

QUANTUM Series

B.Tech - 1st Year

Common to All Branches

Environment and Ecology



- Topic-wise coverage of entire syllabus in Question-Answer form.
- Short Questions (2 Marks)

**Session
2022-23**
Odd & Even Semester

Includes solution of following AKTU Question Papers (Odd & Even)

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QUANTUM SERIES

For

B.Tech Students of First Year
of All Engineering Colleges Affiliated to
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Environment & Ecology

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UNIT

Environment and Ecosystem

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PART-1

Environment: Definition, Types of Environment, Components of Environment, Segments of Environment, Scope and Importance, Need for Public Awareness.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.1. Define environment. Discuss in brief the segments of environment.

OR

Discuss the four segments of environment.

OR

What is meant by environment ? Enumerate and discuss its various components.

AKTU 2017-18 (Sem-4), Marks 07

Answer

1. Environment can simply be defined as one's surroundings, which includes everything around the organism, i.e., abiotic (non-living) and biotic (living) environment.
2. Environment is defined as the social, cultural and physical conditions that surround, affect and influence the survival, growth and development of people, animals or plants.
3. The environment consists of four segments. These are as follows :
 - i. **Atmosphere :** It is the blanket of gases surrounding the earth.
 - ii. **Hydrosphere :** It is composed of various water bodies on the earth. It includes the oceans, lakes, rivers, etc.
 - iii. **Lithosphere :** It contains various types of soils and rocks on earth.
 - iv. **Biosphere :** It is composed of all living organisms and their interactions with the environments, viz. atmosphere, lithosphere and hydrosphere. The biosphere is the earth's zone of air, soil, and water that is capable of supporting life.

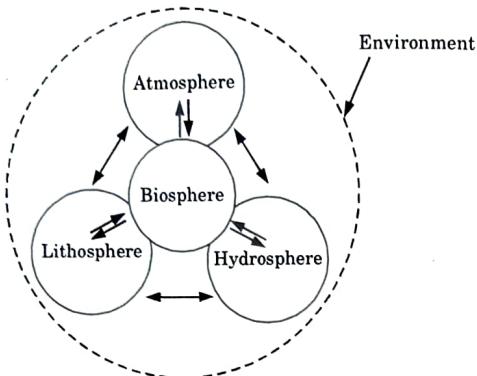


Fig. 1.1.1. Concept of environment.

Que 1.2. Classify the atmosphere on the basis of temperature variation. State the main activities taking place in each of them.

OR

How would you broadly divide major layer or regions of the atmosphere ? State respective altitude and temperature ranges.

AKTU 2014-15 (Sem-2), Marks 05

Answer

Atmosphere can be divided into five concentric layers of regions depending upon their temperature and pressure. They are

1. Troposphere.
2. Stratosphere.
3. Mesosphere.
4. Thermosphere.

5. Exosphere.

1. Troposphere :

- i. The lower portion of atmosphere in which human with other organisms live is called troposphere.
- ii. Tropo means change or turning this refers to the winds which keep the troposphere in constant motion.
- iii. Altitude range of troposphere varies from 0-11 km above earth's surface.
- iv. Troposphere is mainly composed of N_2 and O_2 , it also contains Ar and CO_2 and traces of He, Ne, CH_4 , Kr, H_2 , N_2O , C_6H_6 , O_3 , NH_3 , NO_2 , SO_2 , etc.
- v. It contains 70 % of the mass of the atmosphere. The density of air, in this region, decreases exponentially with increasing altitude.

- vi. The temperature of air in troposphere decreases uniformly with increasing altitude from the ground temperature to a temperature of about $-56^\circ C$. The top of troposphere is called tropopause.

2. Stratosphere :

- i. Stratosphere extends from upper most level of troposphere, (i.e., tropopause) to the stratopause, the upper most level of stratosphere, i.e., 11 to 50 km above the surface of earth.
- ii. In stratosphere temperature raises from a minimum of about $-56^\circ C$ to $-2^\circ C$. Because of very low temperature, there are virtually no clouds, dust or water vapours, there are also no convection currents.
- iii. The stratosphere is rich in ozone. Principal constituents of stratosphere are N_2 , O_2 , O_3 and some water vapours which are chemically inactive due to UV solar radiation.

3. Mesosphere :

- i. This is the region above the stratopause and extends upto 85 km height.
- ii. In this region, the temperature again decreases with height. The temperature, in this region decreases from $-2^\circ C$ to $-92^\circ C$ at the top of the mesosphere.

4. Thermosphere or Ionosphere :

- i. Region immediately above the mesopause is called as thermosphere or ionosphere. This region extends upto 500 km above the earth surface, and characterised by steady rise in temperature with increasing altitude.
- ii. In ionosphere most of the gaseous components such as O_2^+ , O^+ , NO^+ are ionized due to ultraviolet radiation absorbed from the sun.

5. Exosphere :

- i. The upper most layer of atmosphere, i.e., the region above the thermosphere is called exosphere or outer space.
- ii. It extends upto a height of 1600 km. In this region earth's magnetic field become more prominent than the gravitational field. Thus, there are no atoms except that of Hydrogen and Helium.
- iii. Temperature in this region is very high (of the order of $1200^\circ C$) due to the reason that is receives all kinds of solar radiation.

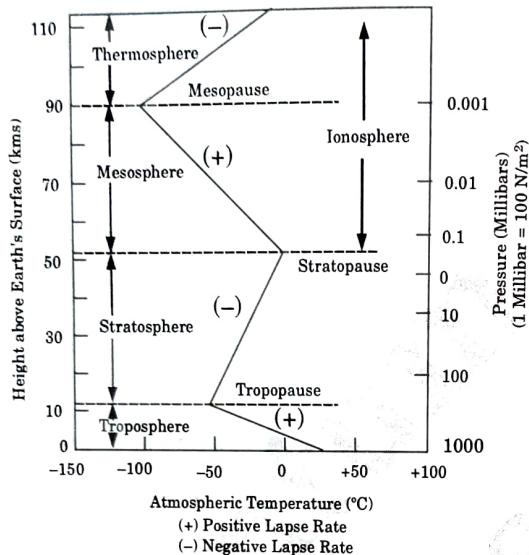


Fig. 1.2.1. Temperature and pressure profile.

Que 1.3. Discuss in brief various types of environment.

Answer

There are two different types of environment :

A. Natural Environment :

- It consists of all components provided by nature and hence called as the natural environment.
- It is also referred to as the physical environment as it pertains to the physical requirements of life.
- These physical or geographic conditions are not dependent on the existence of humans.
- Sometimes, humans have no control over the physical conditions of the environment.
- It includes natural resources, the earth's surface, mountains, plains, land, water, deserts, storms, cyclones, volcanoes, oceans, climatic factors, and so on.
- Natural environment consist of four segments namely :
 - Atmosphere :** Segment which includes various gases, water vapours.
 - Hydrosphere :** Containing water bodies.

iii. Lithosphere : Which contain land/soil.

iv. Biosphere : Which includes atmosphere, hydrosphere, lithosphere with life like plants, animals and other organisms.

B. Man-made (Anthropogenic) Environment :

- This environment is used to refer to the one created by man in order to regulate and monitor certain environmental conditions.
- Some address it as a social-cultural environment.
- Man-made or anthropogenic environment is modified by human activities.
- Humans modify the environment according to their own needs and ways without taking into account its consequences.

Que 1.4. Give an account of biotic and abiotic components of the environment.

Answer

A. Biotic Components :

- The living components of an ecosystem are called the biotic components.
- Some of these factors include plants, animals, as well as fungi and bacteria.
- These biotic components can be further classified, based on the energy requirement source.
- Producers, consumers, and decomposers are the three broad categories of biotic components.

i. Producers : Producers are the plants in the ecosystem, which can generate their own energy requirement through photosynthesis, in the presence of sunlight and chlorophyll. All other living beings are dependent on plants for their energy requirement of food as well as oxygen.

ii. Consumers : Consumers include herbivores, carnivores, and omnivores. The herbivores are the living organisms that feed on plants. Carnivores eat other living organisms. Omnivores are animals that can eat both plant and animal tissue.

iii. Decomposers : Decomposers are the fungi and bacteria, which are the saprophytes. They feed on the decaying organic matter and convert this matter into nitrogen and carbon dioxide. The saprophytes play a vital role in recycling the nutrients so that the producers i.e. plants can use them once again.

B. Abiotic Components :

- Abiotic components are non-living chemical and physical factors in the environment which affect ecosystems.

2. Abiotic components include the climatic and edaphic factors.
3. The climatic factors include temperature, humidity, rain and snowfall etc.
4. The edaphic factors include soil and substratum.
5. Abiotic components can vary from region to region, from one ecosystem to another.
6. They mainly take up the role of life supporter.
7. They determine and restrict the population growth, number, and diversity of biotic factors in an ecosystem. Hence, they are called limiting factors.

Que 1.5. Discuss in brief four segments of environment.

Answer

Environment consists of four segments discussed as follows :

- A. Atmosphere :** It forms the envelope of the earth containing various gases (like Ne, He, CH₄, O₃, N₂, O₂, CO₂, Ar), water vapours, suspended liquids and solids.

Significance :

1. It forms the main source of :
 - i. Oxygen which is essential for life.
 - ii. Carbon dioxide essential for photosynthesis.
2. It forms the clouds, weather, rain etc.
3. Atmosphere protect the earth from excessive radiations, it balances the heat on the earth.
4. The atmosphere extends vertically up to several thousand kilometers. The structure of atmosphere is divided into four layers as :
 - i. Troposphere
 - ii. Stratosphere
 - iii. Mesosphere
 - iv. Thermosphere

- B. Hydrosphere :** This segment consists of glaciers, streams, rivers, lakes as the fresh water bodies and oceans, seas as salty or marine water bodies. Of the total water present on the earth, 97% is contained in seas and oceans, 2% is locked in glaciers and polar ice and only 1% is available as fresh water in lakes, streams, rivers and underground resources.
- C. Lithosphere :** The uppermost layer of soil on the earth is the most important region of the lithosphere. It contains organic matter, and also includes the biological activities and decomposition of organic waste, by micro-organisms in the soil.

- D. Biosphere :** In this segment all the three layers i.e., hydrosphere, lithosphere and atmosphere with all the life forms are included. The life sustaining resources such as air, water, food etc. are recycled within the biosphere.

Que 1.6. Write an explanatory note on the multidisciplinary nature of environmental science.

AKTU 2013-14 (Sem-1), Marks 05

OR

Elaborate the statement "Multidisciplinary nature of environmental science".

AKTU 2014-15 (Sem-2), Marks 05

Answer

1. Keeping in view the complex nature of environment, knowledge inputs from various disciplines of science, social science, law and engineering are included in environmental studies as shown in Fig. 1.6.1.

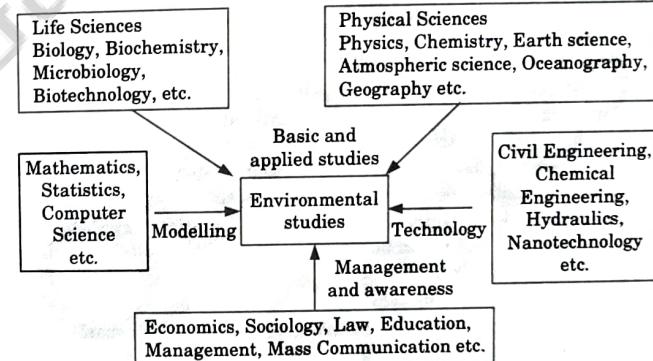


Fig. 1.6.1. Multidisciplinary nature of environmental studies.

2. Life science including botany, zoology, microbiology, genetics and biochemistry help in understanding the biotic components and their interactions. Genetics and biotechnology are emerging as useful tools for finding solutions to environmental problems.
3. For understanding the physical and chemical structure of abiotic components of environment along with mass and energy transfers we have to make use of the basic concept of physics, chemistry, geology, atmospheric science, oceanography and geography.
4. Mathematics, statistics and computer science likewise serve as effective tools in environmental modelling.

5. Subjects like economics, management and sociology provide the inputs for dealing with the socio-economic aspects associated with various development activities.
6. A synthesis of civil engineering, hydraulics, chemical engineering and nanotechnology provide the technical solutions to environmental pollution control and waste treatment that are extremely important for protection of the environment.
7. Environmental laws provide the guidelines and legal measures for effective management and protection of the environment.
8. Environmental education and mass communication are two important subjects that are instrumental in disseminating environmental awareness.
9. Environmental sciences, therefore, is a multidisciplinary subject where we deal with different aspects using a holistic approach.

Que 1.7. Describe the scope and importance of environmental studies.

Answer

A. Scope of Environmental Studies :

The scope of environmental studies in numerous fields is as follows :

1. Conservation and management of natural resources (like forest resources, water resources, etc.)
2. Conservation of biodiversities (like conservation of genetic diversity, species diversity, ecosystem diversity, landscape diversity, etc.)
3. Control of environmental pollutions (like air pollution, water pollution, soil pollution, solid waste pollution, noise pollution, electronic waste pollution, E-pollution, etc.)
4. Control of human population.
5. Replacement of development (like green revolution, urbanization, economic growth, industrialization, etc.) with sustainable development.

B. Importance of Environmental Studies :

The important benefits of environmental studies are as follows :

1. It directs attention towards the unlimited exploitation of environment (nature) by humans for greed or for the sake of development. Exploitation of nature has threatened the survival of all living organisms, including humans.
2. It generates concern for the changing environment, population explosion and throws light on the methods of solution.
3. It helps to understand different food chains and to find ways and means to maintain ecological balance.
4. It helps in the maintenance of healthy life. Through improved health of people, economic productivity gets increased.

5. It imparts knowledge about conservation of energy and reducing material dependence :
 - i. By refusing to purchase things which are harming our environment.
 - ii. By reusing a product number of times.
 - iii. By motivating recycling of recyclable products.
6. It helps in developing social responsibility towards protection of environment and control of environmental pollution.
7. It helps in appreciating and enjoying nature and working towards sustainable development.

Que 1.8. Briefly describe the need of public awareness about the environment.

AKTU 2014-15 (Sem-2), Marks 3.5

OR

Describe the need for public awareness for the conservation and protection of environment.

AKTU 2017-18 (Sem-4), Marks 3.5

OR

Discuss the need of public awareness for environmental protection.

Answer

1. Environmental education provides the view of the environment and human relationships.
2. This education is needed because it will acquire the knowledge and technical skills for active participation in environmental careers.
3. Awareness about environment is necessary :
 - i. To facilitate conservation and regeneration of environmental resources.
 - ii. To create the awareness about environmental problems among people.
 - iii. To impart the basic knowledge about environment and its allied problems.
 - iv. To develop an attitude of concern for the environment.
 - v. To motivate the people to participate in environmental protection and improvement.
 - vi. To acquire the skills to help the concerned individual in identifying and solving environmental problems.

PART-2

Ecosystem : Definition, Types of Ecosystem, Structure of Ecosystem, Food Chain, Food Web, Ecological Pyramid, Balance Ecosystem.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.9. What is an ecosystem? Discuss types of ecosystem.

OR

What are the basic components of ecosystem?

AKTU 2014-15 (Sem-2), Marks 3.5

Answer

A. Ecosystem :

1. The term 'ecosystem' was discovered and coined by A. G. Tensley in 1935.
2. According to Tensley ecosystem is defined as, "the system resulting from the integration of all the living and non-living factors of the environment".
3. Ecosystem is a group of biotic communities of species interacting with one another and with their non-living environment and exchanging energy and matter.
4. According to P. Odum, ecosystem is the basic functional unit of ecology consisting of biotic communities and abiotic environment both influencing each other.
5. Biotic and abiotic factors are the two factors of any environment and there exist an interrelationship between these two.
6. Modern ecology is defined as study of ecosystem.

B. Types of Ecosystem :

1. Natural Ecosystems :

They operate by themselves under natural conditions without any interference by humans. Broadly they are subclassified into terrestrial and aquatic ecosystem.

i. Terrestrial Biomes (Ecosystems) :

- a. They are often defined by the vegetation types that dominate the community.
- b. The types of vegetation affect the climate and soil structure and thus characterize the particular biome.
- c. Terrestrial vegetation has a rapid exchange of oxygen, water and carbon dioxide.
- d. Terrestrial biomes include tropical rain forests, grasslands, deserts, cultivated lands, etc.

ii. Aquatic Biomes (Ecosystems) :

- a. They fall into two categories, viz., freshwater and marine.
- b. Freshwater biomes may be lotic (running-water) such as streams, rivers and springs or lentic (standing water) such as lakes, ponds, and swamps, whereas, marine biomes include deep sea and oceans.

2. Artificial Ecosystems :

- i. These ecosystems are controlled and manipulated by humans. These are created by humans in order to fulfill certain needs.

ii. Broadly, they are subclassified into the following two types :

- a. Agriculture ecosystem.
- b. Aquaculture ecosystem.

Que 1.10. Differentiate between natural and artificial ecosystem.

Answer

S. No.	Natural Ecosystem	Artificial Ecosystem
1.	Consists of many species of plants and animals.	Species diversity is low.
2.	Genetic diversity is very high.	Genetic diversity is very low.
3.	Sunlight is the energy source for plants and this energy drives all biological cycles.	Sunlight is the ultimate energy source for plants but artificial fertilizers and other nutrients are externally supplied to the soil.
4.	Food chains are long and complex.	Food chains are simple and often incomplete as other species are killed as pests or weeds.
5.	Ecological succession takes place over time.	No ecological succession.
6.	Natural nutrient cycling.	Incomplete nutrient cycling.
7.	Naturally sustainable.	Unsustainable as most fertilizers are made from non-renewable fossil fuels, and they add to water pollution, biomagnification and other ecological disturbance.

Que 1.11. What is meant by structure of an ecosystem? Explain the various components of an ecosystem structure. Discuss the functions of an ecosystem also.

OR

Write in detail about the functions of an ecosystem?

AKTU 2014-15 (Sem-2), Marks 3.5

Answer

A. Structure of an Ecosystem : The structure of an ecosystem means :

1. The composition of biological community including species, numbers, biomass etc.
2. The quantity and distribution of the non-living materials.

- B. Components of an Ecosystem Structure :** Two main components are involved in the structure of an ecosystem :
1. **Biotic Components :** It comprises all the living organisms. Biotic components are distinguished into three main categories :
 - i. **At**
 - i. **Producers or Autotrophs :**
 - a. These are the organisms of ecosystem which can prepare their own food.
 - b. These are mainly green plants which synthesize their food in presence of sunlight by making use of carbon dioxide, water and chlorophyll; through the process of photosynthesis.
 - ii. **Consumers :**
 - a. These are the organisms which depend directly as indirectly upon the autotrophs for their food.
 - b. The consumers may be herbivore (plant eaters), carnivores (meat eaters), omnivore and detritivore.
 - iii. **Decomposers :**
 - a. They feed on the dead bodies of producers and consumers and decompose the complex organic molecules to simpler organic compounds and ultimately into inorganic nutrients.
 - b. E.g. various bacteria & fungi.
 2. **Abiotic components :** It is the non-living component of the ecosystem and includes :
 - i. Inorganic substances such as P, S, C, N, H.
 - ii. Organic substances such as carbohydrates, Proteins, lipids etc.
 - iii. Climatic factors such as light, temperature etc.
 - C. **Functions of an Ecosystem :** Major functions of an ecosystem are as follows :
 1. It regulates flow rates of biological energy.
 2. Food chain, food webs and tropics structures.
 3. Nutrient cycling (Biogeochemical cycles).
 4. Ecosystem development.
 5. Biological or ecological regulation including both regulation of organisms by environment and regulation of environment by the organism.

Que 1.12. Define ecology and ecosystem. Explain the role of producers, consumers and decomposers in an ecosystem.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

- A. **Ecology :** Ecology is the study of earth's household including the plants, animals, micro-organisms and human beings that live together as inter-dependent components.
- B. **Ecosystem :** Refer Q. 1.9, Page 1-11N, Unit-1.
- C. **Role of Producers :**
1. Producers are any type of green plant or algae capable of making their own food.
 2. Plants make their own food by the process of photosynthesis and also produce food for other consumers.
 3. Without producers an ecosystem could not sustain itself.
- D. **Role of Consumers :**
1. A consumer is an organism that is responsible for ensuring that the energy cycle by producers are continued.
 2. The consumer is also supposed to use the food that has been provided by the producers so that it is availed to decomposers. Consumers can be omnivores, carnivores or herbivores.
- E. **Role of Decomposers :**
1. The role of decomposers is to decompose or break down dead matter in the environment.
 2. Without decomposers in the environment, we would have waste everywhere we go.
 3. Decomposers are very important to the environment. An example of a decomposer is fungus and bacteria.
- Que 1.13.** Define food chain. Name and explain various types of food chains with suitable examples.
- Answer**
1. In an ecosystem, plants and animals are linked together by their nutritional requirements and this relation is known as a food chain.
 2. The transfer of food energy from the producers through a series of organisms with repeated eating and being eaten is known as food chain.
 3. Hence, food chain is a series of transfer of energy from one trophic level to the other.
 4. Procedures utilize the radiant energy of sun which is transformed into chemical form, during photosynthesis.
 5. Thus in food chain, green plants forms the first trophic (nutritional) level.

6. The energy, stored in food, synthesized by green plants, is then used by the herbivores, which constitute the second trophic level and are the primary consumers.
7. Herbivores in turn are eaten up by the carnivores which constitute the third trophic level are called the secondary consumer.
8. These in turn may be eaten by other carnivores i.e., by tertiary consumer. Some organisms are omnivores i.e., depending upon both plants and animals.

9. Example :

Grass → Grasshopper → Frog → Snake → Hawk
 (Producers) (Primary consumer) (Secondary consumer) (Tertiary consumer) (Top level consumer)

Types of Food Chains : There are three types of food chains :

A. Grazing Food Chain :

1. The food chain starting from green plants i.e. produces and ending in carnivores is called as grazing food chain.
2. This type of food chain describes the general flow of energy.
3. The energy flow through grazing food chain can be described in terms of the following trophic levels.

Example : Grass → Rabbit → Fox

B. Detritus food chain :

1. It starts with dead organic matter.
2. This type of food chain goes from dead organic matter into micro-organisms feeding on the detritus; and their predators.
3. Such ecosystems are less dependent on direct solar energy.
4. An example of detritus food chain is seen in mangrove ecosystem.
5. Here, a large quantity of leaf material i.e. litter falls into the water. These fallen leaves are colonized by small algae which consumed by protrophs or detritores. The detritores are eaten by small carnivorous fishes which in turn are eaten by large carnivorous fishes.

Example : Leaf litter → algae → crabs → small carnivorous fish → large carnivorous fish.

C. Parasitic Food Chain :

1. Parasitic food chain starts with herbivores but in this type, food energy passes from larger to smaller organisms i.e., the larger animals are hosts and smaller animals (parasites) will depend upon the host for their nutritional requirement.

Que 1.14. What do you mean by food web ?

Answer

1. Food chains are found to be interconnected and it forms a complex networks with several linkages known as food web.

2. Thus, food web is a network of food chains, in which different types of organisms are connected at different trophic levels.
3. There exist a number of options of eating and being eaten at each trophic level.
4. The complexity of food web depends upon :
 - i. Diversity of organisms in the system.
 - ii. Length of food chains involved in it.

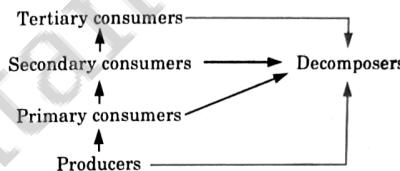


Fig. 1.14.1. A food chain.

Que 1.15. Write in detail about food web and food chain ?

AKTU 2014-15 (Sem-1), Marks 06

Answer

- A. **Food Web :** Refer Q. 1.14, Page 1-15N, Unit-1.
 B. **Food Chain :** Refer Q. 1.13, Page 1-14N, Unit-1.

Que 1.16. Explain the term ecological pyramid. Depict various types of ecological pyramid with suitable examples.

OR

What are ecological pyramids ? Explain why some of these pyramids are upright while others are inverted in different ecosystem.

OR

What is ecological pyramid ? Discuss different types of pyramid with suitable example.

AKTU 2013-14 (Sem-2), Marks 05

OR

What are ecological pyramids ? Describe energy pyramid.

AKTU 2014-15 (Sem-2), Marks 05

OR

What is ecological pyramid ? Explain different types of ecological pyramids for different ecosystem with suitable examples.

AKTU 2017-18 (Sem-4), Marks 07

Answer**A. Ecological Pyramid :**

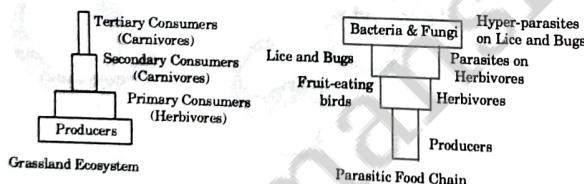
1. Graphic representation of trophic structure and function of an ecosystem, starting with producers at the base and successive trophic levels forming the apex is known as an ecological pyramid.
2. These show the relationship between the numbers, biomass and energy of producers, primary, secondary and tertiary consumers in any ecosystem.
3. These relationships can be drawn graphically in the form of pyramids.

B. Types of Ecological Pyramid :**1. Pyramid of Numbers :**

- i. It represents the number of individual organisms at each trophic level.
- ii. It shows the relationship between producers, herbivores and carnivores on the basis of their number. These can form upright or inverted type depending upon the type of ecosystem.

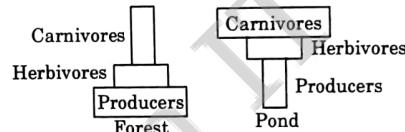
Example : Grassland ecosystem : Forms an upright pyramid of number. The producers in this type are grasses and are very large in number. So they form a broad base. The herbivores are insects. Carnivores are birds, hawks and these are less in number. Hence the pyramid apex becomes narrow, forming an upright pyramid.

Example : Parasitic food chain forms an inverted pyramid of number. Producers like big trees are less in number and herbivores like birds and parasites are greater in number, and the hyper parasites are in the greatest number, thus forming an inverted pyramid.

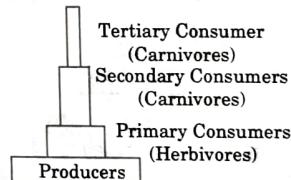
**Fig. 1.16.1. Pyramids of number.****2. Pyramid of Biomass :**

- i. It is based upon the total biomass (dry matter) at each trophic level in a food chain. The pyramid of biomass can also be upright or inverted.
- ii. Forest ecosystem is an example of the upright pyramid of biomass, because the producers (trees) accumulate a huge biomass while the consumer's total biomass declines at higher trophic levels, forming an upright pyramid of biomass.

- iii. Pond ecosystem shows an inverted pyramid of biomass. The total biomass of producers is much less as compared to herbivores, carnivores and tertiary carnivores. Thus pyramid form inverted form.

**Fig. 1.16.2. Pyramids of biomass.****3. Pyramid of Energy :**

- i. In this type of pyramid, the amount of energy at each trophic level is considered.
- ii. It gives the best representation of trophic relationships and it is always upright, as there is always a gradual decrease (about 90 %) in the energy content at successive trophic levels.
- iii. Only 10 % of energy passes to next trophic level.

**Fig. 1.16.3. Pyramid of energy.****Que 1.17. What is meant by 'flow of energy' in an ecosystem ?****What is its importance for ecosystem ?****OR****Explain the energy flow in the ecosystem.****AKTU 2017-18 (Sem-4), Marks 3.5****Answer****A. Flow of Energy :**

1. The existence of the living world depends upon the flow of energy and circulation of materials through ecosystem.
2. Green plants trap solar radiations and in presence of carbon dioxide, water, and chlorophyll, they prepare their carbohydrate food material.
3. This energy is utilized by the organisms in the next trophic level. The flow of energy in an ecosystem takes place through food chain.
4. The most important feature of this energy flow is that it is unidirectional or one way flow, because once the energy flows from the first to next trophic level, it cannot be reverse back to the first trophic level.

5. The flow of energy follows the two laws of thermodynamics :
- Ist law of thermodynamics states that energy can neither be created nor be destroyed but it can be transformed from one form to another. The solar energy trapped by green plants gets converted into chemical energy.
 - IInd law of thermodynamics states that energy dissipates as it is used. As the energy flows through food chain, there occurs loss of energy at every trophic level.

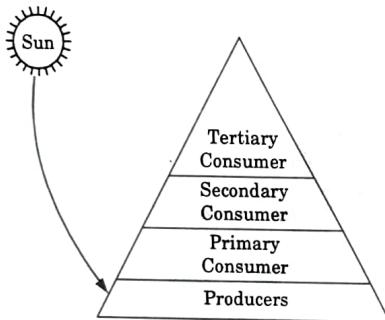


Fig. 1.17.1.

- The loss of energy takes place through respiration, loss of energy in locomotion, running, hunting and other activities.
- At every level there is about 90 % loss of energy and energy transferred from one trophic level to other is only about 10 %.

B. Importance :

- The flow of energy regulates the rates of materials i.e. nutrients.
- It also regulates the modification of environment because the environment is modified by the organisms according to their needs.

Que 1.18. Write a note on Y-shaped model energy flow.

AKTU 2014-15 (Sem-1), Marks 06

Answer

- In nature, both grazing food chain and detritus food chain operate in the same ecosystem. However, sometimes it is the grazing food chain which predominates.
- It happens in marine ecosystem where primary production in the open sea is limited and a major portion of it is eaten by herbivorous marine animals.
- Therefore, very little primary production is left to be passed on to the dead or detritus compartment.

- On the other hand, in a forest ecosystem the huge quantity of biomass produced cannot be all consumed by herbivores.
- Rather, a large proportion of the live biomass enters into detritus (dead) compartment in the form of litter. Hence the detritus food chain is more important there.
- The two channels or Y-shaped model of energy flow shows the passage of energy through these two chains, which are separated in time and space as shown in Fig. 1.18.1.

