuclear power plants, mining and processing of uranium and other ores, nuclear weapons production and natural sources.

Effects: Genetic mutations, birth defects, and certain cancers

8. Heat (Thermal Pollution): eg.: Excessive heat

Human sources: Water cooling electric power plants and some types of industrial plants. Almost half of water withdrawn in Unitd States each year is for cooling purposes in electric power plants.

Effects:

1. Lowers dissolved oxygen levels and makes aquatic organisms more vulnerable to disease, parasites and toxic chemicals

2. When a power plant operates for the first time or shuts down for repair, fish and other organisms adapted to a particular temperature range can be killed by the abrupt change in water temperature known as thermal shock.

9. Point and Non-Point Sources of Water Pollution:

(i) point Sources: These are discharged pollutants at specific locations through pipes, ditches or sewers into bodies of surface water.

Eg.: This includes factories, sewage treatment plants, abandoned underground mines and oil tankers.

(ii) Non-point sources: They cannot be traced to any single site of discharge. They are usually large land areas or airsheds that pollute water by runoff, surface flow or deposition from the atmosphere.

Eg.: include acid deposition and runoff of chemicals into surface water from croplands, livestock feedlots, logged forests, urban street, lawn, golf courses and parking lots.

Some of the trade substance may contain pathogenic bacteria.

| Disease | Type of organism | Symptoms and Comments |
|-------------------------|-----------------------------|---|
| 1. Cholera | Bacteria | Acute vomiting, diarrhoea and dehydration, often fatal if untreated; primary process water borne; secondary cases carried by contact with food and flies. |
| 2. Typhoid | Bacteria | Acute vomiting, diarrhoea, inflamed intestine, enlarged spleen, often fatal if untreated; primarily transmitted by water and food. |
| 3. Amoebic dysentery | Protozoa | Diarrhoea, possible prolonged transmitted through food, including shell-fish. |
| 4. Bacterial dysentery | Several species of bacteria | Diarrhoea, rarely fatal, transmitted through water contaminated with faecal matter or by direct contact through milk, food and flies. |
| 5. Infectious hepatitis | Virus | Yellow jaundiced skin, enlarged liver, vomiting and abdominal pain, often permanent liver damage, transmitted through water and food, including shell-fish foods. |
| 6. Paratyphoid | Several species of bacteria | Severe vomiting and diarrhoea, rarely fatal, transmitted through water or food contaminated with faecal matter. |

8. Discuss the causes, effects and control of marine pollution.

MARINE POLLUTION

Definition: Marine pollution is defined as, “the discharge of waste substances into the sea resulting in harm to living resources, hazards to human health, hindrance to fishery and impairment of quality for use of sea water.”

Marine pollution is associated with the changes in physical, chemical and biological conditions of the sea water. As it is, the sea water is unfit for human consumption and industrial purposes because of the high salt content. Chemically it is a solution of 0.5 M NaCl and 0.005 M MgSO₄ containing races of allconceivable matter in the universe.

Source of Marine Pollution:

About 50% of the world population is habitated near the sea coastal lines. They wish to derive the benefits from the coastal zones and oceans. The coastal zones contain rich heritage, coral reefs, wetlands and seagrass beds.

Benefits of coral reefs: The coral reefs are the most productive eco-systems that offer many benefits to people.

- (i) Reefs support more than one million species,
- (ii) They provide feeding, breeding and nursery areas to fish and shell fish,
- (iii) They offer medicines.
- (iv) They act as buffer to ocean waves and protect coastal lines from storms and so on.

The coastal reefs have been valued at US\$ 47 thousand per square meter of the shoreline in respect of their protection characteristic alone. These coastal wetlands provide habitat for over 2,000 species of fish and plants. A wide variety of commercially valuable species of fish are supported by Sea grass beds which are under water ocean grass lands.

Factors affecting Coral Reefs: The coral reefs are threatened by-

1. The sediment as a result of deforestation carried by the runoffs.
2. The agricultural and industrial chemicals reaching through the river discharges
3. The anchors of the boats and the careless divers
4. Rising ocean temperatures

The wet lands are being destroyed or degraded by conversion into – agricultural lands, fish ponds, for urban expansion or for industrial development. The various coastal development activities have been adversely affecting the sea grass beds.

I] Dumping the wastes

Dumping of untreated wastes and sewage into oceans by the coastal towns, cities and industrial units is the most serious issue. Also, what ever is carried by rivers in their traverse ends up in sea. These carried materials are like large amounts of sewage, garbage, agricultural discharge, pesticides including heavy metals. Enormous amount of plastic is also being dumped into sea.

Effect: Many marine birds are affected by gastro-intestinal disorders when they ingest plastic,

II] Oil Pollution of Marine Water

The greatest damage to water is inflicted by petroleum and its several products. Oil enters the oceans from cracks in the oil tankers as also because of the spillage. Merchant and warships clean their fuel tanks, again resulting in oil spillage into the ocean. Street cleaning also causes the same effect.

The very heavy portions of the petroleum products tend to precipitate to the bottom or are adsorbed on rock, stone and sand banks resulting in the inhibition of the life of the hydrobionts. Even one drop of petroleum is capable of spreading over as a thin film over a large area and isolate the water from contact with atmospheric oxygen.

Effect: The large spreads of oil films would hamper the photosynthesis and the formation of oxygen. This in turn inhibits growth of plankton, which is the main source for the hydrobionts inhabiting the water bodies. Also, all the aquatic animals depend either directly or indirectly on plankton, which forms the basis of the trophic chain.

The surface of water in contact with the shore is usually contaminated with oil, which interferes with the normal development of many hydrobionts.

Effects of Marine pollution

- Presence of heavy metals and organic pollutants cause intense damage in birds such as thinning of eggshell and the tissue damage of egg.
- Oil pollution can cause damage to marine fauna and flora including algae, fish, birds, invertebrates.. About 50,000 to 2,50,000 birds are said to be killed every year by oil .
- Oil spillage in sea water leads to abnormally low body temperature in birds resulting in hypothermia. Eg. Nearly 150 rare species of bald eagles became victims when they ingested oil during Exxon Valdez accident.
- Oil films are capable of significantly retarding the rate of oxygen uptake by water.
- The continuous oil films inhibit photosynthesis and oxygen formation leading to the debilitating rate of plankton growth.

- Hydrocarbons and Benzpyrene tend to accumulate in the food chain and consumption of fish by man may lead to cancer. Detergents used to clean up the spillage also take their turn causing harm to marine life.

Control Measures of Marine Pollution

A charter of six principles for sustainable management of Marine pollution has been recommended by The World Wide Fund for Nature and World Conservation Union.

- Plans for conserving marine biodiversity must be taken into account of human needs.
- People should be educated about marine eco systems and the benefits offered by them.
- Local communities must be made to involve in the protecting and management of their coastal resources
- Incentives, both social and economic should be offered for conserving and sustainable use of marine resources
- All the oceans of the world are connected is a fact that should be reflected whenever policy decisions are taken.
- Governments of different regions must manage their own waters and also extend necessary cooperation to the neighbouring governments.

Other Control Measures:

- Industrial units on the coastal lines should be made to equip their industries with pollution control instruments and efficient treatment facilities.
- There must be proper regulation in respect of urban growth near the coasts.
- The needs of the fishermen living on the coasts and depending on marine resources should be accommodated and their grievances alleviated.

9. Write a detailed note on Municipal Solid waste management.

Methods of disposal of Municipal solid wastes

a] Landfill, b] Incineration and c] Composting

a] Landfill

Solid wastes are placed in landfill system in alternate layers of 80 cm thick of refuse, covered with 20 cm thick layer of selected earth fill. It is allowed to that way for two to three years. By that time the solid waste volume would shrink by 25 to 30% and then the land can be used for building parks, roads and small buildings.

The most common and cheapest method of waste disposal is dumping in sanitary land-fills. This is the method invariably employed in Indian cities. Land-fill structure can be either built into the ground or on the ground into which the waste is dumped. This methods consists in spreading the solid waste on the ground, compacting it and then covering it with soil at suitable intervals.

Advantages:

1. It is simple and economical
2. segregation is not required
3. Land-filled area can be reclaimed after a few years and used for other purposes.
4. This method can convert low lying, marshy waste-land into useful areas
5. Natural resources are returned to the soil and recycled.

Disadvantages:

1. Large areas are required
2. Transportation cost will be heavy ,since the land available for land-filling will be away from town.
3. If the land-fills are not properly managed bad odours will be emitted.
4. These areas will be breeding centres for mosquitoes and flies and hence insecticides and pesticides are to be applied at regular intervals. These insecticides and pesticides will cause pollution on their own.
5. In wet weather formation of Methane gas is possible and this may lead to fire hazards.

b] Incineration

This is a hygienic way of disposing solid waste. If the solid waste contains more hazardous material and organic content then this method is more appropriate. It is a thermal process and is very effective for detoxification of all combustible pathogens. It is an expensive technology compared to land-fill and composting because incinerators are very expensive.

Incinerator is a furnace in which the municipal solid wastes are burnt. The combustible materials such as rubbish, garbage, dead organisms and the non-combustible matter such as glass, porcelain, metals are separated before feeding to the incinerators. The non-combustible materials can be left out for recycling and reuse. He left out ashes from the incinerators, usually reduced to 10 to 20% of the original waste material volume, need further disposal either by sanitary landfill or by some other means.

The heat generated in the incinerators in turn can be used for generating electricity through the route of steam power and turbines. The municipal solid waste is generally wet but has a very high calorific value. It has to be dried up first before incinerating. This is done in a preheater from where it is taken into the large incinerating furnace, called destructors which can incinerate about 100 to 150 tonnes per hour. The temperature normally maintained in a combustion chamber is about 700°C and may be increased to 1000°C when electricity can be generated.

Advantages:

- The residue from incineration is only 20 to 25% of original weight, the clinker can be used after treatment
- It needs very little space
- Cost of transportation is not high as incinerators are located within the city limits.
- Very safe from hygienic point of view.
- 3 MW of power can be generated from an incinerator plant of 300 tonnes per day.

Disadvantages:

- Its capital cost and operating cost are very high.
- Formation of smoke, dust and ashes need further disposal, due to which air pollution might increase.

(c) Composting:

It is another popular method practiced in many cities in India. In this method, bulk organic waste is converted into a fertilising manure by biological action.

The separated compostable waste is dumped in underground earthen trenches in layers of 1.5 m and is finally covered with earth of about 20 cm and left over for decomposition. Sometimes certain micro organisms such as actinomycetes are introduced for active decomposition. Within 2 to 3 days biological action starts, the organic matter being destroyed by actinomycetes and a lot of heat is liberated increasing the temperature of the compost by about 75°C and finally the refuse is converted to powdery brown coloured odourless mass known as humus and has a fertilizing value for use in agriculture fields. The compost contains lot of Nitrogen essential for plant growth apart from phosphates and other minerals.

WHO (World Health Organization) has set up a compost plant in New Delhi in 1981 with a capacity to handle 90 to 100 tonnes of waste every day. The prepared compost can be supplied to nurseries, kitchen gardens and horticulture department. The developing countries widely employ the composting technology.

Advantages:

1. When the compost manure is used, it increases the water retention and ion-exchange capacity of soil.
2. A variety of industrial solid wastes can also be treated by this method.
3. The compost manure can be marketed thus reducing the cost of disposal of solid wastes
4. Recycling is one of the major benefits of composting.

Disadvantages:

1. The non-compostables have to be disposed off separately
2. Farmers have not yet accepted compost as a fruitful manure and hence the marketing may be difficult.

10. Discuss the role of an individual in prevention of pollution.

ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION

It is not possible to entirely prevent environmental pollution. It is also not possible to completely remove pollution. Proper implementation and individual participation are the most important aspects which should be given due importance and stress.

The individual participation is useful in law making processes and restraining the pollution activities. Thus the public participation plays a major role in the effective environmental management.

Each individual should modify his or her lifestyle in such a way as to reduce environmental pollution.

Individual Participation:

- Plant more trees
- Help more in pollution prevention than pollution control.
- use water, energy and other resources efficiently and prudently.
- Purchase products which can be recycled, already recycled products and environmentally safe products.
- Use CFC free refrigerators.
- Use natural gas than coal. If coal is available cheap, make proper process modifications to see that pollution is minimized.
- Reduce deforestation.
- Increase use of renewable resources.
- Remove NO_x from motor vehicular exhaust.
- Use less harmful substitutes for harmful cleaning agents, paints and other products.
- Use office machines in well ventilated areas.
- Use eco-friendly products
- Do not use polystyrene cups that have chloro fluoro carbon (CFC) molecules. Which destroy ozone layer
- Use rechargeable batteries. Rechargeable batteries will reduce metal pollution.
- Use organic manures instead of commercial inorganic fertilizers
- Reduce garbage by recycling and reuse
- Slow down population growth.

11. What is air pollution? Write the preventive and control measures. (MAY/JUNE 2013)

Air Pollution: Air pollution refers to the release into the atmosphere of materials that are harmful to man, other animals, plants and buildings or other objects.

Sources of Air Pollution:

The major sources of air pollution are fossil fuels (coal and petroleum) and industries.

Human Sources. Many activities done by man are the main source of air pollution. These activities can be divided into following categories

1. Combustion activities; 2. Industrial activities; 3. Agricultural works; 4. Use of solvents.
5. Activities concerned with atomic energy.

Preventive measures for air pollution

To prevent and control air pollution, two types of measures can be adopted.

1. Instead of releasing poisonous gases containing various pollutants into the atmosphere they could be destroyed or used by some other measures.
2. Converting harmful pollutants to harmless products and releasing them into the atmosphere.

Control measures for minimising air pollution.

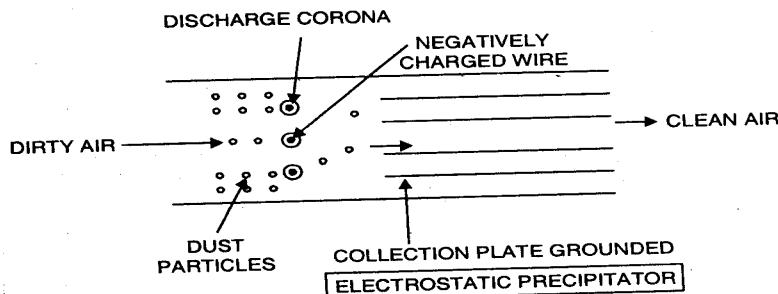
1. Simple combustible solid wastes should be burnt in incinerators.
2. Automobiles must be either made to eliminate the use of gasoline and diesel oil or complete combustion is obtained in the engine so that harmful products are omitted.

Catalytic converter: Automobiles need to be well maintained so that they do not emit much pollutants. Catalytic converters, having expensive metals namely platinum-palladium and rhodium as the catalysts, are fitted into automobiles for reducing emission of gases. As the exhaust passes through the catalytic converter, unburnt hydrocarbons are converted into carbon dioxide and water and carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas, respectively. Motor vehicles equipped with catalytic converter should use unleaded petrol because leaded petrol inactivates the catalyst.

It has been established that installation of catalytic converters can slash carbon monoxide emission from 90 grams to 3.4 grams per mile run. So if half the vehicles on Delhi and Mumbai roads are made to install such catalytic converters, then total CO emission in India can be reduced by 70 per cent.

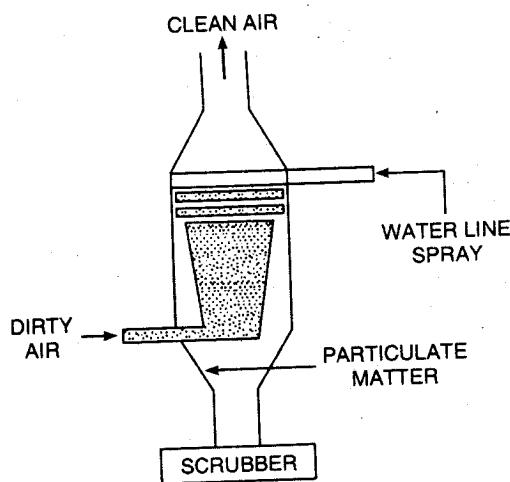
3. There should be cut in the use of agricultural sprays.
4. Excessive and undesirable burning of vegetation should be stopped.
5. Smoking should be stopped.
6. Use of electrostatic precipitators and filters in the factories to minimise atmospheric pollution.
7. Use of tall chimneys can substantially reduce the concentration of pollutant at ground level.
8. Weather forecasts can help in controlling air pollution as the meteorological conditions affect the dispersion, dilution and mixing of various emission and proper operation of factory schedule e.g. when atmospheric stagnation or calm is predicted, a power plant should switch over from coal to gas.
9. Separation of pollutants from harmless gases.
10. Dispersion of pollutants to innocuous products before releasing into atmosphere.
11. Use of electrostatic precipitator and scrubber.

An electrostatic precipitator. It removes over 99% particulate matter present in the exhaust from a thermal power plant. It has electrode wires and a stage of collecting plates. The electrode wires are maintained at several thousand volts, which produce a corona that releases electrons. These electrons attach to dust particles and give them a net negative charge within a very small fraction of a second. The collecting plates are grounded and attract the charged dust particles. The velocity of air between the plates must be low enough to allow the dust to fall.



Electrostatic precipitator

Scrubber. A scrubber can remove gases like sulphur dioxide. In a scrubber, the exhaust is passed through a spray of water or lime. Water dissolves gases and lime reacts with sulphur dioxide to form a precipitate of calcium sulphate or sulphite.



12. List and explain the methods of waste management in the order of preference. (NOV/DEC 2013)

Municipal solid waste (MSW), commonly known as **trash** or **garbage** (US), **refuse** or **rubbish** (UK) is a waste type consisting of everyday items that are discarded by the public.

Functional elements of solid waste

The municipal solid waste industry has four components: recycling, composting, landfilling, and waste-to-energy via incineration.^[5] The primary steps are generation, collection, sorting and separation, transfer, and disposal. Activities in which materials are identified as no longer being of value and are either thrown out or gathered together for disposal.

The three primary strategies for effectively managing materials and waste are reduce, reuse, and recycle. Reduce waste by considering product packaging and making smart purchasing decisions.

Purchase products manufactured with recycled content (learn more at [Buy Recycled](#)). Reuse containers and products. Recycle anything from plastics to electronics.

MSW can be broadly categorized into five broad categories as-

- Biodegradable waste: food and kitchen waste, green waste (vegetables, flowers, leaves, fruits), paper (can also be recycled).
- Recyclable material : paper, glass, bottles, cans, metals, certain plastics, etc.
- Inert waste: construction and demolition waste, dirt, rocks, debris.
- Composite wastes: waste clothing, Tetra Packs, waste plastics such as toys.
- Domestic hazardous waste (also called "household hazardous waste") & toxic waste: medication, e-waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

Collection System

This section should contain descriptions and analyses of the various significant pathways along which MSW is transported from its point of generation to its end use or ultimate disposal, and the collection methods for each, according but not limited to the following:

- (a) type and number of pathways available, including nodes such as transfer stations and marshalling yards;
- (b) estimates of the amount and type of municipal solid waste flowing along each pathway;
- (c) the persons responsible for funding, operating and maintaining the collection systems for each pathway;
- (d) the geographic area and population served by communal systems;
- (e) the potential for and constraints to expansion of communal systems;
- (f) problems with and impacts of various collection methods and pathways; and
- (g) the total collection system costs, in aggregate and for each pathway.

Post-collection System — Operations

(1) This section should contain information about the various methods of processing and disposing of MSW after collection, including the following:

- (a) recycling, including individual and communal composting, and markets for recyclables;
- (b) recovery;
- (c) thermal reduction, including incinerators; and
- (d) landfilling

(2) In addition to identifying existing landfill sites, the study should identify the location and environmental status of all closed landfill sites, including historical sites, private landfills, illegal dumps and landfills on federally administered lands which are on sites adjacent to provincially administered lands.