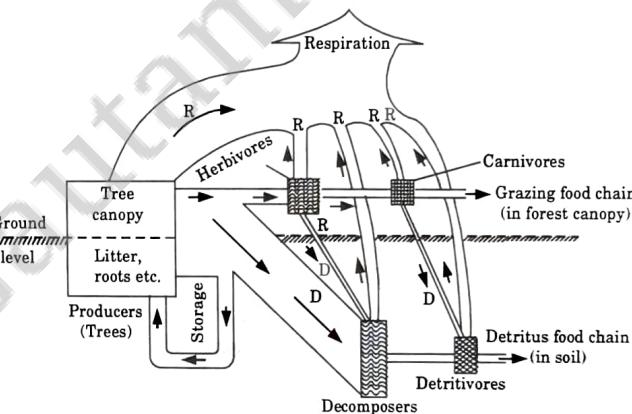


Fig. 1.18.1. Y-shaped or 2-channel energy flow model showing energy flow through the grazing food chain and the detritus food chain
(R = Respiration, D = Detritus or dead matter).

Que 1.19. What is balanced ecosystem ? Discuss factors of balanced ecosystems. Give the importance of balanced ecosystem.

OR

Discuss the balanced ecosystem in brief.

Answer

A. Balanced Ecosystem : Balanced Ecosystem means that the nutrients are able to cycle efficiently, and no community of organisms or natural phenomena is interrupting the flow of energy and nutrients to other parts of the ecosystem.

B. Factors of balanced ecosystems :

- In a balanced ecosystem, the community of living (biotic) organisms interacts with non-living (abiotic) features in the environment.
- Abiotic features of ecosystems include precipitation, temperature, landscape, sunlight, soil, water chemistry, and moisture.

3. The types of biotic factors in a balanced ecosystem include primary producers, primary consumers, secondary consumers, and detritivores.
4. Biotic factors rely upon abiotic factors to survive.
5. Plants require a certain temperature, moisture, and soil chemistry to thrive.
6. Animals rely on those plants for their food.
7. Anything affecting any factor of an ecosystem can throw it off balance and force organisms to adapt or die off.

C. Importance of balanced ecosystem :

1. Balanced ecosystem ensures the stability of the organisms and environment.
2. It creates a conducive environment for organism multiplication and thriving.
3. It enhances a stable environment that is free from ecological imbalances such as flood, hunger caused by drought, windstorms that may wipe out everything, and over hunting of the predators.

PART-3

Effects of Human Activities such as Food, Shelter, Housing, Agriculture, Industry, Mining, Transportation, Economic and Social Security on Environment.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 1.20. | What are the environmental impacts of food ?

Answer

Following are the environmental impacts of food :

1. Food accounts for over a quarter (26%) of global greenhouse gas emissions.
2. Half of the world's habitable land is used for food production.
3. 70% of global freshwater withdrawals are used for food production.
4. 78% of global ocean and freshwater eutrophication (the pollution of waterways with nutrient-rich pollutants) is caused by food production.
5. 94% of mammal biomass (excluding humans) is livestock. This means livestock outweigh wild mammals by a factor of 15-to-1.

6. Food, therefore, lies at the heart of tackling climate change, reducing water stress, pollution, restoring lands back to forests or grasslands, and protecting the world's wildlife.

Que 1.21. | What are the environmental impacts of shelters ?

Answer

Following are the environmental impacts of shelters :

1. With increasing population, there is also increasing pressure on finite land resources for housing.
2. Shelter for humans or habitat development on this earth has largely taken place within about 5% of land area, which supports more than half of global population.
3. Both overcrowded unplanned urban settlements and unhygienic, underdeveloped rural settlements pose big challenges for the present and future generations.
4. Fast depletion of natural resources, shrinking land, rising pollution levels and associated health problems have forced us to re-look at environmental approach to buildings.

Que 1.22. | What are the environmental impacts of housing ?

Answer

Following are the environmental impacts of housing :

1. Building and construction activities associated with housing have major environmental impacts over their entire life cycle.
2. Resources such as ground cover, forests, water, and energy are exploited recklessly to give way to housings.
3. The drain on resources does not end with the completion of the housings.
4. Once it starts housing people, resource-intensive materials, such as water, energy-consuming systems such as lighting, air conditioning, and water heating is required to provide comfort to the occupants.
5. These amenities adversely impact the environment.
6. Water is a vital resource for the occupants, which gets consumed continuously during construction and occupation.
7. The various functions of housing occupant generate large amounts of waste.
8. Housings are thus among major pollutants that affect urban environment and contribute to environmental pollution.

Que 1.23. | What are the environmental impacts of poor housing on an individual health ?

Answer

Following are the ill-effects that arise as a result of poor housing :

A. Poor Health :

1. Poor sanitation and hygiene, inadequate ventilation, and smoke inhalation are aspects of poor housing that affect health.
2. In India more than 80% rural population lives in kaccha (weak) and semi-pucca houses with mud walls and thatched roofs.
3. Around 87 % of homes in villages do not have a toilet.
4. Cooking is usually done inside the house using cow dung cakes or twigs or crop residue.
5. This increases the risk of respiratory disorders such as bronchitis, asthma, and tuberculosis.
6. Also, poor living conditions such as overcrowding, dampness, poor air-conditioning also result in a negative environmental impact on human health.

B. Lack of Basic Amenities :

1. Heavy housing demands have lead to proliferation of slums.
2. These slums lack basic amenities forcing millions of people to live under unhygienic conditions.
3. With no proper segregation of potable water supply and sewage disposal, there is widespread contamination.
4. Due to this people are exposed to waterborne diseases such as cholera, diarrhea, etc.

C. Solid waste Management :

1. Poor sewage systems and improper solid waste management is another big environmental hazard.
2. Governments worldwide are finding it difficult to match municipal facilities with growing demands.
3. Open drains, garbage and pitiful shacks are becoming a common sight in many developing countries.

Que 1.24. Discuss the ill effects of modern agriculture on environment.**Answer**

The harmful effects of modern agriculture are as follows :

1. **Soil Erosion :** Excessive water supply and strong wind removes the top fertile layer (soil) of the farm, known as soil erosion. It causes loss of fertility of the soil.

2. Ground Water Contamination/Methemoglobinemia :

- i. Excess fertilizers (nitrogenous fertilizers) may reach the underground water by leaching due to which ground water gets contaminated with nitrate.
- ii. Nitrate contaminated ground water is used by human beings for drinking. In our body nitrate reacts with hemoglobin of blood to form methemoglobin which stops the oxygen supply to the body parts.
- iii. It causes a disease methemoglobinemia. This disease is also known as blue baby syndrome because babies are born blue in colour and die soon.

3. Water Logging :

- i. Due to excessive irrigation, water gets accumulated in the farm. This results in the soil becoming saturated with water and the condition is called water logging.
- ii. Such soil is not fit for crop plants because they lack air, which is essential for germination and growth.
- iii. Moreover water logged soil cannot mechanically support the plants, resulting in submergence (sinking) of plants in mud and as a result plants die.

4. Salinization :

- i. Excessive use of fertilizers (salts) and irrigation causes accumulation of salts on the soil surface, which is called salinization.
- ii. Salinization (salinity) directly affects the productivity by making the soil unsuitable for crop plants.

5. Eutrophication :

- i. The surface runoff from agricultural fields carries a heavy load of chemical fertilizers (Nitrates and Phosphates) reach the nearby water body.
- ii. These nitrates and phosphates act as nutrients for aquatic plant (algae and other unwanted plants).
- iii. As a result algae and unwanted plants grow in excess, which is known as algal bloom.

Effect of Eutrophication :

- i. Algal blooms may totally cover the water surface and release toxic chemicals in water, which kill fish, birds and other aquatic plants.
- ii. Decomposition of algal bloom leads to oxygen depletion in water. Due to lack of dissolved oxygen, water plants and animals die and their dead bodies get deposited at the bottom of the water body. This causes a disturbance in aquatic habitat.
6. **Biomagnification :**
- i. We use several toxic chemicals like pesticides to protect our crop plants from various diseases.

- ii. These chemicals are :
 - a. Either washed down into soil and finally enter the underground water table, or
 - b. These chemicals are taken up from the soil by the plants along with water and minerals and thus enter the food chain.
- iii. As these chemicals are not degradable, these harmful chemicals get concentrated at each trophic level in the food chain. This phenomenon is termed as biomagnifications or biological magnification.

Que 1.25. Write the effects of industry on environment.

OR

What are the effects of industrial growth ?

Answer

Following are adverse effects of industry :

1. Industrial practices release enormous quantities of air and water pollution.
2. They generate huge amounts of hazardous wastes.
3. Industrial effluents have polluted many lakes, rivers, and coastal environments.
4. Industrial accidents, such as Bhopal gas tragedy, often have tragic environment consequences.

Que 1.26. Discuss the environmental effects of extracting and using mineral resources.

OR

What are the major consequences of over exploitation of mineral resources ? How can they be conserved ?

Answer

- A. **Effect of Extracting and using Mineral Resources :** Following are the effects of it :
1. Emission of dust, suspended particles causes air pollution.
 2. Mining results in acid mine drainage which causes land damage.
 3. Coal residue contributes to water pollution.
 4. Fertility of the soil is lost.
 5. Deforestation is followed.
 6. Species are killed due to toxicity of water or soil due to mine chemicals.
 7. Ecosystem is disturbed.
 8. Health and safety of coal miners is greatly at risk. Explosions and fires cause deaths and causalities.

- 9. Pneumoconiosis commonly known as black lung disease is a major hazard to underground mining.
- 10. Mineral resources are non-renewable resources; therefore, these are limited in natural deposits. So, these should be recycled and reused.

B. Conservation of Mineral Resources :

The following four steps are very useful for the conservation of mineral resources :

1. Encourage use of improved technologies so as to reduce waste generation.
2. Encourage recycling of metals.
3. Regulate the use of mineral resources.
4. Reduce the purchase of unwanted products made from mineral resources.

Que 1.27. What are the effects of transportation on environment ?

Answer

Following are the adverse effects of transportation on environment :

1. **Air Pollution :** Emissions of pollutants like CO_2 , NO_x particulate matter etc., from exhaust vehicles are a major cause of air pollution.
2. **Water Pollution :** Spillage during transportation of hazardous substances cause water pollution. Marine oil spills can devastate marine and coastal environments.
3. **Biodiversity Loss :** Habitat fragmentation by roads or railway tracks leads to biodiversity loss. Transport allows urban expansion and damages natural habitats.
4. **Biosecurity Risks :** International transportation of goods can allow new organisms to enter a region and increase risk for diseases.
5. **Noise :** The noise generated by vehicles can interfere with daily activities such as communicating or sleeping. It thus affects health of people.
6. Transportation sector also adversely affects our environment in all the stages of its operation. They are summarized as follows :
 - i. **Production :** Production of construction materials, vehicles, and fuels badly affect our environment.
 - ii. **Infrastructure Creation :** Development of highways, railroads, airports, bicycle and pedestrians facilities cause habitat fragmentation and result in biodiversity loss.
 - iii. **Disposal :** Disposal of vehicles after their service life, disposal of spilled oil, disposal of parts of vehicles or any other disposal is a biggest challenge as far as our environment is concerned.
 - iv. **Operation :** Running of vehicles mean contribution to air, water or noise pollution.

Que 1.28. What is the impact of economic growth on environment ?**Answer**

1. Economic growth means an increase in real output (real GDP).
2. Therefore, with increased output and consumption we are likely to see costs imposed on the environment.
3. The environmental impact of economic growth includes the increased consumption of non-renewable resources, higher levels of pollution, global warming and the potential loss of environmental habitats.

Impact of Economic Growth on Environment :

1. **Pollution :** Increased consumption of fossil fuels can lead to problems such as poor air quality and soot.
2. **Global Warming and Volatile Weather :** Global warming leads to rising sea levels, volatile weather patterns and could cause significant economic costs.
3. **Soil Erosion :** Deforestation resulting from economic development damages soil and makes areas more prone to drought.
4. **Loss of Biodiversity :** Economic growth leads to resource depletion and loss of biodiversity. This could harm future 'carrying capacity of ecological systems' for the economy.
5. **Long-term Toxins :** Economic growth creates long-term waste and toxins, which may have unknown consequences. For example, economic growth has led to increased use of plastic, which when disposed of do not degrade.

Que 1.29. What is the impact of social security on environment ?**Answer**

1. The well-being of future generations motivates numerous public policies.
2. Social security and environmental protection affect future generations.
3. These two policies are interrelated.
4. An immediate pension system reform that orders a transition from a pay-as-you-go system to a 'what you save is what you get' system can erode incentives to maintain environmental conservation efforts.
5. If environmental conservation is highly productive in the long run, pension reform could :
 - i. Damage every generation through time,
 - ii. Place perhaps a modest but unnecessary drag on economic performance or, at the other extreme,
 - iii. Destabilize the ecological system entirely by destroying a highly prized environmental resource critical to future welfare.

PART-4*Environment Impact Assessment, Sustainable Development.***Questions-Answers****Long Answer Type and Medium Answer Type Questions****Que 1.30.** What is Environment Impact Assessment (EIA) ? What are major steps for an EIA ?

OR

What is EIA ? Discuss the methodology for EIA.

OR

What do you understand by Environment Impact Assessment ? What are various segments of propagation in it ?

AKTU 2017-18 (Sem-3), Marks 07**Answer****A. Environmental Impact Assessment :**

1. It is a procedure that ensures that the environment implications of decisions are taken into account before the decisions are taken.
2. It may also be defined as a formal process used to predict the environmental consequences of any development project.

B. Steps/Stages of EIA :

The EIA procedure in India comprises the following steps or stages :

1. **Screening :** This is done to see whether a project requires environmental clearance as per the statutory notifications. Screening criteria are based upon scales of investment, type of development, and its location.
 2. **Scoping and Search for Alternatives :** Scoping is a process of detailing the terms of reference of EIA. It is done by the consultant in consultation with the project proponent and Impact Assessment Agency.
 3. **Base-Line Information :** Baseline data describes the existing environmental status of the identified study area. The site-specific primary data is monitored for the identified parameters and supplemented with secondary data if available.
 4. **Impact Prediction :** It is a way of 'mapping' the environmental consequences of the significant aspects of the project and its alternatives.
- The following impacts of the project should be assessed :

- i. **Air :**
 - a. Changes in ambient levels and ground level concentrations due to total emissions from point, line and area sources.
 - b. Effects on soils, materials, vegetation, and human health.
- ii. **Noise :**
 - a. Changes in ambient levels due to noise generated from equipment and movement of vehicles.
 - b. Effect on fauna and human health.
- iii. **Water :**
 - a. Availability to competing users.
 - b. Changes in quality.
 - c. Sediment transport.
 - d. Ingress of saline water.
- iv. **Land :**
 - a. Changes in land use and drainage pattern.
 - b. Changes in land quality including effects of waste disposal.
 - c. Changes in shoreline/riverbank and their stability.
- v. **Biological :**
 - a. Deforestation/tree-cutting and shrinkage of animal habitat.
 - b. Impact on fauna and flora (including aquatic species if any) due to contaminants/ pollutants.
 - c. Impact on rare and endangered species, endemic species, and migratory path/ route of animals.
 - d. Impact on breeding and nesting grounds.
- vi. **Socio-economic :**
 - a. Impact on the local community including demographic changes.
 - b. Impact on economic status.
 - c. Impact on human health.
 - d. Impact of increased traffic.
- 5. **Assessment of Alternatives, Delineation of Mitigation Measures and Environmental Impact Statement :**
 - i. For every project, possible alternatives should be identified and environmental attributes compared. Alternatives should cover both project location and process technologies. Alternatives should consider 'no project' option also.
 - ii. They should then be ranked for selection of the best environmental option for optimum economic benefits to the community at large.
 - iii. Once the alternatives have been reviewed, a mitigation plan is drawn up for the selected option and is supplemented with an Environmental Management Plan (EMP) to guide the proponent towards environmental improvement.

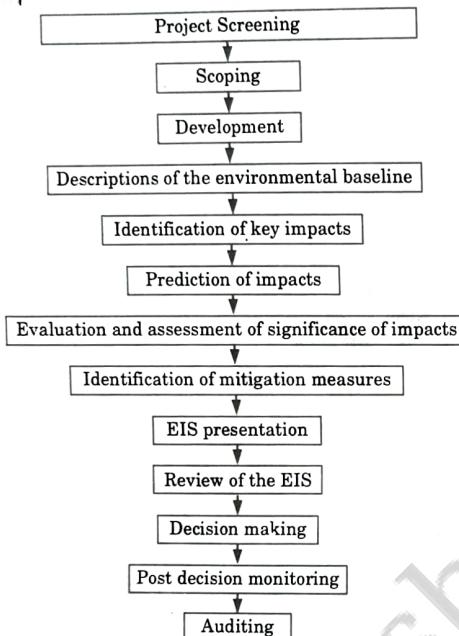
- iv. The EMP is a crucial input to monitoring the clearance conditions and, therefore, details of monitoring should be included in the EMP.
- v. The EIA report should provide clear information to the decision-maker on the different environmental scenarios without the project, with the project, along with project alternatives.
- vi. Uncertainties should be clearly reflected in the EIA report.
- 6. **Public Hearing :**
 - i. After the completion of EIA report, the law requires that the public must be informed and consulted on a proposed development.
 - ii. The State Pollution Control Boards will conduct the public hearing before the proposals are sent to MOEF for obtaining environmental clearance.
 - iii. Anyone likely to be affected by the proposed project is entitled to have access to the executive summary of the EIA.
 - iv. The affected persons may include :
 - a. Bona fide local residents.
 - b. Local associations.
 - c. Environmental groups active in the area.
 - d. Any other person located at the project site/sites of displacement.
 - e. They are to be given an opportunity to make oral/written suggestions to the State Pollution Control Board as per Schedule IV.
- 7. **Decision Making :**
 - i. This process involves consultation between the project proponent (assisted by a consultant) and the impact assessment authority (assisted by an expert group if necessary).
 - ii. The decision on environmental clearance is arrived at through a number of steps including evaluation of EIA and EMP.
- 8. **Evaluation and Monitoring :**
 - i. Project monitoring should be done during both construction and operation phases.
 - ii. This is not only to ensure that the commitments made are complied with but also to check the validity of the predictions made in the EIA reports.
 - iii. Wherever the impacts are found to exceed the predicted levels, corrective action needs to be taken.
 - iv. Monitoring enables the regulatory agency to review the validity of predictions and conditions of implementation of the EMP.

Que 1.31. | With the help of a flow chart describe EIA process.

OR

With the help of flow chart, describe the Environment Impact Assessment process.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

EIA process : Refer Q. 1.30, Page 1-28N, Unit-1.

Que 1.32. | What are the principles of EIA ?**Answer**

The principles of EIA are as follows :

1. **Participation :** The process should include adequate participation of all stakeholders.
2. **Transparency :** EIA should be conducted through an established process. All elements of the process should be clearly understood by all participants.
3. **Certainty :** The process should have clear objectives, be consistent, and be conducted within agreed time-frames.
4. **Accountability :**
 - i. Decision makers within government need to be able to provide clear and detailed reasons for their decisions to all stakeholders.

- ii. The EIA process should cover the life of the proposal, through project design, construction, operation and finally decommissioning.
- iii. Project operators must be accountable for commitments made during project approval.
5. **Integrity :** Decisions need to be based on the best available information, and all relevant factors need to be taken into account by decision-makers. Where impacts are uncertain, outcomes should rely on sound risk assessment and management.
6. **Cost-effectiveness :** The process should meet its objectives while imposing the least cost to participants. Accreditation of state government processes by the Commonwealth is a key mechanism for avoiding unnecessary duplication of approval processes.
7. **Flexibility :** The process should recognise community concerns, commercial realities, best practice technology, and scientific uncertainties.
8. **Precautionary :** Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Que 1.33. | What is Environmental Impact Assessment ? Discuss its importance in planning and implementation of engineering projects.

AKTU 2014-15 (Sem-2), Marks 06

Answer

- A. **EIA :** Refer Q. 1.30, Page 1-28N, Unit-1.

Importance in Planning and Implementation :

1. EIA is very important in planning and implementation of engineering projects. The Ministry of Environment and Forests (MoEF) has prepared environmental guidelines to the implementation of engineering.
2. Project guidelines have been prepared to bring out specific information on the environment required for environmental clearance.
3. The agencies which are primarily responsible for the respective sectors are closely involved in preparing the guidelines.
4. River, valley projects, thermal power projects, mining projects and industries, ports and harbours, development of beaches, highway/rail way projects are the sectors for which guidelines have already been prepared.
5. These guidelines basically consists of projects in India, which require EIA's are large development projects like nuclear power, river, valley, thermal power plants, etc., where government play an important role.

Que 1.34. "EIA is an instrument for sustainable development".

Comment.

AKTU 2013-14 (Sem-1), Marks 05

Answer

1. To gain the sustainable development, EIA is required as it could form a major instrument in decision making and for measurement of sustainability, provided the conceptual framework is extended to the cumulative assessment of developmental projects.
2. EIA is potentially one of the most valuable, inter disciplinary objective decision-making tools with respect to alternate routes for development process technologies and project sites. Also it aims to identify the potential impacts likely to be generated by the Project.
3. It is an ideal anticipatory mechanism, which establishes quantitative values for parameters indicating the quality of the environment before, during and after the proposed development activity, thus allowing measures that ensure environmental compatibility.
4. It presents a clear and concise picture of all benefits and costs associated with alternative courses of action and provide a mechanism for merging the concerns for environment and economics in the process of decision-making.
5. It aims to predict environmental impacts at an early stage in project planning and design. By using EIA both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoided treatment/clean-up costs and impacts of laws and regulations.

Que 1.35. How inventory and monitoring helps in controlling the pollution ?

Answer

A. Inventory :

1. The first duty in the writing of any EIS is the gathering of data, such as hydrological, meteorological, biological etc., information.
2. A listing of the species of plants and animals in the area of concern for example is included in the inventory.
3. There are no decisions made at this stage, since everything properly belongs in the inventory.
4. This inventory plays an important role in the implementation of the environmental convention and in environmental protection.

B. Monitoring :

1. Environmental monitoring describes the processes and activities that need to take place to characterise and monitor the quality of the environment.

2. Environmental monitoring is used in the preparation of environmental impact assessments as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment.
3. All monitoring strategies and programmes have reasons and justifications which are often designed to establish the current status of an environment or to establish trends in environmental parameters.
4. In all cases the results of monitoring will be reviewed, analysed statistically and published. The design of a monitoring programme must therefore have regard to the final use of the data before monitoring starts.

Que 1.36. What do you understand by sustainable development ?

OR

Define sustainable development.

OR

Write a short note on sustainable development.

AKTU 2014-15 (Sem-2), Marks 06

Answer

A. Sustainable Development :

1. It means meeting the needs of the present without compromising the ability of future generations to meet their own needs.
2. Sustainable development is a continuous process. To be sustainable is a constant challenge for humanity.
3. The pillars of sustainable development are the following :
 - i. Human and social capital, their culture and knowledge constitute social pillar.
 - ii. Nature, biodiversity or natural capital constitute environment pillar.
 - iii. Money, goods or man-made capital constitute economic pillar.
- iv. The actions of governments to implement sustainable development in their policies are considered the institutional pillar.

B. Environmental Sustainability : When the sum total of nature's resources (natural capital) is used up faster than it can be replenished, degradation of the environment occurs. However, if human activity only uses nature's resources at a rate at which they can be replenished naturally, sustainability occurs.

C. Sustainable Lifestyle : A lifestyle that attempts to reduce an individual's or society's use of the earth's natural resource and his/her own resources is known as a sustainable lifestyle.

Que 1.37. Define sustainable development. Explain the equitable use of resources for sustainable lifestyle.

AKTU 2013-14 (Sem-2), Marks 2.5

AKTU 2014-15 (Sem-2), Marks 2.5

OR

Give some examples of how an individual can adopt sustainable lifestyle.

Answer

A. Sustainable Development : Refer Q. 1.36, Page 1-34N, Unit-1.

B. Equitable Use of Resources for Sustainable Lifestyle :

1. Equitable use of resources for sustainable lifestyle requires that the rate of use of renewable resources do not exceed regeneration rates and rates of use of nonrenewable resources do not exceed rates of development of renewal substitutes.
2. Some examples of lifestyle changes which we can adopt to assist in environmental sustainable development are :
 - i. Installing a rainwater harvesting tank,
 - ii. Washing our car on the lawn,
 - iii. Growing our own vegetable in the back garden,
 - iv. Using cloth bags for shopping and their re-use, instead of use of plastic bags.
 - v. Installing energy-saving light bulbs in our homes, schools, colleges, offices, etc.
 - vi. One should not waste water and electricity.
 - vii. One should travel via car-pooling instead of using individual cars.

Que 1.38. What do you understand by sustainable development ?

Discuss its various elements and goal.

AKTU 2017-18 (Sem-3), Marks 07

Answer

Sustainable Development : Refer Q. 1.36, Page 1-34N, Unit-1.

Elements of Sustainable Development :

1. Environmental Sustainability :

- i. This relates with maintenance of carrying capacity of natural resource base and life support systems.

- ii. This emphasizes on area of conservation of biodiversity hotspots, increase in forest cover, watershed protection, and adoption of holistic approach.
- iii. Equally important are reduction of environmental threats, environmental pollution and adoption of environment friendly clean and green technologies to mitigate local to global level environmental problems.
- iv. Some of the Environmental sustainability parameters are as follows :
 - a. Fresh water/ground water.
 - b. Agriculture/Secure food supply.
 - c. Urbanization.
 - d. Coastal zone.
 - e. Air pollution and ozone depletion.
 - f. Global climate change.

2. Economic Sustainability :

- i. This provides basically important energy source like a "battery" to secure environmental and social sustainability.
- ii. This emphasizes on promotion of economic self-sustenance of development projects through measures like adequate budgeting, budget transparency and financial incentive.
- iii. The focus area includes - alleviation of poverty, increase in per capita income, promotion of income generating activities including off farm employment and green micro-enterprises, establishment of mechanism of fair sharing of benefit and natural resource accounting.
- iv. Some of the economic sustainability parameters are as follows :
 - a. Consumption and production pattern.
 - b. Energy generation, distribution and consumption.
 - c. Waste management.
 - d. Economic structure and development.
 - e. Trade, both internal and international.
 - f. Productivity.

3. Social Sustainability :

- i. This focuses on upgrading human environmental quality of life with fulfillment of basic needs and transforming human from most dangerous animal to most important creative resource.
- ii. It emphasizes local communities be well-informed on tips of sustainable ways of resource utilization.
- iii. Ensure active public participation at various level of development activity as well as fair sharing of responsibility of benefit as user groups.

- iv. Collaborative effort in conservation and development activities, improvement in public health, education and basic need, reduction of conflict among stakeholders on resource use.
- v. Some of the social sustainability parameters are as follows :
 - a. Level of education.
 - b. Health/water/supply/sanitation.
 - c. Welfare and quality of life.
 - d. Population.
 - e. Role of women.

Goals : Following are the objectives of sustainable development :

1. To prevent excessive depletion and degradation of all natural resources.
2. To use energy more efficiently and improve quality of human life.
3. To shift from polluting fossil fuels to renewable sources of energy, as derived from the sun.
4. To stall the pace of renewable resources to the rate at which they can be regenerated and replaced.
5. To reduce waste and pollution generation to levels at which they can be biodegraded and rendered harmless.
6. To slow down and ultimately stabilize population growth.
7. To reduce poverty that leads people to use resource unsustainably.

Que 1.39. | What is sustainable development ? Describe the measures of sustainable development.

AKTU 2017-18 (Sem-4), Marks 07

Answer

Sustainable Development : Refer Q. 1.36, Page 1-34B, Unit-1.

Measures for Sustainable Development :

1. The idea of sustainable development is based on eliminating some unsustainable trend or form of behaviour such as our rapidly-growing population, the destruction of renewable resources, or steady increase in levels of pollution.
2. To accomplish this, various important measures for sustainable development have been envisaged. Some of the measures have been discussed as follows :
 - i. Implementing effective planning for population control.
 - ii. Reducing per-capita demand of natural resources.
 - iii. Using efficient technological devices.
 - iv. Following the three Rs (reduce, reuse, and recycle) approach.
 - v. Promoting environmental awareness through education.

- vi. Using effective planning for regeneration of natural resources.

Que 1.40. | What are the major obstacles in the path of sustainable development in India ?

Answer

Major obstacles in path of sustainable development in India are as follows :

1. Population explosion.
2. Absence of adequate political and industrial willingness for sustainable future.
3. Non-availability of eco-friendly and resource efficient technology.
4. Absence of appropriate land use planning.
5. Non-availability of sufficient funds.
6. Absence of strict environment laws and practices.
7. Absence of practice of effective methods of pollution control.
8. Insufficiency of environmental awareness, non-conservation of resources.

Que 1.41. | What do you understand by carrying capacity ? Explain.

Answer

A. Carrying Capacity :

1. The ability of an environment to sustain the resource demands of a species or community without losing its ability to regenerate the resource is termed as carrying capacity.
2. It can also be defined by the maximum population that can be supported by the system on sustainable basis.
3. Any system can sustain a limited number of organisms on long term basis, which is known as its carrying capacity.
4. In case of human beings, the carrying capacity concept becomes more complex.
5. It is because unlike other animals, human beings, not only need food to live, but need so many other things to maintain the quality of life.
6. Sustainability of a system depends largely on its carrying capacity.
7. If the carrying capacity of the system is crossed, environmental degradation starts and continues till it reaches a point of no return.

B. Carrying capacity has two components :

1. Supporting capacity i.e., the capacity to regenerate.
2. Assimilative capacity i.e., the capacity to tolerate different stresses.

VERY IMPORTANT QUESTIONS

Following questions are very important. These questions may be asked in your SESSIONALS as well as UNIVERSITY EXAMINATION.

Q. 1. Define environment. Discuss in brief the segments of environment.

Ans. Refer Q. 1.1, Unit-1.

Q. 2. Classify the atmosphere on the basis of temperature variation. State the main activities taking place in each of them.

Ans. Refer Q. 1.2, Unit-1.

Q. 3. Briefly describe the need of public awareness about the environment.

Ans. Refer Q. 1.8, Unit-1.

Q. 4. Define ecology and ecosystem. Explain the role of producers, consumers and decomposers in an ecosystem.

Ans. Refer Q. 1.12, Unit-1.

Q. 5. Explain the term ecological pyramid. Depict various types of ecological pyramid with suitable examples.

Ans. Refer Q. 1.16, Unit-1.

Q. 6. What is Environment Impact Assessment (EIA) ? What are major steps for an EIA ?

Ans. Refer Q. 1.30, Unit-1.

Q. 7. With the help of a flow chart describe EIA process.

Ans. Refer Q. 1.31, Unit-1.

Q. 8. What do you understand by sustainable development ?

Ans. Refer Q. 1.36, Unit-1.



2

UNIT

Natural Resources

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PART- 1**Natural Resources : Induction, Classification.****Questions-Answers****Long Answer Type and Medium Answer Type Questions**

Que 2.1. What are the natural resources ? Classify it with examples.

Answer**A. Natural Resources :**

Natural resources are the materials that living organism can take from nature for the sustenance of their life or any component of the natural environment that can be utilized by man to promote his welfare.

B. Types of Natural Resources :

Based on their availability or how human activities affect them, natural resources are of following three types :

1. Perpetual Resources :

i. Perpetual resources are those natural resources that naturally perpetuate themselves and are not affected by human use.

ii. **Examples :** Sunlight, wind, rainfall water and tides.

2. Renewable Resources :

i. Renewable resources are those natural resources that have the inherent ability to renew or replenish themselves, if given a reasonable amount of time.

ii. **Examples :** Soil, fresh water, forest, etc.

3. Non-renewable (or Exhaustible) Resources :

i. Non-renewable resources are those natural resources that cannot be regenerated or renewed or replaced within a time framework.

ii. **Examples :** Fossil fuels (such as coal, petroleum, natural gas, etc.), nuclear power.

4. Intangible Resources :

i. Intangible resources are those natural resource that are available in huge quantities, but at the same time these can be destroyed easily.

- ii. Tourism industry is based on serenity, beauty, diversity, open space and satisfaction. However, a small piece of trash can easily destroy the beauty of any place.
- iii. Thus, intangible resources are both exhaustible and inexhaustible.

Que 2.2. Differentiate the perceptual, renewable and non-renewable natural resources.

Answer

S.No.	Perpetual	Renewable	Non-renewable
1.	They are replenished naturally at a rate faster than their rate of consumption.	The environment has the capacity to replenish them as long as they are properly conserved.	They are being consumed or used up faster than they can be made by nature.
2.	They last forever regardless of anything humans do to them.	Human activities can affect the supplies of renewable resources.	Once these resources are used up, they are gone forever.
3.	Examples : Wind, sunlight, etc.	Examples : Soil, forest, etc.	Example : Coal, petroleum, etc.

Que 2.3. What is natural resource ? Discuss the major reasons for depletion of natural resources. How can we achieve sustainability in resource use ?

AKTU 2013-14 (Sem-2), Marks 05

Answer

A. Natural Resources : Refer Q. 2.1, Page 2-2N, Unit-2.

B. Reasons for Depletion of Natural Resources : The major reasons for the depletion of natural resources are as follows :

1. Deforestation :

- i. This process involves the cutting down, burning and damaging of forests.
- ii. Deforested landscape has suffered loss of topsoil due to wind and water erosion.
- iii. In wet regions, deforestation has triggered extensive landslides killing people and burying human habitation locally.
- iv. Deforestation encourages the growth and spread of herbs, shrubs and grasses leading to fire in dry regions.

2. Mining :

- It is the extraction (removal) of metals and minerals from the earth.
- It is one of the most important causes of deforestation throughout the world as most of the resources, except probably oil and natural gas, lie buried entirely under forests.
- Due to leaching out of toxic elements, the growth of vegetation is adversely affected. Loss of fauna and flora is also observed.

3. Soil Erosion :

- It is basically the wearing away of soil or geological materials from one point on the earth's surface to be deposited elsewhere.
- Erosion is basically the slow loss of topsoil in a locality or region.
- The natural factors of soil erosion are wind and water.
- Soil erosion results in the loss of fertility because it is the top soil layer which is fertile.

4. Loss of Wetlands :

- Silting and sedimentation due to human activities slowly transform wetlands into terrestrial habitats.
- The primary reason for the loss of a wetland is the lack of sensitivity of the government to the human traditions and values that created and for years maintained the habitats as a common property.

C. Sustainability of Natural Resources :

Some of the important measures for sustainable development are as follows :

1. Using Appropriate Technology :

- It is one which is locally adaptable, eco-friendly, resource-efficient and culturally suitable.
- It mostly involves local resources and local labour.
- Indigenous technologies are more useful, cost-effective and sustainable.

2. Reduce, Reuse, Recycle Approach :

- The 3-R approach advocating minimization of resource use, using them again and again instead of passing it on to the waste stream and recycling the materials goes a long way in achieving the goals of sustainability.
- It reduces pressure on our resources as well as reduces waste generation and pollution.

3. Promoting Environmental Education and Awareness :

- Making environmental education the centre of all learning process will greatly help in changing the thinking and attitude of people towards our earth and the environment.
- 'Earth thinking' will gradually get incorporated in our thinking and action which will greatly help in transforming our lifestyles to sustainable ones.

PART-2

Water Resources : Availability, Sources and Quality Aspects, Water Borne and Water Induced Diseases, Fluoride and Arsenic Problems in Drinking Water.

Questions-Answers**Long Answer Type and Medium Answer Type Questions****Que 2.4. What are the different sources of water ?****Answer**

Following are the main sources of water :

1. Groundwater :

- It is the water found underground in the cracks and spaces in soil, sand and rock.
- It is stored in and moves slowly through geologic formations of soil, sand and rocks called aquifers.
- Most usable groundwater occurs up to a depth of 750 m.
- Groundwater supplies water to wells, springs, and even to rivers and streams.
- Groundwater reservoirs do not suffer seepage losses such as surface reservoirs, e.g., streams and lakes.

2. Surface Water : After precipitation, the amount of water that does not percolate down into the ground or does not return to the atmosphere as evaporation or transpiration and enters the rivers, streams, lakes, ponds, wetland, or artificial reservoirs constitutes surface water.**Que 2.5. Write a note on the availability of water on the earth.****Answer****A. Availability of Water :**

- The total water in the world is estimated to be $1400 \times 10^6 \text{ km}^3$.
- Unfortunately, 97.5 % of this water is found in the oceans and is too salty to drink.

3. Of the remaining 2.5 % fresh water, 2 % is locked up in relatively inaccessible ice caps and glaciers, and 0.5 % is groundwater and most of it lies too far underground.
4. About 2×10^5 km³ of freshwater is found in lakes and rivers and 14×10^8 km³ freshwater is found in the atmosphere.

B. Availability of Water in India :

1. India is the wettest country in the world, but rainfall is highly uneven with space and time.
2. Rainfall is high in the North-East but extremely low in Rajasthan.
3. Out of 4000 billion cm³ rainfall received, about 600 billion cm³ is put to use so far.
4. With 16 % of the world's population, India has only 4 % of global water resources.

Que 2.6. Describe the characteristics of good quality water.

Answer

Following are the various characteristics of good quality water :

1. It is transparent, colourless and odourless.
2. It has sufficient oxygen concentration for marine life to survive.
3. It is free from bacteriological contamination.
4. It is free from any water pollution.
5. It is free excessive nutrient like N, P, etc., which are responsible for eutrophication.
6. It is fit for the intended use.

Que 2.7. What is meant by 'water conservation'? Suggest various measures that should be adopted to conserve water in domestic, agriculture and industrial fronts.

Answer

A. Water Conservation :

1. Over the years rising populations, growing industrialization, and expanding agriculture have pushed up the demand for water. Water conservation is the most cost-effective and environmentally sound way to reduce our demand for water.
2. Efforts have been made to collect water by building dams and reservoirs and digging wells for this purpose.
3. Conserving water can extend the life of our septic system by reducing soil saturations, and reducing and pollution due to leaks.

B. Measures to Conserve Water :

1. Water Conservation in Domestic Use :

- i. **Check for Hidden Water Leaks :** Read the house water meter before and after a two-hour period when no water is being used. If the meter does not read exactly the same, there is a leak.
- ii. **Check your Toilets for Leaks :** Put a little food colouring in your toilet tank. If, without flushing, the color begins to appear in the bowl within 30 minutes, you have a leak that should be repaired immediately.
- iii. **Do not use the Toilet as an Ashtray or Wastebasket :** Every time you flush a cigarette butt, facial tissue or other small bit of trash 5 to 7 gallons of water is wasted.
- iv. **Do not let the Faucet Run while you Clean Vegetables :** Just rinse them in a stopper sink or a pan of clean water.

2. Water conservation in Agriculture :

Following are some measures to preserve water :

- i. Soil covered by crops, slows down run-off and minimizes evaporation losses. Hence, fields should not be left bare for long periods of time.
- ii. Ploughing helps to move the soil around. As a consequence it retains more water thereby reducing evaporation.
- iii. Planting of trees, grass, and bushes breaks the force of rain and helps rainwater penetrate the soil.
- iv. Shelter belts of trees and bushes along the edge of agricultural fields slow down the wind speed and reduce evaporation and erosion.

3. Water Conservation in Industries :

- i. **Minimal Use in Cleaning :** To avoid high water consumption we can shift to electric brooms, vacuum cleaner or other cleaning devices (like squeegees etc.) in initial process. Wash equipments as and when required than regularly. Reduce the uses of water sprinkler.
- ii. **Equipment modification :** Ensure that sprayer angle is perfect on product. Also use triggers to stop water flow, reduce water flow and pressure wherever possible without affecting performance.
- iii. **Install Water saving Equipments :** There are plenty of water conservation equipments are available. Such as toilet systems, tap aerators, also replace tap from high volume to high pressure and low volume.
- iv. **Routine Checks :** Installation on monitoring, water pressure meter and water flow meter will help to identify leakage in pipes, joints or valves.

Que 2.8. What are the water borne and water induced diseases ? Give the causes and preventive measures of water related disease.

OR

Differentiate between water borne diseases and water induced diseases with suitable example.

AKTU 2013-14 (Sem-2), Marks 2.5**OR**

Explain water related diseases. Discuss in details water borne and water induced diseases.

AKTU 2017-18 (Sem-3), Marks 07**Answer****A. Water Borne Diseases :**

- Water borne diseases are spread by drinking the contaminated water.
- The water may be contaminated due to feces of humans and animals which contain pathogenic micro organisms.
- Water borne disease can also spread if contaminated water is used for the preparation of food.
- It includes the diseases like : Typhoid, Cholera.

Diseases	Responsible Pathogen
Typhoid	Salmonella type bacteria.
Cholera	Vibrio cholerae bacteria.

B. Water Induced Disease :

- Water induced diseases are generally caused by protozoa.
- The diseases like Malaria, Dengue are the examples of water induced diseases.
- Malaria is caused by parasite plasmodium and transmitted by anopheles mosquito.
- Dengue is transmitted by mosquito Aedes aegypti found in urban areas.

C. Causes and Effects of Water-related Diseases :

The causes and consequences of water-related diseases are as follows :

- These are caused by drinking water contaminated by animal excreta, which contain pathogenic micro organisms.
- Contaminated surface water bodies and large poorly functioning municipal water distribution systems contribute to the transmission of water-borne diseases, specially diarrhea, cholera, typhoid, etc.
- Due to frequent stools and vomiting triggered by water-borne infections attacking the digestive system, patients suffer from excessive loss of body fluids, salts and water, which could prove fatal in case of a severe attack.
- These afflictions lower the body's resistance to infections and diseases.

- They also lower the body's intake of nourishment, and could lead to malnutrition (especially among children).
- There is decrease in individual and social productivity.
- Since most of these diseases assume epidemic proportions in densely populated pockets of poor developing countries, social indices of communities as a whole come down.
- Some common social indices that take a beating are high mortality rates especially infants, lower levels of education in affected communities, malnutrition, etc.
- Higher medical bills in affected families.

D. Prevention of Water-related Diseases :

The following are the measures that should be adopted for preventing the occurrence of water induced diseases :

- Proper management of water resources has become the need of the hour as this would ultimately lead to a cleaner and healthier environment.
- The municipal water supply to all human habitation should be safe and constructed properly. Regular checks should be undertaken to ensure that there are no cracks or leakage.
- The water supplied by municipal bodies should be properly treated and disinfected.
- At the individual level, water should be boiled, or filtered to ensure that it is free from harmful germs.
- Hands should be washed with soap after defecation and after cleaning and disposing of an infant's feces.
- Proper use and maintenance of water supply and sanitation systems should be encouraged.
- Proper maintenance of ground water sources such as pumps and wells. Pipes and taps should always be kept clean.
- Disposing of organic and animal wastes should be undertaken properly to avoid insects.

Que 2.9. | What do you mean by water borne disease ? Discuss kinds of disease, their cause effect on human being.

AKTU 2017-18 (Sem-4), Marks 3.5**Answer**

Water Borne Disease : Refer Q. 2.8, Page 2-7N, Unit-2.

Types of Water Borne Disease :

S. No.	Water-Borne Disease	Caused by	Effects
1.	Giardiasis (Type of diarrhea)	Giardia intestinalis	Severe abdominal cramps, diarrhea, nausea, greasy stool, gas, etc.
2.	Amoebiasis (Type of diarrhea)	Entamoeba histolytica (Protozoa)	Extreme abdominal discomfort, loose stools, bloating, weight loss, abdominal pain, etc.
3.	Cryptosporidiosis (Type of diarrhea)	Cryptosporidium parvum (tiny parasites)	Mild fever, weight loss, diarrhea, vomiting, nausea.
4.	Cholera	Vibro cholerae (bacteria)	Sudden onset of acute diarrhea, which may lead to excessive dehydration, kidney failure and finally, even death.
5.	Gastroenteritis or stomach flu	Noroviruses	Low grade fever, diarrhea, frequent vomiting, dehydration, stomach or abdominal cramping.
6.	Typhoid	Consuming food or water contaminated with bacteria found in human excreta	High fever accompanied with diarrhea or vomiting.

Que 2.10. Discuss fluoride problem in India. Also enumerate its effects on human health.

OR

Briefly discuss the fluoride problem in drinking water.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

A. Fluoride Problem in Drinking Water :

- Fluoride is one of the very few chemicals that has been shown to cause significant effects in people through drinking-water.

- Fluoride has beneficial effects on teeth at low concentrations in drinking water but excessive exposure to fluoride in drinking water, or in combination with exposure to fluoride from other sources, can give rise to a number of adverse effects.

3. Sources of Fluoride : Following are the various sources of fluoride :

- Fluoridated water supplies,
- Food processed with fluoridated water,
- Mouthwash enhanced with fluoride,
- Toothpaste enhanced with fluoride, and
- Food supplements.

B. Fluoride's Dangers/ Effects : Fluoride damages teeth, bone, brain and endocrine system.

- Effect on Teeth :** A permanent discoloration and mottling of the tooth enamel (dental fluorosis) is caused by a child's ingestion of fluoride (0.5 – 1.5 ppm) before its permanent teeth have erupted.
- Effect on Bone :** In an area of high natural levels of fluoride (1.5 – 5.5 ppm), fluoride can weaken bone and increase the risk of fractures.
- Effect on Brain :** Fluoride lowers the IQ of children, even when present at 1.8 ppm in water. It is apparent that fluorides have the ability to interfere with the functions of the brain.

Que 2.11. What is Nalgonda process and where it has being used ?

AKTU 2015-16 (Sem-2), Marks 05

Answer

Nalgonda Technique :

- Nalgonda technique involves addition of aluminum salts, lime bleaching powder followed by rapid mixing, flocculation sedimentation, filtration and disinfection.
- Aluminum salt may be added as aluminum sulphate or aluminum chloride or combination of these two.
- Aluminum salt is only responsible for removal of fluoride from water.
- The dose of aluminum salt increases with increase in the fluoride and alkalinity levels of the raw water.
- The selection of either aluminum sulphate or aluminum chloride also depends on sulphate and chloride contents of the raw water to avoid them exceeding their permissible limits.
- The dose of lime is empirically 1/20th that of the dose of aluminum salt.
- Lime facilitates forming dense floc for rapid settling.

8. Bleaching powder is added to the raw water at the rate of 3 mg/l for disinfection.
9. This technique is extremely useful for both domestic as well as for community water supply.

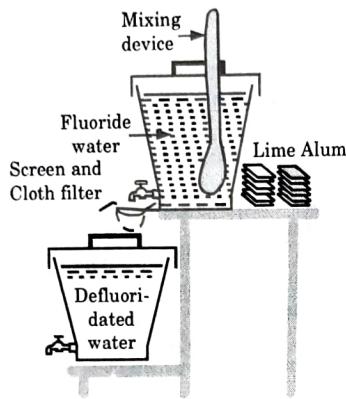


Fig. 2.11.1.

Que 2.12. Discuss arsenic problem in India. Also enumerate its effects on human health

Answer

A. Arsenic Problem in Drinking Water :

1. Arsenic occurs naturally as a trace component in many rocks and sediments.
2. Arsenic is introduced into soil and groundwater during weathering of rocks and minerals followed by subsequent leaching and runoff.
3. It can also be introduced into soil and groundwater from anthropogenic sources.
4. In drinking-water supplies, arsenic poses a problem because it is toxic at low levels and is a known carcinogen.

B. Sources of Arsenic : Following are the various sources of arsenic :

1. Arsenic is emitted into the atmosphere by high-temperature processes such as coal-fired power plants, burning vegetation and volcanism.
2. In water, particularly groundwater, where there are sulfide mineral deposits and sedimentary deposits deriving from volcanic rocks, the concentrations can be significantly elevated.
3. Natural low-temperature biomethylation and reduction to arsines also releases arsenic into the atmosphere.

B. Effect of arsenic on human health : Following health effects are linked to arsenic contamination :

1. Skin lesions,
2. Peripheral neuropathy,
3. Gastrointestinal symptoms,
4. Diabetes,
5. Renal system effects,
6. Cardiovascular disease, and
7. Cancer.

Que 2.13. Discuss various techniques used for removal of arsenic from water.

Answer

Following are various techniques used for removal of arsenic from water :

A. Oxidation Techniques :

1. Oxidation involves the conversion of soluble arsenite to arsenate.
2. This alone does not remove arsenic from the solution, thus, a removal technique, such as adsorption, coagulation, or ion exchange, must follow.
3. For anoxic groundwater, oxidation is an important step since arsenite is the prevalent form of arsenic at near neutral pH.
4. In developing countries, atmospheric oxygen, hypochlorite, and permanganate are the most commonly used oxidants.
5. Oxidation of arsenite with oxygen is a very slow process, which can take hours or weeks to complete.
6. On the other hand, chemicals, such as chlorine, ozone, and permanganate, can rapidly oxidize arsenic.
7. To efficiently remove arsenic from a solution by oxidation, oxidants should be selected carefully.

B. Coagulation-Flocculation :

1. Coagulation and flocculation are among the most employed techniques for arsenic removal from water.
2. In coagulation, positively charged coagulants reduce the negative charge of colloids, thereby making the particles collide and get larger.
3. Flocculation involves the addition of an anionic flocculant that causes bridging or charge neutralization between the formed larger particles leading to the formation of flocs.

4. During these processes, dissolved arsenic is transformed by the chemicals into an insoluble solid, which undergoes precipitation later.
5. The major drawback of coagulation-flocculation is the production of high amounts of arsenic-concentrated sludge.
6. The management of this sludge is necessary so as to prevent the consequence of secondary pollution of the environment.
7. Moreover, treatment of sludge is costly.

C. Membrane Technologies :

1. Membrane filtration is a technique that can be used for the removal of arsenic and other contaminants from water.
2. Typically, membranes are synthetic materials with billions of pores acting as selective barriers, which do not allow some constituents of the water to pass through. A driving force, such as pressure difference between the feed and the permeate sides, is needed to transport the water through the membrane.
4. Generally, there are two categories of pressure-driven membrane filtrations :
 - i. low-pressure membrane processes, such as microfiltration (MF) and ultrafiltration (UF); and
 - ii. high-pressure membrane processes, such as reverse osmosis (RO) and nanofiltration (NF).

D. Adsorption and Ion Exchange :

1. Adsorption is a process that uses solids as medium for the removal of substances from liquid solutions.
2. This process is driven mainly by Van der Waals forces and electrostatic forces between the adsorbate molecules and the adsorbent surface atoms.
3. Adsorption is the most widely used technique for arsenic removal due to its several advantages including relatively high arsenic removal efficiencies, easy operation, and handling, cost-effectiveness, and no sludge production.
4. However, adsorption of arsenic strongly depends on the system's concentration and pH.
5. At low pH, arsenate adsorption is favored, whereas for arsenite, maximum adsorption can be obtained between pH 4 and 9.

PART-3

Mineral Resources : Material Cycles; Carbon, Nitrogen and Sulfur Cycles.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 2.14. What is meant by mineral resources ? Describe the effect of mineral extraction on environment.

Answer

A. Mineral Resources :

1. Natural resources in the form of minerals are known as mineral resources.
2. They include the ores of base metals such as copper, iron and lead as well as strategic and critical metal such as chromium, titanium, platinum, cobalt, manganese, palladium, etc.
3. Minerals are broadly classified into two categories: metallic and non-metallic.
4. Metallic minerals are further sub-divided into ferrous and non-ferrous materials. Non-metallic minerals comprise of mineral fuels, precious stones, etc.

B. Effects of Mineral Extraction on Environment : The major environmental impacts of extracting and using mineral resources are :

1. Degradation of land due to excavations.
2. Pollution of air due to emission of dust and poisonous gases during mining and processing stages.
3. Pollution of ground and surface water resources due to accidental or periodic discharge of pollutants.
4. Damage to local ecological functions, nutrient cycling and biodiversity due to alterations in water availability or quality.
5. Deforestation leading to loss of flora and fauna.
6. Problem in rehabilitation of affected population.
7. Problems in providing living environment and clean water, air, etc. for the survival of large number of worker who have migrated nearby mine sites.

8. Occupational health hazards.
9. Problems in the safe disposal of tremendous amounts of solid waste generated during mining.

Que 2.15. Why the conservation of mineral resources is necessary?

Write down the steps used in it. Also describe the mineral resources of India.

Answer

A. Necessity of Conservation of Mineral Resources :

1. The mineral resources are very essential for the growth and development of a country.
2. The ever-increasing population in the world with improved lifestyles is responsible for the rapid consumption of mineral resources.
3. The geological processes of mineral formation are so low that the rates of replenishment are very small in comparison to the present rates of consumption.
4. Thus, mineral resources are valuable but they will be available for a limited time.

B. Steps in Conservation : The following steps are very useful for the conservations of mineral resources :

1. Encourage use of improved technologies so as to reduce waste generation.
2. Encourage recycling of metals.
3. Regulate the use of mineral resources.
4. Reduce the purchase of unwanted products made from mineral resources.
5. Encourage research for providing suitable eco-friendly alternatives for fossil fuels, metals, etc.

C. Mineral Resources of India : Following are the major sources of mineral in India :

1. Energy Generating Minerals :

- i. **Coal and Lignite :** West Bengal, Jharkhand, Orissa, Madhya Pradesh, Andhra Pradesh.
- ii. **Uranium (Pitchblende or Uranite Ore) :** Jharkhand, Andhra Pradesh (Nellore, Nalgonda), Meghalaya, Rajasthan (Ajmer).

2. Other Commercially used Minerals :

- i. **Aluminium (Bauxite Ore) :** Jharkhand, West Bengal, Maharashtra, Madhya Pradesh, Tamil Nadu.
- ii. **Iron (Haematite and Magnetite Ore) :** Jharkhand, Orissa, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Goa.
- iii. **Copper (Copper Pyrites) :** Rajasthan (Khetri), Bihar, Jharkhand, Karnataka, Madhya Pradesh, West Bengal, Andhra Pradesh and Uttarakhand.

Que 2.16. What do you mean by the term material cycle? Explain carbon cycle with the help of diagram.
OR

Describe carbon cycle in detail.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

A. Material Cycle :

1. Materials or nutrients like carbon, nitrogen, sulphur, oxygen, hydrogen, phosphorus, etc., move in circular paths through biotic and abiotic components and these cycles are known as material cycles.
2. The materials like carbon, phosphorus, nitrogen, etc. move through the food chain and ultimately reach the detritus compartment where various micro-organisms carry out the decomposition.
3. Various organically bound nutrients of dead plants and animals are converted into inorganic substances by microbial decomposition that is readily used up by plants and the cycle starts a fresh.

B. Carbon Cycle :

1. The carbon cycle begins with the use of CO_2 by the green plants.
2. During the process of photosynthesis, plants absorb carbon dioxide and synthesize their carbohydrate food material in presence of sunlight.
3. The organic compounds synthesized are passed from producers (green plants) to the consumers (herbivores and carnivores).
4. During respiration, plants and animals release carbon back to the surrounding medium as carbon dioxide.
5. CO_2 is also released during the decomposition of dead bodies of plants and animals.
6. Some part of organic matter of green plants contributes to the formation of coal deposition.
7. By burning of coal, oil, CO_2 is returned to the air.

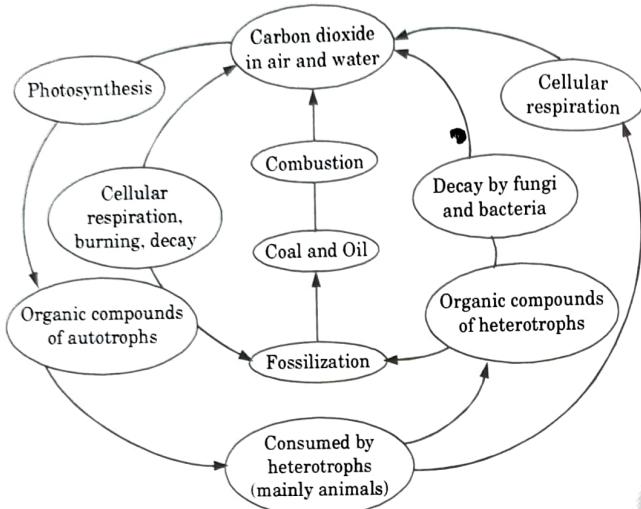


Fig. 2.16.1 Carbon cycle.

Que 2.17. Explain nitrogen cycle. Discuss detrimental effects of excess nitrogen.

OR

Explain the phenomenon of nitrogen cycle with help of suitable line diagram. Discuss its physical significance also.

OR

Draw and explain nitrogen cycle. Explain nitrification and de-nitrification process.

AKTU 2015-16 (Sem-1), Marks 05

Answer

A. Nitrogen Cycle :

1. Nitrogen is present in the atmosphere as N_2 in large amount (78%). But though the concentration is high, plants cannot absorb N_2 directly. So, the N_2 present in atmosphere is fixed either by physical process lightning or biologically by some bacteria like rhizobium species and cyanobacteria.
2. Now this form of N_2 can be taken up by the plants and used in metabolism for the synthesis of amino acids, proteins etc. and passes through the food chain.

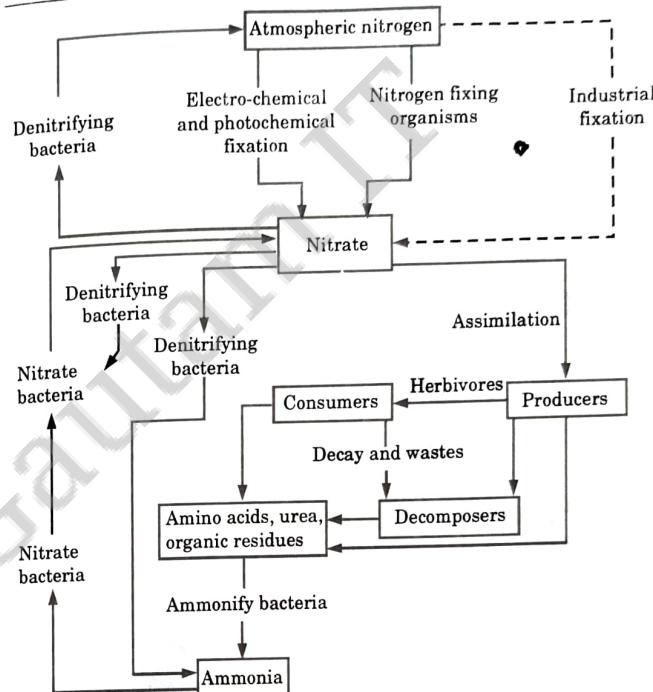


Fig. 2.17.1. Nitrogen cycle.

3. When organisms die, decomposers consume the organic matter and lead to the process of decomposition.
 4. During this process, a significant amount of nitrogen contained in dead organism is converted into ammonia.
 5. This ammonia is again available for the plants use by the plants, or for further transformation into nitrite then to nitrate. This process by which ammonia is oxidized to nitrates through nitrites is called as nitrification.
 6. The bacteria involved are *Nitrosomonas* and *Nitrobacteria* which are called as nitrifying bacteria.
 7. Some bacteria's convert nitrates into molecular nitrogen which is called as denitrification. The process is brought about by denitrifying bacteria, such as *sp. Pseudomonas*, *sp. thiobacillus*.
 8. In this way, N_2 is released back in the atmosphere and the cycle goes on.
- B. Effects of Excess Nitrogen :**
1. The high concentration may cause asphyxiation and respiratory discomfort.

2. NO_2 is responsible for causing eye and nasal irritations. Very high concentration of oxides of nitrogen as such as 40 to 50 mg/m³ may lead to quicker deaths.
- C. Physical Significance :**
- The nitrogen cycle represents one of the most important nutrient cycles found in terrestrial ecosystems. Nitrogen is used by living organisms to produce a number of complex organic molecules like amino acids, proteins, and nucleic acids.
 - Nitrogen is essential to all living systems, which makes the nitrogen cycle one of earth's most important nutrient cycles. Eighty percent of Earth's atmosphere is made up of nitrogen in its gas phase.

Que 2.18. Explain in detail carbon and nitrogen cycle.

AKTU 2014-15 (Sem-2), Marks 06

AKTU 2017-18 (Sem-3), Marks 07

Answer

- A. Carbon Cycle : Refer Q. 2.16, Page 2-17N, Unit-2.
 B. Nitrogen Cycle : Refer Q. 2.17, Page 2-18N, Unit-2.

Que 2.19. Explain sulphur cycle and phosphorus cycle.

Answer

A. Sulphur Cycle :

- Plants and animals depend on the sulphur and its compounds for the synthesis of amino acids and proteins.
- SO_2 and H_2S are the gaseous form of sulphur. Sulphate ions are found in water and soil.
- Plants and bacteria absorb sulphate ions from the soil are reduced and ultimately incorporated as sulphhydryl group ($- \text{SH}$) in proteins.