(3) Each method identified in (1) should be described and analyzed in terms of, but not limited to the following elements, as applicable:

- (a) site / facility locations, classification and number of people served;
- (b) operational status and requirements;
- (c) types and quantities of MSW accepted and banned;
- (d) ownership and persons responsible for each aspect of the operation;
- (e) land, equipment and labour involved;
- (f) operational problems;
- (g) markets and quantities of recyclables shipped;
- (h) disposal of residue;
- (i) public involvement / support;

Post-collection System — Administrative and Financial Structure

(1) In terms of the administrative structure, this section should describe any existing or proposed solid waste management bylaws and regulations. Specified area bylaws should be described in terms of

population served, location and functions. A listing and brief description of all existing waste management permits should also be included.

(2) In terms of financial structure, this section should include total solid waste management system costs, including projected facilities. The funding of each system element should be described, including revenues and cost recovery mechanisms such as general taxation, specified areas, local service areas, user-pay strategies and government grants or loans. Finally, the economic viability of facilities or operations and future financial requirements should be assessed.

**13. Explain the causes, effects and control measure of water pollution. (MAY/JUNE 2013)
(NOV/DEC 2013)**

Water pollution may be defined as, “**the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on humans and aquatic life.**”

The pollutants include sewage, industrial chemicals and effluents, oil and other wastes. Besides, chemicals from the air dissolved in rain water, and fertilizers, pesticides and herbicides leached from the land also pollute water.

Types, effects and sources of water pollution:

Water pollution is any chemical, biological or physical change in water quality that has a harmful effect on living organisms or makes water unsuitable for desired uses.

1. Infectious agents: eg.: Bacteria, viruses, protozoa, and parasitic worms

Human Sources: Human and animal wastes

Effects: Variety of diseases

2. Oxygen Demanding Wastes: eg.: Organic wastes such as animal manure and plant debris that can be decomposed by aerobic (oxygen-requiring) bacteria

Human Sources: Sewage, animal feedlots, paper mills and food processing facilities.

Effects: Large populations of bacteria decomposing these wastes can degrade water quality by depleting water of dissolved oxygen. This causes fish and other forms of Oxygen-consuming aquatic life to die.

3. Inorganic Chemicals: eg.: Water soluble inorganic chemicals.

(i) acids; (ii) Compound of toxic metals such as lead (Pb). Arsenic (As) and selenium (Se) and (iii) salts such as NaCl in ocean water and fluorides (F^-) found in some soils

Human Sources: surface runoff, industrial effluent and household cleansers.

Effects:

- (vii) Can render fresh water non potable and unusable for irrigation
- (viii) Causes skin cancers and neck damage
- (ix) Damage the nervous system, liver and kidneys
- (x) Harm fish and other aquatic life
- (xi) Lower crop yields
- (xii) Accelerate corrosion of metals exposed to such water.

4. Organic Chemicals: eg.: Oil, gasoline, plastics, pesticides, cleaning solvents, detergents.

Human Sources: Industrial effluents, household cleaners, surface runoffs from farms

Effects: (i) Can threaten human health by causing nervous system damage and some cancers; (ii) Harm fish and wild life.

5. Plant Nutrients: eg.: Water soluble compounds containing nitrate (NO_4^{3-}), phosphate (PO_4^{3-}) and ammonium (NH_4^+) ions.

Human Sources: Sewage, manure, and runoff of agricultural and urban fertilizers.

Effects:

- (iii) Can cause excessive growth of algae and other aquatic plants, which die, decay, deplete dissolved oxygen in water and kill fish.
- (iv) Drinking water with excessive level of nitrates lower the oxygen carrying capacity of the blood and can kill urban children and infants.

6. Sediment: eg.: Soil, silt, etc.

Human Sources: Land erosion

Effects:

- (vi) Can cloud water and reduce photosynthesis
- (vii) Disrupt aquatic food webs
- (viii) Carry pesticides, bacteria, and other harmful substances.
- (ix) Settle out and destroy feeding and spawning rounds of fish

(x) Clog and fill lakes, artificial reservoirs, stream channels and harbours.

7. Radioactive Materials: eg.: Radioactive isotopes of Iodine, radon, uranium, cesium and thorium

Human Sources: Nuclear power plants, mining and processing of uranium and other ores, nuclear weapons production and natural sources.

Effects: Genetic mutations, birth defects, and certain cancers

8. Heat (Thermal Pollution): eg.: Excessive heat

Human sources: Water cooling electric power plants and some types of industrial plants. Almost half of water withdrawn in Unitd States each year is for cooling purposes in electric power plants.

Effects:

1. Lowers dissolved oxygen levels and makes aquatic organisms more vulnerable to disease, parasites and toxic chemicals

2. When a power plant operates for the first time or shuts down for repair, fish and other organisms adapted to a particular temperature range can be killed by the abrupt change in water temperature known as thermal shock.

9. Point and Non-Point Sources of Water Pollution:

(i) point Sources: These are discharged pollutants at specific locations through pipes, ditches or sewers into bodies of surface water.

Eg.: This includes factories, sewage treatment plants, abandoned underground mines and oil tankers.

(ii) Non-point sources: They cannot be traced to any single site of discharge. They are usually large land areas or airsheds that pollute water by runoff, surface flow or deposition from the atmosphere.

Eg.: include acid deposition and runoff of chemicals into surface water from croplands, livestock feedlots, logged forests, urban street, lawn, golf courses and parking lots.

Control measures of Water Pollution:

1. The State or Central Government should control the administration of pollution control
2. Scientific techniques should be adopted for the environmental control of catchment areas of rivers, ponds or streams.
3. The industrial processes should be so designed as to adopt recycling operations which will stop the discharge of industrial wastes into natural water sources and by products can be extracted from the wastes.
4. Plants, trees and forests control pollution and they are the natural air conditioners.
5. If forests are present in and around big cities and industrial establishments can positively reduce the sulphur dioxide and nitric oxide pollutants to a greater extent from the atmosphere. “Conservation of Forests” should be treated as the moto and national goal. “Plant more trees” should be the aggressive call to every countryman.. Globally, destruction of forests should be highly discouraged or at least minimized and afforestation should be encouraged. No one can escape from the adverse effects of a balding earth.

14. Write a note on Control of Thermal Pollution. (MAY/JUNE 2013) (NOV/DEC 2013)

Control of Thermal Pollution: Though the effects of thermal pollution are not so severe, control of thermal pollution is necessary since in future the effects may worsen. The use of water from a water course for cooling purposes, with subsequent return to the waterway after passage through the condenser is termed as ‘once-through cooling’. To reduce the magnitude of the pollution, the outlet water can be made to give up some of its heat to the atmosphere and then may be discharged into the water course. To make it effective, cooling towers are primarily used in many power plants and artificial lakes or cooling ponds are situated in some of the places.

1. Cooling towers. Cooling towers transfer some of the heat from cooling water to the atmosphere, most probably through the evaporation of water. Evaporative cooling towers are of the following two types

(a) Natural draft towers. In such towers, hot water is sprayed down through a rising current of air. The water vapour gives its heat to the counter-current air and gets cooled. The cooled water is collected at the bottom and returned to the water body. However, the installation and operation costs of such towers are high.

(b) Mechanical draft towers. In such towers, air flow is forced or induced by fans. Hot water during its passage to water course gets cooled by the action of air. However, these towers are not preferred, as they create annoyable noise due to the operation of fans and operation cost is also high.

Evaporative cooling towers cool the water by 10°C or more, but they evaporate nearly 2 per cent or more of water during evaporation. One of the demerits of such towers is that they may form fog under cold weather, creating driving hazards over an extended area. Similarly, in non-evaporative cooling towers, heat is transferred directly to the air by means of heat exchangers. It, however, involves high operational cost.

2. Artificial lakes or cooling ponds. These are the man-made bodies of water which offer one possible alternative to ‘one-through cooling’. The heated effluents can be discharged into the lake at one end and the water for cooling purposes may be drawn at the other end since the heat would eventually be dissipated through evaporation, the cooling pond would have to be replenished continuously. Such cooling ponds are in use in some locations, but they are not a very attractive alternative since they require so much space. -A one megawatt plant, for example, would require cooling pond with 1000-2000 acres of surface area. In many areas, the cost of using land for this purpose would be too great to justify the procedure.

UNIT- III

PART – A

1. State any two problems caused by construction of dams.

- ❖ Thousands of hectares of forests have been cleared for executing river valley projects.
- ❖ The greatest social cost of big dam is the widespread displacement of tribal people such a biodiversity, cannot be tolerated.

2. What is water logging?

Water logging is the land where water stand for most of the year.

3. What are the two functions of forests?

They recycle rain water and remove pollutants from air. They moderate temperature and weather and help to maintain humidity.

4. What are the advantages of conjunctive use of water?

Consumptive use – water is completely utilized and not reused.

Non – consumptive use – water is not completely utilized and is reused.

5. What are the causes for deforestation?

Destruction of forest area. Submergence of forest area under water.

6. Differentiate between deforestation and land degradation.

Land degradation – is the process of deterioration of soil and loss of the fertility of soil. Deforestation – process of removal or elimination of forests resources due to many natural or man – made activities.

7. Define Hydrologic cycle.

Hydrologic cycle is defined as the interchange of water between the atmospheres and the Earth's surface.

8. Name some water borne diseases and the responsible organisms.

| | |
|---|--------------|
| Typhoid, Paratyphoid, Diarrhoea, Cholera, Bacillary Dysentery | - Bacteria |
| Amoebiasis, Giardiasis | - Protozoa |
| Viral Hepatitis (Jaundice), Poliomyelitis | - Viruses |
| Roundworm, hookworm, threadworm | - Helminthes |

9. Name the sedimentary cycle.

Phosphorous cycle and Sulphur cycle

10. What are the two adverse effects caused by overgrazing?

Land degradation, soil erosion, loss of useful species.

11. What are the advantages of rain water harvesting?

Advantages of rain water harvesting – Reduction in the use of current for pumping water, increase the availability of water from the wells, rise in ground water levels, minimizing soil erosion and flood hazards, upgrading social and environmental status.

12. State the environmental effect of extracting & using mineral resources?

Rapid depletion of mineral deposits, causes environmental pollution.

13. What do you understand by the terms ‘mineral’ and ‘ore’?

Ore is the unprocessed part of the rock excavated

14. What are the various processes by which mineral deposits are formed?

Minerals are naturally occurring substances having definite chemical and physical properties. Ores are minerals or combination of minerals from which useful substances such as metals can be profitably extracted.

15. What are strategic and critical minerals? Give examples.

Strategic minerals – required for the defence of the country [Eg. – manganese, cobalt.]

Critical minerals – essential for the economic power of a country. [Eg. – iron, aluminium.]

16. What are the effects of over exploitation of mineral resources?

Devegetation and defacing of land scape, Ground water contamination, Air pollution, Subsidence of land

17. Give some methods that can be applied for the management of mineral resources.

Modernization of mining activities, reuse and recycling of metals, environmental impacts can be minimized by adopting ecofriendly mining technology.

18. How can you differentiate between under nutrition & mal nutrition?

People who cannot buy enough food to meet their basic energy needs suffer from undernutrition. Deficiency or lack of nutrition often leads to malnutrition.

19. What are the changes caused by overgrazing and agriculture?

Overgrazing – Land degradation, soil erosion, loss of useful species.

Agriculture – loss of nutrients, soil erosion, deforestation.

20. What do you understand by micronutrient imbalance?

Most of the chemical fertilizers used in modern agriculture contain N.P.K. which are macro-nutrients, when excess of nutrients is used in the fields it leads to micronutrient imbalance.

21. What is blue baby Syndrome?

When nitrogen fertilizers are applied in the fields they leach deep into the soil and contaminate the ground water, the nitrate in the water gets increased, when the nitrate concentration exceeds 25mg/lit they cause serious health problem called blue baby syndrome.

22. Define Eutrophication.

A large portion of n and p used in crop fields is washed off by the runoff water and reaches the water bodies causing overnourishment of lakes called Eutrophication.

23. Explain briefly the various methods of harvesting solar energy.

Solar voltaic cells, solar heat collectors, solar water heater.

24. Write a note on tidal power.

Ocean tides produced by gravitational forces of the sun and moon contain enormous amount of energy which can be harnessed by constructing a tidal barrage.

25. Compare nuclear power with coal power.

| | |
|-------------------------------|--|
| Coal power fossil fuel | Nuclear power generated from nuclear fission or fusion |
| governed by temp and pressure | no effect of temp and pressure |

26. Write a note on production of electricity from solar energy.

Energy that we get directly from the sun is called solar energy. – solar cells, solar heat collectors.

27. What are renewable and non-renewable energy sources?

Renewable energy resources are natural resources which can be regenerated continuously and are inexhaustible. They can be used again and again. Eg: solar energy, wind energy etc. Non-renewable energy resources are energy resource that is not replaced or is replaced only very slowly by natural processes. Eg: fossil fuels--oil, natural gas, and coal.

28. Write briefly about geothermal energy.

Temperature of the earth increases at the rate of 20 – 75°C per Km, when we move down the earth's surface. High temperature and pressure fields exists below the earth's surface in many places. The energy harnessed from the high temperature present inside the earth is called geothermal energy.

29. What are the disadvantages of H₂ as fuel?

Highly inflammable and explosive in nature, safe handling required, difficult to store and transport.

30. What are bio fuels?

Fuels obtained by fermentation of biomass.

31. What is LPG?

Petroleum gas obtained during cracking and fractional distillation can be converted into liquid under pressure, colorless and odourless gas.

32. What is the necessity of alternate energy resources?

Importance of solar energy, hydel power projects, hydroelectric power generation – to avoid environmental implications, ecological balance existing on earth – to provide more energy to meet the requirements of increasing population, to reduce environmental pollution, to reduce safety and security risks associated with the use of nuclear energy.

33. Name the different types of energy resources.

34. Define sustainable forestry.

Using the forest wealth for all needful and other purposes without basically affecting the minimum area requirement for forests can be called sustainable forestry. For achieving sustainability of forestry. For this care should be taken to prevent deforestation as far as possible. Even if deforestation is taking place a planned forestation programme is to be implemented.

35. What are the conventional sources of energy for mankind?

Coal, petroleum, natural gas and nuclear fuels.

36. What are the measures recommended for conservation of natural resources?

Conservation of energy, water, soil, food resources and forests.

37. What is the role of an individual in conservation of natural resources?

Role of individual in the conservation of natural resources. – duty of every individual to conserve natural resource in such a way that it is available for future generations also. Due to advancement I technology and population growth, the present world is facing lot of problems on degradation of natural resource.

38. Mention some uses of land resources.

Uses of land resources – provides food, wood, minerals etc for us, nurtures the plants and animals that provide food and shelter, used as watershed or reservoir, used for construction of buildings and industries.

39. What is land degradation?

Land degradation. – Process of deterioration of soil or loss of fertility of soil.

40. What are the causes of land degradation?

Causes of land degradation. – Increase in population, increase in urbanization, increased applications of fertilizers and pesticides, damage of top soil.

41. What do you understand by desertification?

Desertification–Progressive destruction or degradation of arid or semi arid lands to desert.

42. Mention the causes of land slides.

Causes of landslides – removal of vegetation, underground mining, transport, addition of weight and ground water level.

43. What do you mean by environmental impact?

Environmental impact–The effect on the natural environment caused by various human actions. It includes 2 types. Indirect effects– Eg: pollution, Direct effects– Eg: cutting down trees.

44. Explain overgrazing.

Overgrazing-A process of eating away of forests without giving it a chance to regenerate.

45. State the reasons of over exploitation of forests. (MAY/JUNE 2013)

1. Shifting of Cultivation – 300 million people – 5 lakh hectares of forest for slash and burn culture
2. Fuel requirement
3. Raw materials for industrial use
4. Developmental projects
5. Growing food needs
6. Overgrazing
7. Forest fires

46. Write the ways of drought management. (MAY/JUNE 2013)

- Selecting appropriate crop or plantation depending upon the climate, soil type .
- Afforestation

47. Mention the major environmental impacts of Mining. (NOV/DEC 2013)

Impacts of Mining are: Soil erosion, Contamination of soil, Loss of biodiversity, Formation of sinkholes.

48. What are the changes caused due to overgrazing? (NOV/DEC 2013)

Overgrazing leads to loss of biodiversity, loss of minerals, Soil erosion, leads to desertification.

49. What are the harmful effects of land degradation?(NOV/DEC 2013)

Harmful effects of land degradation. – Soil structure and texture are deteriorated, loss of soil fertility due to loss of valuable nutrients, increase in water logging, salinity, alkalinity, acidity problems.

PART – B

1. (i) What is deforestation and give its ill effects. (ii) Illustrate the various environmental ill effects and benefits associated with dams with reference to a case study.

(i) What is deforestation and give its ill effects.

DEFORESTATION:

The total forest area of the world in 1900 was 7000 million hectares -1975 – 2900 mha – 2000 – 2300 mha.

Deforestation rate in temperate countries are relatively moderate. But it is alarming in tropical countries. It is estimated that in next 60 years we would lose more than 90% of our tropical forest.

INDIAN STATUS:

Stabilized since 1982, with about 0.04% declaration per year between 1982 - 90. During this period it is estimated that about 1.44 mha land was brought under afforestation. As per our NFP, we have a target of achieving 33% forest area. But we still have only 19.27% of our land area covered by forests(satellite data).

MAJOR CAUSES OF DEFORESTATION:

- Shifting of Cultivation – 300 million people – 5 lakh hectares of forest for slash and burn culture
- fuel requirement
- raw materials for industrial use
- developmental projects
- growing food needs
- overgrazing

CONSEQUENCES OF DEFORESTATION

1. threatens many wild life species due to destruction of natural habitat
2. biodiversity is lost along with that genetic diversity
3. hilly regions are made prone to landslides
4. soil erosion and loss of soil fertility
5. hydrological cycle is affected
(loss of rainfall, flood, drought etc)

ii) Illustrate the various environmental ill effects and benefits associated with dams with reference to a case study.

DAMS – BENEFITS AND PROBLEMS

River valley projects with big dams are considered to play a key role in the development of a country. India has large number of river valley projects

1. These dams are regarded as symbol of national development.
2. provides large scale employment of tribal people and increase the std. of living of them
3. contribute for economic uplift and growth
4. help in checking flood
5. generate electricity
6. reduce power and water shortage
7. provide irrigation water
8. provide drinking water to remote areas
9. promote navigation and fishery.

Environmental problems:

The environmental problems can be at upstream as well as downstream

Level

Upstream problems

1. Displacement of tribal people
2. Loss of flora and fauna
3. siltation and sedimentation near reservoir
4. stagnation and water logging near reservoir

5. growth of aquatic weeds
6. micro climatic changes
7. RIS causes earthquakes
8. breeding of disease vectors

Downstream problems

1. Water logging and salinity due to over irrigation
2. micro climatic changes
3. salt water intrusion at river mouth
4. loss of fertility due to sediment deposits
5. out break of vector born diseases.

2. What is soil? Give an account of soil erosion. Discuss methods for conservation of soil.

Soil. The top layer of the land constitutes soil. It is the region which supports vegetation by providing enormous water and mineral nutrients. However of the total land area of 13,393 million hectares, only 11% is available for agriculture, the rest covered by human dwellings, roads, canals, railways, meadows, pastures and forests.

Soil erosion. Damage or removal of top soil renders the soil infertile. Erosion may occur in many ways

1. Top soil is carried away by wind sweeping across ploughed soil left unused in dry season.
2. Loss of forests by felling or fire starts erosion. Soil is carried away by rivers and streams and deposited in the oceans. No doubt, the forests are renewable, it takes many decades to have full grown forests again. Erosion continues till then.
3. Unprotected fields are eroded by wind and water.
4. Burrowing animals contribute to soil erosion. They make the soil loose and liable to be carried away by water.
5. Ocean waves and glaciers also cause soil erosion.
6. Human activities, such as felling of trees, overgrazing, overcropping and faulty tilling accelerate soil erosion.

Methods of soil conservation. The various means of soil conservation are:

- (a) Bio-technology. Under this different types of agricultural methods are used. For example, contour agriculture, mulching, crop rotation, dry farming and other agricultural practices.
- (b) Engineering methods. Making basins for collection of water on land suitable for agricultural purposes. Soil conservation can be done even by making contours, on the surface.
- (c) Other Methods. The plantation, making drainage lines, planting trees at certain angles in the desert area (which will decrease the speed of strong winds).