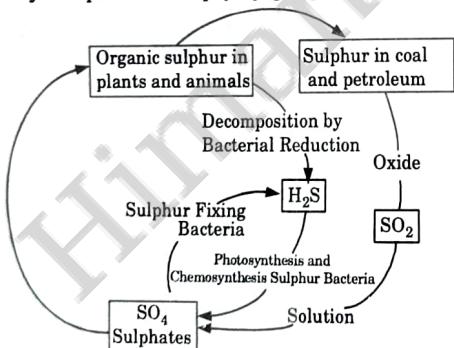


Fig. 2.19.1. Sulphur cycle.

- Some sulphates are reduced under anaerobic conditions directly to sulphites, H_2S or to elemental sulphur by desulfovibrio bacteria.
- H_2S produced escapes into the air and replenishes the sulphur lost by precipitation.
- Atmosphere receives sulphur through bacterial emissions, in the form of hydrogen sulphide, fossil fuel burning as sulphur dioxide and volcanic emissions.

B. Phosphorus Cycle :

- Phosphorous cycle is an important nutrient cycle, which is shown in Fig. 2.19.2.

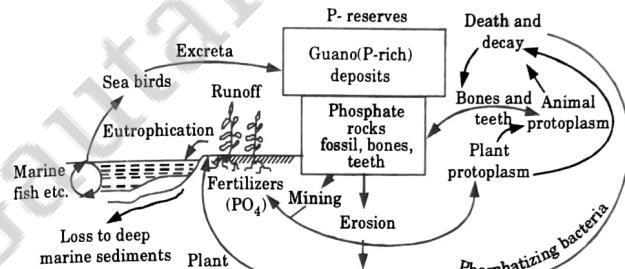


Fig. 2.19.2. Phosphorus cycle-a sedimentary cycle with major reserves of phosphorus in the sediments.

- The reservoir of phosphorus lies in the rocks, fossils etc., which is excavated by man for using it as a fertilizer.
- Farmers use the phosphate fertilizers indiscriminately and as a result excess phosphates are lost.
- A good proportion of phosphates moving with surface runoff reaches the oceans and is lost into the deep sediments.
- Our limited supply of phosphorus lying in the phosphate rocks of this earth are thus over-exploited by man and a large part is taken out of the normal cycle due to loss into oceans.
- So human beings are making the phosphorus cycle acyclic.
- Sea birds, on the other hand, are playing an important role in phosphorus cycling.
- They eat sea-fishes which are phosphorus rich and the droppings or excreta of the birds return the phosphorus on the land.

Significance : Phosphorus is an essential nutrient for plants and animals. Phosphorus is a limiting nutrient for aquatic organisms.

Phosphorus forms parts of important life-sustaining molecules that are very common in the biosphere.

PART-4

Energy Resources : Conventional and Non-conventional Sources of Energy.

Questions-Answers
Long Answer Type and Medium Answer Type Questions

Que 2.20. Explain the different types of energy with example.

Answer

Following are the different types of energies :

1. Mechanical Energy :

- i. Energy due to object's motion (kinetic) or position (potential) is known as mechanical energy.
- ii. **Example :** Windmill used to make electricity, water wheel used to grind grain.

2. Radiant Energy :

- i. Radiant energy is electromagnetic energy. It includes energy from gamma rays, X-rays, ultraviolet rays, visible light, infrared rays, microwaves and radio waves.
- ii. **Example :** Solar panel used to provide electricity and heat for a house, microwave oven used for cooking.

3. Chemical Energy :

- i. Energy that is available for release for chemical reaction is termed as chemical energy.
- ii. **Example :** Gasoline is used to run a car.

4. Heat Energy :

- i. The heat energy of an object determines how active its atoms are.
- ii. **Example :** Coal is used to produce steam for a steam engine of train.

5. Electrical Energy :

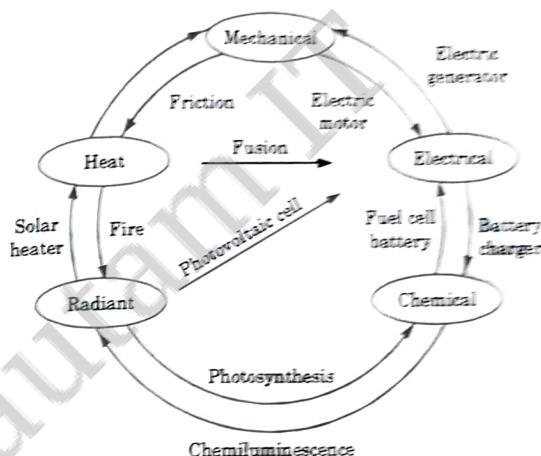


Fig. 2.20.1. Inter conversion of different types of energies.

- i. Energy caused by the movement of electrons is called electrical energy.
- ii. **Example :** Electricity is used to run appliances in our home.
- 6. **Nuclear Energy :**
 - i. It is the energy stored in the nucleus of an atom. It is the energy that holds the nucleus together. It is released when the nuclei are combined (Nuclear Fusion) or split apart (Nuclear fission).
 - ii. **Example :** Nuclear power plant uses the fission of atoms to create energy that is converted into electricity.

Que 2.21. Describe the non renewable or conventional energy resources with examples.

OR

Describe conventional energy resources.

AKTU 2013-14 (Sem-1), Marks 05

Answer

- A. **Non-renewable Energy Sources :** These are available in limited amount and develop over a longer period. Because of unlimited use they are likely to be exhausted one day. These include coal, mineral oil, natural gas, nuclear power, etc.

- 1. Coal :**
 - i. Coal is a combustible black or brownish black sedimentary rock composed mostly of carbon and hydrocarbons.
 - ii. It is formed from dead and decomposed plant and animal remains that accumulated in swamps millions of years ago.
 - iii. Coal comes in various grades-anthracite, bituminous, and lignite-and is used for domestic cooking, industrial heating, and for the production of electricity in thermal power plants.
 - iv. It is a non-renewable source of energy because the formation of this fossil fuel takes a very long time.
- 2. Oil and Natural Gas :**
 - i. Petroleum, like coal, is formed as a result of decay of organic material compressed for over millions of years under high pressures and temperatures associated with deep burial.
 - ii. The crude oil formed under these conditions gets accumulated in underground pockets from which it is extracted for commercial uses.
 - iii. Natural gas is a mixture of light hydrocarbons, primarily methane.
 - iv. It may be mixed with oil or trapped in regions in which crude oil is not abundant.
 - v. When natural gas is found solely in reservoirs it is called non-associated gas and when it is found in the same reservoir as crude oil it is called associated gas.
- 3. Nuclear Energy :** A nuclear energy is generated either when the bonds between the atoms are broken as in nuclear fission, or when the atoms are brought together, as in nuclear fusion.

Que 2.22. What are non-conventional energy resources ? Discuss any two of them.

AKTU 2014-15 (Sem-2), Marks 3.5

OR

Describe "Renewable energy resource" with two examples and diagram.

AKTU 2015-16 (Sem-2), Marks 7.5

OR

What do you understand by non conventional energy resources ? Discuss the solar energy in details.

AKTU 2017-18 (Sem-3), Marks 07

Answer

A. Non-conventional Energy Resources :

1. Renewable sources of energy are those resources which are inexhaustive and can be regenerated within a given span of time.
2. Renewable energy resource has a potential to replace conventional energy resources but they are not likely to supply a substantial amount of energy to developing countries over the short term. But in long term, we can work to harness the available resources completely.

3. Renewable energy resources like solar energy, wind energy, tidal energy, ocean thermal energy, biomass, geothermal energy, etc., are really present in abundance and can fulfill our requirements
- B. Types of Non-conventional Energy Resources :** Following are the various renewable resources :
 - 1. Solar Energy :**
 - Solar energy is a clean, cheap and abundantly available renewable energy and it is also the most important of the non-conventional sources of energy because it is non-polluting and, therefore helps in decreasing the green house effect.
 - Solar energy can be used as :
 - a. By direct conversion to a fuel by photosynthesis.
 - b. By direct conversion to electricity by photovoltaic.
 - c. By conversion to electricity via thermo-electric power system.
 - 2. Hydro Energy :**
 - It is a renewable energy source, which is used to generate electricity.
 - Hydropower is obtained from water flow or falling water from a height.
 - Water stored behind dam and at a height has a lot of potential energy which is converted into mechanical and electrical energy.
 - The water is released gradually and is allowed to fall under the gravitational force and drive hydraulic turbines which rotate and the generators produce the electricity.
 - 3. Biomass :** Green plants trap solar energy through the process of photosynthesis and convert it into organic matter. This organic matter is known as biomass. Wood, charcoal, agricultural waste produces the bio energy after burning, and cow dung, garbage are an aerobically decomposed to obtain the energy.
 - 4. Biogas :** Biogas is formed due to the decomposition of organic waste matter. During decomposition of organic matter the gases, such as carbon dioxide, hydrogen and hydrogen sulphide are formed.
 - 5. Wind Energy :** Wind energy is a renewable source of non-polluting energy and it has tremendous potential which if harnessed, can easily satisfy the energy demands of a country.
 - 6. Tidal Energy :** Gravitational pull by sun and moon results in the tides. This type of energy can be harnessed by constructing the tidal barrage. Energy can be harnessed from high as well as from low tides.
 - 7. Wave Energy :**
 - The motion of the sea surface in the form of wind waves forms a source of energy.
 - Floating propellers are placed in shallow waters, near the shores and due to motion of the waves, the propellers also get the motion and this kinetic energy can be used to drive turbines.
 - This is cheap, clean and inexhaustible source of energy.

Que 2.23. Discuss the limitations of conventional energy sources. Does the renewable energy have the potential to overcome these

limitations in India ? Enumerate the possibilities of all renewable sources.

Answer
A. Limitations of Non-Renewable Energy Resources :

1. The limitations of conventional energy sources are that they will fail to meet the increasing demands. Demands for energy will continue to grow but the resources are limited.
2. The continuous growth of energy demands require that new alternatives must be developed with the utmost vigour.

B. Possibilities of all Renewable Sources :

1. Yes, India has huge potential of renewable energy resources to overcome the limitation of conventional energy resources.
2. According to energy experts, India's non-conventional energy potential is estimated at about 1, 95,000 MW.
3. An estimate of 31 per cent of this potential comes from sun, 30 per cent from ocean-thermal, 26 per cent from bio-fuel and 13 per cent from wind.

Table 2.23.1 :Non- Conventional Energy Potential of India.

Source/System	Approximate Potential (MW)	Achievements (as on 31 March 2007, MW)
Solar Photovoltaic Power	50000	2.92
Wind Power	45,000	7092.00
Small Hydro Power (upto 25 MW)	15,000	1975.6
Biomass Cogeneration Power	19,500	613.43
Ocean Energy	50000	60.20
Energy Recovery from Wastes	7000	43.45

C. Renewable Energy Resource : Refer Q. 2.22, Page 2-24N, Unit-2.

Que 2.24. Write short note on geothermal energy.

Answer
Geothermal Energy :

1. The energy harnessed from the hot rocks present inside the earth is called as geothermal energy.
2. There is an increase in the temperature of the earth with increasing depth below the surface.

3. The fission of radioactive material naturally occurring in the rocks increases the temperature of the earth as we move down from the earth's surface.
4. Hot molten rocks called 'Magma' are present in the core of the earth. This causes sometimes volcanic action.
5. This hot steam is used to operate turbines to generate electricity.
6. Artificially it can also be harnessed with the help of pipes by drilling the hot rocks, which make the hot water to push out through pipes which turns the turbine of the generator to produce electricity.

B. Advantages :

1. It is cheap and clean source of energy.
2. This type of energy is almost free from the pollution.

C. Limitations :

1. Air pollution results in case of release of gases like H_2S , NH_3 present in the steam waste.
2. Noise pollution results from the drilling operations.

Que 2.25. What are the differences between conventional and non-conventional energy resources ?

Answer

S.No.	Conventional Energy Resources	Non-conventional Energy Resources
1.	They are fully developed.	They are still undergoing development.
2.	They use non-renewable sources.	They use renewable sources.
3.	Inexpensive (comparatively).	Expensive.
4.	Ecologically not safe for usage.	Ecologically safe to use.
5.	Available in limited quantity.	Available in plenty.
6.	Technologies required are already established.	Require new technologies which are still under research and development.
7.	Carbon and other greenhouse gas emission from the combustion of coal, natural gas etc.	Free from such problems.
8.	Example : Petroleum, coal etc.	Example : Solar, wind etc.

Que 2.26. What is hydroelectric energy? How it is produced? Give the advantages and disadvantages of hydroelectric energy.

Answer

A. Hydroelectric Energy :

1. Hydroelectric energy or hydro power energy is the energy of water.
2. It helps in developing electricity by harnessing the power of water flowing down from a high level.
3. It is renewable, affordable and pollution free source of energy.
4. The water flowing in the river is collected by constructing a big dam where the water is stored and allowed to fall from height.
5. In the course of the fall of the water, the water rotates turbine.
6. The produced mechanical energy is converted to electricity by the generators connected to it.
7. Transformers convert the alternating current produced by generators into currents of high voltage for easy transmission over long distances.

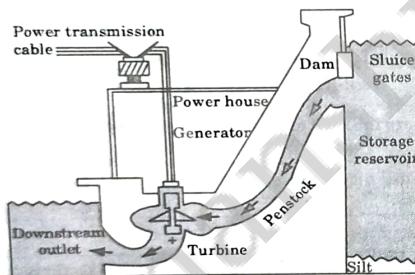


Fig. 2.26.1. Generation of hydro-electric energy using a dam.

B. Advantages of Hydroelectric Energy :

1. It is economical as well as operating labour is also low.
2. It is a renewable resource.
3. It is a safe.
4. Pollution free source of energy.

C. Disadvantages of Hydroelectric Energy :

1. In case of failure of a dam, millions of people become homeless, sick and even die.
2. Population has to be relocated in order to construct a dam and harness hydropower.

3. As river convey silt, higher the siltation, lower will be the service life of the dam.
4. Dams are responsible for habitat fragmentation, aquatic ecosystem disruption.
5. Energy production is affected by the amount of river flow, especially during drought, hydroelectric energy cannot be harnessed.

Que 2.27. What do you mean by the term fossils and fossil fuel? What are the different types of fossil fuel based energy? Briefly explain them.

AKTU 2013-14(II), Marks 05

Answer

- A. Fossil :** A fossil is the naturally preserved remains or traces of animals or plants or that lived in the geologic past.

These are two main types of fossils :

- 1. Body Fossils :** It includes the remains of organisms that were once living.
- 2. Trace Fossils :** These are the signs that organisms were present.
- B. Fossil Fuel :** Petroleum and coal are formed from the fossilized remains of animals and plants, hence they are known as fossil fuels. As they are used up much more rapidly than they are replenished by nature, it might ultimately result in fuel shortage.

C. Types of Fossil Fuel :

i. Coal :

- Coal is defined as stratified rock, consisting of organic matter of fuel value derived from the partial decay and alteration of accumulated plant materials by the action of heat and pressure over millions of years.

- ii. Coal is of the following four types :

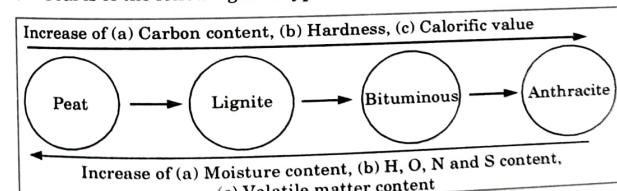


Fig. 2.27.1. Types of coal.

iii. Advantages : The factors which are in favour of usage of coals in huge tonnage quantities are : availability, low cost, least risk of fire hazards and easy storage.

iv. Disadvantages :

- Combustion of coal is a slow process.
- Combustion control is not easy.
- After combustion, ash is always produced and so its disposal is a problem. Smoke is also invariably produced.
- Use of coal in internal combustion engines is not possible.
- Calorific value and thermal efficiency is least.

2. Petroleum : Petroleum is a complex mixture of paraffinic, olefinic and aromatic hydrocarbons with small quantities of organic compounds containing oxygen, nitrogen and sulphur. It is also called mineral oil because it occurs beneath the earth.

Following are some petroleum fuels :

i. Gasoline or Petrol :

- It is a mixture of hydrocarbons from pentane to octane. It is highly volatile and inflammable.
- It is used as a fuel for internal combustion engines. Its calorific value is about 11,250 cal/g.

ii. Diesel Oil :

- It is a mixture of higher hydrocarbons (C_{15} to C_{18}).
- It is used as a fuel for diesel engines and its calorific value is about 11,000 cal/g.

iii. Kerosene Oil :

- It is a mixture of hydrocarbons (C_{10} to C_{16}).
- Its calorific value is about 11,000 cal/g. It is used as domestic fuel in stoves.

3. Gaseous Fuels :

i. Natural Gas : It is obtained from wells dug in the oil bearing regions. It is mainly composed of methane, ethane and other hydrocarbons.

ii. Compressed Natural Gas (CNG) :

- The natural gas compressed at very high pressure of about 1000 atmosphere is called CNG.
- The calorific value of CNG is 31400 – 37700 kJ/m³.
- The use of CNG as a fuel for automobiles has reduced pollution in urban cities, as it undergoes complete combustion in CNG engine so there is nil possibility of release of CO in the atmosphere.

iii. Liquefied Petroleum Gas (LPG) :

- The main constituents of LPG are *n*-butane, iso-butane, butylene and propane.

- The calorific value of LPG is about 27,800 kcal/m³.
- It is mainly used as domestic fuel.

Que 2.28. | What is nuclear energy? Discuss its merits and demerits.

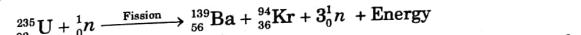
Answer

A. Nuclear Energy :

- The study of nuclear fuel is important because energy changes involved are many million times greater than in chemical fuels.
- The source of energy in nuclear fuel is nuclear fission or nuclear fusion reaction.
- These are discussed below :

i. Nuclear Fission :

- When an unstable nucleus of a heavy atom (like Uranium-235) is bombarded with neutrons, the former splits up into two medium weight nuclei with the liberation of an enormous amount of energy.



- In all fission reactions, more neutrons are emitted than consumed. They, in turn, are capable of fission of more heavy atoms and a chain reaction is started.
- When this chain reaction is controlled, it can lead to power generation in a device called a nuclear reactor.

ii. Nuclear Fusion :

- When two lighter nuclei (like deuterium atoms) are heated to a very high temperature ($\sim 10^6$ °C), they fuse together to form a heavy, more stable nucleus and an enormous amount of energy is liberated.



- High temperatures needed for fusion can be attained by using the heat evolved in a fission reaction. But, in this way, the fusion of hydrogen gets out of control and leads to explosion (hydrogen bomb).

B. Merits and Demerits of Nuclear Energy :

1. Merits of Nuclear Energy :

- Availability :** Nuclear power plants could still produce electricity after coal and oil become scarce.
- Less Fuel Requirement :** One ton of uranium produces more energy than is produced by several million tons of coal or several million barrels of oil.

- iii. **Less Pollution :** Well-operated nuclear power plants do not release contaminants into the environment. As combustion is not done so, no CO_2 , SO_x , NO_x , are released. Thus, there is very little effect on environment.
 - iv. **Economical :** Cost of fuel is a much smaller percentage of the total cost and operating cost is about the same as coal-based thermal power plant.
 - v. **Employment :** Energy generation from nuclear power plants creates high paying, skilled jobs.
 - vi. **Safe :** Safety record of nuclear power plants in the world is fantastic.
 - vii. **Reliable :** Nuclear power plants have very high capacity factors. Presently, 12 % to 18 % of the world's electricity is generated through nuclear energy.
- 2. Demerits of Nuclear Energy :**
- i. **Large Initial Cost :** To develop a single nuclear power plant about 15 years to 20 years are required along with expenditure of huge amount of money.
 - ii. **Dangerous Waste :** The waste produced after fission reactions of uranium consist mainly of unstable, radioactive elements. It is very dangerous to the human health and environment for thousands of years.
 - iii. **Less Life of Nuclear Reactors :** They could only last for about 40 years to 50 years.
 - iv. **Chances of Worse Disasters :** Meltdown is one possible type of reactor disaster in which the fission reaction goes out of control, leading to nuclear explosion and the emission of great amount of radiation.
 - v. Domestic unavailability of safe storage and reprocessing facilities.
 - vi. Fear security concerns, terrorism and proliferation of nuclear weapons. They are a major threat to the world as they cause large-scale devastation.

Que 2.29. What is solar energy? Discuss advantages and limitations of solar energy.

Answer

A. Solar Energy :

1. Sun is the ultimate source of energy. The nuclear fusion reactions occurring inside the sun releases enormous quantities of energy in the form of heat and light.
2. The solar energy received by the near earth space is approximately 1.4 kilojoules/second/ m^2 .
3. Solar energy can be converted into other forms of energy such as heat and electricity.

B. Advantages of Solar Energy :

1. Solar energy can be obtained free of cost, and it is unlimited.
2. It is non-polluting.
3. It is eco-friendly.

C. Limitations of Solar Energy :

1. Solar energy cannot be obtained in diffused sunlight and even in rainy season.
2. The amount of sunlight received is not constant. It varies with location, time and weather conditions.
3. Large area is required to collect the energy, at a useful rate.

Que 2.30. Explain the various equipments which are working on solar energy with their merits and demerits.

OR

Explain the uses of solar energy in detail.

OR

Explain the principle and working of solar cell with diagram.

AKTU 2015-16 (Sem-1), Marks 7.5

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

Solar Energy Devices :

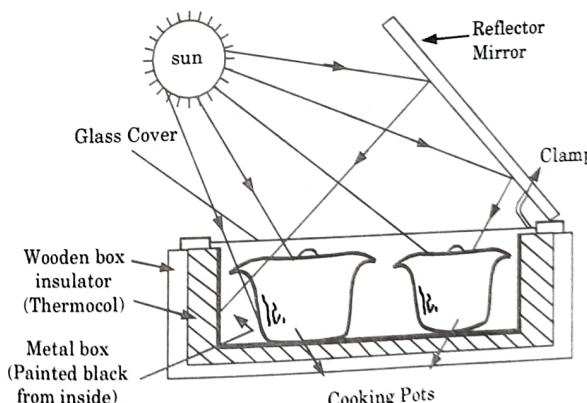


Fig. 2.30.1. Solar cooker.

Following are the various uses of solar energy :

1. Solar Cooker :

- Solar cooker is a device which is used to cook food by utilizing the solar energy.
- A solar cooker consists of an insulated wooden and a metal box which is painted all black from inside as black surfaces are good absorbers of heat energy.
- There is a thick glass sheet cover the box and a plane reflector mirror attached to the box.
- The glass sheet cover allows the solar energy to enter the box, but does not allow it to flow out in the form of radiant heat.
- The reflector is adjusted at any angle so that solar energy could be reflected into the box.

Advantages (Merits) of Solar Cooker :

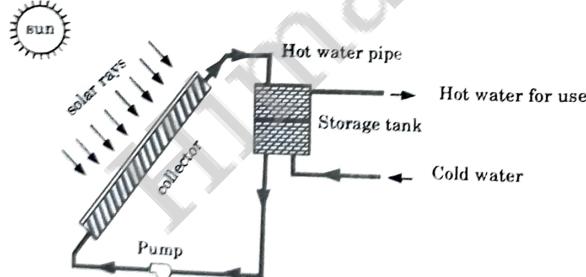
- It does not require fuel or electricity.
- Cost of cooking food is zero as solar energy is free of cost.
- No environmental pollution.
- It preserves all the nutrients in the food as food cooks at medium temperature.

Disadvantages (Limitations) :

- It cannot cook food at night or when sky is cloudy.
- It cannot cook food in half an hour. It takes generally 3 to 4 hours to cook food.
- The direction of reflector has to be changed so that it always faces the sun.
- It cannot be used for frying, baking and making chapattis.

2. Solar Water Heater :

- A solar water heater is a device which supplies hot water by using solar energy.
- It can be installed on the top of flat roofed building.

**Fig. 2.30.2. Solar water heater.**

- It consists of an insulated water storage tank with an inlet for cold water and outlet for hot water. The cold water is passed through an iron pipe fitted with collector.

- The water absorbs heat from collector and becomes hot.

Advantages (Merits) :

- It does not require fuel or electricity.
- No environmental pollution.
- It is used in big hotels, hospitals and industries for hot water supply.

Disadvantages (Limitations) :

- It does not work at night.
- It is very costly to install.
- The heater requires a large space to set up.
- Heating is slow.

3. Solar Cells or Photovoltaic Cells :

- A device which directly converts solar energy into electrical energy is called solar cell or photovoltaic cell.
- Principle :** Solar cell is work on the principle of photovoltaic effect. The photovoltaic effect is the creation of voltage or electric current in a material upon exposure to light and is a physical and chemical property/phenomenon.
- Working :** When light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material. If electrical conductors are attached to the positive and negative sides, forming an electrical circuit, the electrons can be captured in the form of an electric current that is, electricity.

- These solar cells when exposed to solar radiation give direct current (DC) which can be converted into alternating current (AC), using inverters.

Uses of Solar Cell :

- Solar cells are used to generate electricity in man-made space satellites.
- In India solar cells are being used for providing electricity for street lights at night and for running TV, radio, fans etc.
- Solar panel (group of solar cells) is used for pumping water.
- Solar cells are also used to run watches and calculators.

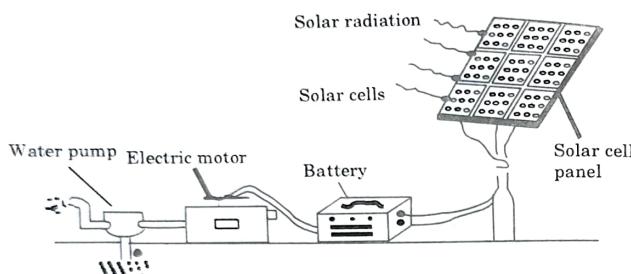


Fig. 2.30.3. Solar cells or photo voltaic cells.

Advantages of Solar Cell :

- It is pollution free device.
- It has a long effective life.
- It is highly reliable.
- Maintenance cost is low and easy to operate.

Disadvantages (Limitations) of Solar Cell :

- Solar cells / solar panel do not work at night.
- Installation cost of solar panel is very high.
- A solar energy installation requires a large area.
- Pollution in the environment can also degrade the quality and efficiency of photovoltaic cells.

4. Solar Furnace :

- It is an arrangement of mirrors to focus sunlight from a wide area into a small volume (focal point).
- The temperature at the focal point may reach $3,500^{\circ}\text{C}$ and this heat can be used to generate electricity, melt steel, make hydrogen fuel, etc.

- Solar Distillation/Evaporation :** It is a process in which sun's heat is used to evaporate sea water to produce sodium chloride (salt).

Que 2.31. What is the term biomass? Explain the biomass based energy resources in detail.

Answer**A. Biomass :**

- The term biomass is used for the dead plants and trees (e.g. wood, crop residue, etc.) and the waste material of living organisms (e.g. cattle dung, sewage, etc.).
- Biomass energy or bioconversion means the direct burning of waste paper, wood, cattle dung or converting them to a fuel.

B. Biomass Based Energy Resources : Following are the common biomass based energy resources :

- Biogas :** Biogas consists mainly of methane. It burns with a blue flame and its average calorific value is about 5300 kcal/m^3 .

i. Advantages :

- More heat is generated by burning gobar gas instead of cattle dung.
- It is free from smoke, dust, dirt, etc. Thus, the environment and utensils remain comparatively clean.
- In addition to cattle dung, a gobar-gas plant can also digest human refuse, poultry, etc. Thus, production of gobar gas means optimum utilisation of waste.

- Limitation :** Gobar gas should be used within 10 metres of the gobar-gas plant.

ii. Applications :

- Biogas is used as domestic fuel in many villages.
- Biogas is also used for lighting purposes.
- A biogas plant also simultaneously gives good quantity of excellent manure. This manure has 2 % nitrogen content as against 0.75 % in farmyard manure.

- Green Fuel :** Green fuel (or biofuel) is a type of fuel obtained from nonfood sources like green algae which is more environmental friendly than the widely used and quickly disappearing fossil fuels.

Que 2.32. What is biomass energy? Explain the different methods of biogas production in India. AKTU 2017-18 (Sem-4), Marks 3.5

Answer

Biomass Energy : Refer Q. 2.31, Page 2-36N, Unit-2.

Method : Method of biogas production can be understood on the basis of types of biogas plants in India :

1. Floating Gas Holder Type Biogas Plant :

- This type has a well shaped digester tank which is placed under the ground and made of brick.
- In the digester tank, over the dung slurry, an inverted steel drum floats to hold the bio-gas produced.
- The gas-holder can move which is controlled by a pipe and the gas outlet is regulated by a valve.
- This digester tank has a partition wall and one side of it receives the dung-water mixture through inlet pipe while the other side discharges the spent slurry through the outlet pipe as shown in Fig. 2.32.1.

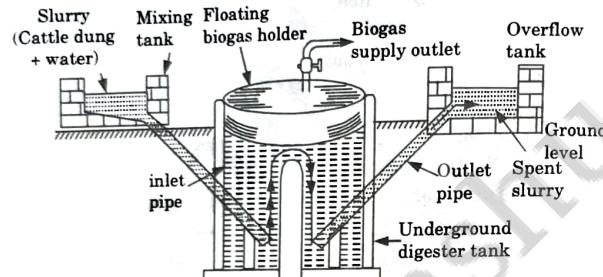


Fig. 2.32.1. Floating gas holder type biogas plant.

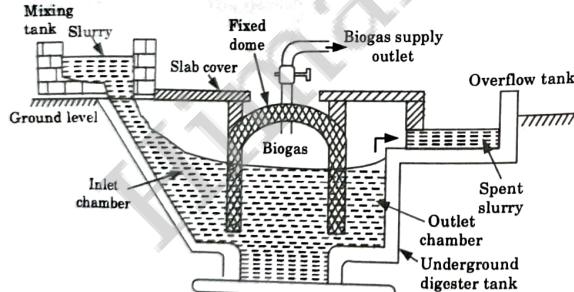
2. Fixed Dome Type Biogas Plant :

Fig. 2.32.2. Fixed dome type Biogas plant.

- The structure is almost similar to floating gas holder type biogas plant, but instead of a steel gas holder, there is a dome shaped roof made of cement and bricks.
- Instead of partitioning there is a single unit in main digester but it has inlet and outlet chambers as shown in the Fig. 2.32.2.

Que 2.33. What are gross primary productivity, net primary productivity and net community productivity ?

Answer

1. Gross Primary Productivity : It is the rate of conversion of carbon dioxide to organic carbon per unit surface area.

Units : $\text{g cm}^{-2} \text{ year}^{-1}$, or kJ m^{-2} .

2. Net Primary Productivity : It is measure of how much energy or carbon is stored as biomass.

$$\text{NPP} = \text{GPP} - R_A$$

Where, R_A = Respiration by autotrophs.

GPP = Gross primary production.

3. Net Community Production : It is the measure of how much GPP is not lost to respiration.

$$\text{NCP} = \text{GPP} - R_A - R_H = \text{NPP} - R_H$$

Where, R_H = Respiration by heterotrophs.

Que 2.34. Define hydrogen energy. Write its advantages, disadvantages and applications.

Answer**A. Hydrogen Energy :**

- Hydrogen is considered as an alternative future source of energy. It is a non-conventional energy resource.
- Hydrogen energy has a tremendous potential because it can be produced from water which is available in abundance in nature.
- In sun's core, hydrogen atom combines to form helium atom which is known as fusion reaction.
- It gives the radiant energy which sustains the life on the earth.

5. Hydrogen can be separated from water by means of electrical energy. It also can be obtained from fossil fuels.

B. Advantages of Hydrogen Energy :

1. Hydrogen is a pollution free fuel.
2. It is less costly to ship hydrogen by pipeline than sending electricity over long distances by wire.
3. A large volume of hydrogen can be easily stored.
4. It can be used for transportation, heating and power generation in places where it is difficult to use electricity.
5. It is a highly efficient fuel.

C. Disadvantages of Hydrogen Energy :

1. Hydrogen is less available in environment in its pure form.
2. It is difficult to store, handle and transport hydrogen.
3. Large energy is required for production of hydrogen.

D. Applications :

1. It can be used for generating electricity for domestic appliances.
2. It is used in domestic cooking as a fuel.
3. It is used in automobiles.

Que 2.35. "Hydrogen is an alternative future source of energy".

Comment.

Answer

1. Hydrogen is a very light gas and its density is eight times less than that of natural gas.
2. There are no significant problems regarding storage, transportation and dispensation.
3. Hydrogen is either formed through the steam reformation of natural gas or through electrolysis of water with renewable energies such as solar, wind and geothermal.
4. More than 90 % of worlds energy requirement are met by burning fossil fuels which leads to emission of carbon dioxide and other toxic gases, which results in global warming.

5. A hydrogen based transport system has the potential to play an important role in reducing greenhouse gas emissions.
6. To propel vehicles, hydrogen can be burnt directly in internal combustion engine (ICEs) or can be used as fuel for producing electricity in fuel cells.
7. The electricity is produced by an electrochemical reaction.
8. The electric power is then used to power an electric motor in the vehicle.
9. Fuel cell driven vehicles have great potential to be more efficient and eco friendly than conventional fuel-driven vehicles.
10. The vehicles will only emit steam and will not emit any greenhouse gases.
11. Hence it is said that hydrogen can become an alternative source of energy.

PART-5

Forest Resources : Availability, Depletion of Forests, Environment Impact of Forest Depletion on Society.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 2.36. What is the role of forests in human existence ?

Answer

1. Forests, because of their ecological resources, play a vital role in human existence.
2. Forests provide indirect benefits by helping to sustain and control biophysical components of the ecosystem, such as climate and water.
3. Tropical forest ecosystems are globally recognized for their benefits and services to humans.
4. The resilience of these ecosystems and the sustainability of the products and services they offer are significant concerns in the context of global change and the climate component.

5. Forests, in particular, have played an essential role in the biogeochemical control of the carbon and water cycles, the supply of wood and non-wood forest products, and the provision of cultural and customary services.

Que 2.37. What is deforestation ? Give main causes, and adverse effects of deforestation.

OR

What are the various factors which influence the deforestation and list out the impact of deforestation ?

AKTU 2014-15 (Sem-1), Marks 06

OR

What is deforestation ? Enumerate and discuss the various causes for deforestation.

AKTU 2017-18 (Sem-3), Marks 07

Answer

A. Deforestation :

1. Destruction of the forest without plantation is called as deforestation.
2. The destruction of forest due to indiscriminate felling of trees has resulted in the deterioration of the environment.
3. Deforestation is creating the threat to country's economy and future development.

B. Causes of Deforestation : Following are the causes of deforestation :

1. **Population Explosion :** Due to population explosion, requirement of forest product such as timber, fuel, etc, has been increased.
2. **Construction Purpose :** Forests have been cleared for agriculture, houses, road, railway tracks, for setting up an industry, etc.
3. **Shifting Cultivation :** Shifting cultivation requires destruction of forest.
4. **Overgrazing :** Overgrazing by livestock has resulted in large scale degradation of the forest.
5. **Expansion of Agriculture :** As the demand for agricultural product increases, it needs more land for cultivation which results in destruction of the forest.
6. **Forest Fires :**

These may be natural or man-made and causes huge forest loss.

C. Effects of Deforestation : Following are the adverse effects of deforestation :

1. Destruction of flora and fauna.

2. Result in soil degradation and soil erosion.
3. Decreases the rainfall, can lead to drought condition.
4. Contributes in the global warming by releasing carbon dioxide which is greenhouse gas.
5. Reduction in the oxygen content liberated by the plants.
6. Depletion of all the forest products which affect the economy of the country.

Que 2.38. What is deforestation ? Enumerate the effects of deforestation. Explain the measures taken for conserving forest wealth.

Answer

A. Deforestation : Refer Q. 2.37, Page 2-42N, Unit-2.

B. Effects of Deforestation : Refer Q. 2.37, Page 2-42N, Unit-2.

C. The Measures taken for Conserving Forest Wealth :

1. **Sustainable Forest Management (SFM) :** SFM is the use of the world's forests in such a way that they continue to provide resources in the present, without depriving future generations of their use.
2. **Forest Certification :** Be responsible consumers. Buy wood only from companies that follow sustainable practices.
3. **Involve Local Communities in Joint Forest Management (JFM) :** These are protected forests in which local communities are allowed to harvest fruits, nuts, medicines, fibres, rubber, etc., in ways that do not harm the forest.
4. **Improve Governance and Accountability :** The Government must take bold political decisions and develop new civil society institutions to improve governance and accountability regarding forest use. Stop harmful subsidies to timber companies.
5. **Accelerate Education, Research and Training :** This is to ensure that SFM and JFM can quickly become a reality.

Que 2.39. What are the measures that are helpful in controlling forest destruction ?

Answer

The important measures that are helpful in controlling forest destruction are as follows :

1. Mining activities should be prohibited in areas declared as protected forests.
2. Cutting of trees should be followed by massive plantation.
3. The environmental laws and legal provisions should be strictly enforced.
4. Forest extension should be carried out through social forestry, agro forestry, recreation forestry, extension forestry, etc.
5. Public awareness regarding medicinal and other economic and environmental significance of forests should be created.
6. Local people should be educated about the evil effects of deforestation and they should be taught to participate actively in forest conservation programmes.

VERY IMPORTANT QUESTIONS

Following questions are very important. These questions may be asked in your SESSIONALS as well as UNIVERSITY EXAMINATION.

- Q. 1. What are the water borne and water induced diseases ? Give the causes and preventive measures of water related disease.
Ans. Refer Q. 2.8, Unit-2.
- Q. 2. Discuss fluoride problem in India. Also enumerate its effects on human health.
Ans. Refer Q. 2.10, Unit-2.
- Q. 3. What is Nalgonda process and where it has being used ?
Ans. Refer Q. 2.11, Unit-2.
- Q. 4. What is meant by mineral resources ? Describe the effect of mineral extraction on environment.
Ans. Refer Q. 2.14, Unit-2.
- Q. 5. What do you mean by the term material cycle ? Explain carbon cycle with the help of diagram.
Ans. Refer Q. 2.16, Unit-2.

- Q. 6. Explain nitrogen cycle. Discuss detrimental effects of excess nitrogen.
Ans. Refer Q. 2.17, Unit-2.
- Q. 7. Describe the non renewable or conventional energy resources with examples.
Ans. Refer Q. 2.21, Unit-2.
- Q. 8. What are non-conventional energy resources ? Discuss any two of them.
Ans. Refer Q. 2.22, Unit-2.



3

UNIT

Environmental Pollution

CONTENTS

- Part-1 :** Pollution and their Effects; 3-2N to 3-5N
Public Health Aspects
of Environmental
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- Part-6 :** Solid Waste Management 3-20N to 3-25N

PART-1

Pollution and their Effects; Public Health Aspects of Environmental.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.1. What is pollution and pollutants ? Also classify the pollution.

Answer

A. Pollution :

- i. Pollution is defined as the presence of impurities or pollutant substances in sufficient concentration levels, causing harmful effects on human beings, animals, plant life or material resources when exposed for a sufficient duration of time, thus reducing the quality of life in the environment.
- ii. Pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings.

B. Pollutant : It include solid, liquid or gaseous substances present in greater than natural abundance, produce due to human activity, which have a detrimental effect on our environment.

C. Types of Environmental Pollution : Following are five types of environmental pollution :

1. **Air Pollution :** Any unwanted change in physical, chemical and biological properties of air which adversely affects living beings (various life forms) and property is called air pollution.
2. **Water Pollution :** Any unwanted change in physical, chemical and biological properties of water which adversely affects living beings and property is called water pollution.
3. **Soil Pollution :** Any unwanted change in physical, chemical and biological properties of soil which adversely affects living beings and property is called soil pollution.
4. **Noise Pollution :** Unpleasant loud sound is called noise and disturbing level of noise is known as noise pollution.
5. **Radiation Pollution :** Pollution of air, water and soil with radioactive materials is called radioactive pollution.

Que 3.2. What are the causes (or sources) and impacts of environmental pollution ?

Answer

A. Cause/source of environmental pollution : Environmental pollution can be caused either by natural activities or by man-made activities (anthropogenic activities).

B. Natural activities or natural causes : These include :

1. Volcanic eruption
2. Forest fires
3. Soil erosion
4. Dust storms
5. Flood
6. Pollen grains
7. Biological decay (decay of plant and animal body)

C. Man-made activities (anthropogenic activities or anthropogenic pollution) : These include :

1. Fast growth in human population
2. Faster rate of development
3. Industrialization
4. Deforestation
5. Urbanization
6. Mining activities
7. Agricultural practices
8. Automobile transportation
9. Nuclear wars

D. Impacts/effects of environmental pollution : The various impacts of environmental pollution are as follows :

1. Acid rain
2. Global warming
3. Ozone layer depletion
4. Eutrophication of water bodies
5. Biomagnification of chemical pesticides (for eg: DDT) and heavy metals (for eg: Hg, Cd, Pb).
6. Various diseases in plants animals and human beings.
7. Corrosion (decay) of property (buildings/monuments)
8. Loss of biodiversity
9. Ecological imbalance

Que 3.3. Discuss public health aspects of pollution.

Answer

1. Most of the disorders and diseases afflicting mankind today can be traced to polluted environments; be it air, water or soil (land).

2. Following are the consequences of pollution on public health :

A. Health consequences of air pollution :

1. Exposure to high levels of air pollution can cause a variety of adverse health outcomes.
2. It increases the risk of respiratory infections, heart disease and lung cancer.
3. Both short and long term exposure to air pollutants have been associated with health impacts.

B. Health consequences of water pollution :

1. Unsafe water has severe implications for human health.
2. Water pollution can cause water to become toxic to humans and the environment.
3. Contaminated water is linked to transmission of diseases such as cholera, diarrhea, dysentery, hepatitis A, typhoid and polio.

C. Health consequences of soil (land) pollution :

1. Soil pollution affects everything. The food we eat, the water we drink, the air we breathe.
2. Our health and the health of all the organisms on the planet is dependent on healthy soil.

Que 3.4. Write the short note on public health aspects.

Answer

1. Health is an outcome of the interactions between people and their environment.

2. Disturbance of ecosystem and natural cycles, resource depletion, waste generation and pollution of natural resources affects human health.

3. Common cold, influenza, chicken pox, tuberculosis, silicosis, gout, black lung cancer, bronchitis and asthma are diseases caused by air pollution.

4. Cholera, typhoid, dysentery, minamata disease, hepatitis, intestinal disorders are diseases caused by water pollution.

5. Botulism, viral food poisoning, fungal food poisoning, staphylococcal poisoning are food-borne diseases.

6. Teeth/gum diseases, rickets/osteomalacia, anaemia and avitaminosis are deficiency diseases.

7. Cancer is caused by harmful environmental exposure, tobacco smoking and alcohol consumption.
8. The key to attaining a good health is based on proper nutrition, safe drinking water availability, provision of maternal and child health care, immunization against the major infectious diseases, prevention and control of locally endemic diseases, etc.
9. Characteristics of a healthy person are :
 - i. Absence of physical discomfort,
 - ii. Cheerfulness,
 - iii. Courage to face reality,
 - iv. Enthusiastic and efficient ability to work,
 - v. Self-control and self-confidence,
 - vi. Stable mental attitude,
 - vii. Efficiency, and
 - viii. Freedom from disease.

PART-2***Water Pollution.*****Questions-Answers****Long Answer Type and Medium Answer Type Questions**

Que 3.5. What is water pollution ? Give the causes of water pollution.

Answer**A. Water Pollution :**

It is defined as presence of any foreign substance or energy in water in such concentration and for such duration that tends to degrade the quality of water so that humans, animals or any other organism cannot enjoy the beneficial qualities of water but the use constitutes a hazard.

B. Causes of Water Pollution :

The principal causes of water pollution are categorized into the following two types :

1. **Natural Causes :** Soil erosion due to rains, deposition of dead and decaying remains of plants and animals, high-speed winds, floods, etc., are some of the natural phenomena that contribute to water pollution.

2. **Man-made Causes :** Some of the man-made causes of water pollution are as follows :
 - i. **Sewage Disposal :** Sewage wastes include human excreta, paper, cloth, soap, detergent, etc. They may be biodegradable or non-biodegradable and may release a number of chemical substances into the water rendering it unfit for use.
 - ii. **Industrial Waste :** Effluents released from industrial units contain a wide variety of both inorganic and organic pollutants such as oil, grease, plastic, metals, acids, and other toxic chemicals, many of which are not readily susceptible to degradation and lead to serious pollution problems.
 - iii. **Eutrophication :**
 - a. Sewage disposal in water bodies results in high nitrogen-phosphorous content that triggers exponential growth of algae-algal bloom-in it.
 - b. This followed by decay of the plants leads to severe depletion of oxygen in the water, thereby reducing its quality and making it unfit for survival of aquatic animals thus endangering the entire aquatic ecosystem.
 - iv. **Agricultural Waste :**
 - a. Modern agricultural practices require the use of large amounts of fertilizers, pesticides, biocides, and other soil additives.
 - b. A variety of fertilizers and pesticides such as DDT, slowly move to water bodies through irrigation, rainfall, and poor drainage, and cause pollution.
 - v. **Customs and Traditions :**
 - a. Disposal of dead bodies and immersion of idols of gods and goddesses into water bodies during various festivals of India degrade the quality of water.
 - b. Such water pollution can damage the ecosystem by killing aquatic plants and organisms and other living creatures dependent on the water.
 - c. Drinking such polluted water can cause breathing problems, affect digestion, and may cause blood impurities and skin diseases.
 - vi. **Thermal Power Stations :** Release of hot water from thermal power stations and various industries directly into water bodies may often kill both aquatic plants and animals, which may experience shock as a result of temperature variance.

Que 3.6. What are the sources and effects of water pollution ?

What are its control measures ?

OR

Describe the methods for controlling the water pollution.

Answer**A. Sources of Water Pollution :**

1. Sewage and other waste including human and animal excreta, paper, soap, detergent, oils etc.
2. Industrial effluents.
3. Agricultural waste including fertilizers, pesticides etc.
4. Industrial waste coming from chemical industries, petrochemicals industries, tanneries, thermal power plants, nuclear power plants, mercury, lead and other metals.
5. Silt in surface runoff from construction sites, burn particles or land clearing.
6. Heat discharge of cooling water by power plants.
7. Burning the dead bodies nearby river.

B. Effects of Water Pollution :

1. Rise in Biological Oxygen Demand (BOD) which is the amount of oxygen required by micro-organisms to decompose the organic substances in water.
2. Lowering of Dissolved Oxygen (DO).
3. The enrichment of an ecosystem with chemical nutrients i.e., fertilizers containing nitrogen and phosphorus which is called as eutrophication.
4. Bioaccumulation which is the accumulation of the pollutants pesticides in the living organisms, and biomagnification which denotes the increase in the concentration of the pollutants.
5. Destruction of the aquatic life due to industrial effluents containing poisonous chemicals such as arsenic, mercury, cadmium and lead, and it may also harm the human body through contaminated food such as fishes.
6. Result in the waterborne diseases like typhoid, cholera, amoebic dysentery etc. It can also result the water induced diseases like malaria and dengue.

C. Control Measures of Water Pollution :

1. Water pipes should be properly checked for leaks and cracks.
2. Proper use of fertilizers and pesticides.
3. Dead bodies should not be burnt near the river.
4. Water used in thermal power plant should be cooled before discharge into the river.
5. By treatment of water which includes :
- i. **Primary Treatment :** It includes screening, grit removal and sedimentation.

3-8 N (Sem-1 & 2)

- ii. **Secondary Treatment :** It includes the methods like activated sludge process, trickling filters etc.
- iii. **Tertiary Treatment :** It includes removal of suspended solids, toxic substances, dissolved solids etc.
6. Enforce zero-emissions laws to protect water from pollutants and contaminants.
7. Support clean agriculture by preferably purchasing and consuming healthy organic foods. In the growing of organic food, no pesticide or other harmful contaminants are used.
8. Create awareness in public through media, child education, etc., for preventing water pollution.
9. Treat waste water (from domestic and industrial houses) before disposal.
10. Avoid littering in any form and prevent pollution caused by animals.
11. Conserve clean water supplies.

Que 3.7. | What are the main causes and effects of water pollution ? How can water pollution be controlled ?

AKTU 2017-18 (Sem-3), Marks 07

Answer

- A. **Water Pollution and its Causes :** Refer Q. 3.5, Page 3-5N, Unit-3.
- B. **Effects and Control Measures :** Refer Q. 3.6, Page 3-6N, Unit-3.

Que 3.8. | What is water pollution ? Explain the various causes, effects and controlling measures of water pollution.

AKTU 2017-18 (Sem-4), Marks 07

Answer

- A. **Causes of Water Pollution :** Refer Q. 3.5, Page 3-5N, Unit-3.
- B. **Effects and Control Measures :** Refer Q. 3.6, Page 3-6N, Unit-3.

Que 3.9. | Discuss the various methods of purifying water.

Answer

Some of the purification methods are as follows :

1. **Reverse Osmosis or RO Method :**
 - i. In this, water is forced through a semi-permeable membrane.
 - ii. This filters unwanted substances, producing clear, fresh-tasting drinking water.

- iii. RO uses no chemicals and can also be used to desalinate seawater.
- 2. The UV Method :**
 - i. Ultraviolet radiation is directed through clear, pre-filtered, particle-free water.
 - ii. The UV light is extremely effective in killing and eliminating bacteria, viruses, fungi and certain harmful organisms.
 - iii. It is mainly used in industry and hospitals to treat water. The method must be used in conjunction with other filters such as carbon or sediment filter.
- 3. Distillation Method :** Water is boiled to create steam and when this steam cools, it condenses to form water droplets, which in turn are deposited in container.
- 4. Planted Filter Method :**
 - i. This can be used to purify sewage water.
 - ii. The wastewater first goes through a septic tank and a baffle reactor, in which all particulate and organic matter are removed.
 - iii. Next, water is sent through an open horizontal planted gravel filter containing pebbles with plants like reeds which absorb many of the impurities.
 - iv. Finally, water moves through an open polishing pond. The output is good enough for gardening and irrigation.

PART-3**Air Pollution.****Questions-Answers****Long Answer Type and Medium Answer Type Questions**

Que 3.10. Define air pollution. What are the sources of air pollutants? How will you classify air pollutants?

OR

Discuss the natural and manmade (synthetic) pollutants that cause air pollution.

Answer

- A. Air Pollution :** Air pollution is the presence of substances in the air (which generally originate from human activities) in sufficient concentrations and sufficient time, to interface with the comfort, health, safety or full use and enjoyment of property.

- B. Types of Air Pollutants :** Air pollutants can be of two types :
 - 1 Primary Pollutants :** These are emitted directly into the atmosphere. Common sources of primary pollutants include power station and industrial plants (sulphur dioxide), and road transport (carbon monoxide, particulate matter and nitrogen oxides).
 - 2 Secondary Pollutants :** These types of pollutants are formed in the air as a result of chemical reactions occurring between primary pollutants.
- C. Causes of Air Pollution :**

The principal causes of air pollution are categorized into the following two types :

 - 1. Natural Causes :**
 - i. Natural disasters such as cyclones, volcanic eruptions, and earthquakes cause suspension of dust particles and ash in air and cause air pollution.
 - ii. Air pollution may also be caused by other natural factors such as forest fires, pollen grains, microbes, etc.
 - iii. Various gases are also released into the atmosphere as a result of natural processes; for example, methane gas is released in natural gas fields due to decay of organic matter, radon gas is released due to radioactive decay within the Earth's crust, and smoke and carbon monoxide are emitted during forest fires.
 - 2. Man-made Causes :**
 - Human beings are the major contributors to air pollution. Some of the man-made causes of air pollution are :
 - i. Industrial Wastes :**
 - a. Different industries produce air pollution in different manners depending on the processes involved.
 - b. Petroleum refineries emit large amounts of hydrocarbons and particulate matter, and industries such as iron and steel mills, paper mills, chemical plants, and cement plants release vast amounts of different types of particulates into the atmosphere.
 - ii. Automobiles :**
 - a. Owing to the rapid increase in population, the number of automobiles on the roads has also increased.
 - b. These automobiles make transportation easy and convenient, but also emit dangerous pollutants such as carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen oxides, hydrocarbons, ozone, particulates, lead, and chlorofluorocarbons.
 - iii. Thermal Power Stations :**
 - a. To meet the increasing demand for electricity by human beings for a variety of purposes, a large number of thermal power stations have been set up.
 - b. Most thermal stations use coal as the main fuel and coal ash is generated as a waste product.

- c. This coal ash is handled in wet form and is disposed in ash ponds.

iv. Nuclear Explosions :

- a. A nuclear explosion causes severe air pollution across a large area.
- b. It releases huge amounts of pollutants including many hazardous chemicals and dust particles into the atmosphere.
- c. Huge amounts of radioactive material with long lifetimes, which cause great damage on the health and well-being of the human beings animals.

v. Agricultural Activities :

- a. The excessive use of fertilizers and pesticides causes severe environmental damage.
- b. These chemical cause air pollution when sprayed; they also travel large distances via air and hence cause air pollution over a vast area.
- c. Other agricultural facilities that contribute to air pollution by emission of air contaminants such as harmful gases and particulate matter include industries such as cottonseed oil mills, sugar mills, feed mills, smokehouses machines such as cotton gins and processes such as hide tanning, seed cleaning, sugarcane and crop-residue burning, etc.

vi. Disposal of Garbage : All types of biodegradable and non-biodegradable waste materials produce smoke and soot when burnt and hence cause air pollution.

Que 3.11. What are the major effect of air pollution on the human, plant and materials ?

AKTU 2015-16 (Sem-1), Marks 10

Answer

A. Effects of Air Pollution on Human :

1. Oxides of nitrogen especially NO_2 can irritate the lungs and cause conditions like chronic bronchitis and emphysema.
2. Carbon monoxide (CO) reaches lungs and combines with hemoglobin of blood to form carboxyhemoglobin.
3. Many other air pollutants like benzene, formaldehyde and particulates like polychlorinated biphenyls toxic metals and dioxins can cause mutations, reproductive problems or even cancer.
4. Many other hazardous materials like Asbestos, Beryllium, Mercury, Arsenic and radioactive substance cause lung diseases and /or affect other vital organs like kidney, liver, spleen, brain and some may also cause cancer.

B. Effects of Air Pollution on Plants :

1. Air pollutants affect plants by entering through stomata, destroy chlorophyll and affect photosynthesis.
2. Pollutant also erodes waxy coating of the leaves called cuticle. Cuticle prevents excessive water loss and damage from diseases, pests, drought and frost.
3. Particulates deposited on leaves can form encrustations and plug the stomata and also reduce the availability of sunlight. The damage can result in death of the plant.
4. SO_2 causes bleaching of leaves, chlorosis, injury and necrosis of leaves. NO_2 results in increased abscission and suppressed growth.
5. O_3 causes flecks on leaf surface, premature aging, necrosis and bleaching.
6. Peroxyacetyl nitrate (PAN) causes silvering of lower surface of leaf, damage to young and more sensitive leaves and suppressed growth.
7. Fluorides cause necrosis of leaf-tip while ethylene results in epinasty, leaf abscission and dropping of flowers.

C. Effects on Materials :

1. Presence of SO_2 and moisture can accelerate corrosion of metallic surfaces due to formation of sulphuric acid. Metal parts of buildings, vehicles, bridges, wires and metallic railway tracks are affected.
2. Sulphuric acid also damages buildings and causes disfigurement of statues made up of marble and limestone.
3. Sulphuric acid formed by the atmospheric SO_2 and water vapours damages the leather binding of books. The pages of the books also become brittle. SO_2 can affect fabric, leather, paint and paper.
4. Ozone in the atmosphere can cause cracking of rubber. Nylon stockings are weakened and ultimately damaged. Types of various vehicles are also damaged.
5. Oxides of nitrogen and ozone can also cause fading of cotton and rayon fibres.

D. Effects on Aquatic Life : Air pollutants mixing up with rain can cause high acidity (lower pH) in fresh water lakes. This affects aquatic life especially fish. Some of the freshwater lakes have experienced total fish death.

Que 3.12. Discuss measures used for controlling air pollution.

Answer

Control of Air Pollution :

Some of the measures to reduce and control air pollution are as follows :

1. The forest cover should be protected. Adequate forest cover is essential for maintaining the quality of air. Trees absorb carbon dioxide (CO_2) and releases oxygen (O_2).

2. Green belts should be created. Such areas should be developed around densely populated cities. There should be strict restriction for establishment of large buildings and industries along the Green belt areas.
3. Automobile engines should be redesigned in such a way that their emissions cause minimum pollution. Old automobile engines should be replaced by new ones. People should be encouraged to share the vehicle, and to avoid vehicles for short distances.
4. Electric engines should be used instead of steam or diesel engines.
5. Industrial areas should be located at a safe distance from the residential areas.
6. Smoke free furnaces should be used.
7. Forest fires should be checked. Adequate preventive measures should be adopted to protect the forests.
8. In industries there should be the arrangement for pollution control.
9. Cheap devices for controlling air pollution should be developed.

Que 3.13. What is air pollution ? Discuss its causes, effects and its remedial measures.

AKTU 2017-18 (Sem-3), Marks 07

Answer

- A. Air Pollution and its Causes : Refer Q. 3.10, Page 3-9N, Unit-3.
- B. Effects : Refer Q. 3.11, Page 3-11N, Unit-3.
- C. Remedial Measures : Refer Q. 3.12, Page 3-12N, Unit-3.

Que 3.14. What is SPM ? How it is formed ? Also discuss its effect on human health, vegetation and property.

Answer

A. SPM:

1. Suspended particulate matter (SPM) consists of solids in the air in the form of smoke, dust, and vapour that can remain suspended for extended periods and is also the main source of haze which reduces visibility. Suspended matter consists of dust, fumes, mist and smoke.
2. The main chemical component of SPM that is of major concern is lead, others being nickel, arsenic, and those present in diesel exhaust.

B. Formation of SPM : Suspended particulate matter (SPM) is caused due to following sources :

1. Human Sources Include :

- i. Motor vehicle use.
- ii. Combustion products from space heating.

- iii. Industrial processes.

- iv. Power generation.

2. Natural Sources Include :

- i. Soil.

- ii. Bacteria and viruses.

- iii. Fungi, molds and yeast.

- iv. Pollen.

- v. Salt particles from evaporating sea water.

C. Effect of Suspended Particulate Matter on Human Health :

1. Lung inflammatory reactions.

2. Respiratory problems.

3. Adverse effects on the cardiovascular system.

4. Increase in medication.

5. Increase in hospital admissions.

6. Increase in mortality.

D. Effect of Suspended Particulate Matter on Vegetation :

Effects of particulate matter on vegetation may be associated with the reduction in light required for photosynthesis and an increase in leaf temperature due to changed surface optical properties.

E. Effect of Suspended Particulate Matter on Property :

1. Corrode metals and masonry.

2. Damage to exposed surface of soil structures and motor vehicle.

3. Disfigurement of statues made up of marble and limestone.

Que 3.15. Differentiate the line sources and point source of air pollution. How can you control air pollution as special reference to particulate matter ?

Answer

A. Difference between Line Source and Point Source :

S.No.	Point Source	Line Source
1.	It is the source which causes direct release of air pollutants.	A line source is a source of air, noise, water contamination that emanates linearly.
2.	A point source has no geometric dimensions.	It is one dimensional source of air pollution.
3.	It is a stationary source.	It is basically a mobile source.
4.	For example : industries, power plant etc.	For example : Highway vehicles, rails, ships etc.

B. Control Measure of Particulate Matter :

Following are the devices used to control the particulate matter :

1. Cyclone :

- It consists of a cylinder with an inverted cone attached at the bottom.
- The gas with particles in it enters tangentially at the top of the cylinder and spins forming a vortex. Due to centrifugal force, the particles strike the wall of the cylinder.
- The particles then fall in the hopper due to gravity from where they are removed. The spinning gas forms an inner vortex and leaves from the top.
- The cyclone is very efficient for larger particles.

2. Bag House Filters :

- A bag house filter contains a large number of filter bags made of fabric. They are hung upside down in several compartments of bag house filter.
- Dirty gas is passed through the filter bag which leaves the bags through their pores. The dust particles get deposited on the inner surface of the bag filters and may form a cake which can be removed by shaking.
- The device is efficient for removal of very small particles.