Decreasing soil pollution is also a method which helps in soil conservation.

3. Describe sources of water supply.

Sources of water.

Rain. It is the prime source of water. When it seeps into the ground, it forms ground water. Part of it evaporates back into the atmosphere and some runs off to form streams and rivers which ultimately flow into the sea. Some part of it is taken by the plants and is transpired by the leaves. It is the purest form of water. Chemically, it is soft water containing only traces of dissolved solids. Normally, the rain water does not carry disease causing bacteria. But as it falls through the atmosphere, it tends to get impure. It picks up impurities, such as dust, soot, bacteria and gases like carbon dioxide, oxygen, nitrogen and ammonia.

Surface Water. It originates from rain water. Rivers, streams, tanks, ponds, lakes etc. are different sources of surface water. In general, surface water supplies possess a high probability of organic, bacterial and viral contamination.

Brackish Water. The content of dissolved salts in brackish water is higher than the fresh water and ranges between 0.5 to 35%. These waters of intermediate salinity range are distinct from fresh or marine waters. In estuary which represents the tail end of a river, mixing of fresh water with sea

Marine Water. The sea water is highly salty. The average salinity of sea water remains almost constant at 35 parts of salts per 1000 parts of water by weight and written as 35%. Some salt lakes may also have salinity between 25% to 35%. Salts present in the sea water includes chlorides of sodium, potassium, magnesium; sulphates of magnesium, calcium and strontium. Also present in sea water are calcium carbonate and sodium fluoride. The biotic activity in such habitats is greatly restricted.

The absence of many fresh water animals and plants from the marine environment is largely due to their inability to tolerate the high salinity of the sea water. Insects are mostly absent from marine environment.

Ground Water. Ground water represents a major subterranean reservoir of fresh water. In general, it is not tapped by plants as it is too deep and does not suffer from loss due to evaporation. It slowly flows through the underground porous substratum from one place to another under the influence of gravity. Its flow may vary from a few millimeters to as much as a metre or so per day. At some places ground water reappears at the surface in the form of a spring.

Wells are the major forms of ground water. They may be shallow or deep. The zone of sub-surface formation that provides water to wells is called an aquifer. Some aquifers exhibit an unusually high hydrostatic pressure to force water upto the soil surface when a well is dug. Such a well from which water is pushed automatically to the soil surface is called an artesian well.

In areas devoid of lakes and rivers ground water is the most important source of water.

The total exploitable potential of ground water amounts to 42.3×10^{10} cubic metres in India. A quarter of it is already being used in the country for irrigation, industries and domestic uses. In many places ground water withdrawals have already exceeded the recharge rates causing serious problems.

4. Discuss the role of an individual in the conservation of natural resources.

The steps necessary for every individual to conserve the natural resources are:

Conserve water:

- Keep taps closed.
- Conserve water in the washing machines.
- Check for water leaks in the pipes.
- Use drip irrigation
- Build rain water harvesting system

Conserve Energy

- Turn off lights,fans.
- Use solar cooker
- Grow deciduous trees and climbers

Protect the soil

- Grow different ornamental plants
- Use sprinkling irrigation
- Use mixed cropping

Promote sustainable agriculture

- Reduce use of pesticides
- Use drip irrigation.

5. Write a brief note on changes caused by overgrazing and agriculture?

CHANGES CAUSED BY OVERGRAZING AND AGRICULTURE: Overgrazing:

Process of eating away the vegetation along with its roots without giving a chance to regenerate
Land degradation-leads to organically poor, dry, compacted soil cannot be used for further cultivation
Soil erosion-cover of vegetation gets removed from soil

Loss of useful species-good quality grasses and herbs with high nutritive value, when grazed lose even the root stocks which carry the reserve food for regeneration get destroyed which gives raise to secondary species like parthenium, Lantane, Xanthium etc

Modern agriculture:

The practice through which specific plant species are cared and managed so as to obtain maximum yield of consumable parts of plants agriculture .Makes use of hybrid seeds and selected and single crop variety, high tech equipment and lots of energy subsidies in the form of fertilizers, pesticides and irrigation water e.g. green revolution

- Damage to soil
- Water contamination
- Water scarcity
- Global climate change
- Water logging-results when soil is over irrigated
- Soil salinity-increase plant productivity, interferes with water uptake by plants
- Fossil fuels and pesticides produce air pollution Impacts related to high yielding varieties:
- Monoculture i.e. the same genotype is grown over vast areas. Disease spread easily
- Micronutrient imbalance e.g. Zinc deficiency-affect soil productivity
Nitrate pollution-nitrogenous fertilizers applied deep soil contaminates ground water. cause blue baby syndrome methaemoglobinemia- affects infants
- Eutrophication: Over nourishment of lakes due to agriculture field wash out-leads to alga bloom-dead organic matters increases due to decomposition-leads to oxygen demand
Problems associated with pesticide use
- Evolution of genetic resistance
- Imbalance in ecosystem
- Creation of new pest
- Persistence, Bioaccumulation and Biomagnification
- Mobility through soil, water, air, washed away into rivers, streams, when it rains can harm fishes
- Creating super pest
- Death of non target organisms
- Salinity
- Water logging.

Water logging / salinisation: Saturation of soil with irrigation water or excessive precipitation, so that water table rises close to surface. Water logging results when soils are over irrigated without drainage. Occurs in clayey soil, soil root zone becomes saturated with so much water blocking oxygen supply for growth and soil becomes unsuitable. Carbon dioxide and ethylene accumulate around roots and affects plants

6. Describe the problems associated with the over exploitation of mineral resources and ground water.

✓ Environmental impacts of over extraction of mineral resources:

- Depending on the conditions of terrain and depth of ore deposits 2 types of mining operations are carried out. 1. open cast mining and 2. underground mining. In both types each steps in mining processing produce several environmental effects such as,
 - ⊕ Deforestation takes place due to removal of vegetal covers.
 - ⊕ Great volume of debris has been generated which disrupt the surface and ground water circulation. It also reduces the water carrying capacity of streams very close to mining area
 - ⊕ The stacking of over burden and building of spoil banks creates problems of landslides
 - ⊕ Under ground fire in coalmines is a hazard that is difficult to control
 - ⊕ Mining and ore processing normally causes air pollution and water pollution
 - ⊕ The acid water generated in coalmines can pose a serious problem of water pollution, which adversely affects the flora and fauna.
 - ⊕ Deeper excavation of ground causes lowering of water table, which leads to drying of wells or sea water intrusion
 - ⊕ In stone quarries, blasting of rocks not only annoying the people nearby, but also cause hazard from fly rocks and dusts and damage to buildings due to vibrations

The disposal of waste material produced after concentrations of ore create increase concentration of heavy metals and toxic elements in the environment

- ✓ Effects of over utilization of ground water:

Reasons: Economic development, rapid industrial growth and population explosion

The use of ground water and surface water rates which are higher than that of recharge ultimately leads to

- Water scarcity
- Water logging
- Salination
- alkalinization
- water pollution or contamination

- creates declining of water levels
- crops failure and reduction in agricultural production
- over pumping of ground water create drought, famine and food shortage
- over pumping of ground water sea water intrusion in coastal aquifers
- land subsidence may due to over pumping of ground water
- river pollution due to industrial activities and dumping of waste into rivers, which in turn force to utilize the ground water, ultimately leads to over pumping

Clean water is universal right. It is the responsibility of everyone to ensure the purity of water. Water is a valuable commodity and it has to be conserved.

7. Write an essay on the impact of dams on people? What are the benefits and negative impacts on people? (NOV/DEC 2013)

Most dams are built to control flood hazards, to store water for irrigation or other uses or to produce hydroelectricity. In India, where nearly 75 percent of the population depends on agriculture, the execution of River Valley Projects and dam building are some important steps of growth strategy of the country.

Benefits of Dams

1. Dams are needed for power, they can have a positive effect in offsetting environmental costs associated with other power sources. Hydropower is cleaner and safer than nuclear power. Water turbines are also cleaner than coal-fired generators. Furthermore, both nuclear and coal power require extensive mining with great damage to environment.
2. The dams have tremendous potential for economic upliftment and growth.
3. They can help in checking floods and famines, generate electricity and reduce water and power shortage.
4. Provide irrigation water to lower areas
5. Provide drinking water in remote areas and promote navigation, fishery etc.

Negative Impact of Dams

1. Displacement due to Dams. The big dams are being constructed everywhere in tribal or hilly areas. The people of these regions are being uprooted to provide power to big cities, industries and irrigation water to comparatively more prosperous area. This is unethical. Big river valley projects like Hirakund dam (Orissa) Bhakra Nngal dam (Punjab), Tehri dam (Uttaranchal), Sardar Sarovar Project (Gujarat) and Damodar Valley project (West Bengal) etc., have caused large scale displacement of local people. In the last 50 years more than 20 million people have been displaced by dams.
2. Loss of forests, flora and fauna
3. Changes in fisheries and the spawning grounds
4. Siltation and sedimentation of reservoirs
5. Loss of non-forest land
6. Stagnation and water logging near reservoir
7. Breeding of vectors and spread of vector-borne diseases
8. Reservoir induced seismicity (RIS) causing earthquakes
9. Growth of aquatic weeds.
10. Changes in the micro climate
11. Reduced water flow and slit deposition in river
12. Flash floods

13. Salt water intrusion at river mouth

14. Loss of land fertility along the river since the sediments carrying nutrients get deposited in the reservoir.

8. i) Discuss the effects of timber extraction on forests and tribal people. (NOV/DEC 2013)

(ii)What is land degradation? Mention the factors responsible for land degradation. (MAY/JUNE 2013) (NOV/DEC 2013)

i) Discuss the effects of timber extraction on forests and tribal people.

- Threatens the existence of wildlife species.
- It destructs the natural habitat
- Loss of biodiversity
- Soil erosion.
- Loss of soil fertility
- Leads to hill slides
- Global warming

ii)What is land degradation?Mention the factors responsible for land degradation.

Land is an finite and valuable resource upon which we depend for our food,fibre and fuel wood.

More and more pressure on the limited resources which are getting degraded due to over-exploitation.

Soil erosion,water looging,salinization and contamination of soil with industrial wastes like fly-ash,press-mud or heavy metals all cause degradation of land.

Soil erosion is wearing away of soil.It is the movement of soil components,especially surface-litter and top soil from one place to another.

It is of 2 types:

Normal or geologic erosion –Caused by gradual removal of soil by natural processes.

Accelerated erosion-Caused by anthropogenic activities.

The agents which cause these type of erosions are:

Chemical and Biotic agents.

Practices followed to conserve soil are:

i.Conservational till farming

ii.Contour farming

iii.Terracing

iv.Strip cropping

v.Alley cropping

vi.Wind breaks.

9. What is Deforestation? Explain the causes for deforestation and explain its consequences. (NOV/DEC 2013)

What is Deforestation

Deforestation is defined as the destruction of forested land. It has proved to be a major problem all over world. However, the rates of destruction of forests are particularly high in the tropics.

Causes of Deforestation

The causes of deforestation vary form place to place.

The main causes of deforestation are explosion of human and livestock population of increased demand for timber, fuel wood, expansion of croplands, construction of roads and dams. Deforestation causes deterioration of the quality of life in a society, because of the following factors

1. It results in reduced shade and there is quick run off which causes erosion and floods.
2. it causes decreased rain fall which ultimately leads to drought.
3. It also reduces the water retention power of soil which leads to drought.
4. Deforestation causes increased convection which again leads to drought.
5. Floods and drought caused by deforestation disturbs plant and animal life.

Effects of Deforestation

Deforestation has been the cause of many problems facing the world today such as erosions, loss of biodiversity through extinction of plant and animal species, and increased atmospheric carbon dioxide.

Importance of Vegetation

Deforestation consequently decrease the supply of oxygen found on earth. Oxygen is essential to the existence of all living things and without it every living creature (including humans) will not be able to sustain life. In addition, forests provide homes for many important species such as the Northern Spotted Owl which can only survive in the northwestern United States . Furthermore, forests prevent desertification by replenishing nutrients in the land. These are just a few reasons why forests are soon important.

Economic impact

Historically, utilization of forest products, including timber and fuel wood, has played a key role in human societies, comparable to the roles of water and cultivable land. Today, developed countries continue to utilize timber for building houses, and wood pulp for paper. In developing countries almost three billion people rely on wood for heating and cooking.

The forest products industry is a large part of the economy in both developed and developing countries. Short-term economic gains made by conversion of forest to agriculture, or over-exploitation of wood products, typically leads to loss of long-term income and long-term biological productivity.

10. (i) Enumerate the effects of modern agriculture. (MAY/JUNE 2013)

Modern agriculture:

The practice through which specific plant species are cared and managed so as to obtain maximum yield of consumable parts of plants agriculture .Makes use of hybrid seeds and selected and single crop variety, high tech equipment and lots of energy subsidies in the form of fertilizers, pesticides and irrigation water e.g. green revolution

- Damage to soil
- Water contamination
- Water scarcity
- Global climate change
- Water logging-results when soil is over irrigated
- Soil salinity-increase plant productivity, interferes with water uptake by plants
- Fossil fuels and pesticides produce air pollution Impacts related to high yielding varieties:
- Monoculture i.e. the same genotype is grown over vast areas. Disease spread easily
- Micronutrient imbalance e.g. Zinc deficiency-affect soil productivity
Nitrate pollution-nitrogenous fertilizers applied deep soil contaminates ground water.cause blue baby syndrome methaemoglobinemia- affects infants
- Eutrophication: Over nourishment of lakes due to agriculture field wash out-leads to alga bloom-dead organic matters increases due to decomposition-leads to oxygen demand
Problems associated with pesticide use
- Evolution of genetic resistance
- Imbalance in ecosystem
- Creation of new pest
- Persistence, Bioaccumulation and Biomagnification
- Mobility through soil, water, air, washed away into rivers, streams, when it rains can harm fishes
- Creating super pest
- Death of non target organisms
- Salinity
- Water logging.

(ii) Write a note on wind energy and tidal power. (MAY/JUNE 2013)

(ii) Wind energy

The high speed winds have a lot of energy in them as kinetic energy due to their motion. The driving force of the winds is the sun. The wind energy is harnessed by making use of wind mills. The blades of the wind mill keep on rotating continuously due to the force of the striking wind. The rotational

motion of the blades drives a number of machines like water pumps, flour mills and electric generators. A large number of wind mills are installed in clusters called wind farms, which feed power to the utility grid and produce a large amount of electricity. These farms are ideally located in coastal regions, open grasslands or hilly regions, particularly mountain passes and ridges where the winds are strong and steady. The minimum wind speed required for satisfactory working of a wind generator is 15 km/hr.

Tidal energy

Ocean tides produced by gravitational forces of sun and moon contain enormous amounts of energy. The high tide and low tide refer to the rise and fall of water in the oceans. A difference of several meters is required between the height of high and low tide to spin the turbines. The tidal energy can be harnessed by constructing a tidal barrage. During high tide, the sea water flows into the reservoir of the barrage and turns the turbine, which in turn produces electricity by rotating the generators. During low tide, when the sea level is low, the sea water stored in the barrage reservoir flows out into the sea and again turns the turbine.

There are only a few sites in the world where tidal energy can be suitably harnessed. The Bay of Fundy, Canada having 17-18m high tides has a potential of 5000 MW of power generation. The tidal mill at La Rance, France is one of the first modern tidal power mill. In India, Gulf of Cambay, Gulf of Kutch and the Sunderban deltas are the tidal power sites.

11. Discuss the environmental damage caused by mining activities. (MAY/JUNE 2013)

(i) Devegetation and defacing of landscape: The topsoil as well as the vegetation are removed from the mining area to get access to the deposit. While large scale deforestation or devegetation leads to several ecological losses, the landscape also gets badly affected. The huge quantities of debris and tailings alongwith big scars and disruptions spoil the aesthetic value of the region and make it prone to soil erosion.

(ii) Subsidence of land: This is mainly associated with underground mining. Subsidence of mining areas often results in tilting of buildings, cracks in houses, buckling of roads, bending of rail tracks and leaking of gas from cracked pipe-lines leading to serious disasters.

(iii) Groundwater contamination: Mining disturbs the natural hydrological processes and also pollutes the groundwater. Sulphur, usually present as an impurity in many ores is known to get converted into sulphuric acid through microbial action, thereby making the water acidic. Some heavy metals also get leached into the groundwater and contaminate it posing health hazards.

(iv) Surface water pollution: The acid mine drainage often contaminates the nearby streams and lakes. The acidic water is detrimental to many forms of aquatic life. Sometimes radioactive substances like uranium also contaminate the water bodies through mine wastes and kill aquatic animals. Heavy metal pollution of water bodies near the mining areas is a common feature creating health hazards.

(v) Air pollution: In order to separate and purify the metal from other impurities in the ore, smelting is done which emits enormous quantities of air pollutants damaging the vegetation nearby and has serious environmental health impacts. The suspended particulate matter (SPM), Sox, soot, arsenic particles, cadmium, lead etc. shoot up in the atmosphere near the smelters and the public suffers from several health problems.

(vi) Occupational health hazards: Most of the miners suffer from various respiratory and skin diseases due to constant exposure to the suspended particulate matter and toxic substances. Miners working in different types of mines suffer from asbestosis, silicosis, black lung disease etc.

UNIT – IV PART – A

1. What is development?

Development should bring benefits to all, not only for the present generation, but also for the future generation.

2. State the aspects of sustainable development.

Inter- generational equity & Intra –generational equity

3. What is urbanization?

It is the movement of human population from rural areas to urban areas for the want of better education, communication, health, employment, etc.,

4. State the causes of urbanization.

Since cities are the main centers of economic growth, trade, transportation, education, medical facilities and employment, rural people moves to cities.

5. State the solutions for urban energy problem.

Urban people may use public transport instead of using motor cycles and cars. Production capacity may be increased.

6. State the need for water conservation.

Over exploitation of ground water leads to drought. Agricultural and industrial activities require more fresh water.

7. State the different strategies for water conservation.

Reducing evaporation losses; Reducing irrigation losses; Re-use of water: Preventing wastage of water; Decreasing run-off losses: Avoid discharge of sewage.

8. What are the advantages of rain water harvesting?

Increasing the availability of water from well. Rise in ground water levels.

9. What are the factors affecting watershed?

The watersheds are found to be degraded due to uncontrolled, Unplanned and unscientific land use activities; Droughty climate also affects the watershed.

10. What are the objectives of watershed management?

To minimize the risks of floods, droughts and landslides; To raise the ground water level.

11. State the causes for displacement of people.

Due to developmental activities; Due to disaster; Due to conservation initiatives.

12. What is resettlement?

It is the simple relocation (or) displacement of human population.

13. What is environmental ethics?

It refers to the issues principles and guidelines relating to human interactions with their environment.

14. What are the common objectives of Environmental Legislation?

- To control further damage to the environment and ecosystem
- To conserve the environment.
- To restore the environment in areas damaged including such measures as reclamation of degraded land.
- To create authorities to administer the policy and contents of the legislation.
- To provide penalties and prosecution for violation of laws

15. Name some of the acts enacted by the Indian Government to protect the environment.

The Water (Prevention and Control of Pollution) Act 1974

The Water (Prevention and Control of Pollution) Cases Act 1977

The Air (Prevention and Control of Pollution) Act 1981

The Environment (Protection) Act 1986

The Public Liability Insurance Act 1991

16. Mention some of the Environmental Quality Objectives.

Reduced climate impact, A non-toxic environment, Cleaner air, A perfect zone layer. Good quality ground water, Sustainable forests

17. What is the main objective of ISO 14000 series?

The main purpose of ISO 14000 series is to promote effective and efficient environmental management in organizations.

18. What is the role of ISO in environmental protection?

The main involvement of ISO is to develop the standards in the following areas.

- 1) Environmental Management System (EMS), 2) Environmental Auditing, 3) Environmental Labeling, 4) Environmental Performance Evaluation, 5) Life cycle assessment, 6) Terms and definitions

19. What is the difference between normal osmosis process and reverse osmosis process?

In the normal osmosis process, more dilution of concentrated solution occurs by the movement of molecules from the less concentrated side. But incase of reverse osmosis process, due to the application of high external pressure, the molecules of solution move from the more concentrated side to the less concentrated side through the semi-permeable membrane.

20. Define HDI.

HDI is an estimate of human resources development, as measured by three parameters – life span, literacy and standard of living. It determines the quality of life in a country.

21. What is disaster?

It is defined as the sudden calamity which brings misfortune and miseries to the humanity.

22. What is earthquake?

It is defined as sudden, violent, and shaking of part of the earth.

23. What is cyclone and mention the prevention taken at the time of cyclone?

- It is an area of low pressure in the centre and high pressure outside.
- Store all the loose items inside the home
- Fuel your car and park it under solid cover
- Close the shutters or heavily tape all the windows
- Disconnect all the electrical appliances
- Turn off the gas

24. What is landslide?

It is a sudden collapse of larger mass of hill slide.

25. What is Rain water harvesting?

In urban areas, the construction of houses, footpaths and roads has left little exposed earth for water to soak in. In parts of the rural areas of India, floodwater quickly flows to the rivers, which then dry up soon after the rains stop. If this water can be held back, it can seep into the ground and recharge the groundwater supply.

26. Define sustainable development. (NOV/DEC 2013)

Sustainable development is defined as, “meeting the needs of the present without compromising the ability of future generation to meet to meet their own needs”.

27. List the objectives of Forest Conservation Act. (NOV/DEC 2013)

Illegal non-forest activity within a forest area can be immediately stopped under this act.

Provides conservation of all types of forests. Non forest activities include clearing of forest land for cultivation of any types of crops.

PART – B

1. Write a detailed note on Disaster Management.

Disaster is any sudden event of calamity which causes great effect on the human population, plants, animals and property. Disasters are of two types

- Natural
- Man made

Natural Disasters

1. Earthquakes. Sudden tremors of the earth's surface are produced due to movement of tectonic plates under the earth. This displacement of earth's crust releases energy stored within the earth's interior which produces vibratory waves. The intensity of earthquake is measured by Richter, Scale which ranges from 0 to 9. The point from which the earthquake originates is called as epicentre.

Prevention, Control & Mitigation

(i) Constructing earthquake resistant building in the known earthquake prone zones e.g. wooden houses are preferred in Japan.

(ii) Installation of earthquake study centres studying seismic activities and analysis of seismic zones.

(iii) There must be insurance policies for earthquake victims to rehabilitate them.

(iv) Creation of special task forces, fully trained and equipped, to manage such calamities within shortest possible time.

2. Tsunami. The impact of earthquake is high at sea area of origin. In this, most serious form of earthquake, giant seismic tidal waves of as high as 10 metre or more travel at the speed of 1,000 km/hour or faster, away from the epicentre of, the earthquake. Tsunamis may also be caused due to underwater volcanic eruptions or seafloor slumping.

Prevention, Control & Mitigation

(i) Planting more trees on the coastal areas.

(ii) Timely warning and speedy evacuation of people.

(iii) Conservation of mangroves in the coastal areas.

(iv) Construction of embankments in inhabitable areas.

(v) Immediate relief and rehabilitation to the affected people.

3. Drought. A drought is the drying up condition of the land due to insufficient or absence of rainfall for a long period affecting the vegetation1 animal and human life.

Control Measures

(i) Rain water harvesting and canal irrigation.

(ii) Improvement of agricultural practices like dry land forming to conserve water in drought prone areas.

(iii) Stopping paddy cultivation in areas of water scarcity and growing drought resistant variety of crops.

(iv) Promoting social forestry and wasteland reclamation, growing species according to the ecological requirements of the area.

(v) Supplying food, fodder and water to drought-hit people and their rehabilitation with all essential requirements of life.

4. Flood. A flood occurs due to continuous heavy rainfall in an area, overflowing of rivers and submerging the surrounding areas damaging life and property.

Control

(i) Various preventive measures are proper embankment of water bodies, building check dams on flood-prone streams, prohibiting cultivation in flood plain of rivers and growing forests and perennial trees, interlinking of river of the country and constructing houses on raised platforms and supported by reinforced stilts.

(ii) Floods can be controlled by collecting data from meteorological department and alerting the people of affecting area.

(iii) Educating the people about the steps to be taken in the event of disaster.

(iv) Hill slopes and catchment areas of rivers must be afforested and reforested.

5. Cyclones. A cyclone is powerful circular or oval swirling storm of high velocity wind in the coastal regions of Indian ocean. It is called hurricane in Atlantic ocean, typhoon in Western Pacific and Willy-willy in sea around Australia.

Control

(i) Afforestation of coastal areas is the best measure.

(ii) Construction ol'dams, embankments, wind breakers etc.

(iii) Conservation of mangroves in coastal plains.

(iv) Better forecast, warning systems with the help of remote sensing satellites.

(v) Construction of cyclone proof houses and building in coastal areas.

6. Landslides. Landslide is the sudden downslope movement of a mass of rock or soil due to gravitational pull, generally in the rainy season.

Control

(i) Afforestation and reforestation in the landslide prone areas is the best measure.

(ii) There should be no construction activity in slopy areas.

(iii) Proper drainage of surface and sub surface water.

(iv) Making concrete support at the base of slope along the road.

(v) Construction of curved stone blocks in the risky areas.

2. What are the salient features of the Air pollution Act1981 and Environment Act 1986?

- The main objective of this Act is to provide the protection and improvement of environment (which includes water, air, land, human being, other living creatures, plants, micro-organism and properties) and for matters connected therewith. There is a constitutional provision also for the environment protection. Article 48A, specify that the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country and every citizen shall protect the environment (51 A). The Environment (Protection) Act is applicable to whole of India including Jammu & Kashmir.

- Environment: It 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 Pollution: It means any solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to environment and human being are known as pollutant and presence of any pollutant in the environment in such proportion and concentration that has bearing on health and environment is termed as "Environmental Pollution".
- Handling: In relation to any substance, it means the manufacturing, processing, treatment, packaging, storage, transportation, use, collection, destruction, conversion, offering for sale, etc.
- Occupier: It means a person who has control over the affairs of the factory or the premises, and includes, in relation to any substance, the person in possession of the substance.
- The Act provide power to make rules to regulate environmental pollution, to notify standards and maximum limits of pollutants of air, water, and soil for various areas and purposes, prohibition and restriction on the handling of hazardous substances and location of industries (Sections 3-6).
- The Central Government is empowered to constitute authority or authorities for the purpose of exercising of performing such of the powers and functions (Sec 3), appoint a person for inspection (Sec 4), for analysis or samples and for selection or notification of environmental laboratories. Such person or agency has power to inspect or can enter in the premises or can take samples for analysis (Secs 10, 11).
- According to the section 5, the Central Government may issue directions in writing to any person or officers or any authority to comply. There could be closure, prohibition of the supply of electricity or operation or process; or stoppage or regulation of the supply of electricity or water or any other service. Section 6 empowers the government to make rules to achieve the object of the Act.
- Persons carrying on industry, operation etc. not to allow emission or discharge of environmental pollutants in excess of the standards (Sec 7). Persons handling hazardous substances must comply with procedural safeguards (Sec 8) and occupiers must furnish the information to authority.

Penalty

- Whoever Person or Owner/Occupier of companies, factories or whichever source found to be the cause of pollution may be liable for punishment for a term which may extend to five years or with fine which may extend to one lakh rupees or both (Sec 15, 16, 17). If not comply fine of Rs. 5000 per day extra and if not comply for more than one year then imprisonment may extend up to 7 years. Section 17 specify that Head of the department/ in-charge of small unit may be liable for punishment if the owner /occupier produce enough evidence of innocence. The CPCB or state boards have power to close or cancel or deny the authorisation to run the factory/institution/hospital whichever is causing pollution. No suit, prosecution or other legal proceedings shall lie against govt. officer who has exercise power in good faith in pursuance of this Act (Sec 18).

3. Explain in detail the strategies adopted for conservation of water.

WATER CONSERVATION

Water conservation refers to reducing use of fresh water, through technological or social methods. Over the years rising populations, growing industrialization, and expanding agriculture have pushed up the demand for water. Efforts have been made to collect water by building dams and reservoirs and digging wells; some countries have also tried to recycle and desalinate (remove salts) water. Water conservation has become the need of the day. The idea of ground water recharging by harvesting rainwater is gaining importance in many cities.

Rainwater harvesting

In urban areas, the construction of houses, footpaths and roads has left little exposed earth for water to soak in. In parts of the rural areas of India, floodwater quickly flows to the rivers, which then dry up soon after the rains stop. If this water can be held back, it can seep into the ground and recharge the groundwater supply.

The goals of water conservation efforts include:

- **Sustainability** - To ensure availability for future generations, the withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate.

- Energy conservation - Water pumping, delivery, and wastewater treatment facilities consume a significant amount of energy. In some regions of the world (for example, California ^[1]).
- Habitat conservation - Minimizing human water use helps to preserve fresh water habitats for local wildlife and migrating waterfowl, as well as reducing the need to build new dams and other water diversion infrastructure.

Some of the benefits of rainwater harvesting are as follows

- Increases water availability
- Checks the declining water table
- Is environmentally friendly
- Improves the quality of groundwater through the dilution of fluoride, nitrate, and salinity
- Prevents soil erosion and flooding especially in urban areas

4. What are green house gases and green house effect? Discuss the potential and contribution of green house gases to global warming phenomenon?

A **greenhouse gas** is a gas in an atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. In the Solar System, the atmospheres of Venus, Mars, and Titan also contain gases that cause greenhouse effects. Greenhouse gases greatly affect the temperature of the Earth; without them, Earth's surface would be on average about 33 °C (59 °F) colder than at present.

Global warming is the process wherein the average temperature of the Earth's near surface air increases, owing largely to various anthropogenic activities. Though there are some natural causes for this rise in temperature, they stand to be insignificant when compared to the anthropogenic causes. Understanding global warming causes and effects can give us a brief idea of the dreadful phenomena our future generations may have to face. Here are some of the prominent global warming causes and effects.

Causes of Global Warming

The causes of global warming are broadly divided into two categories - natural causes and anthropogenic (man-made) causes.

Natural Causes

Natural causes of global warming include the release of methane gas from arctic tundra and wetlands, climate change, volcanoes etc. Methane, a greenhouse gas which traps the heat within the earth's atmosphere, is let out in large quantities in the arctic tundra and wetlands. In case of volcanoes, when a volcano erupts, tons of ash is let out into the atmosphere. Even though nature contributes to global warming, this contribution is very insignificant when compared to human contribution for this hazard.

Anthropogenic Causes

Anthropogenic causes for global warming are those which are caused due to human activities. The most prominent cause being man-made pollution. A large part of this pollution can be attributed to the burning of fossil fuels. This includes burning coal to produce electricity as well as burning gasoline to power internal combustion engine vehicles. When these fossil fuels are burnt, they let out carbon dioxide, which is yet another greenhouse gas which traps heat within the atmosphere of the Earth and contributes to global warming. Secondly when the Earth is dug to extract these fossil fuels in the process known as mining, the methane inside the Earth's crust escapes into the atmosphere and adds to other greenhouse gases such as carbon dioxide. If we start investigating the anthropogenic causes of global warming, we zero in on one of the most important cause of global warming - population. More population means more requirements, which includes food, electricity and transport. In order to fulfill these requirements, more fossil fuels are consumed, which eventually leads to global warming. Humans breathe out carbon dioxide, and with an increasing population, the amount of carbon dioxide humans breathe out also increases and leads to global warming. Even agriculture contributes to global warming, owing to the extensive use of fertilizers, and the dung produced by cattle which is another prominent source of methane.

Effects of Global Warming

The effects of global warming range from a rise in sea levels to the extinction of certain species of flora and fauna. Basically, global warming means an increase in temperature of the Earth's atmosphere. This increase in temperature will trigger a series of events which can cause a lot of

Changes in the Global Sea Level

As the temperature will increase, the ice cover on the planet will start melting. The water from these melting glaciers will end up in the oceans, which will lead to a rise in the sea level. Over the last century, sea levels have increased by 4 to 8 inches, and by 2100, it's expected to increase to 35 inches. An additional 2 degree rise in global temperature will lead to the complete melting of the Greenland ice cap, which will cause the sea level to rise by 5 to 6 meters. Such a rise will cause many of the low lying areas, such as the US Gulf Coast and Bangladesh, as well as islands, such as Lakswadweep, to submerge underwater. If the whole of the Antarctic ice sheet melts, the global sea level is expected to rise by 10.5 meters.

Drastic Changes in Climate Patterns

Global warming will alter the climatic patterns of the planet. As far as precipitation is concerned, it will increase in equatorial, polar and sub-polar regions, and decrease in subtropics. This change in precipitation pattern will trigger a drought in some regions, while floods in other regions. Warming of the atmosphere will increase the temperature of ocean waters, which will continue being warm for a few centuries. Warm water will lead to frequent natural disasters like hurricanes. Overall, the planet will experience extreme weather conditions, characterized by flood and droughts, heat waves and cold waves, and extreme storms like cyclones and tornadoes.

Widespread Extinction of Flora and Fauna

A rise in global temperature will also hamper the rich biodiversity of various ecosystems. According to the Intergovernmental Panel on (IPCC), an increase in global temperature by 1.5 to 2.5 degrees will make 20 to 30 percent of species vulnerable to extinction, while a rise of about 3.5 degrees will make 40 to 70 percent species vulnerable to extinction. Climate change will result in loss of habitat for many animal species like polar bears and tropical frogs. More importantly, any change in the climate patterns will seriously affect the migration patterns of various bird species. Irregular patterns of precipitation will affect animals and humans alike.

Global Warming and Humans

In case of humans, global warming will affect our food and water supplies as well as our health conditions. Changes in precipitation will affect basic necessities such as agriculture, power production etc. Increase in the temperature of ocean waters will hamper fisheries. The sudden change in climate patterns will have a hazardous effect on the human body which won't be able to endure the extreme conditions, a hint of which can be seen in form of frequent heat waves and cold waves. Increase in natural calamities such as storms, will lead to heavy human causalities. Infectious diseases will rise to a great extent as disease transmitting insects will adapt to wet, hot conditions. Many people will die of malnutrition as food production will decrease due to frequent droughts and floods.

These were just a few of the numerous global warming causes and effects. Many people argue that global warming is a slow process, and will take centuries for all these devastating effects to take place. But they forget that the factors which cause global warming are rapidly rising. The rate at which we are contributing to global warming has rose considerably, and is expected to rise at a faster rate in the future. We have already done enough of damage, and hence it's high time we understand the global warming causes, effects and the future repercussions and work out some global warming solutions at the earliest. We may not live to face the dreaded consequences of global warming, but if we don't act fast, it will be our future generations who will have to bear the brunt.

5. Write short notes on Forest Conservation Act. (MAY/JUNE 2013)

Forest Conservation Act

Forest (conservation) Act, 1980

It deals with conservation of forest and includes reserve forest, protected forest and any forest land irrespective of ownership.

Salient features

1. State government can use forest only forestry purpose.
2. Provision for conservation of all types of forests. Advisory committee appointed for funding conservation
3. Illegal non-forest activity within a forest area can be immediately stopped under this act.

Non forest activity means clearing land for cash-crop agriculture, mining etc.

However construction in forest for wild life or forest management is exempted from non forestry activity.

1992 Amendment:

1. This amendment allows transmission lines, seismic surveys, exploration drilling and hydro electric project in forest area without cutting trees or with limited cutting of trees – prior approval CG to be sought.
2. Wild life sanctuaries, National parks etc. are prohibited from exploration except with CG prior approval.
3. Cultivation of coffee, rubber, tea (cash crop), fruit bearing trees, oil yielding trees, trees of medicinal values are also prohibited in reserved forest area with out prior approval from CG. Has this may create imbalance to ecology of the forest.
4. Tusser (a type of silk yielding insect) cultivation in forest area is allowed since it discourages monoculture practices in forests and improves biodiversity.
5. Plantation of mulberry for rearing silk worm is prohibited.
6. Proposal sent to CG for non-forestry activity must have a cost benefit analysis and environmental impact statement (EIS).

6(a) Discuss the salient features of Wild life protection act 1972 (b) Discuss the salient features of Forest conservation act 1980.

a) Discuss the salient features of Wild life protection act 1972

■ WILDLIFE (PROTECTION) ACT, 1972

The act, a landmark in the history of wildlife legislation in our country, came into existence in 1972. Wildlife was transferred from State list to concurrent list in 1976, thus giving power to the Central Govt. to enact the legislation.

The Indian Board of Wildlife (IBWL) was created in 1952 in our country, which after the enactment of the Wildlife (Protection) Act actively took up the task of setting up wildlife National Parks and sanctuaries. The major activities and provisions in the act can be summed up as follows:

- (i) It defines the wild-life related terminology.
- (ii) It provides for the appointment of wildlife advisory Board, Wildlife warden, their powers, duties etc.
- (iii) Under the Act, comprehensive listing of endangered wild life species was done for the first time and prohibition of hunting of the endangered species was mentioned.
- (iv) Protection to some endangered plants like Beddome cycad, Blue Vanda, Ladies Slipper Orchid, Pitcher plant etc. is also provided under the Act.
- (v) The Act provides for setting up of National Parks, Wildlife Sanctuaries etc.
- (vi) The Act provides for the constitution of Central Zoo Authority.
- (vii) There is provision for trade and commerce in some wildlife species with license for sale, possession, transfer etc.
- (viii) The Act imposes a ban on the trade or commerce in scheduled animals.

(ix) It provides for legal powers to officers and punishment to offenders.

(x) It provides for captive breeding programme for endangered species.

Several Conservation Projects for individual endangered species like lion (1972) Tiger (1973), Crocodile (1974) and Brown antlered Deer (1981) were started under this Act. The Act is adopted by all states in India except J & K, which has its own Act.

Some of the major drawbacks of the Act include mild penalty to offenders, illegal wild life trade in J & K, personal ownership certificate for animal articles like tiger and leopard skins, no coverage of foreign endangered wildlife, pitiable condition of wildlife in mobile zoos and little emphasis on protection of plant genetic resources.

(b) Discuss the salient features of Forest conservation act 1980

■ FOREST (CONSERVATION) ACT, 1980

This Act deals with the conservation of forests and related aspects. Except J & K, the Act is adopted all over India. The Act covers under it all types of forests including reserved forests, protected forests or any forested land irrespective of its ownership.

The salient features of the Act are as follows:

(i) The State government has been empowered under this Act to use the forests only for forestry purposes. If at all it wants to use it in any other way, it has to take prior approval of Central government, after which it can pass orders for declaring some part of reserve forest for non-forest purposes (e.g. mining) or for clearing some naturally growing trees and replacing them by economically important trees (reforestation).

(ii) It makes provision for conservation of all types of forests and for this purpose there is an advisory committee which recommends funding for it to the Central government.

(iii) Any illegal non-forest activity within a forest area can be immediately stopped under this Act.

Non-forest activities include clearing of forest land for cultivation of any type of plants/crops or any other purpose (except re-afforestation). However, some construction work in the forest for wildlife or forest management is exempted from non-forest activity (e.g. fencing, making water-holes, trench, pipelines, check posts, wireless communication etc.)

7. What is sustainable development and explain its concepts? (MAY/JUNE 2013)

Development: True development does not mean a high standard of living with all benefits accompanied with an increase of GNP (Gross National Product) of a few countries. But it should bring benefits to all, not only for the present generation, but also for the future generations.

SUSTAINABLE DEVELOPMENT

Definition: G. H. Brundtland, Prime Minister of Norway and Director of World Health Organization [WHO] defined as “meeting the needs of the present without compromising the ability of future generation to meet their own needs”.

Is it true sustainable development?

A handful of developed countries have reached the greatest heights of scientific and technological development. However the air we breathe, the water we drink and the food we eat all have been badly polluted. Our natural resources are just dwindling due to over exploitation. Hence this is not true sustainable development.