3. Wet Scrubbers :

- Dirty gases are passed through water in the chamber or water is sprayed on the gas. Particles are made wet and are removed from the gas stream which leaves from the top of the scrubber.
- Wet scrubbers are very efficient for removing the particulates. The scrubbers are very useful for removal of toxic and acidic gases also.

Que 3.16. Explain why thermal power stations are the main source of pollution ?

AKTU 2015-16 (Sem-2), Marks 10

Answer

A thermal power station is a power plant in which the prime mover is steam driven. Water is heated, turns into steam and spins a steam turbine which drives an electrical generator. Following are various environmental issues related with thermal power plants :

1. Environmental Impact during Operational Stage : Among thermal based power generation, coal based power plants are highest in : Air pollution, Waste generation, Water consumption, Emission of mercury, Greenhouse emission.

2. Impact of Thermal Power Plant on Water Source :

Water intensive :

- New thermal power plant of 500 MW installed capacity requires around 14 million m³ of water per annum.
- High impact on river and ground water.
- Water demand for the once-through system is 30 to 50 times that of a closed cycle system.

3. Largest Emitter of Mercury :

- Typical power plant emits 90 % of its mercury into the air and 10 percent on land.
- On an average 65 tonnes of mercury released in the atmosphere.

4. Air Pollution due to Thermal Power Plants :

- Air Pollution from Point Source :** Particulates matter, Gaseous emission - Sulphur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, Hydrocarbon.
- Air Pollution from Non-point Source :** Transportation of coal, Loading/unloading of fuel, Coal storage yard, Fly ash handling & Transportation, Coal storage yard.

Due to above reasons thermal power stations are the main source of pollution.

PART-4**Soil Pollution.****Questions-Answers****Long Answer Type and Medium Answer Type Questions**

Que 3.17. What is the soil / land pollution ? Also discuss its various sources.

Answer

A. Soil / Land Pollution : Soil or land pollution can be defined as the introduction of substances, biological organisms or energy into the soil that lead to a change in the quality of soil so that plant growth and animal health is adversely affected.

B. Sources and Causes of Land Pollution :

The main reasons of soil pollution are as follows :

i. Faulty Agricultural Practices :

ii. Unskilled Irrigation :

a. Water-logging may occur when the drainage system of the agricultural field is not maintained scientifically.

- b. Water-logging closes the passage of air to the soil, stops the growth of soil organisms and makes the soil barren.
- ii. **Shifting Cultivation :** In it, the forest is burnt to use the land for cultivation. However, this practice exposes the soil for soil erosion.
- iii. **Injudicious Use of Chemical Fertilizers :**
 - a. Use of inorganic fertilizers increases the nutrient contamination.
 - b. The microbes of the soil reduce the nitrogen to nitrite ions which enter the animal body through food or water.
- iv. **Pesticides :**
 - a. Large amounts of pesticide in the soil interfere with the soil's metabolic process.
 - b. Pesticides kill many non-targeted beneficial soil organisms such as earthworms. Thus, the soil becomes infertile.
 - c. High concentration of pesticides get accumulated in fatty tissues of prey organisms. When predators eat these prey organisms, they also get killed. Thus, pesticides lead to poisoning of the ecosystem.
- 2. **Mining :** For mining, trees are cut down. Loss of greenery results in land degradation, drought and desertification.
- 3. **Solid Wastes from Homes and Industries :** Chemical, petroleum, and metal-related industries, dry cleaners and gas stations produce hazardous waste such as oils, battery metals and organic solvents. These hazardous wastes contaminate soil and water resources.
- 4. **Acid Rain :** It converts neutral soil to an acidic one.

Que 3.18. Explain the effects and control measures of soil / land pollution.

Answer

A. Effects of Soil / Land Pollution :

Following are the effects of soil / land pollutions :

1. Fluorosis occurs as a result of consumption of fluoride containing maize and jowar crops.
2. Emission of toxic gases (from dumped solid wastes on land) are detrimental to health. The unpleasant smell and spread of insects cause inconvenience to people.
3. Poisoning of the ecosystem takes place by soil pollution.
4. Contamination of underground and surface drinking water takes place by soil pollution.
5. Reduction in the fertility of soil takes place by soil pollution.

B. Control of Land Pollution :

The land pollution can be controlled by the following methods :

1. Polluted soil can be treated by bioremediation. It uses micro-organisms (yeast, fungi or bacteria) to break down, or degrade, hazardous substances into less toxic or nontoxic substances (such as CO_2 and H_2O). Proper treatment of liquid wastes from industries and mines must be done.
2. The principles of three *Rs*, namely, Recycle, Reuse and Reduce, help in minimising the generation of solid waste. For example, use of bio-fertilizers and natural pesticides help in minimising usage of chemical fertilizers and pesticides.
3. Proper disposal methods must be employed. For example, composting of biodegradable solids and incineration of non-biodegradable solids should be done.
4. Planned afforestation help in preventing soil erosion.
5. Formulation and effective implementation of stringent pollution-control legislation also help in controlling soil pollution.

PART-5

Noise Pollution.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.19. What is noise pollution ? Explain in detail of its various sources, effects and control measures.

AKTU 2014-15 (Sem-1), Marks 06

OR

Explain source and effect of noise pollution.

AKTU 2015-16 (Sem-2), Marks 05

OR

What is noise pollution ? Explain the different sources and effects of noise pollution.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

A. Noise Pollution :

1. The unwanted sound in the atmosphere is called noise pollution.

2. Noise is expressed in terms of the unit called decibel (dB). Noise level can range from 0 to more than 120 dB. Noise beyond 120 dB causes physical discomfort.

B. Sources of Noise Pollution :

1. Various industries such as textile mills, printing press, defence equipment.
2. Transport vehicles like trains, trucks, buses, cars etc, also causes noise pollution.
3. Domestic appliances such as mixer, exhaust fans, desert coolers, vacuum cleaners are the sources of noise pollution.
4. Entertaining equipments like radios, television also contribute to noise pollution.
5. Public address systems also form the source of noise pollution.
6. Operations such as blasting, construction work, stone, crushing etc, and use of crackers on festival occasions also contribute the noise pollution.

C. Effects of Noise Pollution :

1. Noise can cause temporary or permanent hearing loss.
2. Noise interfere the communication of man.
3. It causes anxiety and stress.
4. Noise cause dilation of the pupil, impairment of the night vision.
5. It causes emotional disturbances.
6. Damage to heart, brain in animals due to prolonged noise pollution.

D. Control of Noise Pollution :

1. Proper lubrication and maintenance of the machines can reduce the noise.
2. Noisy machines should be installed in sound-proof chambers.
3. Noise producing industries should be located away from the human settlements.
4. There should be silence zones around the residential areas and hospitals.
5. Workers should use ear plugs and ear muffs.
6. Plantation of the certain trees also helps to control noise.

Que 3.20. Give an account of the rules formed by the government to control noise pollution.

Answer

A. Rules formed by Government to Control Noise Pollution :

1. In 2000, the Indian government notified the Noise Regulation Rules under the Environment (Protection) Act of 1986. Two types of noise standards are prescribed : ambient noise level standards and noise limits for designated types of machinery, appliances and fire crackers.
2. The rules regulate noise levels in industrial (75 dB), commercial (65 dB) and residential zones (55 dB), and also establish zones of silence (100 m) near schools, courts, hospitals, etc.

3. The rules specify that no permission could be granted by any authority for use of public address system in the open after 10.00 pm and before 6.00 am. After permission has been procured the sound must fall within the sound limits prescribed in the Noise Rules.

B. Amendment to the Rules : These were made in January 2010, addresses the following issues :

1. Stress has been laid on making the night peaceful. The 'night time' has been defined (10.00 pm to 6.00 am) and restrictions have been imposed on the use of horns, sound emitting construction equipments and bursting of the crackers during night time.
2. 'Public place' has been defined and the occupant of a public place has to restrict the volume of public address system, etc., so that the noise emitting from its activity would not exceed the noise limit more than 10 dBA.
3. Similarly, the occupant of a private place has to restrict the volume of music system, etc., so that the noise emitting from its activity would not exceed the noise limit by more than 5 dBA.
4. State Governments must specify in advance the number and particulars of days, not exceeding fifteen in a year, on which 2 hours exemption (10.00 pm to 12.00 midnight) would be operative for the use of public address system.

PART-6

Solid Waste Management.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 3.21. What is waste ? Discuss different types of solid wastes. Briefly discuss the various criteria for selecting an environmentally safe site for waste disposal.

AKTU 2013-14 (Sem-2), Marks 05

Answer

A. Solid Waste :

The waste materials which have been rejected for further use and which can neither readily escape into the atmosphere nor can be transported by water into streams are called solid waste.

- B. Types of Waste Materials :** Following are the waste materials :
1. **Domestic Wastes :** Domestic garbage refers to household wastes and includes paper, plastic, glass pieces, metal objects, leather, etc.
 2. **Industrial Wastes :** Wastes discharged from paper and pulp industries, metal smelters, oil refineries, chemical industries, etc., are the major types of industrial wastes. These wastes may contain hazardous chemicals such as mercury and cyanide.
 3. **Commercial Wastes :** It includes paper fibres, plastic, packaging material, etc., that are generated as wastes in almost all industries.
 4. **Mining Wastes :** Mining activities result in generation of a lot of waste materials, such as substances that are removed to get to the useful minerals, e.g., topsoil, rocks.
 5. **Radioactive Wastes :** Nuclear explosions, nuclear testing, use of radioactive substances in medical and scientific research, etc., generate sizable amounts of radioactive wastes.
 6. **Agricultural Wastes :** These wastes result from farms, feedlots, and livestock yards and may include paddy husk, bagasse from sugarcane, tobacco and corn residues, etc.
 7. **Hospital Wastes :** Hospital waste includes disposable needles, syringes, blades, blood-soaked bandages, human flesh, tissues, and many more such item that may cause contagious diseases.

C. Selection Criteria of Disposal Site :

The following important factors must be considered when evaluating potential landfill sites for disposal of solid wastes :

1. It is important to ensure that sufficient land area is available for disposal of solid wastes for a reasonable period of time.
2. Haul distance will have significant impact on operating cost. Although route location, local traffic patterns and access conditions must also be considered.
3. It is important that the cover material should be available at or near the landfill site. Therefore the soil conditions and topography of the site must be considered.
4. Climate conditions, e.g., wind patterns and local surface water hydrology of the area has to be considered because these will have impact on the access to landfill sites.
5. It is to be ensured that the movement of leachate and the gases from the landfill will not contaminate the ground water aquifer.

6. Extreme care is necessary in the operation of the landfill so that it is environmentally acceptable with respect to noise, odour, dust, vector control.
7. The issue of the ultimate use of the completed landfill site is to be considered prior to the layout and designed the proposed landfill.

Que 3.22. | What are the adverse effects of solid waste ?

Answer

Following are the various health and environmental hazards of solid waste :

1. Flies and mosquitoes breed on choked drains and gully pits through solid wastes. These flies and mosquitoes then contaminate food and water. In turn, diseases like diarrhea, amoebic dysentery, bacillary dysentery, malaria, dengue, etc. result.
2. Stray animals and scavengers invade the roadside garbage dumps. It results in harming the aesthetic beauty of the surroundings.
3. Bad odours pollute the air as a result of decomposition of organic solid wastes.
4. Percolation of decomposed garbage causes pollution of underground water and land. The crops and water supply get contaminated and result in occurrence of cholera, hepatitis, jaundice, gastro-intestinal diseases.
5. Rats living in solid waste dumping sites rapidly multiply in numbers and may cause plague and other diseases.
6. E-waste is either burnt or buried, so it can have harmful effects on the environment. This is because E-waste contains many hazardous materials like lead, mercury, cadmium, flame retardants, etc.

Que 3.23. | Explain the methods of disposal of solid waste with advantages and disadvantages.

Answer

Following are the methods of disposal of solid waste :

A. Composting :

1. Composting is the thermophilic and aerobic decomposition of organic matter present in solid waste by micro-organisms, mainly bacteria and fungi.
2. As a result of this composting process, the organic matter is transformed into stable humus like substance, which is valuable manure for crops.

Advantages of Composting :

- It makes soil easier to cultivate.
- It helps keep the soil cool in summer and warm in winter.
- It aids in preventing soil erosion by keeping the soil covered.
- It helps in controlling the growth of weeds in the garden.

Disadvantages of Composting : The major drawback of this method is the necessity to separate organic materials from other wastes.

B. Sanitary Landfills :

- Sanitary landfill sites have liner systems and other safeguards to prevent groundwater contamination.
- These sites are consistent with the economic considerations, hydrogeological requirements, climatic conditions and topography.

Advantages of Sanitary Landfills :

- The site is well above the groundwater table, so underground water pollution is avoided.
- The site is easily accessible, so the process is low in cost.
- The site is at least 1.5 km downwind from the commercial and residential areas, so it is not offensive to the surrounding environment.
- The finished sanitary landfill can be used for the development of regions of recreation like parks, golf courses, etc.

Disadvantages of Sanitary Landfills :

- Leachate from sanitary landfill site can contaminate the groundwater.
- The sites cannot be used in future as productive farmland.
- In a sanitary landfill, about 60 % of methane gas (odourless) is generated. When its concentration in air reaches about 5 %, it is explosive and so very hazardous.

C. Combustion : Solid waste is burned at high temperature in combustion facilities.**Advantages of Combustion :**

- Energy is generated.
- Amount of waste is reduced by up to 90 % in volume and 75% in weight.

Disadvantages of Combustion :

- Cost increases with rise in the moisture content of solid waste. This is because energy is required for preheating the solid waste.

- Ash formed after combustion has high concentrations of dangerous toxins such as dioxins and heavy metals. It results in air and water pollution.

D. Incineration :

- It is the controlled combustion of organic solid wastes so as to convert them into incombustible residue and gaseous products.
- The weight and volume of solid waste is reduced and often energy is also produced.

Advantages of Incineration :

- Less transportation cost is required.
- Larger wastes can be accommodated in a given landfill area.

Disadvantages of Incineration :

- Not applicable for radioactive wastes.
- High capital and operational costs.
- Air pollution chances if incineration is not properly done.
- Highly trained manpower is needed.

Que 3.24. What do you mean by solid waste ? Describe various methods of solid waste disposal.

Answer

- Solid Waste :** Refer Q. 3.21, Page 3-20N, Unit-3.
- Methods :** Refer Q. 3.23, Page 3-22N, Unit-3.

Que 3.25. What are different components of a solid waste management system ? Explain interrelationship between each of it.

Answer

The components of solid waste management are as follows :

- Waste Generation :** Those activities in which materials are identified as no longer being of value and are either thrown away or gathered for disposal.
- Onsite Handling, Storage and Processing :** Those activities associated with the handling, storage and processing of solid waste wastes at or near the point of generation.
- Collection :** Those activities associated with the gathering of solid wastes and the hauling wastes after collection to the location where the collection vehicle is emptied.

4. **Transfer and Transport :** Those activities associated with the transfer of wastes from the smaller collection vehicle to the larger transport equipment and the subsequent transport of the wastes, usually over long distance to the disposal site.
5. **Processing and Recovery :** Those techniques, equipments and facilities used both to improve the efficiency of the other functional elements and to recover usable materials, conversion products or energy from solid wastes.
6. **Disposal :** Those activities associated with ultimate disposal of solid wastes including those waste collected and transported directly to the landfill site, semisolid waste from waste water treatment plants, incinerator residue, compost or other substances from various solid waste processing plants that are of no further use.

Interrelationship : Interrelationship between different components of a solid waste management system :

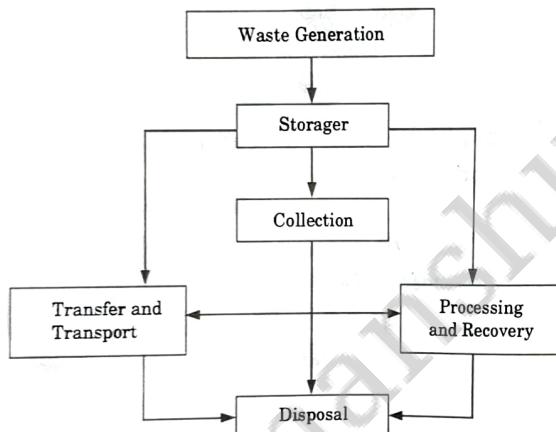


Fig. 3.25.1.

VERY IMPORTANT QUESTIONS

Following questions are very important. These questions may be asked in your SESSIONALS as well as UNIVERSITY EXAMINATION.

- Q. 1. What are the main causes and effects of water pollution ? How can water pollution be controlled ?
Ans: Refer Q. 3.7, Unit-3.
- Q. 2. Define air pollution. What are the sources of air pollutants ? How will you classify air pollutants ?
Ans: Refer Q. 3.10, Unit-3.
- Q. 3. What is noise pollution ? Explain in detail of its various sources, effects and control measures.
Ans: Refer Q. 3.19, Unit-3.
- Q. 4. What is waste ? Discuss different types of soled wastes. Briefly discuss the various criteria for selecting an environmentally safe site for waste disposal.
Ans: Refer Q. 3.21, Unit-3.



4

UNIT

Current Environmental Issues

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PART-1

Global Warming, Green House Effects.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.1. Write a note on global warming.

AKTU 2014-15 (Sem-1), Marks 3.5

OR

"Climate change is the main cause of Global warming." Comment on it.

OR

What is global warming ? What are its causes and effect ? Discuss the measures to control it.

AKTU 2017-18 (Sem-4), Marks 07

Answer

A. Global Warming :

1. Global warming is the term which indicates the increase in the average temperature of the atmosphere.
2. The increased volumes of carbon dioxide and other green house gases released by the burning of fossil fuels and other human activities, contribute to the warming of the earth.
3. The amount of heat trapped in the atmosphere depends mostly on the concentrations of green house gases.
4. The major green house gases are carbon dioxide, ozone, methane, chlorofluorocarbons (CFCs) and water vapours.
5. Due to anthropogenic activities, there is an increase in the concentration of the green house gases in the air, which result in the increase in average surface temperature.

B. Effects :

1. If the emission of green house gases continues, the global temperature will increase.
2. With the increase in global temperature sea water will expand, which will results in sea level. Heating will melt the polar ice caps resulting in further rise in sea level.
3. Result in the floods.
4. Global warming will lead to changes in the rainfall pattern.
5. Loss of biodiversity and destruction of ecosystem.

C. Control Measures :

1. To cut down the current rate of use of CFCs and fossil fuels.
2. Use of renewable energy resources.
3. Aforestation.
4. Stabilization of population growth.

Que 4.2. What is greenhouse effect? What are greenhouse gases? How it is correlated with global warming?

AKTU 2017-18 (Sem-3), Marks 07

OR

What is greenhouse effect? Explain the green house gases and their sources.

Answer**A. Greenhouse effect :**

1. Greenhouse effect is the process by which radiations from the sun are absorbed by the greenhouse gases and not reflected back into space.
2. Due to this, the surface of the earth gets heated up.
3. The greenhouse effect is generally believed to come from the buildup of carbon dioxide gas in the atmosphere.
4. Carbon dioxide is produced when fuels are burned.
5. Plants convert carbon dioxide back to oxygen, but the release of carbon dioxide from human activities is higher than the world's plants can process.
6. Thus, the amount of carbon dioxide in the air is continuing to increase.
7. This build up acts like a blanket and traps heat close to the surface of our earth.

B. Greenhouse gases : These are given in the Table 4.2.1.

Table 4.2.1 : Green house gases and their sources.

Greenhouse Gases	Sources
Carbon dioxide	Fossil-fuel burning, Industrial process, Deforestation.
Methane	Livestock, Paddy fields, Biomass burning, Transport and handling of natural gas, Coal mining, Sewage/landfills.
CFCs	Refrigeration, Foams, Aerosols, Solvents.
Nitrous oxide	Fossil-fuel burning, Fertilizers, Biomass burning, Deforestation, Manure management.

C. Correlation of greenhouse effect with global warming :

1. Global warming refers to a gradual increase in global surface temperatures and the temperature of the Earth's atmosphere.
2. Global warming is associated with the greenhouse effect that is produced when the Earth's surface and atmosphere absorb solar energy and reradiates the energy back into space.
3. A portion of the absorbed energy is emitted by land and oceans, absorbed by the Earth's atmosphere, and reradiated back to the Earth.
4. The greenhouse effect is one of several climate forces, which are the major drivers of Earth's climate.

Que 4.3. "Greenhouse effect at its natural level is very essential for life to exist on this marvelous planet-Earth". Justify the statement.

AKTU 2013-14 (Sem-1), Marks 10

Answer

1. The release of key greenhouse gases (GHGs), such as carbon dioxide, methane, chlorofluorocarbon (CFC), and nitrous oxide, is however, not only due to the burning of fossil fuels, it is also a part of nature's normal processes.
2. Like the panels of a greenhouse, GHGs allow sunlight to pass through the troposphere (lower atmosphere) which heats the Earth's surface.
3. As the heat rises from the surface into the troposphere, some is reflected back to the surface by the molecules of GHGs hence warming the air.
4. This natural trapping of heat or the greenhouse effect has made the earth habitable; without it, Earth would have been a cold, lifeless planet.
5. Therefore, this effect helps to maintain the mean temperature at 15 °C and in the absence of the greenhouse effect, the mean temperature would have been around -18 °C.
6. Their levels in the atmosphere are determined by a balance between 'sources' (processes which release these gases) and 'sinks' (processes, such as photosynthesis, which absorb or remove the gases).

PART-2

Climate Change.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.4. What is climate change? What are the impacts of climate change on environment?

Answer

A. Climate Change :

- Weather is defined as the condition of the atmosphere at a particular place and time. It is characterized by parameters such as temperature, humidity, rain, and wind.
- Climate, on the other hand, refers to the long-term pattern of weather conditions of a given area.
- Climate change refers to the variation in earth's global climate or in regional climates over time.
- From the ice age of the past to the industrial age of the present, the climate of earth has been changing.
- It describes changes in the average state of the atmosphere over time scales ranging from a few decades to millions of years.
- These changes can be caused by earth's internal processes, by external forces such as variations in sunlight intensity, or by human activities.

B. Impacts of Climate Change : Following are the impact of climate change :

1. Positive Impacts : Reduced deaths from cold and higher agricultural outputs in northern regions are few positive impact of global warming.

2. Negative Impacts :

- Submergence of low-lying islands (especially in the Pacific), vast saline inundations in countries like Bangladesh, etc., are linked to rise in sea level.
- The tourism industry will suffer in parts of southern Europe because of change of climate towards hotter than ever before.
- Damaging changes in wildlife behaviour like failure of Scottish seabirds to raise young during the 2004 breeding season.
- Migration of the animals including humans.
- Disturb the hydrological cycle.
- Climate change can result in floods and droughts.
- Green house gases results in increase in average global temperature.

Que 4.5. "The earth system is not and never free from climate change". Comment on it.

Answer

- Weather is the mix of events like temperature, rainfall and humidity that happens every day in our atmosphere.

- Climate is the average weather pattern in a place over many years.
- Our weather is always changing and now it is established that our climate does not stay the same either.
- The average weather over a period of many years differs in regions of the world that receive different amounts of sunlight and have different geographic factors, such as proximity to oceans and altitude.
- Climates will change if the factors that influence them fluctuate.
- To change climate on a global scale, either the amount of heat that is let into the system changes, or the amount of heat that is let out of the system changes.
- For instances, warming climates are either due to increased heat let into the earth or a decrease in the amount of heat that is let out of the atmosphere.

PART-3

Acid Rain.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.6. What is acid rain? What are the causes and effects of acid rain? What remedial measures do you suggest?

OR

What is acid rain? How is it formed? Discuss effect and remedial measures of acid rain.

AKTU 2013-14 (Sem-2), Marks 05

OR

Explain source, cause and effect of acid rain. How it can be controlled?

AKTU 2015-16 (Sem-1), Marks 7.5

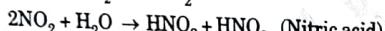
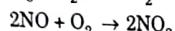
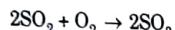
Answer

- Acid Rain :** Oxides of nitrogen and sulphur, dissolve in rain water to form sulphuric acid and nitric acid and come down as acid rain. The pH of acid rain is below 5.6.
- Sources of Acid Rain :**
 - There are two main sources of acid rain:
- Oxides of Sulphur :** SO_2 and SO_3 are released into the atmosphere by the burning of fossil fuels.

- 2. Oxides of Nitrogen :** NO_x are released into the atmosphere by the automobiles exhaust and other sources.

C. Causes of Acid Rain :

1. Acid rain is caused by gases which are given out by the industries.
2. When fuels are burnt, it produces sulphur dioxide. Oxides of nitrogen also originate from the industrial operation.
3. These pollutants go into the atmosphere and react with rain water to form acid and causes acid rain.
4. The reactions can be given as :



D. Effects of Acid Rain :

1. Acid rain causes irritation in eyes and skin of human beings.
2. It causes deterioration of the buildings, especially made of marble.
3. Acid rain can damage buildings, metal, bridges etc.
4. It damage stone statues.
5. Lake acidification result in the destruction of aquatic life.
6. Acid rains change the pH of soils and affect the plant growth in various ways. It affects the enzymatic activities.

E. Remedial Measures for Acid Rain :

1. Acid rain can be controlled by reducing the emission of SO_2 and NO_2 from industries by using pollution control equipments.
2. This can be achieved by using less energy from fossil fuels in power plants, vehicles and industries.
3. Switching to cleaner burning fuels is a way out.
4. For instance using natural gas which is cleaner than coal or we can use coal with low sulphur content.
5. Developing more efficient vehicles will reduce pollutants from being released into the air.
6. If pollutants have already been formed by burning fossil fuels, they can be prevented from entering the atmosphere by using scrubbers in the smokestacks of factories.
7. These spray a mixture of water and limestone into the polluting gases, recapturing the sulphur.
8. In catalytic converters, the gases are passed over metal coated beads in cars.

9. Once acid rain has affected soil, powdered limestone can be added to the soil by a process known as liming to neutralize the acidity of soil.

PART-4

Ozone Layer Formation and Depletion.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.7. What is ozone cycle ?

OR

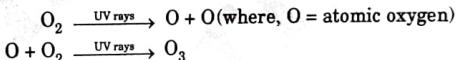
How ozone is formed in stratosphere ?

Answer

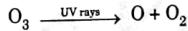
Ozone Cycle :

1. In stratosphere, ozone continuously forms and dissociates through ozone cycle.
2. The formation and dissociation of ozone is a continuous process which remains in dynamic equilibrium (balance) and as a result the concentration of ozone is always maintained in the stratosphere.

3. Ozone Formation :



4. Ozone Dissociation :



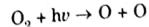
Que 4.8. What is meant by ozone depletion ? How CFC and other ozone depleting substances affect ozone shield ?

AKTU 2014-15 (Sem-2), Marks 06

Answer

A. Ozone Layer Depletion :

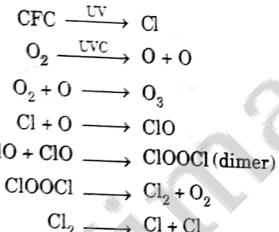
1. Ozone layer filters out harmful ultraviolet radiations from the sunlight and thus protects various life forms on the earth.
2. Ozone is a form of oxygen. In the stratosphere ozone is continuously created by the absorption of short wavelength ultraviolet radiations.
3. These radiations decompose molecular oxygen into atomic oxygen.



4. The atomic oxygen combines with oxygen to create ozone.
 $O_2 + O + M \rightarrow O_3 + M$
5. Ozone molecules absorb the UV light after which ozone splits into a molecule of O_2 and an oxygen atom.
 $O_3 + h\nu \rightarrow O_2 + O$
6. The net result of the reactions is an equilibrium concentration of ozone.
7. This equilibrium is disturbed by reactive atoms of chlorine, bromine which destroy ozone molecules and causes the thinning of ozone layer which is called as ozone hole.
8. The amount of atmospheric ozone is expressed in Dobson units (DU).
9. These reactive atoms have both natural and anthropogenic sources.
10. These elements are found in certain stable organic compounds like chlorofluorocarbons (CFCs) which may enter in the stratosphere.
11. These Cl and Br atoms liberated from the parent compound can destroy ozone molecules.

B. Effect of CFC on Ozone Shield :

1. CFCs are powerful ozone destroyers.
2. They rise slowly from the earth's surface into the stratosphere.
3. Here, under the influence of high-energy ultraviolet (UV) radiation, they break down and release chlorine atoms, which speed up the breakdown of an ozone molecule (O_3) into an oxygen molecule (O_2) and oxygen atom (O).
4. One CFC molecule can break down 100,000 ozone molecules through catalytic chain reactions.
5. The mechanism of ozone depletion involving CFC can be summarized as follows :



6. Equations (i) to (iii) indicate the state of equilibrium between ozone formation and destruction cycle.
7. Hence, CFC does not destroy the ozone layer directly, but they act as carriers for the chlorine to the upper atmosphere.

Que 4.9. Explain the various adverse effect of ozone layer depletion and give the control measure of it.

Answer**A. Effect of Ozone Layer Depletion :**

- In the absence of an ozone layer, these ultraviolet radiations could cause the following problems :
1. Swelling of skin and skin cancer, skin aging, burning sensation.
 2. Death of phytoplanktons in marine environment (the sole producers) leading the entire ecosystem to collapse.
 3. Reduction in the body ability to fight off disease, as UV suppresses the immune system, premature aging.
 4. Inhibition and alteration of DNA replication and formation of DNA adduct, leukemia, breast cancer.
 5. Visual impairment, dizziness, cataracts of eyes.
 6. Damage to plants, reduction in crop yields, faster deterioration of paints, fabrics, plastics.

B. Remedial Measures to Control Depletion of Ozone Layer :

1. Spread awareness about the restricted use of CFCs (Chlorofluorocarbons) for the healthy survival of mankind.
2. Avoid purchasing and using refrigerators, air-conditioners, etc., which use CFCs, freons, etc. as coolants.
3. Ban atmospheric nuclear explosions, as they emit NO and deplete the ozone layer.
4. Avoid any fire extinguisher that contains bromine-based halons. Preferably use water, carbon dioxide or dry chemical fire extinguisher.
5. Reduce the air-traffic of supersonic aircrafts that fly at ozonosphere altitude, as they release large amount of NO and deplete the ozone layer.
6. Montreal protocol was signed in 1987 which is a treaty for protection of ozone layer which bans the use of CFCs.
7. Facilitate advance research to plug ozone holes that have already been formed.