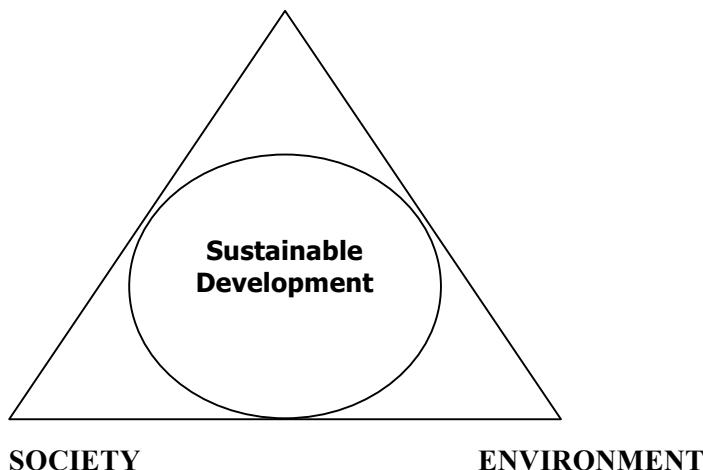
True sustainable development: True sustainable development should aim at optimum use of natural resources with high degree of reusability, minimum wastage, least generation of toxic by-products and maximum productivity.

World Summit on sustainable Development

Rio De Jenario in Brazil has been the venue for the UN Conference on Environment and Development (UNCED), also known as Earth Summit, held in 1992. There has been an extensive discussion on sustainable development. The conference at Rio made a declaration that "**a new and equitable global partnership through the creation of new levels of cooperation among the states.**" Out of the 5 very significant agreements arrived at this summit **Agenda – 21** proposes a global programme of action on sustainable development in social, economic and environmental context for the 21st century.

Dimensions of sustainable development: sustainable development is a multi dimensional concept aiming at benefits derived from the interactions between society, economic and environment.

ECONOMY



Aspects of Sustainable Development

(a) Inter-generational equity: This states that we should hand over a safe, healthy and resourceful environment to our future generations.

(b) Intra-generational equity: This states that the technological development of rich countries should support the economic growth of the poor countries and help in narrowing the wealth gap and lead to sustainability.

Approaches For Sustainable Development: The following approaches (or) methods are proposed for the build up of Sustainable Development.

1. Developing appropriate technology: it is the one approach which is locally adaptable, eco-friendly, resource-efficient and culturally suitable. It uses local labours, less resources, and produces minimum waste.

2. Reduce, Reuse, Recycle (3 – R) approach: This approach insists on optimum use of natural resources, using it again and again instead of throwing it on wasteland or water and recycling the material into further products. It reduces pressure on our natural resources and reduces waste generation and pollution.

3. Providing environmental education and awareness: By providing environmental education and awareness, the thinking and attitude of people towards our earth and the environment can be changed.

4. Consumption of Renewable resources: In order to attain sustainability, it is very important to consume the natural resources in such a way that the consumption should not exceed the regeneration capacity.

5. Conservation of non-renewable resources: For sustainability non-renewable resources should be conserved by recycling and reusing.

6. Population control: Sustainable development can be made by controlling population growth.

8. Write an account on urban problems and detail how to solve them. (MAY/JUNE 2013)

URBAN PROBLEMS RELATED TO ENERGY

Urbanization: Urbanization is the movement of human population from rural areas to urban areas for the want of better education, communication, health, employment etc.

Causes of urbanization: Cities are the main centres of economic growth, trade, transportation, education, medical facilities and employment. Hence rural people move to cities.

Urban Sprawl: Nearly 50% of the world's population lives in urban areas and people from rural area continue to move to cities for employment. Thus the urban growth is so fast that it is difficult to

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accommodate all the commercial, industrial, residential and educational facilities within a limited area. As a result there is enlargement of city areas into suburban or rural areas. This phenomenon is called urban sprawl.

Energy Demanding Activities: In the developing countries simultaneously urban growth as well as population growth are very fast. The population growth is not only fast but also unplanned and hence uncontrollable. When compared to rural people urbanites consume a lot more of energy and materials and also generate a lot of waste. This is owing to the higher standard of living the urban population and all this demands more and more energy inputs.

Examples of energy demanding activities:

1. Residential and commercial lightings.
2. Transportation means including motor cycle, car and public transport for moving from residence to work place
3. Industries using a large proportion of energy
4. Modern life style using a large number of electrical appliances (fans, refrigerator, washing machines, air-conditioners, , water heaters etc.) in every day life.
5. Control and prevention of pollution need more energy dependent technologies.

Thus due to high population growth and high energy demanding activities, the urban problems related to energy are more and more magnified in comparison with rural population.

Solution for urban energy problem:

1. Urban people should be encouraged to use public transport instead of individual transport modes like cars or motor cycles.
2. Even high level officials also could be educated into forming groups and using single- good and comfortable – transport instead of individual limousines.
3. Energy consumption must be minimized.
4. Energy production capacity may be increased.
5. Use of energy efficient technologies adopted.
6. Usage of Solar energy and wind energy should be encouraged.
7. Apart from encouraging energy saving methods strict laws and penalties have to be imposed together with energy audit.

9. Discuss the phenomenon of global warming and the factors contributing to it. (NOV/DEC 2013)

Global warming is the increase in the average temperature of Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Global surface temperature increased $0.74 \pm 0.18^\circ\text{C}$ ($1.33 \pm 0.32^\circ\text{F}$) during the 20th century. Most of the observed temperature increase since the middle of the 20th century has been caused by increasing concentrations of greenhouse gases, which result from human activity such as the burning of fossil fuel and deforestation. Global dimming, a result of increasing concentrations of atmospheric aerosols that block sunlight from reaching the surface, has partially countered the effects of warming induced by greenhouse gases.

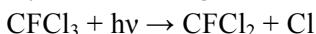
The greenhouse effect is the process by which absorption and emission of infrared radiation by gases in the atmosphere warm a planet's lower atmosphere and surface. The question in terms of global warming is how the strength of the presumed greenhouse effect changes when human activity increases the concentrations of greenhouse gases in the atmosphere.

Naturally occurring greenhouse gases have a mean warming effect of about 33°C (59°F). The major greenhouse gases are water vapor, which causes about 36–70 percent of the greenhouse effect; carbon dioxide (CO_2), which causes 9–26 percent; methane (CH_4), which causes 4–9 percent; and ozone (O_3), which causes 3–7 percent. Clouds also affect the radiation balance, but they are composed of liquid water or ice and so have different effects on radiation from water vapor.

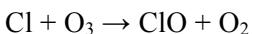
10. Discuss the possible mechanism of stratospheric ozone depletion. (NOV/DEC 2013)

Ozone depletion describes two distinct, but related observations: a slow, steady decline of about 4 percent per decade in the total volume of ozone in Earth's stratosphere (the ozone layer). Ozone can be destroyed by a number of free radical catalysts, the most important of which are the hydroxyl radical (OH^-), the nitric oxide radical (NO^-), atomic chlorine (Cl^-) and bromine (Br^-). All of these have both natural and manmade sources; at the present time, most of the OH^- and NO^- in the stratosphere is of natural origin, but human activity has dramatically increased the levels of chlorine

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and bromine. These elements are found in certain stable organic compounds, especially chlorofluorocarbons (CFCs), which may find their way to the stratosphere without being destroyed in the troposphere due to their low reactivity. Once in the stratosphere, the Cl and Br atoms are liberated from the parent compounds by the action of ultraviolet light, e.g. ('h' is Planck's constant, 'v' is frequency of electromagnetic radiation)



The Chlorine and Bromine atoms can then destroy ozone molecules through a variety of catalytic cycles. In the simplest example of such a cycle, a chlorine atom reacts with an ozone molecule, taking an oxygen atom with it (forming ClO) and leaving a normal oxygen molecule. The chlorine monoxide (i.e., the ClO) can react with a second molecule of ozone (i.e., O₃) to yield another chlorine atom and two molecules of oxygen. The chemical shorthand for these gas-phase reactions is:



Effects:

Increased UV

Ozone, while a minority constituent in the Earth's atmosphere, is responsible for most of the absorption of UVB radiation. The amount of UVB radiation that penetrates through the ozone layer decreases exponentially with the slant-path thickness/density of the layer. Correspondingly, a decrease in atmospheric ozone is expected to give rise to significantly increased levels of UVB near the surface.

Increases in surface UVB due to the ozone hole can be partially inferred by radioactive transfer model calculations, but cannot be calculated from direct measurements because of the lack of reliable historical (pre-ozone-hole) surface UV data, although more recent surface UV observation measurement programmed exist .Because it is this same UV radiation that creates ozone in the ozone layer from O₂ (regular oxygen) in the first place, a reduction in stratospheric ozone would actually tend to increase photochemical production of ozone at lower levels (in the troposphere), although the overall observed trends in total column ozone still show a decrease, largely because ozone produced lower down has a naturally shorter photochemical lifetime, so it is destroyed before the concentrations could reach a level which would compensate for the ozone reduction higher up.

11. Why do we refer to environmental protection act, 1986 as an umbrella act? Discuss the major environmental protection rules, 1986? (NOV/DEC 2013)

THE ENVIRONMENT (PROTECTION) ACT, 1986

An Act to provide for the protection and improvement of environment and for matters connected therewith:

WHEREAS the decisions were taken at the United Nations Conference on the Human Environment held at Stockholm in June, 1972, in which India participated, to take appropriate steps for the protection and improvement of human environment;

AND WHEREAS it is considered necessary further to implement the decisions aforesaid in so far as they relate to the protection and improvement of environment and the prevention of hazards to human beings, other living creatures, plants and property;

BE it enacted by Parliament in the Thirty-seventh Year of the Republic of India as follows:-

a. SHORT TITLE, EXTEND AND COMMENCEMENT

(1) This Act may be called the Environment (Protection) Act, 1986.

(2) It extends to the whole of India.

(3) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint and different dates may be appointed for different provisions of this Act and for different areas.

b. DEFINITIONS

In this Act, unless the context otherwise requires,-

(a) "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;

(b) "environmental pollutant" means any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to environment;

(c) "environmental pollution" means the presence in the environment of any environmental pollutant;

(d) "handling", in relation to any substance, means the manufacture, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale, transfer or the like of such substance;

(e) "hazardous substance" means any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plant, micro-organism, property or the environment;

(f) "occupier", in relation to any factory or premises, means a person who has, control over the affairs of the factory or the premises and includes in relation to any substance, the person in possession of the substance;

(g) "prescribed" means prescribed by rules made under this Act.

c. POWER OF CENTRAL GOVERNMENT TO TAKE MEASURES TO PROTECT AND IMPROVE ENVIRONMENT

(1) Subject to the provisions of this Act, the Central Government, shall have the power to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing controlling and abating environmental pollution.

(2) In particular, and without prejudice to the generality of the provisions of sub-section (1), such measures may include measures with respect to all or any of the following matters, namely:--

(i) co-ordination of actions by the State Governments, officers and other authorities--

(a) under this Act, or the rules made thereunder, or

(b) under any other law for the time being in force which is relatable to the objects of this Act;

(ii) planning and execution of a nation-wide programme for the prevention, control and abatement of environmental pollution;

(iii) laying down standards for the quality of environment in its various aspects;

(iv) laying down standards for emission or discharge of environmental pollutants from various sources whatsoever: Provided that different standards for emission or discharge may be laid down under this clause from different sources having regard to the quality or composition of the emission or discharge of environmental pollutants from such sources;

(v) restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards;

(vi) laying down procedures and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures for such accidents;

(vii) laying down procedures and safeguards for the handling of hazardous substances;

(viii) examination of such manufacturing processes, materials and substances as are likely to cause environmental pollution;

(ix) carrying out and sponsoring investigations and research relating to problems of environmental pollution;

(x) inspection of any premises, plant, equipment, machinery, manufacturing or other processes, materials or substances and giving, by order, of such directions to such authorities, officers or persons as it may consider necessary to take steps for the prevention, control and abatement of environmental pollution;

(xi) establishment or recognition of environmental laboratories and institutes to carry out the functions entrusted to such environmental laboratories and institutes under this Act;

(xii) collection and dissemination of information in respect of matters relating to environmental pollution;

(xiii) preparation of manuals, codes or guides relating to the prevention, control and abatement of environmental pollution;

(xiv) such other matters as the Central Government deems necessary or expedient for the purpose of securing the effective implementation of the provisions of this Act.

(3) The Central Government may, if it considers it necessary or expedient so to do for the purpose of this Act, by order, published in the Official Gazette, constitute an authority or authorities by such name or names as may be specified in the order for the purpose of exercising and performing such of the powers and functions.

d. APPOINTMENT OF OFFICERS AND THEIR POWERS AND FUNCTIONS

(1) Without prejudice to the provisions of sub-section (3) of section 3, the Central Government may appoint officers with such designation as it thinks fit for the purposes of this Act and may entrust to them such of the powers and functions under this Act as it may deem fit.

(2) The officers appointed under sub-section (1) shall be subject to the general control and direction of the Central Government or, if so directed by that Government, also of the authority or authorities, if any, constituted under sub- section (3) of section 3 or of any other authority or officer.

e. POWER TO GIVE DIRECTIONS

Notwithstanding anything contained in any other law but subject to the provisions of this Act, the Central Government may, in the exercise of its powers and performance of its functions under this Act, issue directions in writing to any person, officer or any authority and such person, officer or authority shall be bound to comply with such directions.

Explanation--For the avoidance of doubts, it is hereby declared that the power to issue directions under this section includes the power to direct--

- (a) the closure, prohibition or regulation of any industry, operation or process; or
- (b) stoppage or regulation of the supply of electricity or water or any other service.

f. RULES TO REGULATE ENVIRONMENTAL POLLUTION

(1) The Central Government may, by notification in the Official Gazette, make rules in respect of all or any of the matters referred to in section 3.

(2) In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:--

- (a) the standards of quality of air, water or soil for various areas and purposes;⁴
- (b) the maximum allowable limits of concentration of various environmental pollutants (including noise) for different areas;
- (c) the procedures and safeguards for the handling of hazardous substances;⁵
- (d) the prohibition and restrictions on the handling of hazardous substances in different areas;⁶
- (e) the prohibition and restriction on the location of industries and the carrying on process and operations in different areas;⁷
- (f) the procedures and safeguards for the prevention of accidents which may cause environmental pollution and for providing for remedial measures for such accidents.⁸

g. PREVENTION, CONTROL, AND ABATEMENT OF ENVIRONMENTAL POLLUTION

i) Persons carrying on industry operation, etc., not to allow emission or discharge of environmental pollutants in excess of the standards

- ii) Persons handling hazardous substances to comply with procedural safeguards
- iii) Furnishing of information to authorities and agencies in certain cases
- iv) Powers of entry and inspection
- v) Power to take sample and procedure to be followed in connection therewith
- vi) Environmental laboratories

(1) The Central Government may, by notification in the Official Gazette,--

- (a) establish one or more environmental laboratories;
- (b) recognise one or more laboratories or institutes as environmental laboratories to carry out the functions entrusted to an environmental laboratory under this Act.¹⁶

(2) The Central Government may, by notification in the Official Gazette, make rules specifying--

- (a) the functions of the environmental laboratory;
- (b) the procedure for the submission to the said laboratory of samples of air, water, soil or other substance for analysis or tests, the form of the laboratory report thereon and the fees payable for such report,
- (c) such other matters as may be necessary or expedient to enable that laboratory to carry out its functions.

vii) Government analysts

The Central Government may by notification in the Official Gazette, appoint or recognise such persons as it thinks fit and having the prescribed qualifications¹⁹ to be Government Analysts for the purpose of analysis of samples of air, water, soil or other substance sent for analysis to any environmental laboratory established or recognised under sub-section (1) of section 12.

viii) Penalty for contravention of the provisions of the act and the rules, orders and directions
a) Offences by companies

(1) Where any offence under this Act has been committed by a company, every person who, at the time the offence was committed, was directly in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly:

Provided that nothing contained in this sub-section shall render any such person liable to any punishment provided in this Act, if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence.

(2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Explanation--For the purpose of this section,--

(a) "company" means any body corporate and includes a firm or other association of individuals;

(b) "director", in relation to a firm, means a partner in the firm.

b) Offences by government departments

(1) Where an offence under this Act has been committed by any Department of Government, the Head of the Department shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly.

Provided that nothing contained in this section shall render such Head of the Department liable to any punishment if he proves that the offence was committed without his knowledge or that he exercise all due diligence to prevent the commission of such offence.

(2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a Department of Government and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any officer, other than the Head of the Department, such officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

12. (i). What is watershed? Discuss its objectives and its practices. (NOV/DEC 2013)

(ii)Short notes on Nuclear Accidents and holocausts. (MAY/JUNE 2013) (NOV/DEC 2013)

i) What is watershed?Discuss its objectives and its practices.

Watershed is defined as a land area from which water drains under gravity to a common drainage It is a delineated area with a well defined topographic boundary and one water outlet.

Objectives of watershed management:

Rational utilization of land and water resources for optimum production causing minimum damage to the natural resources.

Minimize the risk of floods.

Manage watershed for beneficiary activities.

Watershed Management Practices

Water harvesting

Afforestation and agroforestry

Mechanical measures for reducing soil erosion

Scientific mining

Public participation.

ii)Short notes on Nuclear Accidents and holocausts

Nuclear holocaust refers to a possible nearly complete annihilation of human civilization by nuclear warfare. Under such a scenario, all or most of the Earth is made uninhabitable by nuclear weapons in future world wars.

Nuclear physicists and others have speculated that nuclear holocaust could result in an end to human life, or at least to modern civilization on Earth due to the immediate effects of nuclear fallout, the temporary loss of much modern technology due to electromagnetic pulses, or nuclear winter and resulting extinctions.

Atomic bombings of Hiroshima and Nagasaki

During the final stages of World War II in 1945, the United States conducted two atomic bombings against the Japanese cities of Hiroshima and Nagasaki, the first on August 6, 1945, and the second on August 9, 1945. These two events are the only use of nuclear weapons in war to date.^[15]

For six months before the atomic bombings, the United States intensely fire-bombed 67 Japanese cities. Together with the United Kingdom and the Republic of China, the United States called for the unconditional surrender of Japan in the Potsdam Declaration issued July 26, 1945. The Japanese government ignored this ultimatum. By executive order of President Harry S. Truman, the U.S. employed the uranium-type nuclear weapon code named "Little Boy" on the city of Hiroshima on Monday, August 6, 1945,^{[16][17]} followed three days later by the detonation of the plutonium-type weapon code named "Fat Man" over the city of Nagasaki on August 9.

Within the first two to four months after the bombings, acute effects killed 90,000–166,000 people in Hiroshima and 60,000–80,000 in Nagasaki,^[18] with roughly half of the deaths in each city occurring in the first 24 hours. The Hiroshima prefectural health department estimates that - of the people who died on the day of the detonation - 60% died from flash or flame burns, 30% from falling or flying debris, and 10% from other causes. During the following months, large numbers died from the chronic effects of burns, radiation sickness, and other injuries, compounded by illnesses. In a U.S. estimate of the total immediate and short-term causes of death, 15–20% died from radiation sickness, 20–30% from flash burns, and 50–60% from other injuries, compounded by illnesses. In both cities, most of the dead were civilians.

13.What is an earthquake? Write about its effects and measures to face the earthquake. (NOV/DEC13)

Earthquakes. Sudden tremors of the earth's surface are produced due to movement of tectonic plates under the earth. This displacement of earth's crust releases energy stored within the earth's interior which produces vibratory waves. The intensity of earthquake is measured by Richter, Scale which ranges from 0 to 9. The point from which the earthquake originates is called as epicentre.

Prevention, Control & Mitigation

- (i) Constructing earthquake resistant building in the known earthquake prone zones e.g. wooden houses are preferred in Japan.
- (ii) Installation of earthquake study centres studying seismic activities and analysis of seismic zones.
- (iii) There must be insurance policies for earthquake victims to rehabilitate them.
- (iv) Creation of special task forces, fully trained and equipped, to manage such calamities within shortest possible time.

Effects of Earthquake:

Shaking and ground rupture

Shaking and ground rupture are the main effects created by earthquakes, principally resulting in more or less severe damage to buildings and other rigid structures. The severity of the local effects depends on the complex combination of the earthquake magnitude, the distance from the epicenter, and the local geological and geomorphological conditions, which may amplify or reduce wave propagation.^[46] The ground-shaking is measured by ground acceleration.

Ground rupture is a visible breaking and displacement of the Earth's surface along the trace of the fault, which may be of the order of several metres in the case of major earthquakes. Ground rupture is a major risk for large engineering structures such as dams, bridges and nuclear power stations and requires careful mapping of existing faults to identify any which are likely to break the ground surface within the life of the structure.^[47]

Landslides and avalanches

Earthquakes, along with severe storms, volcanic activity, coastal wave attack, and wildfires, can produce slope instability leading to landslides, a major geological hazard. Landslide danger may persist while emergency personnel are attempting rescue.^[48]

Fires

Earthquakes can cause fires by damaging electrical power or gas lines. In the event of water mains rupturing and a loss of pressure, it may also become difficult to stop the spread of a fire once it has

started. For example, more deaths in the 1906 San Francisco earthquake were caused by fire than by the earthquake itself.^[49]

Soil liquefaction

Soil liquefaction occurs when, because of the shaking, water-saturated granular material (such as sand) temporarily loses its strength and transforms from a solid to a liquid. Soil liquefaction may cause rigid structures, like buildings and bridges, to tilt or sink into the liquefied deposits. For example, in the 1964 Alaska earthquake, soil liquefaction caused many buildings to sink into the ground, eventually collapsing upon themselves.^[50]

Tsunamis

Tsunamis are long-wavelength, long-period sea waves produced by the sudden or abrupt movement of large volumes of water. In the open ocean the distance between wave crests can surpass 100 kilometers (62 mi), and the wave periods can vary from five minutes to one hour. Such tsunamis travel 600-800 kilometers per hour (373–497 miles per hour), depending on water depth. Large waves produced by an earthquake or a submarine landslide can overrun nearby coastal areas in a matter of minutes. Tsunamis can also travel thousands of kilometers across open ocean and wreak destruction on far shores hours after the earthquake that generated them.^[51]

Floods

A flood is an overflow of any amount of water that reaches land.^[52] Floods occur usually when the volume of water within a body of water, such as a river or lake, exceeds the total capacity of the formation, and as a result some of the water flows or sits outside of the normal perimeter of the body. However, floods may be secondary effects of earthquakes, if dams are damaged. Earthquakes may cause landslides to dam rivers, which collapse and cause floods.^[53]

The terrain below the Sarez Lake in Tajikistan is in danger of catastrophic flood if the landslide dam formed by the earthquake, known as the Usui Dam, were to fail during a future earthquake. Impact projections suggest the flood could affect roughly 5 million people.^[54]

Human impacts

An earthquake may cause injury and loss of life, road and bridge damage, general property damage, and collapse or destabilization (potentially leading to future collapse) of buildings. The aftermath may bring disease, lack of basic necessities, and higher insurance premiums.

UNIT – V
PART – A

1. What is crude fertility rate?

The general fertility rate indicates the number of live born children per 1,000 women of the mean population aged 15 to 49.

2. What do you mean by Total fertility rate, Zero population growth?

- Total fertility rate is defined as the average number of children that would be born to a woman in her lifetime if the age specific birth rates remain constant.
- When birth plus immigration in a population are just equal to deaths plus emigration, it is said to be zero population growth.

3. What are the types of population growth curves?

(i) Pyramid shaped; (ii) Bell shaped & (iii) Urn shaped

4. What is meant by Life expectancy?

It is the average age that a newborn infant is expected to attain in a given country. The average life expectancy, over the globe, has risen from 40 to 65.5 years over the past century. In India, life expectancy of males and females was only 22.6 years and 23.3 years, respectively in 1900.

5. What are the post and preindustrial phases of demographic transition?

- Preindustrial phase characterized by high growth and death rates and net population growth is low.
- Post industrial phase during which zero population growth is achieved.

6. Give the reasons for human population.

- Birth rate increases with community and/or religious thinking.
- Death rate is decreasing due to high level of health care and sanitation.

- Cultural, economic, political and demographic factors influence the process of controlling rate of population growth in different countries.

7. Mention about the four phases associated with urbanization and growth.

- Pre industrial phase
- Transitional phase
- Industrial phase
- Post industrial phase

8. Define Infant mortality rate, replacement level.

- Infant mortality rate is the percentage of infants died out of those born in a year.
- Two parents bearing two children will be replaced by their offspring. But due to infant mortality this replacement level is usually changed.

9. What do you mean Demographic transition?

It has been observed that couples from economically sound nations produce fewer children so as to maintain high standard of living. This means that birth rate is low. The death rate has also been reduced in those nations because of improved health care. As a result, net population growth rate is low. This phenomenon is called demographic transition.

10. Expand WHO, CEDAW, NNWM.

WHO: World health Organization,

NNWM: National Network for women and Mining

CEDAW: International convention on the Elimination of all forms of discrimination against Women.

11. What are the effects of infectious organisms on human?

Microbes especially bacteria can cause food poisoning by producing toxins in the contaminated food. Infectious organisms can also cause respiratory disease (pneumonia, tuberculosis, influenza etc.) and gastrointestinal diseases (diarrhea, dysentery, cholera.)

12. Which state in India has the lower birth rate?

Kerala has earned the distinction of having lowest birth rates among all the states of India.

13. When does United Nations Decade for women held?

1975-85 witnessed inclusion of several women welfare related issues on international agenda.

14. Mention the present world population.

The world population is the total number of living humans on Earth at a given time. As of September 2008, the world's population is estimated to be about 6.7 billion (6,700,000,000).

15. Mention the ways the HIV spread in various parts of world.

- HIV has spread in Africa through HIV contaminated polio vaccine prepared by using monkey's kidney.
- It had spread through hepatitis B viral vaccine in New York, Los Angeles and San Francisco.
- It has spread through small pox vaccine programme of Africa.

16. If a nation has an annual growth rate of 2%, how many years the population will be doubled?

The world's population, on its current growth strategy is expected to reach nearly 13.4 billion by the year 2075.

17. Does HIV affect population growth?

Yes, Women are especially at risk of contracting HIV because of the interplay of biological, economic, and cultural factors. Physical differences make it more likely that a woman will contract the virus from a man than vice versa. Perhaps more important, powerlessness, dependence, and poverty tend to diminish women's ability to protect themselves from unsafe sex. A woman's choices are often limited by her inability to negotiate when or with whom to have sex or whether to use a condom; by society's acceptance of men having sex before or outside marriage; and by the need for economic support from men.

18. What does ENVIS generates?

The ENVIS centers work for generating a network of database in areas like pollution control, clean technologies, remote sensing, coastal ecology, biodiversity, Western Ghats and Eastern Ghats, environmental management, media related to environment, renewable energy, desertification, mangroves, wildlife, Himalayan ecology, mining, etc.

19. Explain the population clock.

The world population estimates and projections used to produce these figures were developed by the International Programs Center based on analysis of available data on population, fertility, mortality,

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and migration. The analysis was performed separately for the 226 countries or areas of the world with a population of 5,000 or more. Population estimates and projections analyses are based on census, survey, and administrative information.

20. Mention the theories on population explosion.

Malthusian Theory: According to Thomas Malthus in 1978, human population tends to increase at an exponential or compound rate, while food production either increases slowly or remains stable. This will result in poverty, starvation, disease, crime and misery.

Marxian Theory: Karl Marx opined that slowing down of population growth and alleviation of crime, disease, starvation, misery and environmental degradation could be achieved through social justice.

21. What does Value-based environmental education emphasizes?

Value-based environmental education imparted to the students would encourage them to undertake pro-environmental actions respecting and nurturing the natural environment. Value based environmental education can go a long way in attaining the goal of sustainable development preserving our precious environment as because it can bring about a total transformation of our mindset, attitude and mode of life-style.

22. When does AIDS discovered?

It was confirmed in 1983 that AIDS occurs due to infection of a previously undocumented virus in a patient afflicted with the disease. This virus was initially given several names, currently it is known as Human immunodeficiency virus (HIV).

23. Define Human Rights.

Human rights refer to the "basic rights and freedoms to which all humans are entitled. Examples of rights and freedoms which are often thought of as human rights include civil and political rights, such as the right to life and liberty, freedom of expression, and equality before the law; and social, cultural and economic rights, including the right to participate in culture, the right to food, the right to work, and the right to education. All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.

24. Mention the activities involved in women welfare in two lines.

Article 14 confers on men and women equal rights and opportunities in the political, economic and social spheres. Article 15 prohibits discrimination against any citizen on the grounds of religion, race, caste, sex etc. Article 15(3) makes a special provision enabling the State to make affirmative discriminations in favor of women. Similarly, Article 16 provides for equality of opportunities in matter of public appointments for all citizens.

25. What do you meant by carcinogenic, mutagenic, neurotoxins?

- **Carcinogenic:** The term carcinogen refers to any substance, radionuclide or radiation that is an agent directly involved in the promotion of cancer or in the fatation of its propagation.
- **Mutagenic:** In biology, a mutagen (Latin, literally origin of change) is a physical or chemical agent that changes the genetic information (usually DNA) of an organism and thus increases the frequency of mutations above the natural background level.
- **Neurotoxin:** A neurotoxin is a toxin that acts specifically on nerve cells (neurons), usually by interacting with membrane proteins such as ion channels.

26. What does environment education's objective?

- To help individuals, groups and societies acquire the action competence or skills of environmental citizenship - in order to be able to identify and anticipate environmental problems and work with others to resolve, minimize and prevent them
- To create an overall understanding of the impacts and effects of behaviors and lifestyles - on both the local and global environments, and on the short-term and long-term.

27. What does Draft Declaration on human rights describes?

- Articles 1 and 2 are the foundation blocks, with their principles of dignity, liberty, equality and brotherhood. The seven paragraphs of the preamble, setting out the reasons for the Declaration, are represented by the steps. The main body of the Declaration forms the four columns.
- The first column (articles 3-11) constitutes rights of the individual, such as the right to life and the prohibition of slavery.
- The second column (articles 12-17) constitutes the rights of the individual in civil and political society.
- The third column (articles 18-21) is concerned with spiritual, public and political freedoms such

28. Whether the Life expectancy over the globe has improved or not?

- There are great variations in life expectancy worldwide, mostly caused by differences in public health, medicine and nutrition from country to country.
- There are also variations between groups within single countries. Significant differences still remain in life expectancy between men and women in France and other developed countries, with women outliving men by five years or more.

29. What is Database?

A Computer Database is a structured collection of records or data that is stored in a computer system. The structure is achieved by organizing the data according to a database model. The model in most common use today is the relational model. Other models such as the hierarchical model and the network model use a more explicit representation of relationships.

30. Mention the advantages of remote sensing.

- Relatively cheap and rapid method of acquiring up-to-date information over a large geographical area. Example: Landsat 5 covers each area of 185x160km at a ground resolution of 30m every 18 days, cost of the original digital data is \$5000 (6200 ha \$-1, each hectare contains approximately 11 observations. Even with the cost of ground truthing this is very economical.
- It is the only practical way to obtain data from inaccessible regions, e.g. Antarctica, Amazonia.
- At small scales, regional phenomena which are invisible from the ground are clearly visible. Examples: faults and other geological structures. A classic example of seeing the forest instead of the trees.

31. What do you meant by MHRD?

Ministry of human resource development to provide details on national Education policies, Schemes, Scholarships, Statistics and also malpractice alerts.

32. What does UN assembly adopted for child welfare?

- Declaration of the Rights of the Child, "the child, by reason of his physical and mental immaturity, needs special safeguards and care, including appropriate legal protection, before as well as after birth".
- The United Nations Convention on the Rights of the Child, often referred to as CRC or UNCRC, is an international convention setting out the civil, political, economic, social and cultural rights of children. Nations that ratify this international convention are bound by it by international law. Compliance is monitored by the United Nations Committee on the Rights of the Child which is composed of members from countries around the world. Once a year, the Committee submits a report to the Third Committee of the United Nations General Assembly, which also hears a statement from the CRC Chair, and the Assembly adopts a Resolution on the Rights of the Child.

33. Mention the advantages of distribution Information centers.

Web access and Internet services such as e-mail ; Market access and e-commerce ; Access to socio-economic databases ; e-Learning (Computer Aided Learning Processes) and e-education; e-Medicine, e-consulting ; e-Governance applications, government to citizen (citizen centric) services ; Weather information ; IT awareness among local people ; Computer training programmes ; Tender notification ; E-employment notification

34. What is meant by GIS?

- A geographic information system (GIS), also known as a geographical information system, is an information system for capturing, storing, analyzing, managing and presenting data which is spatially referenced (linked to location).
- In the strictest sense, it is any information system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically referenced information.

35. How to create awareness among villages for women welfare?

- The women must get organized in their respective villages.
- The Self-help concept -Savings & Credit activity- has to be practiced more intensively.
- Parents should be encouraged to allow their girls to study and at least complete school education.
- The girls who have already dropped out of school should be encouraged to complete their education through private studies.
- Villagers should meet frequently to discuss how to curb the unwanted cultural, social and religious restrictions on women's education.
- We should voice against atrocities towards women.

36. When was Vienna world conference occurred?

On 25 June 1993, representatives of 171 States adopted by consensus the Vienna Declaration and Programme of Action of the World Conference on Human Rights, thus successfully closing the two-

37. What are different values of environmental education?

- Values concerned with a mode of conduct are called instrumental values (i.e. honesty, respect for the environment) and those involving end states of existence are called terminal values (i.e. a world at peace, environmental quality).
- A value system is a hierarchy of ideals or values, arranged in order of importance 14. “The more widely shared a value, the greater the societal demands placed upon us and therefore the greater the ‘oughtness’ we experience.”

38. What is HIV?

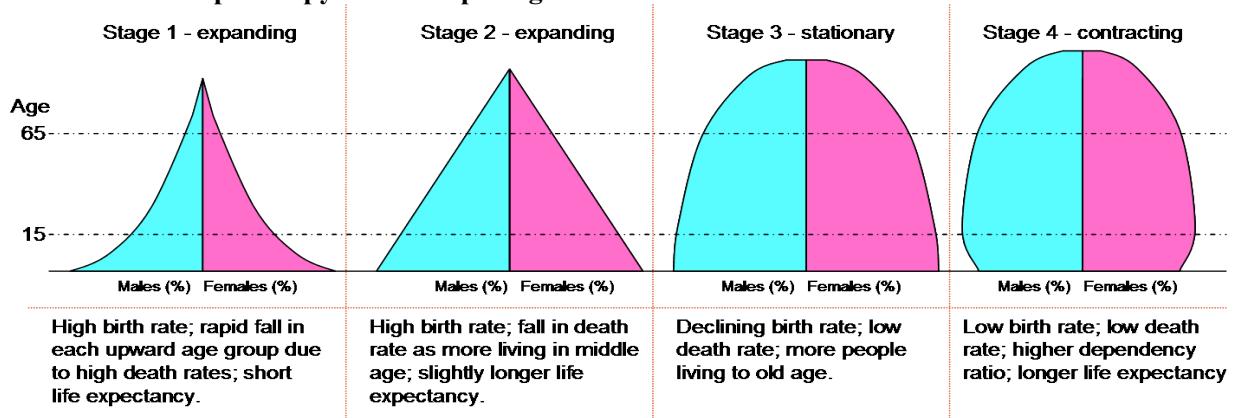
Human immunodeficiency virus (HIV) is a lentivirus (a member of the retrovirus family) that can lead to acquired immunodeficiency syndrome (AIDS), a condition in humans in which the immune system begins to fail, leading to life-threatening opportunistic infections.

39. What are vector borne diseases?

A vector-borne disease is one in which the pathogenic microorganism is transmitted from an infected individual to another individual by an arthropod or other agent, sometimes with other animals serving as intermediary hosts.

- The transmission depends upon the attributes and requirements of at least three different living organisms: the pathologic agent, either a virus, protozoa, bacteria, or helminth (worm); the vector, which are commonly arthropods such as ticks or mosquitoes; and the human host.
- In addition, intermediary hosts such as domesticated and/or wild animals often serve as a reservoir for the pathogen until susceptible human populations are exposed.

40. Give an example for pyramid shaped age structure.



41. Define Population explosion. (NOV/DEC 2013)

Unprecedented growth of human population at an alarming rate is defined as population explosion. For, e.g. Between 1950-1990, in just 40 years the population crossed 5 billion mark with current addition of about 92 million every year.

42. What is value education? Give its significance. (NOV/DEC 2013)

Value education is an instrument used to analyse our behavior and provide proper direction to our youths. It teaches them the distinction between right and wrong, to be compassionate, helpful, loving, generous and tolerant. so that a youth can move towards the sustainable future.

43. What do you mean by Doubling Time? (NOV/DEC 2013)

The **doubling time** is the period of time required for a quantity to double in size or value. It is generally applied to denote the population growth.

44. State the role of Information Technology in Environment.

It plays a vital role in the field of environmental education. IT means collection, processing, storage, and dissemination of information. A number of software have been developed to study about the environment.

PART – B

1. Give the various reasons for the population explosion.

The rapid growth of the world's population over the past one hundred years results from a difference between the rate of birth and the rate of death. The human population will increase by 1 billion people

in the next decade. This is like adding the whole population of China to the world's population. The growth in human population around the world affects all people through its impact on the economy and environment. The current rate of population growth is now a significant burden to human well-being. Understanding the factors which affect population growth patterns can help us plan for the future.

People had many children, but a large number of them died before age five.

- During the Industrial Revolution, a period of history in Europe and North America where there were great advances in science and technology, the success in reducing death rates was attributable to several factors:
 - (1) increases in food production and distribution,
 - (2) improvement in public health (water and sanitation), and
 - (3) medical technology (vaccines and antibiotics), along with gains in education and standards of living within many developing nations.
- Without these attributes present in many children's lives, they could not have survived common diseases like measles or the flu. People were able to fight and cure deadly germs that once killed them. In addition, because of the technology, people could produce more and different kinds of food. Gradually, over a period of time, these discoveries and inventions spread throughout the world, lowering death rates and improving the quality of life for most people.

2. Discuss the factors influencing the family size.

Introduction:

Average family size has changed greatly over the course of U.S. history. Any number of variables influences parents' decisions about family size. One key determinant is family economics. For much of our history, large families were common, especially when most people lived in rural areas and needed extra hands to work family farms. As the country industrialized and urbanized, family size decreased. Over the past century, family size has fluctuated with economic and cultural trends.

For instance, during the Great Depression of the 1930s, American families were relatively small because couples could not afford to feed and take care of many children. During the years after World War II, the country experienced economic prosperity, contributing to the prolonged U.S. Baby Boom (1946-1964) when couples had more children. That was followed by a decline in family size as women gained more opportunities in education and work outside the home. Also, modern methods of family planning have enabled couples to better plan the timing and spacing of their children. Today's average family size in the United States is two children. The field of demography is the study of human populations and the changes and trends in those populations over time.

Knowledge. In well-developed programs, knowledge of family planning methods is nearly universal. The results presented here indicate that a higher level of sophistication (as measured by knowledge of the reproductive cycle) is associated with greater use of the commercial sector.

Cost Recovery in the Public Sector. In low-income countries where there are social marketing programs, high levels of cost recovery in the public sector will probably make the commercial sector immediately price competitive with the public sector. Cost recovery is particularly enticing as a policy lever because it raises revenue for the public sector (thus relieving fiscal pressures) and potentially reduces the service delivery burden at public facilities as public sector users shift to other sources of supply. Nevertheless, the public sector cannot eliminate its role in offering low-cost services altogether, as it provides an important safety net for those users too poor to pay or too distant from normal commercial markets.

Public Sector Program Effort. It is puzzling that family planning program effort is associated with small commercial market shares. A systematic examination of the content of most public sector family planning programs would probably show a near complete neglect of the commercial sector. To the extent that the public sector is differentially assisted by program effort, the commercial sector is likely to suffer. Greater emphasis on bringing commercial sector representatives into the process of family planning policy and program planning, however, may foster a more diverse and comprehensive array of supply and service delivery points. Examples of such efforts include more precise market segmentation and development and enhancement of public/private partnerships. For many years, family planning has been provided as if it were a public good in many countries. Large public programs were designed to expand service delivery in public sector facilities, while limited attention was paid to growth of the commercial sector, likely assuming commercial sector share would grow as a consequence of growth in general public interest in family planning. This study identifies factors for

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which key policy support may be able to generate increased use of the commercial sector for family planning. In an era of increasing resource needs, governments may need to increasingly focus their efforts on serving those most in need. Commercial sector expansion will be needed to divert those able to pay away from public sources. Public programs can become effective partners of the commercial sector by helping foster supportive policy environments, laws, regulations, and policies that enable a wide array of private, commercial sector providers to delivery high-quality family planning services and supplies.