PART-5**Population Growth.****Questions-Answers****Long Answer Type and Medium Answer Type Questions**

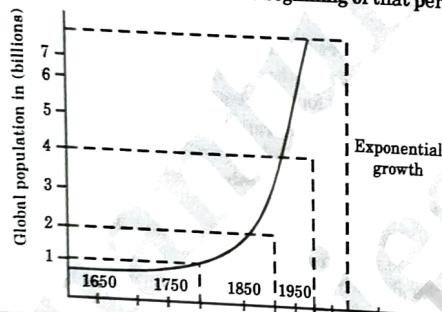
Que 4.10. Write short note on population growth.

Answer

- An increase in the number of people that reside in a country, state, county, or city is known as population growth.
- To determine the population growth, the following formula is used: $(\text{birth rate} + \text{immigration}) - (\text{death rate} + \text{emigration})$.

Population Growth Rate :

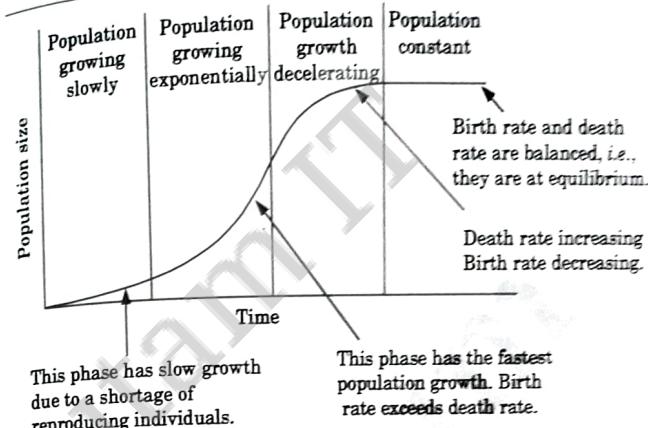
- The "population growth rate" is the rate at which the number of individuals in a population increases in a given time period, expressed as a fraction of the initial population.
- Specifically, population growth rate refers to the change in population over a unit time period, often expressed as a percentage of the number of individuals in the population at the beginning of that period.



- Fig. 4.10.1.** Global population growth trends in the last four centuries.
- A positive growth rate indicates that the population is increasing, while a negative growth rate indicates that the population is decreasing.
 - A growth ratio of zero indicates that there were the same number of individuals at the beginning and end of the period.
 - A growth rate may be zero even when there are significant changes in the birth rates, death rates, immigration rates, and age distribution between the two times.

Que 4.11. Explain sigmoidal curve of population growth.**Answer**

- Any population that grows exponentially starts slowly and then goes through a rapid growth phase and then levels off, once the carrying capacity of the area is reached. If we plot a graph (for the above case), it yields an S-shaped curve.

**Fig. 4.11.1.**

2. S-shaped curve can be divided into three phases :
 - Exponential.
 - Transitional.
 - Plateau.
3. Population growth is fastest during the exponential growth phase as : $\text{birth rate} + \text{immigration} > \text{death rate} + \text{emigrations}$.
4. Population growth slows down during the transitional phase as disease, predation and competition set limits to increase in population.
5. Population growth is zero at the plateau phase as it has reached its carrying capacity.

Que 4.12. What are causes and effects of population growth ?**Answer**

- Causes of Population Growth :**
 - Conquest of Diseases :** Population has shown a remarkable increase during the past few decades because of the improvement in medical facilities and cure of dreaded diseases.
 - Improved knowledge about nutrition, vaccinations, better public health practices, and the development of new medicines have led to much lower death rate than ever before and its rate is decreasing further each year.
- Poverty :** People who live below the poverty line wrongly believe that more children mean additional hands to work : to help in the

- fields, to work for wages or to beg on the streets, to fetch water and fuel wood, to look after younger sibling while the parents work, and to look after the parent in their old age.
3. **Preference of Sons :** One of the most disturbing trends in India is the preference of sons; this attitude is found in all strata of the society and is not restricted to poor and uneducated people.
 4. **Early Marriage :** Another reason for the high birth rate is the custom of child marriage, which involves marrying off young children even before they have attained a marriageable age, particularly in rural areas.
 5. **Illiteracy :** It is another factor responsible for high birth rate. Illiterate people have no access to information related to family planning and hence are largely responsible for growth in population.

B. Effects of Population Growth :

- Following are the adverse effects of population growth :
1. Excessive growth in population leads to more deforestation activities in order to meet the requirements of fuel wood, agriculture, settlements, and also for industrial establishments.
 2. The indiscriminate felling of trees for agricultural expansion and timber products also leads to the degradation of watersheds affecting the water-catchment areas.
 3. Population growth affects the natural resources availability. It causes increased demand for food, water, arable land, and other essential materials, such as firewood. Excessive exploitation of natural resources causes ecological imbalance in nature.
 4. An increase in the number of people, with majority living in poverty, puts tremendous pressure on social, health, and educational services.
 5. Unemployment is another serious problem arising because of overpopulation.
 6. Owing to the growing population, water resources are exploited for various purposes including domestic, livestock, and industrial use.
 7. It has lead to the extensive economic activities and rising pollution in rivers, lakes, and ponds. Water crisis also leads to conflicts over water allocation and use.

Que 4.13. Explain the term 'Population Explosion'. Enumerate and discuss its effects on environment.

AKTU 2013-14 (Sem-1), Marks 10

Answer

A. Population Explosion :

1. A drastic growth in population beyond normal limits is called population explosion.

- Population explosion refers the sudden and rapid rise in the size of population, especially human population.
2. It is an unchecked growth of human population caused as a result of :
 - i. Increased birth rate,
 - ii. Decreased infant mortality rate, and
 - iii. Improved life expectancy.
 4. It is more prominent in under-developed and developing countries than in developed countries.
- B. Causes :** The causes of population explosion are as follows :
1. **Accelerating Birth Rate :** Due to lack of awareness about the positive impact of using birth control method, there has been a steady growth in birth rate.
 2. **Decrease in Infant Mortality Rate :** An improvement in medical science and technology, wide usage of preventive drugs (vaccines), has reduced the infant mortality rate.
 3. **Increase in Life Expectancy :** Due to improved living conditions, better hygiene and sanitation habits, better nutrition, health education, etc. the average life expectancy of human population has improved significantly.
 4. **Increased Immigration :** An increase in immigration often contributes towards population explosion, particularly in developed countries. It happens when a large number arrive at an already populated place with the intention to reside permanently.
- C. Effects :** The effects of population explosion in India are as follows :
1. Over-population.
 2. Unemployment.
 3. Poverty.
 4. Illiteracy.
 5. Poor health economy.
 6. Pollution and global warming.

Que 4.14. Discuss population explosion in Indian context. What are the major cause and effect of population explosion ?

AKTU 2017-18 (Sem-4), Marks 07

Answer

A. Population Explosion in Indian Context :

1. A drastic growth in population beyond normal limits is called population explosion.

2. It is more prominent in under-developed and developing countries than in developed countries.
3. However, in context to India, it refers to the rapid increase in population in post-independence era.
4. The population of India was around 360 million during the census of 1951. It reached over 1.21 billion during the census of 2011.
5. The fastest rise in the population of India was during the period of 1951 to 1981, in which the population was from 360 million in 1951 was reached around to 700 million in 1981.
6. During this period of 30 yr, population increases around 340 million, which is the fastest rise in the history of population statistics.
7. Some statistics relating to population growth indicate that by 2030, the population of India is likely to pass the 1.5 billion mark.
8. Thus, there is no denying that India is currently experiencing a population explosion.

B. Causes and Effects : Refer Q. 4.13, Page 4-13N, Unit-4.

Que 4.15. Explain Pyramid, Bell and Urn shape of population with examples.

AKTU 2015-16 (Sem-2), Marks 10

Answer

Population Pyramids :

The proportion of different age groups in any population is generally expressed graphically in the form of pyramids. These pyramids are known as population pyramids. There are three types of population pyramids:

1. **Broad-based Pyramid or Expanding-age Pyramid :** In a rapidly growing population, birth rate is high, and population growth is exponential. So each successive generation will be more numerous than the preceding one, and the shape of the age structure is like a pyramid.
2. **Bell-shaped Polygon :** As the rate of growth of a population slows and stabilizes, the reproductive and pre-reproductive age groups become almost equal in size while the post-reproductive group is the smallest and thus a stable age pyramid or bell-shaped polygon is formed.

Age group

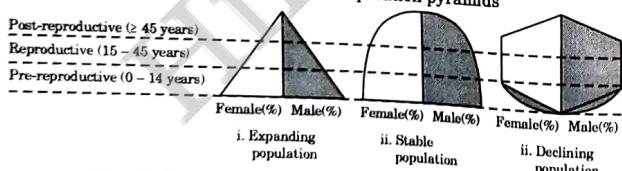


Fig. 4.15.1. Age distribution and population pyramids.

3. **Urn-shaped Pyramid :** If the birth rate is drastically reduced, the pre-reproductive group decreases in proportion to the reproductive and post-reproductive group and thereby, an urn-shaped pyramid is formed. This type of age pyramid is also known as a diminishing-age pyramid and it is the representation of a population that is dying off.

PART-6

Automobile Pollution.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.16. Define automobile pollution. What are the causes and sources of automobile pollution ?

Answer

A. Automobile Pollution :

1. It may be defined as pollution which includes air and noise pollution caused by a vehicle powered by either spark ignition or compression ignition internal combustion engine or generating power to drive such vehicle by burning fuel.
2. This definition includes the automobile air pollution are emissions from cars and other vehicular traffic consisting chiefly of carbon monoxide, nitrogen oxides, unburned gasoline, carbon dioxide and lead.

B. Causes of Automobile Pollution :

The reasons of automobile pollution are as follows :

1. Absence of effective mass rapid transport system and intra-city railway networks.
2. High population of humans and vehicles in the urban cities.
3. Improper traffic management system and road conditions.
4. Inadequate inspection and maintenance facilities.
5. Adulteration of fuel and fuel products.
6. Older vehicles (with old inferior technology) still allowed to operate on roads.
7. Faulty engine.

C. Sources of Automobile Pollution :

1. The various sources of emission from automobiles are as follows :
 - i. Exhaust system.

- ii. Fuel tank and carburetor.
- iii. Crankcase.
2. The exhaust system produces pollution like unburnt hydrocarbons, CO, NO_x and lead oxides.
3. Evaporation from fuel tank goes on constantly due to volatile nature of petrol causing emission of hydrocarbons.
4. Evaporation from carburetor continues as the engine is stopped and emits hydrocarbons.

Que 4.17. Describe the adverse effects of various pollutants in automobile pollution. Suggest the measures of control it.

Answer

A. Adverse Effects of Various Pollutant in Automobile Pollution:

Table 4.17.1. Health and environmental effects of automobiles emissions.

S. No.	Pollutant in Automobile Exhaust	Health Effects	Environmental Effects
1.	CO	Headaches and fatigue	Increases greenhouse gases
2.	Volatile organic compounds	Headaches, eyes and skin irritation, nausea	Smog precursor
3.	NO _x	Respiratory and cardiovascular illness	Eutrophication and overfertilization due to nitrogen deposition
4.	Particulate matter	Particles penetrate deep into lungs and can blood stream	Visibility
5.	Lead [from combustion of fuel having tetra ethyl lead]	Damages nervous system.	Kills animals and fishes

B. Technical Measures for Controlling the Problem of Automobile Pollution :

These are as follows :

1. Upgradation of technology (for production of vehicles, for combustion of fuels, for zero emissions etc.).
2. To provide urban roads, flyovers and mass transit systems.
3. To enhance fuel quality.
4. To use unleaded petrol for the petrol fuelled engine.

C. Control Measures :

Following are the control measures of automobile pollution are :

1. Change oil at recommended time.
2. Use good quality lubricant.
3. Inspect spark-plug clearance and replace it, if necessary.
4. Maintain appropriate tyre pressure.
5. Tune and dirt free the carburetor.
6. Maintain and service the vehicle at regular intervals.
7. Drive at recommended speed.

PART-7

Burning of Paddy Straw.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 4.18. Why do farmers burn paddy straw (stubble) ? What are the advantages of stubble burning ?

Answer

Following are the reasons farmers burn paddy straw :

1. They do not have alternatives for utilising paddy straw effectively.
2. The farmers are ill-equipped to deal with waste because they cannot afford the new technology that is available to handle the waste material.
3. With less income due to crop damage, farmers are likely to be inclined to light up their fields to cut costs and not spend on scientific ways of stubble management.
4. Burning straw is considered a low-cost solution alternative to tilling in the straw.

Advantages of stubble burning :

1. It quickly clears the field and is the cheapest alternative.
2. Kills weeds, including those resistant to herbicide.
3. Kills slugs and other pests.
4. Can reduce nitrogen tie-up.

Que 4.19. What are the effects of paddy straw (stubble) burning ?

Answer

Following are the effects of paddy straw (stubble) burning :

A. Pollution :

- Open stubble burning emits large amounts of toxic pollutants in the atmosphere which contain harmful gases like methane (CH_4), Carbon Monoxide (CO), and volatile organic compound (VOC). They may eventually cause smog.
- Stubble burning causes severe pollution of land and water on local as well as regional and global scales.
- Pollution from stubble burning significantly reduced lung function.
- Pollution from stubble burning causes increase in respiratory symptoms.

B. Soil Fertility :

- Burning husk on ground destroys the nutrients in the soil, making it less fertile.
- Paddy straw burning causes deterioration of soil biological health.

C. Heat Penetration :

- Heat generated by stubble burning penetrates into the soil, leading to the loss of moisture and useful microbes.
- Soil microbial population and enzymes significantly decreased after straw burning.

Que 4.20. What are the major pollutants emitted during paddy straw (stubble) burning ?

Answer

Following are the major pollutants emitted during paddy straw (stubble) burning :

Category	Pollutants	Source
Particulars	SPM (PM_{10})	Incomplete combustion of inorganic material, particle on burnt soil
	RPM (PM_{10})	Condensation after combustion of gases and incomplete combustion of organic matter
	FPM ($\text{PM}_{2.5}$)	
Gases	CO	Incomplete combustion of organic matter
	NO_2	Oxidation of N_2 in air at high temperature
	N_2O	
	O_3	Secondary pollutant, form due to Nitrogen Oxide and Hydrocarbon
	$\text{CH}_4/\text{Benzene}$	Incomplete combustion of organic matter
	PAH_8	Incomplete combustion of organic matter

SPM Suspended particulate matter; PM particulate matter; FPM fine particulate matter

Que 4.21. What are the alternative solutions that can be used to avoid straw (stubble) burning ?

Answer

Following are the alternative solutions that can be used to avoid straw (stubble) burning :

- Use of rice residue as fodder for animals :** Naturally fermented paddy straw can be used as protein enriched livestock feed.
- Use of crop residue in bio thermal power plants :** The rice residue can be used for generation of electricity.
- Use of rice residue as bedding material for cattle :** The farmers can use paddy straw as bedding material for cows during winters. Paddy straw bedding helped the animals keep themselves warm and maintain reasonable rates of heat loss from the body.
- Use of crop residue for mushroom cultivation :** Paddy straw can be used for the cultivation of mushroom.
- Use of rice residue in paper production :** The paddy straw is also being used in conjunction with wheat straw in 40:60 ratios for paper production.
- Use of rice residue for making biogas :** The farm residue can be processed into biogas.
- Incorporation of paddy straw in soil :** The incorporation of the straw in the soil has a favorable effect on the soil's physical, chemical and biological properties such as pH, Organic carbon, water holding capacity and bulk density of the soil.
- Production of bio-oil from straw and other agricultural wastes :** Bio-oil is a high density liquid obtained from biomass through rapid pyrolysis technology. Bio-oil can be produced from paddy straw and other agricultural wastes.

VERY IMPORTANT QUESTIONS

Following questions are very important. These questions may be asked in your SESSIONALS as well as UNIVERSITY EXAMINATION.

Q. 1. What is global warming ? What are the causes, effects and control measures of global warming ?

Ans. Refer Q. 4.1, Unit-4.

Q. 2. What is greenhouse effect ? What are greenhouse gases ? How it is correlated with global warming ?

Ans. Refer Q. 4.2, Unit-4.

Q. 3. What is acid rain ? What are the causes and effects of acid rain ? What remedial measures do you suggest ?

Ans. Refer Q. 4.6, Unit-4.

Q. 4. What is meant by ozone depletion ? How CFC and other ozone depleting substances affect ozone shield ?

Ans. Refer Q. 4.8, Unit-4.

Q. 5. Discuss population explosion in Indian context. What are the major cause and effect of population explosion ?

Ans. Refer Q. 4.14, Unit-4.



Environmental Protection

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PART- 1**Environmental Protection Act 1986.****Questions-Answers****Long Answer Type and Medium Answer Type Questions**

Que 5.1. What is an environment policy ? Name some of the legislations present in India for environment protection.

AKTU 2013-14 (Sem-2), Marks 05

Answer**A. Environmental Policy :**

1. An environmental policy is a statement about an organization's environmental position and values.
2. The ISO 14001 standard states that an environmental policy is the organization's overall environmental performance intentions and direction formally expressed by top management.
3. In 1980, the union government established the department of environment. It became the Ministry of Environment and Forest (MoEF) in 1985.
4. This ministry initiates and oversees the implementation of environmental policies, plans, laws and regulations.
5. MoEF prepared the first national environmental action plan in December 1993, setting environmental priorities.
6. Later the ministry has come out with a National environmental policy.

B. Legislations : There are various legislations present in India for environmental protection :

1. Wildlife (conservation) Act, 1972,
2. Forest (conservation) Act, 1980
3. The Water (Prevention and control of pollution) Act, 1974.
4. The Air (Prevention and control of pollution) Act, 1981
5. The Environmental (Protection) Act, 1986.

Que 5.2. Discuss the salient feature of the environment protection Act, 1986.

AKTU 2017-18 (Sem-4), Marks 3.5

OR

Why do we refer Environmental Protection Act, 1986 as an Umbrella Act? Discuss the Environmental Protection rules 1986.

AKTU 2014-15 (Sem-2), Marks 06

AKTU 2017-18 (Sem-3), Marks 07

Answer

A. Environmental Protection Act, 1986 Refer as an Umbrella Act, because :

1. In the wake of Bhopal tragedy, the Government of India enacted the Environment (Protection) Act, 1986 (EPA) under article 253 of the Constitution. The purpose of the Act is to act as an "umbrella" legislation designed to provide a frame work for Central government co-ordination of the activities of various central and state authorities established under previous laws, such as Water Act and Air Act.
2. The potential scope of the Act is broad, with environment. Environment (Protection) Act is a landmark legislation to provide a single focus in the country for the protection of environment and to plug loopholes in the earlier laws.

B. Environment (Protection) Act, 1986 :

It is the umbrella legislation which authorises the Central Government to :

- i. Protect and improve environmental quality,
- ii. Control and reduce pollution from all sources, and
- iii. Restrict or prohibit the selling and/or operation of any industrial facility on environmental grounds.

According to the Act, the term 'environment' includes water, air and land and the inter-relationship which exists among and between water, air, land, human beings, other living creatures, microorganisms, plants and property.

C. Provisions : The main provisions of the Act are given below :

- i. The Central Government shall have the power to take all such measures as it deems necessary or useful for the purpose of protecting and improving the quality of the environment and preventing, controlling and decreasing environmental pollution.
- ii. No person carrying on any industry, operation or process shall discharge or emit any environmental pollutants or permit to do so in excess of such standards as may be prescribed.
- iii. No person shall handle or cause to be handled any hazardous substance except in accordance with such procedure and after complying with such safeguards as may be prescribed.

- iv. The Central Government or any officer empowered by it in this behalf, shall have power to take, for the purpose of analysis, samples of air, water, soil or other substance from any premises, factory, etc., as may be prescribed.
- v. The Central Government may, by notification in the Official Gazette, establish one or more environmental laboratories, and recognise one or more laboratories or institutes as environmental laboratories to carry out the functions assigned to an environmental laboratory under this Act.
- vi. Whoever fails to comply with or violate any of the provisions of this Act, or the rules made or orders or directions issued thereunder, shall, in respect of each such failure or violation, be punishable with imprisonment or with fine or with both.

D. Under the Environmental (Protection) Rules, 1986 the State Pollution Control Boards have to follow the guidelines provided under Schedule VI, some of which are as follow :

- i. They have to advise the industries for treating the waste water and gases with the best available technology to achieve the prescribed standards.
- ii. The industries have to be encouraged for recycling and reusing the wastes.
- iii. They have to encourage the industries for recovery of biogas, energy and reusable materials.
- iv. While permitting the discharge of effluents and emissions into the environment, the State Boards have to take into account the assimilative capacity of the receiving water body.
- v. The Central and State Boards have to emphasize on implementation of clean technologies by the industries in order to increase fuel efficiency and reduce the generation of environmental pollutants.

Que 5.3. Discuss the salient features of Forest (Conservation) Act, 1980.

OR

Write in detail about Forest Act. AKTU 2014-15 (Sem-1), Marks 06

Answer

A. Forest (Conservation) Act, 1980 :

1. This Act deals with the conservation of forests and related aspects. Except J & K, the Act is adopted all over India.
2. The Act covers under it all types of forests including reserved forests, protected forests or any forested land irrespective of its ownership.
3. 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.

B. 1992 Amendment in the Forest Act :

1. In 1992, some amendments were made in the Act which made provisions for allowing some non-forest activities in forests. The activities such as setting of transmission lines, seismic surveys, exploration, drilling and hydroelectric projects, require prior approval of the Centre Government.
2. Wildlife sanctuaries, national parks etc., are totally prohibited for any exploration or survey under this Act without prior approval of Central Government even if no tree-felling is involved.
3. Cultivation of tea, coffee, spices, rubber and plants which are cash-crops, are included under non-forestry activity and not allowed in reserve forests.
4. Even cultivation of fruit-bearing trees, oil-yielding plants or plants of medicinal value in forest area need to be first approved by the Central Government.
5. Tusser cultivation (a type of silk-yielding insect) in forest areas by tribal's as a means of their livelihood is treated as a forestry activity as long as it does not involve some specific host tree like Asan or Arjun. This is done in order to discourage monoculture practices in the forests which are otherwise rich in biodiversity.
6. Plantation of mulberry for rearing silkworm is considered a non-forest activity. Mining is a non-forestry activity and prior approval of Central Government is mandatory.
7. Removal of stones, bajri, boulder etc. from river-beds located within the forest area fall under non-forest activity.
8. Any proposal sent to Central Government for non-forest activity must have a cost-benefit analysis and Environmental Impact Statement (EIS) of the proposed activity with reference to its ecological and socio-economic impact.

Thus, the Forest (Conservation) Act has made ample provisions for conservation and protection of forests and prevents deforestation.

Que 5.4. Discuss the salient features of water (prevention and control of pollution) Act 1974.

OR

What are the main objectives of "Water (Prevention and Control of Pollution) Act, 1974"? Write the functions of CPCB in "The Water (Prevention and Control of Pollution) Act, 1974".

AKTU 2013-14 (Sem-2), Marks 05

OR

Explain the role of Central Board for Pollution Control and State Board for Pollution Control for controlling pollution.

AKTU 2015-16 (Sem-2), Marks 05

OR

Explain the water (prevention and control of pollution) Act.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

A. Water (Prevention and Control of Pollution) Act, 1974 :

It provides for maintaining and restoring the wholesomeness of water by preventing and controlling its pollution.

The salient features and provisions of the Act are summed up as follows :

1. It provides for maintenance and restoration of quality of all types of surface and ground water.
2. It provides for the establishment of Central and State Boards for pollution control.
3. It confers them with powers and functions to control pollution.
4. The Central and State Pollution Control Boards are widely represented and are given comprehensive powers to advise, coordinate and provide technical assistance for prevention and control of pollution of water.
5. The Act has provisions for funds, budgets, accounts and audit of the Central and State Pollution Control Boards.
6. The Act makes provisions for various penalties for the defaulters and procedure for the same.

B. Function of Central Pollution Control Board (CPCB) :

1. It advises the Central Government in matters related to prevention and control of water pollution.
2. Coordinates the activities of State Pollution Control Boards and provides them technical assistance and guidance.
3. Organizes training programs for prevention and control of pollution.
4. Organizes comprehensive programs on pollution related issues through mass media.
5. Collects, compiles and publishes technical and statistical data related to pollution.

6. Prepares manuals for treatment and disposal of sewage and trade effluents.
7. Lays down standards for water quality parameters.
8. Plans nation-wide programs for prevention, control or abatement of pollution.
9. Establishes and recognizes laboratories for analysis of water, sewage or trade effluent sample.

C. Function of State Pollution Central Boards :

1. The Board advises the State Government with respect to the location of any industry that might pollute a stream or a well.
2. It lays down standards for effluents and is empowered to take samples from any stream, well or trade effluent or sewage passing through an industry.
3. The State Board is empowered to take legal samples of trade effluent in accordance with the procedure laid down in the Act. If the samples do not conform to the prescribed water quality standards (crossing maximum permissible limits), then 'consent' is refused to the unit.
4. Every industry has to obtain consent from the Board (granted for a fixed duration) by applying on a prescribed Performa providing all technical details, along with a prescribed fee following which analysis of the effluent is carried out.
5. The Board suggests efficient methods for utilization, treatment and disposal of trade effluents.

Que 5.5. Discuss the salient features of the Air (Prevention and Control of Pollution) Act, 1981.

Answer

Air (Prevention and Control of Pollution) Act, 1981 :

This is an act to provide for the prevention, control and reduction of air pollution in the country so as to preserve the quality of air.

Salient Features of the Air Act, 1981 :

The salient features of the Air (Prevention and Control of Pollution) Act 1981 are as follows :

1. Act is applicable to the whole of India.
2. Under section 19 of the Act, the State Government in consultation with the State Pollution Control Board (SPCB) has the power to declare Air Pollution Control Area, in which provisions of the Act shall be applicable.
3. As per provisions in section 21(1) and (2), no person can establish or operate any industrial plant without the previous consent of the State Pollution Control Board.

4. Every application for consent shall be made in Form I and shall be accompanied by a prescribed fee. Within a period of four months after the receipt of application, the Board shall complete the formalities to either refuse or grant consent. During the course of processing consent for the application, the Board may seek any information about the industry after giving notice in Form II.
5. Under section 22, 22(A) operating any industrial plant so as to cause emission of any air pollutant in excess of standard laid down by the State Board is liable for legal action by the Board.
6. Under section 2(a), the term air pollutant is defined as any solid, liquid or gaseous substance present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Act has the objectives as, prevention, control and abatement of air pollution, maintaining the quality of air and establishment of boards for prevention and control of air-pollution.

Powers of Central Boards :

1. Power to declare air pollution control areas.
2. Power to establish standards for emission of air pollutants from automobiles.
3. Power to restrict use of certain industrial plants.
4. Power of entry and inspection.
5. Power to take samples.
6. Penalties for violations of the provisions under the Act.

Que 5.6. Discuss the salient features of wildlife conservation act, 1972.

Answer

The major activities and provisions in the Act can be summed up as follows :

1. It defines the wildlife related terminology.
2. It provides for the appointment of Wildlife Advisory Board, wildlife warden, their powers, duties etc.
3. Under the Act, comprehensive listing of endangered wildlife species was done for the first time and prohibition of hunting of the endangered species was mentioned.
4. Protection to some endangered plants like Beddome cycad, Blue vanda, Ladies slipper orchid, Pitcher plant etc., is also provided under the Act.
5. The Act provides for setting up of National Parks, Wildlife Sanctuaries etc.
6. The Act provides for the constitution of Central Zoo Authority.

7. There is provision for trade and commerce in some wildlife species with license for sale, possession, transfer etc.
 8. The Act imposes a ban on the trade or commerce in scheduled animals.
 9. It provides for legal powers to officers and punishment to offenders.
 10. 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.

Que 5.7. Discuss the issues involved in enforcement of environmental legislation.

Answer

Issues involved in enforcement of environmental legislations are as follows :

1. **Public Apathy :** Crime of pollution is a white collared crime and taken for granted.
2. **Limitations of Regulating Agencies :**
Despite the existence of Wildlife Act, wildlife department has no provision to punish poachers and unauthorized hunters. Penalties are nominal cash fines.
3. **Legal Loopholes :** Cases filed by State Pollution Control Boards are still pending for years as they are submitted in lower courts which are very busy. Polluters take benefit of this. The Factories Act, 1948 is an important legislation which provides measures for industrial safety, health of workers and welfare measure but is not followed.
4. Ecological footprints of urban citizens are getting larger day by day.
5. Pollution Control Boards cannot take actions against municipal corporations or other civic bodies. They can't fight rich industrialists.
6. Lack of scientific knowledge about Persistent Organic Pollutants (POPs).
7. **Poverty :** Poor's does not have money to practice environmental conservation strategies. Food, shelter, clothing, medicine, minimum education for their children is their prime priority.

PART-2

Initiatives by Non Governmental Organizations (NGO's).

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.8. Explain the role of NGOs in environmental protection.

AKTU 2017-18 (Sem-3), Marks 07

OR

Describe the role of NGOs in environmental protection. Also explain the NGOs working in India.

OR

Explain the need and functions of NGO's for environmental conservation.

AKTU 2017-18 (Sem-4), Marks 3.5

Answer

A. Role of NGOs in Environmental Protection :

1. Non-governmental organizations play an important role in affecting public perception in the field of environment.
2. NGO has a great potential to be efficient and effective in the delivery of programmes and projects.
3. Environmental education and awareness among children and people, environmental pollution control, protection of forest wealth, wild life conservation, and sustainable development are some of the objectives of NGOs.
4. NGO can be considered as a real force for the protection of environment in any community.
5. There are number of voluntary agencies, community groups, academic bodies, etc., are involved in environmental works in India.
6. This may be attributed to the growing awareness of the people about the depletion of natural resources.

B. NGOs Working in India :

1. Assam Science Society :

- i. The society was established in 1953 and has 75 branches all over the country.
- ii. It imparts environmental education and training through camps for teachers and students and conducts surveys pertaining to environment issues.

2. BAIF Development Research Foundation Kamdhenu :

This was set up in 1967 at Urli Kanchan, in Pune District of Maharashtra with an aim to improve the quality of life through regeneration of degraded resources such as land, livestock, water, and vegetation.