3. Sketch out the stabilization ratio of developing and developed nations and explain in detail.

The data on greenhouse gas emissions highlight issues of both effectiveness and fairness in the effort to address global climate change. Differentiating responsibilities between Annex I and non-Annex I nations, as the UNFCCC has, does not focus efforts on all of the largest emitters. As **Table 1** shows, the emissions of all Annex I nations currently account for just over half of 2000 emissions. Comparing 1990 to 2000 emissions, it is apparent that the share of emissions by non-Annex I nations has been growing.

Table 1. Shares of Global Emissions by the Industrialized (Annex I), Developing (non-Annex I), and Top 20 Countries

| Indicator | Industrialized (Annex I) Countries n=38 ^a | Developing (non-Annex I) Countries n=147 | Top 20 Nations |
|--|--|--|----------------|
| 1990 GHG Emissions (excl. land use) | 58.7% | 40.1% | 75.8% |
| 2000 GHG Emissions (excl. land use) | 51.5% | 47.2% | 75.4% |
| 2000 GHG Emissions (with land use) | 41.3% | 57.6% | 70.4% |
| Cumulative Energy-Related CO ₂ Emissions 1950-2000 (excl. land use) | 71.6% | 26.4% | 80.6% |
| Cumulative Energy-Related CO ₂ Emissions (with land use) | 51.5% | 46.7% | 73.9% |

Source: Climate Analysis Indicators Tool (CAIT) Version 4.0 (Washington, DC: World Resources Institute, 2007).

^a Counting the European Union countries individually, excluding the EU as a collective member

Moreover, contradictory issues of fairness arise. For Annex I countries, the present scheme of controlling greenhouse gases requires them to bear essentially all the direct economic costs. For non-Annex I countries, to the extent that development is linked to increasing greenhouse gas emissions, imposing controls on them could slow their development and hold down their standards of living vis-a-vis the developed nations.

Finally, the focus on emissions levels at specific times (e.g., a baseline of 1990) has differential and arbitrary impacts on individual nations.

- Looking at the industrialization process, to the extent that fossil fuel use is a necessary ingredient of economic development, as acknowledged by the UNFCCC, the emergence of the global climate change issue at this time effectively determines the distinction between the developed, Annex I nations and the developing, non-Annex I nations. For Annex I nations, that energy exploitation has been incorporated into their economies and is part of their baseline for considering any controls on greenhouse gases. For developing, non-Annex I nations, however, economic development will require expanded energy use, of which fossil fuels can be the least

costly. Thus imposing limits on fossil energy use at this time could result in developing countries being relegated to a lower standard of living than those nations that developed earlier.

- Similarly, certain land-use activities, such as clearing land for agriculture and exploiting timber, affect net greenhouse gas emissions. Nations that are currently exploiting their resource endowments, such as Brazil and Indonesia, could find themselves singled out as targets for controls. Yet developed nations, like the United States and most European countries, which exploited such resources in the past, have those greenhouse gas implications embedded in their baselines.
- Also, the focus on 1990 as a baseline means that the Eastern European and former Soviet Union nations have the advantage of reductions in emissions from their subsequent economic contractions, which will allow them room for growth. Likewise, the discovery and exploitation of North Sea gas has allowed Great Britain to back out coal and thereby reduce emissions since the baseline.

In all these cases, the time frame adopted for defining the climate change issue and for taking actions to address greenhouse gas emissions has differential impacts on individual nations, as a result of their individual resource endowments^[19] and stage of economic development. The differential impacts give rise to perceived inequities. Thus the effort to find a metric for addressing greenhouse gas emissions baselines and targets that will be perceived as equitable is challenging.

4. What are the impacts of population growth on environment?

Human population growth is the *number one threat* to the world's environment. Each person requires energy, space and resources to survive, which results in environmental losses. If the human population were maintained at sustainable levels, it would be possible to balance these environmental losses with renewable resources and regeneration. But our population is rapidly rising beyond the earth's ability to regenerate and sustain us with a reasonable quality of life. We are exceeding the carrying capacity of our planet. We need to limit our growth voluntarily, and promote contraceptive use, before Nature controls our population for us with famines, drought and plagues. Our children's future depends on us. The population reached 6.1 billion in 2000. The United Nation projects that world population for the year 2050 could range from 7.9 billion to 10.9 billion, depending on the actions we take today.

Scarce Water --- Currently, 434 million people face either water stress or scarcity. Depending on future rates of population growth, between 2.6 billion and 3.1 billion people may be living in either water-scarce or water-stressed conditions by 2025.

Scarce Cropland ---The number of people living in countries where cultivated land is critically scarce is projected to increase to between 600 million and 986 million in 2025.

Fisheries --- Most of the world 's ocean fisheries are already being fished to their maximum capacities or are in decline.

Forests --- Today over 1.8 billion people live in 36 countries with less than 0.1 hectare of forested land per capita, an indicator of critically low levels of forest cover. Based on the medium population projection and current deforestation trends, by 2025 the number of people living in forest-scarce countries could nearly double to 3 billion.

Global Warming --- In 1998, the last year for which global data are available for both population and heat-trapping carbon dioxide emissions, per capita emissions of CO₂ continued the upward trend that dominated the middle 1990s. When combined with growing world population, these increased per capita emissions accelerated the accumulation of greenhouse gases in the global atmosphere and, thus, future global warming.

Species Extinction --- More than 1.1 billion people live in areas that conservationists consider the most rich in non-human species and the most threatened by human activities. While these areas comprise about 12 percent of the planet's land surface, they hold nearly 20 percent of its human population. The population in these biodiversity hotspots is growing at a collective rate of 1.8 percent annually, compared to the world's population 's annual growth rate of 1.3 percent.

5. Why do you want to know about HIV or AIDS? Justify your answer in eight points.

HIV Hurts the Immune System

People who are HIV positive have been tested and found to have signs of the human immunodeficiency virus in their blood. HIV destroys part of the immune (say: ih-myoon) system.

Specifically, it affects a type of white blood cell called the T lymphocyte (say: lim-fuh-site), or T cell. T cells are one type of "fighter" cell in the blood that help the body fight off all kinds of germs and diseases.

How Many People Have HIV and AIDS?

Since the discovery of the virus more than 20 years ago, millions of people throughout the world have been infected with HIV. Most are adults, but there are kids and teens who have HIV, too. In the world today, AIDS remains an epidemic (say: eh-puh-deh-mik), which means that it affects a large number of people and continues to spread rapidly.

Right now, about 40 million people in the world are living with HIV infection or AIDS. This estimate includes 37 million adults and 2.5 million children. In the United States alone, more than 1 million people are living with HIV.

How Is HIV Spread?

HIV infection isn't like a cold or the flu. A person cannot get HIV by hugging or holding the hand of, sharing a school bus or classroom with, or visiting the home of someone who has HIV. HIV is passed only through direct contact with another person's body fluids, such as blood. The majority of people in North America get infected with HIV by:

- having sexual contact with a person who has HIV
- sharing needles or syringes (used to inject illegal drugs) with a person who has HIV

Other ways of getting HIV can occur when:

- an infected pregnant woman passes it to her unborn child. (This can be prevented by treating the mother and child around the time the baby is delivered.) Because of the risk to an untreated baby, every pregnant woman should be tested for HIV.
- a person has a blood transfusion (say: trans-fyoo-zhun) from a fairly large volume of blood. But in North America today, all donated blood is tested for HIV, so the risk of getting HIV is less than one in a million.

Symptoms of HIV and AIDS

Most people don't feel any different after they are infected with HIV. In fact, infected people often do not experience symptoms for years. Some people develop flu-like symptoms a few days to a few weeks after being infected, but these symptoms usually go away after several days.

An HIV-positive person will eventually begin to feel sick. The person might begin to have swollen lymph nodes, weight loss, fevers that come and go, infections in the mouth, diarrhea, or he or she might feel tired for no reason all of the time. Eventually, the virus can infect all of the body's organs, including the brain, making it hard for the person to think and remember things.

When a person's T cell count gets very low, the immune system is so weak that many different diseases and infections by other germs can develop. These can be life threatening. For example, people with AIDS often develop pneumonia (say: nu-mo-nyah), which causes bad coughing and breathing problems. Other infections can affect the eyes, the organs of the digestive system, the kidneys, the lungs, and the brain. Some people develop rare kinds of cancers of the skin or immune system.

Most of the children who have HIV got it because their mothers were infected and passed the virus to them before they were born. Babies born with HIV infection may not show any symptoms at first, but the progression of AIDS is often faster in babies than in adults. Doctors need to watch them closely. Kids who have HIV or AIDS learn more slowly than healthy kids and tend to start walking and talking later.

HIV and AIDS Diagnosed

A person can be infected with HIV without even knowing it. So doctors recommend that anyone who thinks he or she may have been exposed to the virus get tested - even if the chance of having been infected seems small. Doctors test a person's blood to find out if he or she is infected with HIV.

People who are HIV positive need to have more blood tests every so often. The doctor will want to check on how many T cells the person has. The lower the T cell count, the weaker the immune system and the greater the risk that someone will get very sick.

HIV and AIDS Treated

Right now there is no cure for HIV or AIDS, but new medicines can help people live longer lives. Scientists are also researching vaccines that may one day help to prevent HIV infection, but it's a very tough assignment, and no one knows when these vaccines might become available. It's up to everyone to prevent AIDS by avoiding the behaviors that lead to HIV infection.

HIV and AIDS Be Prevented

People can help stop the spread of HIV by avoiding sexual contact with infected people and by not sharing needles or syringes.

Health care workers (such as doctors, nurses, and dentists) help prevent the spread of HIV by wearing plastic gloves when working on a patient. Hospitals have strict procedures for handling samples of blood and other body fluids to prevent others from coming in contact with HIV.

Living With HIV and AIDS

New drugs make it possible for people who are HIV positive to live for years without getting AIDS. They can work or go to school, make friends, hang out, and do most of the things other people can do. They will have to take certain medicines every day and see their doctors pretty often, and they may get sick more than other people do because their immune systems are more fragile.

Even though they may look OK, people who are HIV positive may sometimes feel scared, angry, unhappy, or depressed. They may feel afraid that the people at work or school could find out and start treating them differently. It is important for all of us to remember that usual social contact, like eating lunch or playing games, with people who are HIV positive does not bring any risk of infection.

When HIV infection gets worse or turns into the disease called AIDS, life really changes. The person may need to spend a lot of time in bed or in the hospital because of serious illnesses. He or she may feel very tired or weak most of the time. The person also might lose weight.

Hope for an HIV-Free Future

Maybe one day, with time and research, a cure for HIV infection will be found and AIDS will no longer exist. Until then, the smartest thing to do is to know the facts and not put yourself at risk.

6. Write few notes on Malthusian theory, Maxian theory, UNDHR, ENVIS.

Malthusian Theory: According to Thomas Malthus in 1978, human population tends to increase at an exponential or compound rate, while food production either increases slowly or remains stable. This will result in poverty, starvation, disease, crime and misery.

Marxian Theory: Karl Marx opined that slowing down of population growth and alleviation of crime, disease, starvation, misery and environmental degradation could be achieved through social justice.

Universal Declaration of Human Rights

PREAMBLE

Whereas recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of freedom, justice and peace in the world,

Whereas disregard and contempt for human rights have resulted in barbarous acts which have outraged the conscience of mankind, and the advent of a world in which human beings shall enjoy freedom of speech and belief and freedom from fear and want has been proclaimed as the highest aspiration of the common people,

Whereas it is essential, if man is not to be compelled to have recourse, as a last resort, to rebellion against tyranny and oppression, that human rights should be protected by the rule of law,

Whereas it is essential to promote the development of friendly relations between nations,

Whereas the peoples of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have determined to promote social progress and better standards of life in larger freedom,

Whereas Member States have pledged themselves to achieve, in cooperation with the United Nations, the promotion of universal respect for and observance of human rights and fundamental freedoms,

Whereas a common understanding of these rights and freedoms is of the greatest importance for the full realization of this pledge,

ENVIS

The ENVIS centers work for generating a network of database in areas like pollution control, clean technologies, remote sensing, coastal ecology, biodiversity, Western Ghats and Eastern Ghats, environmental management, media related to environment, renewable energy, desertification, mangroves, wildlife, Himalayan ecology, mining, etc.

7. Describe the factors responsible for population growth rate.

- Rapid population growth, then, results from poverty and powerlessness, the need for family labor or the income children can bring home, high infant-mortality rates, and lack of education and

opportunity for women. Our thesis for fertility *decline* is that, during the demographic transition, population growth *normally* slows only with far-reaching changes in society. Unfortunately, these changes can be of a positive or a negative nature.

- On the positive side are economic and political changes that reduce infant mortality and convince the majority of people that social arrangements *beyond the family*-jobs, health care, old-age security, and education (especially for women)-offer security, or at least better opportunities than does large family size. We can call that the positive way that fertility rates fall, or *because people are better off, they need fewer children*.
- On the other hand, the nature of poverty and powerlessness can change in ways that transform children from a net benefit to the family into a net cost without empowering people or raising them out of poverty and hunger. That could also bring fertility rates down, but in a negative way. We might describe this as *things getting so bad that people can't even afford to have kids*.
- Another negative scenario of lowered fertility might occur when the economic structures that make additional children necessary have been left intact, yet birth control has been enforced through coercion and/or indoctrination. Then people would have less children when for economic reasons they should be having more, deepening poverty still further. This might be described as *the tragedy of the sterilized, poor, older woman without children to support her*.
- Positive changes and declining fertility
Some of the earliest and most spectacular fertility declines occurred in the context of broad-based changes in living standards. Let's look at some of those examples.
 - Sri Lanka. From the postwar period to 1978, the Sri Lankan government supported the consumption of basic foods, notably rice, through a combination of free food, rationed food, and subsidized prices,³⁰ initiating a long-term decline in fertility and population-growth rates.³¹
 - Cuba. Rationing and setting price ceilings on staples kept basic food affordable and available to the Cuban people from the 1959 revolution to the economic crisis of 1989.³² All citizens were guaranteed enough rice, pulses, oil, sugar, meat, and other food to provide them with nineteen hundred calories a day.³³ As universal health care and education were made available to all, Cuba's birth rate fell from 4.7 to 1.6.³⁴
 - Kerala, India. In this Indian state eleven thousand government-run fair-price shops keep the cost of rice and other essentials like kerosene within the reach of the poor. This subsidy accounts for as much as one-half of the total income of Kerala's poorer families.³⁵ Its population density is three times the average for all India,³⁶ yet commonly used indicators of hunger and poverty-infant mortality, life expectancy, and death rate-are all considerably more moderate in Kerala than in most low-income countries, as well as in India as a whole. Its infant mortality is half the all-India average.³⁷ Literacy and education levels are far superior to other states, particularly for women: the female literacy rate in Kerala is two and a half times the all-India average.³⁸ Not surprisingly then, Kerala rapidly reduced fertility and population growth in the postwar period. By 1991 Kerala had a birth rate that was one-third of the all-India average. That was about half the average for all low-income countries and only slightly higher than the United States.³⁹
 - In most of these societies, income distribution is less skewed than in many other countries. The distribution of household income in Sri Lanka, for example, is more equitable than in Indonesia, India, or even the United States.⁴⁰
 - In Thailand, the Philippines, and Costa Rica-other countries that experienced early fertility decline-health and other social indicators offer clues as to why. Infant death rates are relatively low, especially in Costa Rica, and life expectancy is high-for women, ranging between sixty-five and seventy-six years. Perhaps most important, in the Philippines and Costa Rica an unusually high proportion of women are educated, and in both the Philippines and Thailand, proportionately more women work outside the home than in most third world countries.⁴¹
 - Our careful reading of the scientific literature on fertility decline leads us to the conclusion that the bulk of it observed in the world so far has occurred for the "right" reasons. The Vandermeer study noted above indicates that reductions in poverty and inequality have been key factors. A 1994 Yale University study found that the education of women was the best predictor of reduced fertility rates among sixty-eight low-income countries.⁴² While the researchers did not consider inequality and poverty in this study, it seems reasonable to assume that greater education of women goes hand in hand with reductions of both.

8. Write short notes on (i) Effects of modern agriculture ii) HIV/AIDS iii) Noise pollution iv) role of individual in pollution prevention.

i) Effect of modern agriculture

Historically, man as hunter-gatherer could not affect the environment because he was using the natural population of animals and plants well below the sustainable yields except in those areas where trading of animals and/or plants was introduced. Agriculture has been considered as a way of life. Ever increasing population places greater demands on agriculture to increase the production, to match the increasing demands for food supply. With agricultural development though food production has successfully increased nearly everywhere but it has failed to match with the growing population in many areas - specially developing countries of Africa, Asia and Latin America.

(i) Expansion and Conversion of Agricultural Land

Increasing population growth at a fast rate, especially in the developing countries, has created enormous pressure on the virgin forest lands, cultural waste-lands and current fallow lands to be converted and brought under the cultivation or irrigation to ensure the food production substantially. Conversion and expansion of agricultural land and forest areas changes in their natural limits. Thousands of millions of tons of soil is lost annually due to large-scale deforestation and/ or poor land management records chain reaction in the broad areas.

(ii) Application of Chemical Fertilizers, Pesticides and Insecticides

To assure enhanced productivity in areas where intensive cultivation has been initiated, increased application of chemical fertilizers supplying the plant nutrients has become an essential component of modern agriculture.

(iii) The High Yielding Varieties Programme

The introduction of high yielding varieties has changed the agricultural environment by creating a variety of pest problems. Many of these either were unknown or were of minor importance in the early sixties. The increased irrigational facilities, higher use of fertilizers and the high yielding varieties led to the resurgence of pests. The high-yielding varieties and the monoculture practices led to material change in the pest complex. Pests and diseases such as gall midge, brown plant hopper, bacterial blight and tungro virus (or paddy) considered as minor diseases earlier to the Green Revolution suddenly appeared as major diseases. Agricultural losses due to such pests and/or diseases increased tremendously since the high-yielding varieties were more prone to pests and diseases.

(iv) Development of Irrigational Facilities

Irrigation has increasingly become indispensable. It has become a major consumer of water in many countries. Considering the nature of rainfall and scarcity of water and to meet the increasing needs of water in agriculture with the enhanced use of chemical fertilizers and pesticides, irrigational facilities have been developed to check the flow of surplus rainy water to avoid floods and also to regulate the avoidable water through canals to ensure the availability of water as and when required.

(v) Intensive and Extensive Cultivation

The introduction of intensive cultivation to get the maximum production and the variety of crops through multiple cropping, crop-rotations, changing crop-combination from the same unit of land has

resulted in the decline of the productivity and total production due to critical limit of the soil. Even use of chemical fertilizers also proves as ineffective. Wheat production in Punjab has declined due to the degradation of soil.

ii) HIV/AIDS

Human immunodeficiency virus infection / acquired immunodeficiency syndrome (HIV/AIDS) is a disease of the human immune system caused by infection with human immunodeficiency virus (HIV). During the initial infection, a person may experience a brief period of influenza-like illness. This is typically followed by a prolonged period without symptoms. As the illness progresses, it interferes more and more with the immune system, making the person much more likely to get infections, including opportunistic infections and tumors that do not usually affect people who have working immune systems.

HIV is transmitted primarily via unprotected sexual intercourse (including anal and even oral sex), contaminated blood transfusions, hypodermic needles, and from mother to child during pregnancy, delivery, or breastfeeding. Some bodily fluids, such as saliva and tears, do not transmit HIV. Prevention of HIV infection, primarily through safe sex and needle-exchange programs, is a key strategy to control the spread of the disease. There is no cure or vaccine; however, antiretroviral treatment can slow the course of the disease and may lead to a near-normal life expectancy. While antiretroviral treatment reduces the risk of death and complications from the disease, these medications are expensive and may be associated with side effects.

Genetic research indicates that HIV originated in west-central Africa during the early twentieth century. AIDS was first recognized by the Centers for Disease Control and Prevention (CDC) in 1981 and its cause—HIV infection—was identified in the early part of the decade. Since its discovery, AIDS has caused nearly 30 million deaths (as of 2009). As of 2010, approximately 34 million people are living with HIV globally. AIDS is considered a pandemic—a disease outbreak which is present over a large area and is actively spreading.

HIV/AIDS has had a great impact on society, both as an illness and as a source of discrimination. The disease also has significant economic impacts. There are many misconceptions about HIV/AIDS such as the belief that it can be transmitted by casual non-sexual contact. The disease has also become subject to many controversies involving religion.

iii) Noise pollution

Noise pollution is displeasing or excessive noise that may disrupt the activity or balance of human or animal life. The word noise is cognate with the Latin word nauseas, which means disgust or discomfort. The source of most outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles, aircrafts, and trains. Outdoor noise is summarized by the word environmental noise. Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential areas.

Indoor noise is caused by machines, building activities, music performances, and especially in some workplaces. There is no great difference whether noise-induced hearing loss is brought about by outside (e.g. trains) or inside (e.g. music) noise.

iv) Role of an individual in prevention of pollution.

The concept of pollution prevention centers around the idea of eliminating the creation of pollutants. In some cases that means not creating waste; another perspective is to limit energy consumption, thus reducing the amount of pollution caused in the creation of most common forms of energy. Although industry, commerce and institutions create the majority of pollutants, individuals can address pollution prevention and improve environmental health on a personal-sized scale.

Decrease Waste

Reducing waste is a crucial step in preventing pollution. Landfills and incinerators release carbon dioxide, methane and other greenhouse gases that contribute to local and global air pollution.

Choosing products with recyclable packaging or less packaging reduces waste.

Reduce Toxins

Mercury, a bioaccumulating toxin that affects the brain and neurological health, can be found in electrical switches, fluorescent bulbs, thermometers, thermostats and older batteries. Bioaccumulation is a process in which mercury, or any other persistent pollutant, accumulates in fatty tissues of animals and plants and increases in concentration as the food chain progresses. To prevent mercury pollution, choose mercury-free products, like digital thermometers, or use products that contain little mercury.

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Reduce Energy Consumption

Unplugging electronics when they are not in use and turning off unnecessary lights are examples of reducing energy consumption. Energy conservation does not require significant sacrifices. Purchasing energy-efficient and water-efficient appliances, electronics and plumbing devices reduces not only energy consumption but also your electric and water bills.

Vote Green

Support amendments, initiatives and laws that prevent pollution. Vote to encourage green infrastructure and low-impact development, improve waste reduction, decrease air pollution emissions and groundwater pollution, and limit pesticide use.

9. Discuss about the advantages and disadvantages of information technology on environment. (NOV/DEC 2013)

1. Information Technology has tremendous potential in dealing with environmental issues and health related problems
2. IT can perform a number of tasks extremely rapidly, accurately and spread the information through millions of computers assisted by communication satellites.
3. IT comprises of various components mainly internet facility, World Wide Web, Remote sensing, geographical information system and satellites.
4. A number of software has been developed to study the environment and health related problems.
5. The data on various environmental topics such as wildlife, forest cover, deforestation, desertification, floods, earthquakes, etc. inserted into the computers can be retrieved whenever required.
6. The various changes in the environment can be assessed easily through satellites by remote sensing techniques.
7. The occurrence of natural calamities like drought, floods, volcanic eruptions, earthquakes, etc., can be predicted well in advance through remote sensing techniques.

8. Geographical information system (GIS), which acts as a technique of superimposing various thematic maps with the use of digital data on a large number of inter-related aspects, is considered to be an effective tool in environmental management.

9. Information relating to a number of topics like water resources, industrial growth, forest cover, cropland, grass land, road network, and human settlement can be obtained through GIS.

10. The internet coupled with a number of websites is another efficient tool for providing appropriate environmental data on various topics for any study or environmental management planning.

11. The internet facility can also be extended to create awareness among the general public about environmental issues.

Information technology plays also a key role in human health management

1. Several software's have been developed to insert into computers the information relating to various diseases such as HIV/AIDS, cancer, malaria, encephalitis, fluorosis, etc.,

2. The data regarding birth and death rate, immunization and sanitation programmes can be maintained accurately with the help of computers.

3. The data regarding outbreak of epidemic diseases at remote places can be used to take preventive and remedial measures.

4. Now-a-days, patients can seek the advice of a specialist doctor at far off distance availing themselves of the on-line facility.

10. Discuss Various Issues and Measures for Women and Child Welfare. (MAY/JUNE 2013) (NOV/DEC 2013)

The Department of Women and Child Development (Government of India) was set up in the year 1985 as a part of the Ministry of Human Resource Development to give the much needed impetus to the holistic development of women and children. The Department was upgraded as the Ministry of Women and Child Development in January 2006.

The Ministry is the nodal ministry for the advancement of women and children; it formulates plans, policies and programs; enacts/amends legislation, guides and coordinates the efforts of both governmental and non-governmental organisations working in the field of women and child development. The Ministry also implements certain programs for the welfare and uplift of women and children. These programs cover welfare and support services, training for employment and income generation, awareness generation and gender sensitization.

The Ministry implements the Integrated Child Development Services (ICDS) providing a package of services comprising supplementary nutrition, immunization, health check up and referral services, pre-school non-formal education. The Ministry is also implementing Swayamsidha which is an integrated scheme for empowerment of women. Major policy initiatives undertaken by the Ministry in the recent past include universalization of ICDS and Kishori Shakti Yojana, launching a nutrition program for adolescent girls, establishment of the Commission for Protection of Child Rights and enactment of Protection of Women from Domestic Violence Act. The Ministry has 6 autonomous organisations viz. National Institute of Public Cooperation and Child Development (NIPCCD), Rashtriya Mahila Kosh (RMK), Central Social Welfare Board (CSWB), Central Adoption Resource Agency (CARA), National Commission for Protection of Child Rights (NCPCR) and National Commission for Women working under its aegis. The Food & Nutrition Board (FNB), set up in 1964, is an attached office of the Ministry. The Ministry has also set up a National Resource Centre for Women (NRCW).

The Ministry has formulated the National Policy for Women Empowerment, 2001.

11. Explain population growth and population explosion with the various terms involved to control population. (MAY/JUNE 2013) (NOV/DEC 2013)

POPULATION GROWTH, VARIATION AMONG NATIONS

Our global human population, 6 billion at present, will cross the 7 billion mark by 2015. The needs of this huge number of human beings cannot be supported by the Earth's natural resources, without degrading the quality of human life. In the near future, fossil fuel from oil fields will run dry. It will be impossible to meet the demands for food from existing agro systems. Pastures will be overgrazed by domestic animals and industrial growth will create ever-greater problems due to pollution of soil, water and air.

Seas will not have enough fish. Larger ozone holes will develop due to the discharge of industrial chemicals into the atmosphere, which will affect human health. Global warming due to industrial gases will lead to a rise in sea levels and flood all low-lying areas, submerging coastal agriculture as well as towns and cities. Water 'famines' due to the depletion of fresh water, will create unrest and eventually make countries go to war. The control over regional biological diversity, which is vital for producing new medicinal and industrial products, will lead to grave economic conflicts between biotechnologically advanced nations and the biorich countries. Degradation of ecosystems will lead to extinction of thousands of species, destabilizing natural ecosystems of great value. These are only some of the environmental problems related to an increasing human population and more intensive use of resources that we are likely to face in future. These effects can be averted by creating a mass environmental awareness movement that will bring about a change in people's way of life. Increase in production per capita of agricultural produce at a global level ceased during the 1980's. In some countries, food shortage has become a permanent feature. Two of every three children in South Africa are underweight. In other regions famines due to drought have become more frequent. Present development strategies have not been able to successfully address these problems related to hunger and malnutrition. On the other hand, only 15% of the world's population in the developed world is earning 79% of income! Thus the disparity in the extent of per capita resources that are used by people who live in a '**developed**' country as against those who live in a '**developing**' country is extremely large. Similarly, the disparity between the rich and the poor in India is also growing. The increasing pressures on resources place great demands on the in-built buffering action of nature that has a certain ability to maintain a balance in our environment. However, current development strategies that essentially lead to short-term gains have led to a breakdown of our Earth's ability to replenish the resources on which we depend.

Global population growth

The world population is growing by more than 90 million per year, of which 93% is in developing countries. This will essentially prevent their further economic 'development'. In the past, population growth was a gradual phenomenon and the Earth's ability to replenish resources was capable of adjusting to this increase. In the recent past, the escalation in growth of human numbers has become a major cause of our environmental problems. Present projections show that if our population growth is controlled, it will still grow to 7.27 billion by 2015. However, if no action is taken it will become a staggering 7.92 billion. Human population growth increased from: 1 to 2 billion, in 123 years. 2 to 3 billion in 33 years, 3 to 4 billion in 14 years. 4 to 5 billion in 13 years. 5 to 6 billion in 11 years. It is not the census figures alone that needs to be stressed, but an appreciation of the impact on natural resources of the rapid escalation in the rate of increase of human population in the recent past. The extent of this depletion is further increased by affluent societies that consume per capita more energy and resources, than less fortunate people. This is of great relevance for developing a new ethic for a more equitable distribution of resources. In the first half of the 1900s human numbers were growing rapidly in most developing countries such as India and China. In some African countries the growth was also significant. In contrast, in the developed world population growth had slowed down. It was appreciated that the global growth rate was depleting the Earth's resources and was a direct impediment to human development. Several environmental ill-effects were linked with the increasing population of the developing world. Poverty alleviation programs failed, as whatever was done was never enough as more and more people had to be supported on Earth's limited resources. In rural areas population growth led to increased fragmentation of farm land and unemployment. In the urban sector it led to inadequate housing and an increasing level of air pollution from traffic, water pollution from sewage, and an inability to handle solid waste.

POPULATION EXPLOSION – FAMILY WELFARE PROGRAM

In response to our phenomenal population growth, India seriously took up an effective Family Planning Program which was renamed the Family Welfare Program. Slogans such as 'Hum do hamare do' indicated that each family should not have more than two children. It however took several decades to become effective. At the global level by the year 2000, 600 million, or 57% of women in the reproductive age group, were using some method of contraception. However the use of contraceptive measures is higher in developed countries - 68%, and lower in developing countries - 55%. Female sterilization is the most popular method of contraception used in developing countries at

The first 'green revolution' in the '60s produced a large amount of food but has led to several environmental problems. Now, a new green revolution is needed, to provide enough food for our growing population, that will not damage land, kill rivers by building large dams, or spread at the cost of critically important forests, grasslands and wetlands. The world's most populous regions are in coastal areas. These are critical ecosystems and are being rapidly destroyed. Global climate change is now a threat that can affect the very survival of high population density coastal communities. In the sea, fish populations are suffering from excessive fishing. Once considered an inexhaustible resource, over fishing has depleted stocks extremely rapidly. It will be impossible to support further growth in coastal populations on existing fish reserves. Human populations will inevitably expand from farm lands into the remaining adjacent forests

Planning for the future

How Governments and people from every community meet challenges such as limiting population size, protecting the natural environment, change their consumer oriented attitudes, reduce habits that create excessive waste, elevates poverty and creates an effective balance between conservation and development will determine the world's future.

The Urban Challenge

Population increases will continue in urban centers in the near future. The UN has shown that by 2025 there will be 21 "megacities" most of which will be situated in developing countries. Urban centers are already unable to provide adequate housing, services such as water and drainage systems, growing energy needs, or better opportunities for income generation.

Methods of sterilization

India's Family Welfare Program has been fairly successful but much still needs to be achieved to stabilize our population. The most effective measure is the one most suited to the couple once they have been offered all the various options that are available. The Family Welfare Program advocates a variety of measures to control population. Permanent methods of sterilisation are done by a minor surgery. Tubectomy in females is done by tying the tubes that carry the ovum to the uterus. Male sterilization or vasectomy, is done by tying the tubes that carry the sperm. Both are very simple procedures, done under local anesthesia, are painless and patients have no post-operative problems. Vasectomy does not cause any loss in the male's sexual ability but only arrests the discharge of sperm. There are several methods of temporary birth control. Condoms are used by males to prevent sperms from fertilizing the ovum during intercourse. Intrauterine devices (Copper Ts) are small objects which can be placed by a doctor in the uterus so that the ovum cannot be implanted, even if fertilized. They do not disturb any functions in the woman's life or work.

12. Describe the role of information technology in environment and human health. (NOV/DEC 2013)

Environmental health is that branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. Other phrases that concern or refer to the discipline of **environmental health** include **environmental public health**, and **environmental protection**. The field of environmental health is closely related to environmental science and public health as environmental health is concerned with environmental factors affecting human health.

"Environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments. This definition excludes behaviour not related to environment, as well as behaviour related to the social and cultural environment, as well as genetics."^[1]

Environmental health is defined by the World Health Organization as:^[2]

Those aspects of the human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health.

Environmental health as used by the WHO Regional Office for Europe, includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and well being of the broad physical, psychological, social and cultural environment, which includes housing, urban development, land use and transport.

Technology has played a key role in the development of human society. Modern technologies such as information technology, have changed the human lifestyle. Development of sophisticated instruments like computers, satellites, telecommunication instruments etc have resulted in total revolution in almost all spheres of life. The important role of information technology in environment and human health are as follows

1. Remote Sensing. Remote sensing and Geographical Information System (GIS) has proved to be very effective tool in environment management. Now, the ongoing changes in the environment can be assessed easily through satellites by remote sensing techniques. The occurrence of a number of natural calamities like droughts, floods, volcanic eruptions etc., can also be predicted well in advance. Such assessments help the environmentalists and planners to take ameliorative measure to minimise the effects of these extreme natural events. The Ministry of Environment and Forests, Government of India has created an information system called Environmental Information System (ENVIS) with its headquarters in Delhi. It provides a network database in environmental issues like pollution control, renewable energy, desertification, biodiversity etc.

2. Database. Database is the collection of inter-related data on various subjects in computerized form which can be retrieved whenever required. Now the data regarding birth and death rates, immunisation and sanitation programmes can be maintained more accurately than before in computers at health centers. Database is also available about the diseases like malaria, fluorosis, AIDS etc. The Ministry of Environment and Forests, Government of India has taken up the task of compiling a database on various environmental issues like wildlife, forests cover, wasteland etc.

3. Human health. Information technology also plays a key role in human health. It helps the doctors to monitor the health of people of that area. The information regarding outbreak of epidemic diseases from remote areas can be sent more quickly to the district administration to take corrective measures. Now, patients can seek help of a super specialist doctor placed at far off distance. Many hospitals now, take on-line help of experts to provide better treatment and services to their patients. This has become possible only because of advancement of IT in the recent times.

4. Online Information. It provides vast quantum of information on different subjects including human health and environment.

Role of IT in environment:

Remote Sensing and GIS (Geographic Information System) provides data and knowledge concerning the global environment as it is used for mapping and monitoring various natural resources.

Ministry of Environment and Forest (MoEF) and Government of India (GOI) have created an Environment Information System (ENVIS). Different ENVIS centers are set up in different organizations for information collection, storage which work towards boosting the relationship between trade and environment

IT is used for computer based modeling and simulation of environmental scenarios for analysis and prediction.

It enables environmental scientists and researchers around the world to communicate, collaborate and coordinate.

Role of IT in human health

IT can be used for audio, visual and data communications for medical consultation, diagnosis, treatment, nursing and medical education.

IT is used for testing of DNA, creating DNA database and genetic information about population. Medical records and finger prints which are used by investigating agencies to identify missing persons and criminals.

IT helps in spreading awareness about endemic, epidemic and communicable diseases. With the help of Remote Sensing and GIS there is identification of several infested areas which are prone to some diseases like malaria etc. based upon mapping of such areas.

13. Briefly discuss HIV/AIDS, mode of its spread and its effect on environment. (MAY/JUNE 2013) (NOV/DEC 2013)

Human immunodeficiency virus infection / Acquired immunodeficiency syndrome (HIV/AIDS) is a disease of the human immune system caused by the human immunodeficiency virus (HIV). The illness interferes with the immune system, making people with AIDS much more likely to get infections, including opportunistic infections and tumors that do not usually affect people with working immune systems. This susceptibility increases as this disease gets worse.

HIV is transmitted primarily via sexual intercourse (including oral sex and anal sex), contaminated blood transfusions and hypodermic needles, and from mother to child during pregnancy, delivery, or breastfeeding. Some bodily fluids, like saliva or tears, do not transmit HIV. Prevention of HIV infection, primarily through safe sex and needle-exchange programs, is a key strategy to control the disease. There is no known cure for or vaccine against HIV. However, antiretroviral treatment can slow the course of the disease and may lead to a near-normal life expectancy for people with HIV. Antiretroviral treatment reduces the risk of death and complications from the disease. However, these medications are expensive and may be associated with side effects of their own.

HIV/AIDS is a major health problem in many parts of the world, and is considered a pandemic—a disease outbreak which is present over a large area and is actively spreading. In 2009, the World Health Organization (WHO) estimated that there are 33.4 million people worldwide living with HIV/AIDS, with 2.7 million new HIV infections per year and 2.0 million annual deaths due to AIDS.^[5] As of 2010, approximately 34 million people have HIV globally. Of these, approximately 16.8 million are women and 3.4 million are less than 15 years old. HIV/AIDS resulted in about 1.8 million deaths in 2010, down from 3.1 million in 2001. Since AIDS was first recognized in 1981, it has led to nearly 30 million deaths (as of 2009).

Genetic research indicates that HIV originated in west-central Africa during the late nineteenth or early twentieth century. AIDS was first recognized by the Centers for Disease Control and Prevention (CDC) in 1981 and its cause, HIV, identified in the early 1980s.

Although operating at multiple levels and in many ways, the environmental dimensions of HIV/AIDS have received little attention in the policy arena. Few bridges exist between public health and environmental dialogue and policymaking, as evidenced by the lack of discussion of this intersection at the 2006 HIV/AIDS conference in Toronto. At the conference, the natural environment found a place on the program primarily within the context of food security. Although clearly a critical topic, food security is but one of many dimensions of the pandemic's effect on the natural environment.

Recognizing the associations between HIV/AIDS and the natural environment can contribute to the well-being of both human populations and local environments, particularly in regions characterized by high prevalence of HIV/AIDS and natural resource dependence and scarcity.

Because environmental scarcity can heighten HIV/AIDS vulnerability, environmental policy encouraging sustainable use of local environments can also benefit public health. This is especially true in regions where resource scarcity deepens poverty and robs households of viable livelihood options. In addition, health interventions to reduce HIV/AIDS vulnerability can produce environmental gains, particularly in areas characterized by high levels of resource dependence and where pressure on local resources is intensified by adult mortality. In this region, reduced mortality may lessen environmental pressure by reducing dependence on local natural resources such as fuelwood for cooking.

Because poverty is a driving force in the vulnerability to both HIV/AIDS and unsustainable resource use, poverty reduction efforts could yield substantial gains in both public health and environmental protection. One program recognizing these critical links is the Umzi Wethu Training Academy for Displaced Youth in Eastern Cape, South Africa. A project of the Wilderness Foundation South Africa, the program offers certified vocational training and internships to AIDS orphans and vulnerable youth, helping them qualify for well-paid local conservation jobs. Although the tourism industry has been hard-hit by the loss of employees to AIDS, ecotourism has been increasing 10 percent annually in the region, expanding opportunities for game rangers, hospitality hosts, and other tourism service providers. Enhancing opportunities for local at-risk youth not only helps the local economy, but reduces the likelihood they will engage in risky sexual behavior. These poverty reduction efforts therefore lessen the spread of HIV/AIDS as well as protect natural resources.

Although research on the HIV/AIDS and environment intersection is in its infancy, the early evidence suggests that the public health, HIV/AIDS, and environmental policy and advocacy communities would gain strength by recognizing the overlaps in their agendas. The Umzi Wethu Training Academy has been designed with such overlaps in mind and represents the type of integrated approach to program and policy development that warrants serious consideration.