3. Bombay Natural History Society :

- i. One of the oldest organizations devoted to research of wildlife, the Bombay Natural History Society (BNHS) was established in September 1883 in Mumbai.

- ii. It disseminates knowledge of flora and fauna by means of lectures, field trips, literature, and expeditions.
- iii. A variable ready-reckoner on the condition of biodiversity in the country, BNHS is actively involved in the study of wildlife related problems and subsequent recommendation of conservation plans to preserve wildlife and its habitat.

4. Centre for Environment Education :

- i. Centre for Environment Education (CEE) was set up in 1984 at Ahmedabad with branches all over the country.
- ii. It conducts widespread environmental education and training programmes through its vast network.
- iii. It has also taken up projects related to conservation of biodiversity and ecological development.

5. Indian Association for Environment Management :

This was set up in 1963 at Nagpur, Indian Association for Environment Management (IAEM) promotes conservation of environment and also undertakes dissemination of environmentally sound practices.

6. Narmada Bachao Andolan :

- i. This people's movement was set up in 1986 under the leadership of Medha Patkar to take up the cause of local people against the construction of dams on Narmada River under the Sardar Sarovar mega project in Madhya Pradesh, Maharashtra and Gujarat.
- ii. The Gandhian style of non-violent opposition stirred the whole nation in the 1980s as the Andolan questioned the logic of mega power projects in the name of development.
- iii. The movement aims mainly to take up the cause of those directly affected by large development projects, and spread awareness on the social and environmental impacts of such projects and the need for factoring those costs in the construction of such projects.

7. Rajasthan Environment Preservation Society :

This was set up in 1985 at Jaipur to work towards pollution control, afforestation, ecological, and environmental protection.

Que 5.9. Explain the need and functions of NGOs for pollution control.

AKTU 2015-16 (Sem-1), Marks 7.5

Answer

A. Need of NGOs for Pollution Control :

1. The task of pollution control in India is complex.
2. A comprehensive approach involving the NGO's for pollution control is required.

3. The NGO's are required to educate the public about pollution control measures to be taken.
- B. Functions of NGOs for Pollution Control :**
1. The success of India's environmental programmes depends greatly on the awareness and consciousness of the people. NGOs can help in achieving this goal.
 2. NGOs can organise environmental awareness campaign to sensitise people to the environmental problems through audio-visual programmes, seminars, symposia, training programmes etc.
 3. NGOs can involve the local people to play an active role in preventing poaching, deforestation and environmental pollution.
 4. NGOs help in creating environmental awareness.
 5. NGO's helps to disseminate information on environmental issues.
 6. NGO's helps in spreading the message of sustainable development to the public.

Que 5.10. What are the initiatives taken by NGOs for environment protection ?

Answer

1. NGOs usually act as mediators between governments and citizens.
2. They work at grass roots or community level as also with poor or socially disadvantaged people and provide them necessary support.
3. Most of the NGOs get government funding or aid from their agencies. However, there are NGOs that do not accept funds from others and funds through charities.
4. Various NGOs work hard to rally public opinion. The efforts of these groups have brought changes in the policy of some companies.

Example-1 :

- i. Shell, the oil giant, wanted to dump its worn out oil ship, the Brent Spar in North Sea.
- ii. Greenpeace played a crucial role in preventing this to happen. Greenpeace organized a boycott of service stations of Shell in Germany.
- iii. The sales fell, Shell adopted another way of disposal of Brent Spar.

Example-2 :

- i. Taiwan which wanted to buy a piece of land in North Korea to dump its nuclear waste.
- ii. The Korean Federation of Environmental Movement opposed this move and succeeded.

Example-3 :

- i. In India, Chipko Movement presents a typical case of how people-both men and women mostly living around forests organized themselves in a group to save the forests.

- ii. In 1970s, India's forest cover was declining. It directly affects forest dwellers who depend upon their livelihood on forest resources - fuel, fodder and food.
- iii. Chipko Movement started in 1973 in Uttar Pradesh, the largest state of India.
- iv. The people, especially the women literally embraced the trees when the loggers would come to fell them. As a result of this movement, the government banned felling of trees in Himalayan region. This movement spread to other states of India in 1980s including the coastal areas.
- v. Chipko movement is an example of how a non-violent struggle by thousands of people can achieve the protection of environment. This movement helped to seek for alternative renewable resources for meeting the needs of industry.

Example-4 :

- i. Another example of non-governmental efforts for the cause of environment protection and other related problems is that of Narmada Valley Project for hydroelectric dam and irrigation purpose.
- ii. In the year 1998, the farmers of Karnataka (India) launched a campaign against genetically engineered cotton introduced by the multinational giant, the Monsanto.
- iii. A similar campaign was launched against Monsanto in Manila (Philippines) for putting a stop on Terminator seeds. To meet these pressures, Business Council for Sustainable Development (BCSD) was established in 1992. BCSD presented many cases of best environmental practices to counter the claims of environmental NGOs.

PART-3

Human Population and the Environment : Population growth.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.11. How does the human population affect the environment ?

Answer

Following are the affect of human population on the environment :

1. **Generation of Waste :** Humans have dumped more and more waste in environment. As the man-made waste is not transformed, it causes

degradation and the capacity of environment to absorb more waste is reduced. Further, waste leads to air and water pollution.

2. **Threat to Biodiversity :** Humans have extracted more and more minerals from the earth. Animals have been hunted and plants have disappeared. There has been loss of biodiversity. These have led to ecological imbalance.
3. **Strain on Forests :** Man has established new housing colonies. National highways and hydropower projects have been built and forests have been wiped out. These destructive activities have increased and led to ecological imbalance.
4. **Climatic Change :** Climatic changes are irregular due to green house gases. The thin skin of air that surrounds the planet is being affected by human activities as never before.
5. **Productivity :** Environmental degradation not only harms health but also reduces economic productivity. Dirty water, inadequate sanitation, air pollution and land degradation causes serious diseases on an enormous scale in developing countries like India.
6. **Urbanization :** Rapid growth of population has led to urbanization which has adversely affected environment. Natural resources in the cities are depleted at a fast rate due to population pressure.
7. **Land Degradation :** Intensive farming and excessive use of fertilizers and pesticides have led to over-exploitation of land and water resources. These have led to land degradation in the form of soil erosion, water logging and salination.
8. **Industrialisation :** Underdeveloped countries are following the policy of heavy industrialization which is causing environmental degradation. The establishment of industries such as fertilizers, iron and steel, chemicals and refineries has led to land, air and water pollution.

Que 5.12. | How does population growth impacts the environment ?

Answer

Population growth impacts the environment in a variety of ways, including :

1. **Increasing the Extraction of Resources from the Environment :** These resources include fossil fuels (oil, gas, and coal), minerals, trees, water, and wildlife, especially in the oceans. The process of removing resources, in turn, often releases pollutants and waste that reduce air and water quality, and harm the health of humans and other species.
2. **Increased Burning of Fossil Fuels :** Increasing the burning of fossil fuels for energy to generate electricity, and to power transportation and industrial processes.

3. **Increase use of Freshwater :** Increase in freshwater use for drinking, agriculture, recreation, and industrial processes. Freshwater is extracted from lakes, rivers, the ground, and man-made reservoirs.
4. **Increasing Ecological Impacts on Environments :** Forests and other habitats are disturbed or destroyed to construct urban areas including the construction of homes, businesses, and roads to accommodate growing populations. Additionally, as populations increase, more land is used for agricultural activities to grow crops and support livestock. This, in turn, decrease species populations, geographic ranges, biodiversity, and alter interactions among organisms.
5. **Increased Fishing and Hunting :** Increasing fishing and hunting, which reduces species populations of the exploited species.
6. **Increase in the Transport of Invasive Species :** Increasing the transport of invasive species, either intentionally or by accident, as people travel and import and export supplies.
7. **The Transmission of Diseases :** Humans living in densely populated areas can rapidly spread diseases within and among populations. Additionally, because transportation has become easier and more frequent, diseases can spread quickly to new regions.

PART-4

Environmental Education.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.13. | What do you understand by environmental education ? Discuss the role of it in environment protection.

Answer

A. Environmental Education :

1. Environmental education refers to organized efforts to teach about how natural environments function and particularly, how human beings can manage their behavior and ecosystem in order to live sustainably.
2. Environmental education is a process of recognizing values and clarifying concepts in order to develop skill and added tools necessary to understand and appreciate the inter-relationship among humans, their culture and their biophysical surrounding.

- B. Role of Environmental Education for Environment Protection :**
1. Environmental education focuses on efforts to make world a heaven like Kashmir is in India.
 2. It makes the people sensitized about environmental issues.
 3. Increasing people awareness and knowledge about the environment and environmental challenges.
 4. Developing necessary skills and expertise to address the challenges.
 5. Fostering attitudes, motivations, and commitments to make informed decision and take responsible action for solving environment related problems.
 6. Awareness and understanding of environmental issues help in practicing right actions needed for development that meets the needs of the present without compromising the ability of future generations it meet their own needs.

Que 5.14. What are the objectives and principles of environmental education ?

Answer

A Objectives of Environmental Education :

1. To promote environmental education and training among the people.
2. To control the overpopulation and over consumption of the resources.
3. To recycle and reuse the waste materials.
4. To balance the ecosystem.
5. To maintain the environmental quality.
6. To follow the sustainable development.
7. To help understand the biotic and abiotic environment.
8. To understand interdependence of life at trophic levels.

B Principles of Environmental Education :

1. Environmental education considers the environment in its totality, i.e., ecological, political, natural, technological, sociological, aesthetic and built environments.
2. Environmental education develops awareness of the impotence, beauty and wonders that is, and can be, found in these aspects of the environment.
3. Environmental education explores not only the physical qualities of the human relationship with the environment, but also the spiritual aspect of this relationship.
4. Environmental education is a response to the challenge of moving towards an ecologically and socially sustainable world.

5. Environmental education is concerned with the interaction between the quality of the biophysical environment and the socio-economic environment.
6. Environmental education recognizes the value of local knowledge, practices and perceptions in enhancing sustainability.
7. Environmental education supports relevant education by focusing learning on local environments.
8. Environmental education focuses on current and future perspectives on environmental conditions.

Que 5.15. What are the challenges involved in providing environmental education ?

Answer

In India, the development and environmental protection challenges are enormous due to the following reasons :

1. **Poverty** : It is a big challenge in reaching out to large population cost-effectively because financial sources are very limited.
2. **Increasing Population** : India's annual population increase is equal to the population of Australia.
3. **Less Land** : With about 16 % of the world population and a little over 2 % of its land, there is already enormous pressure on our resources.
4. **Low Literacy Levels** : The environmental educators face many challenges to spread awareness regarding conservation and environmental management.
5. **Low Awareness** : Poor Indian citizens have low or no awareness about importance of environment.
6. **Less Resources and Corruption** : Putting environmental education on the agenda of educational decision makers and policy makers is also a big challenge primarily because of less resources and more corruption.
7. **No Applicability of Global Solutions** : The environmental educators face difficulties in meeting the objectives of effective and local specific environmental education because environmental conditions and environmental concerns vary from one region of the state to another.

Que 5.16. What is the scope of environmental education ? How these are provided ?

Answer

Scope of Environmental Education : Following are the scope of environmental education :

1. Natural resources like forest, land, water, energy resources, their conservation and management.

2. Ecosystem.
3. Biodiversity and its conservation.
4. Environmental pollution and its control.
5. Natural disasters.
6. Social issues and environment.
7. Human population and environment.

Environmental education can be given in two ways :

1. Formal Education :

- i. Formal education is given in schools, colleges, having a well defined and systematic curriculum.
- ii. This type of education is limited to a specific period.
- iii. Formal education is given at primary school level, at secondary and at post graduate level.

2. Non-formal Education :

- i. This education is designed for any age group.
- ii. Non-formal education includes organization of extra-curricular activities like eco-development camps, exhibitions, seminars, nature camps, nature-club activities etc.
- iii. Eco-development camps create awareness about basic ecological principles and solving environmental problems.
- iv. These camps include tree plantation, clearing water bodies, hygiene and promoting the use of non-conventional energy sources.

There are three disciplines which are included in environmental education.

1. **Environmental Science :** It includes the scientific study of environmental i.e., of air, water, soil and land.
2. **Environmental Management :** It includes environmental impact assessment and environmental audit.
3. **Environmental Engineering :** It deals with the study of technical processes involved in the protection of environment and improving the environmental quality.

Que 5.17. "Environment education can play an important role in environment protection". Comment on the statement.

AKTU 2013-14 (Sem-1), Marks 10

Answer

Education can stand as proper solution to solve different sorts of problems exist in a society and therefore, education has a big role to protect environment. The following points will help to understand the roles that education system plays in protecting our environment:

Awareness :

1. The main role of education when it comes to environment protection is offering awareness to everyone in a society. Education can provide better awareness of a variety of environmental issues that take place day by day.
2. Education can give right knowledge on how natural environment functions, and how human beings can deal with behaviour and ecosystems for sustainability.

Knowledge on How to Protect the Environment :

1. Environmental knowledge aids to resolve main environmental problems like acid rain, ozone depletion, climate changes, global warming etc.
2. Environmental education can be provided by the use of audio-visual programs, seminars, training programs, environmental awareness campaign, etc.

Promote a Holistic Approach :

1. Education on protecting environment or effective environment protection programs promote a holistic process and lead by the examples being approached among people.
2. It allows people to make certain sustainable and fair use of resources devoid of damaging the environment.

Qualitative and Quantitative Analysis in Environmental Education :

1. At higher level especially when studying the subject in detail, stats and figures cannot be neglected. Numbers act as the basis for comparison in the improvement of deterioration of the condition.
2. Although qualitative data is easy to find but the results and decisions can be made with the help of figures. NGOs, educational institutions, Govt. and concerned agencies require figures to reach to any conclusion.

PART-5

Women Education.

Questions-Answers

Long Answer Type and Medium Answer Type Questions

Que 5.18. Briefly describe the various schemes launched for women education in India.

Answer

Following are the various schemes launched for women's education in India :

1. **Sarva Shiksha Abhiyan (SSA)** : It serves as an umbrella scheme for schemes directly and indirectly beneficial to the girl child :
 - i. The National Programme for the Education of Girls at an Elementary Level (NPEGEL) provides free uniforms and text books.
 - ii. The Education Guarantee Scheme under SSA also aims to provide vocational and nonformal education to out-of-school children, of which, girls are the main beneficiaries.
2. The Kasturba Gandhi Balika Vidyalaya sets up residential schools at the upper primary region-primarily for girls from SC, ST, and OBC families as well as minority communities.
3. The Early Childhood Care and Education (ECCE) aims at setting up preschools to prepare children for schooling. It has an indirect bearing on education for girls as with her siblings in school, the girl child need not assume sibling care responsibilities during school hours and can therefore, attend school.
4. **Mahila Samakhya (MS) Programme :**
 - i. It seeks to benefit women of all ages, especially those from economically and socially marginalized groups.
 - ii. It aims to integrate formal and nonformal education for girls, education schemes for adult women and vocational training for girls and women.
5. **Mid-Day Meal (MDM) Scheme** : The presence of mid day meals in the schools :
 - i. Increases chances for girls attending schools.
 - ii. Reduces caste biases as it forces children of all castes to eat together.
6. **The education schemes of the Ministry of Women and Child Development (MWCD) :**
 - i. The Balika Samridhi Yojana, the Integrated Child Development services and the Kishori Shakti Yojana, are designed and funded by MWCD.

Que 5.19. How women education can help in environmental protection ?**Answer****Roles of Women in Environment Protection :**

1. An educated woman can easily motivate other women (who are generally shy).

2. She can conduct different campaigns (health care, environment protection, etc.) for local people located in the rural and urban areas. Education will enhance awareness for the preservation of natural resources.
3. She can raise the interest of her family members towards education.
4. Only she can discuss sensitive issues like family planning and the relevant precautionary and preventive measures needed.
5. She is capable of attracting the attention of media, government, NGOs, etc., regarding initiation of developmental activities for sustainable development (e.g. proper waste disposal, cleanliness, tree plantation, etc.).
6. She can mobilize funds through voluntary donations for social activities.

Que 5.20. What are the advantages and obstacles in women education ?**Answer****A. Advantages of Women's Education :**

1. Education provides girls and women with an understanding of basic health, nutrition and family planning.
2. It leads directly to better reproductive health, improved family health, economic growth, lower rates of child mortality and malnutrition.
3. It is also a key in the fight against the spread of HIV and AIDS.
4. Educating girls and women is an important step in overcoming poverty and raising incomes. Educated girls have better skills needed for most of the new job categories.
5. Educated women are more aware of the problems in society and have ideas on how to solve them. They contribute better to a society.
6. A woman with knowledge is more respectable. She has the power to make people listen to her and the charisma that makes people follow her.
7. An educated mother can educate the whole family.

B. Obstacles in Educating Women :

1. The society dominated by male fears that its power will be taken away by women with education.
2. The societies are afraid to lose their cultural identity by women's education and globalization.
3. Poverty and scarcity of resources force the poor to send their children for work and not to school.
4. Girls are trapped in a vicious downward circle of denied rights which generates a number of problems like social unrest, high maternal mortality rates, etc.

VERY IMPORTANT QUESTIONS

Following questions are very important. These questions may be asked in your SESSIONALS as well as UNIVERSITY EXAMINATION.

Q. 1. Discuss the salient feature of the environment (protection) Act, 1986.

Ans: Refer Q. 5.2, Unit-5.

Q. 2. Discuss the salient features of water (prevention and control of pollution) Act 1974.

Ans: Refer Q. 5.4, Unit-5.

Q. 3. Explain the role of NGOs in environmental protection.

Ans: Refer Q. 5.8, Unit-5.

Q. 4. Explain the need and functions of NGOs for pollution control.

Ans: Refer Q. 5.9, Unit-5.



Environment and Ecosystem (2 Marks Questions)

1.1. Define the term environment.

AKTU 2017-18 (Sem-3), Marks 02

Ans: Environment can simply be defined as one's surroundings, which includes everything around the organism, i.e., abiotic (non-living) and biotic (living) environment.

1.2. Write the segments of environment ?

AKTU 2013-14 (Sem-1), Marks 02

Ans: Following are the segments of environment :

- i. Atmosphere. ii. Hydrosphere.
- iii. Lithosphere. iv. Biosphere.

1.3. Classify the atmosphere on the basis of temperature variation and pressure.

Ans: Atmosphere can be divided into five concentric layers of regions depending upon their temperature and pressure. They are

- 1. Troposphere. 2. Stratosphere.
- 3. Mesosphere. 4. Thermosphere.
- 5. Exosphere.

1.4. Discuss in brief various types of environment.

Ans: There are two different types of environment :

- A. **Natural Environment :** It consists of all components provided by nature and hence called as the natural environment.
- B. **Man-made (Anthropogenic) Environment :** This environment is used to refer to the one created by man in order to regulate and monitor certain environmental conditions.

1.5. Define ecosystem and name their components.

AKTU 2015-16, 2021-22 (Sem-2); Marks 02

OR

Write a note on ecosystem.

AKTU 2013-14 (Sem-1), Marks 02

Ans.

- A. Ecosystem :** The term 'ecosystem' was discovered and coined by A. G. Tensley in 1935. According to Tensley ecosystem is defined as, "the system resulting from the integration of all the living and non-living factors of the environment".
- B. Components :** Ecosystem consists of two components :
1. Abiotic components (Non living environment).
 2. Biotic components (A community of environment).

1.6. What do you understand by the term "Biotic and Abiotic" with examples ?

AKTU 2015-16 (Sem-1), Marks 02

AKTU 2017-18 (Sem-4), Marks 02

Ans.

- 1. Biotic Components :** All the living components of the environments constitute the biotic components. Example: plants, animals, human beings, etc.
- 2. Abiotic Components :** All the nonliving components of the environment constitute the abiotic components. Examples: temperature, light, water, etc.

1.7. What are the different types of ecosystem ?

Ans. Following are the two types of ecosystem :

1. **Natural Ecosystem :** They operate by themselves under natural conditions without any interference by human. Broadly they are subclassified into terrestrial and aquatic ecosystem.
2. **Artificial Ecosystem :** These ecosystem are controlled and manipulated by humans. These are created by human in order to fulfill certain needs. Broadly, they are subclassified into the following two types :
 - i. Agriculture ecosystem.
 - ii. Aquaculture ecosystem.

1.8. What is meant by biomagnifications ? How pesticide will deteriorate the ecosystem ?

AKTU 2013-14 (Sem-2), Marks 02

Ans. **Biomagnification :** It is the process by which a compound (such as a pollutant or pesticide) increases its concentration in the tissues of organisms as it travels up the food chain.

Deterioration of ecosystem : Pesticides are present in many streams at concentrations that may have effects on aquatic life or fish eating wildlife. Pesticides affect birds indirectly by weakening them or reducing their food supply. The human body is susceptible to the effects of pesticides. It can cause various health problems like endocrine system problem, neurotoxicity, cancer etc.

1.9. Define food chain with example.

AKTU 2015-16 (Sem-1), Marks 02

AKTU 2017-18 (Sem-4), Marks 02

Ans. It is a feeding hierarchy in which organisms in an ecosystem are grouped into nutritional (trophic) levels and are shown in a succession to represent the flow of food energy and the feeding relationship between them.

Example : Green plant → Rabbit → Fox

1.10. Define food web. How it is different from food chain ?

OR

What is food web ?

AKTU 2017-18 (Sem-3), Marks 02

Ans.

- A. Food Web :** It is a network of food chain where different types of organisms are connected at different trophic levels, so that there are a number of options of eating and being eaten at each trophic level.
- B. Difference :** Food chains follow just one path of energy as animals find food. While food webs show how plants and animals are connected in many ways to help them all survive.

1.11. Explain the term ecological pyramid.

Ans. Graphic representation of trophic structure and function of an ecosystem, starting with producers at the base and successive trophic levels forming the apex is known as an ecological pyramid.

1.12. What is balanced ecosystem ?

Ans. Balanced Ecosystem means that the nutrients are able to cycle efficiently, and no community of organisms or natural phenomena is interrupting the flow of energy and nutrients to other parts of the ecosystem.

1.13. What is the environmental impact of housing ?

Ans. Building and construction activities associated with housing have major environmental impacts over their entire life cycle. Housing is among major pollutants that affect urban environment and contribute to environmental pollution.

1.14. What are the ill effects of modern agriculture on environment ?

Ans. The harmful effects of modern agriculture are as follows :

1. Soil Erosion
2. Ground Water Contamination
3. Water Logging

4. Salinization

1.15. Define mining. Name two effects of mining on the people.

Ans.

- A. **Mining**: It is the extraction (removal) of minerals and metals from earth.
- B. **Effect** : Following are two effects of mining :
 - 1. Respiratory complications.
 - 2. Injuries and fatalities.

1.16. What are the effects of transportation on environment ?

Ans. Following are the adverse effects of transportation on environment :

- 1. Air Pollution 2. Water Pollution
- 3. Biodiversity Loss 4. Biosecurity Risks

1.16. Define EIA. What is the purpose of it ?

Ans. An environment impact assessment (EIA) is an assessment of the possible impact-positive or negative-that a proposed project may have on the natural environment. The purpose of the assessment is to ensure that decision-makers consider environmental impacts used to decide whether to proceed with the project.

1.17. Define sustainable development.

AKTU 2013-14 (Sem-1), Marks 02

Ans. It is defined as meeting the needs of the present without compromising the ability of future generation to meet their own need.

1.18. What is Bio-accumulation ?

AKTU 2015-16 (Sem-1), Marks 02

Ans. It is the accumulation of substances, such as pesticides, or other chemicals in an organism. Bio-accumulation occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost in catabolism and excretion.



Natural Resources (2 Marks Questions)

2.1. Define natural resources.

Ans. Natural resources are the materials which living organism can take from nature for the sustenance of their life or any component of the natural environment that can be utilized by man to promote his welfare.

2.2. What are the different kinds of natural resources ?

Ans. The major natural resources are as follows :

i. Forest resource.	ii. Water resource.
iii. Mineral resource.	iv. Food resource.
v. Energy resource.	vi. Land resource.

2.3. Define water conservation and its function.

Ans. Water conservation refers to reducing use of fresh water, through technological or social methods. Water conservation helps to prevent water pollution in nearby lakes, rivers and local watersheds.

2.4. Briefly discuss the waterborne diseases.

Ans. Waterborne diseases are any illness caused by drinking water contaminated by human or animal feces, which contain pathogenic micro-organisms. Waterborne diseases can be caused by protozoa, viruses, bacteria and intestinal parasites, e.g., Cholera, Typhoid, Hepatitis A, and Dysentery.

2.5. What are the various ways to remove fluoride from water ?

Ans. Following are the various ways for it :

- i. Reverse osmosis filtration.
- ii. Activated alumina defluoridation filter.
- iii. Distillation filtration.
- iv. Nalgonda techniques.

2.6. What is fluorosis ?

AKTU 2017-18 (Sem-3), Marks 02

Ans. When children are exposed to excessive levels of fluoride, a condition known as fluorosis occurs. In its mildest form, fluorosis appears as a very slight, opaque, whitish area on the tooth surface.

2.7. Enumerate effect of arsenic on human health.

- Ans.** Following health effects are linked to arsenic contamination :
1. Skin lesions.
 2. Diabetes.
 3. Cardiovascular disease.
 4. Cancer.

2.8. Name various techniques used for removal of arsenic from water.

- Ans.** Following are various techniques used for removal of arsenic from water :
1. Oxidation Techniques
 2. Coagulation-Flocculation
 3. Membrane Technologies
 4. Adsorption and Ion Exchange

2.9. What is meant by mineral resources ?

- Ans.** Natural resources in the form of minerals are known as mineral resources. They include the ores of base metals such as copper, iron and lead as well as strategic and critical metal such as chromium, titanium, platinum, cobalt, manganese, palladium, etc.

2.10. What do you mean by the term material cycle ?

- Ans.** Materials or nutrients like carbon, nitrogen, sulphur, oxygen, hydrogen, phosphorus, etc., move in circular paths through biotic and abiotic components and these cycles are known as material cycles.

2.11. What are conventional source of energy ? Give example.**AKTU 2015-16 (Sem-2), Marks 02**

- Ans.** These are available in limited amount and develop over a longer period. Because of unlimited use they are likely to be exhausted one day. These include coal, mineral oil, natural gas, nuclear power, etc.

2.12. What are non-conventional energy resources ?

- Ans.** Renewable sources of energy are those resources which are inexhaustive and can be regenerated within a given span of time.

2.13. What do you mean by geothermal energy ?

- Ans.** The energy harnessed from the hot rocks present inside the earth is called as geothermal energy.

2.14. Differentiate between renewable and non-renewable natural resources.**OR****What are renewable and non-renewable energy resources ?****Ans.**

S. No.	Renewable	Non-renewable
1.	Renewable resources which are inexhaustive and can be regenerated within a given span of time.	Non-renewable sources are not be regenerated. Once we exhaust these reserves, the same cannot be replenished.
2.	Example : Forests, wildlife, wind energy, biomass energy, tidal energy, hydro power etc.	Example : Fossil fuels like coal, petroleum, minerals etc.

2.15. Define deforestation.

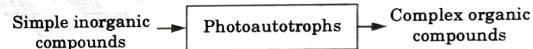
- Ans.** It is the permanent destruction of indigenous (original) forests and woodlands. It is also defined as the complete cleaning of tree formation and their replacement by using land for other purpose.

2.16. Discuss the causes of deforestation.

- Ans.** Major causes of deforestation are population growth, shifting cultivation, fuel and raw material, growing food need, overgrazing, fires and acid rain.

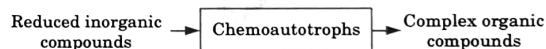
2.17. Differentiate between photoautograph and chemoautograph.**AKTU 2015-16 (Sem-1), Marks 02****Ans.**

- i. **Photoautotrophs** : These are the producers who fix energy from the sun and store it in complex organic compounds.



Examples : Green plants, some bacteria, algae.

- ii. **Chemoautotrophs (Chemosynthesizers)** : They are bacteria that oxidise reduced inorganic substances (typically ammonia and sulphur compounds) and produce complex organic compounds.



Example : Nitrfying bacteria in the soil underground.



3
UNIT

Environmental Pollution (2 Marks Questions)

3.1. Define environment pollution.

Ans. It pollution can, be 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 life or property.

3.2. What are the different types of pollution ?

Ans. Following are the different types of pollution :

- | | |
|-----------------------|------------------------|
| i. Air pollution. | ii. Noise pollution. |
| iii. Water pollution. | iv. Thermal pollution. |
| v. Soil pollution. | vi. Nuclear pollution. |

3.3. Explain the term "Pollutant". Give example.

AKTU 2015-16 (Sem-1), Marks 02

AKTU 2017-18 (Sem-4), Marks 02

Ans. The substances which cause the pollution are called pollutants.
Examples : Oxides of carbon, sulphur and nitrogen, micro organisms, radioactive substances, etc.

3.4. What are primary and secondary pollutants ? Give example.

AKTU 2015-16 (Sem-2), Marks 02

OR

What are primary and secondary air pollutants ?

AKTU 2013-14 (Sem-2), Marks 02

Ans. **Primary Pollutants :** These are emitted directly from the point source (identifiable source) e.g., carbon monoxide (CO), oxides of nitrogen (NO_x), oxides of sulphur (SO_x), hydrocarbons, radioactive substances, etc.

Secondary Pollutants : These are formed by interaction of primary pollutant(s) with other primary pollutant(s) or with some natural constituents of atmosphere, e.g., ozone (O_3), Peroxyacetyl nitrate (PAN), Photochemical smog, etc.

3.5. Define water pollution.

AKTU 2013-14 (Sem-1), Marks 02

Ans. **Water Pollution :** It is defined as presence of any foreign substance (organic, inorganic, biological or radiological) in water which tends to degrade the quality and impair the usefulness of water.

Sources : Sewage and industrial wastewater.

3.6. How can you control the water pollution ?

Ans. The water pollution can be controlled by treating polluted water by physical, chemical or biological means and removing the contaminants up to acceptable quality standards, so that water can be reused or discharged into water bodies.

3.7. Define BOD and COD with example.

AKTU 2015-16 (Sem-2), Marks 02

Ans. **BOD (Biochemical Oxygen Demand) :** The amount of oxygen required for the biological decomposition of sewage under aerobic condition is known as BOD.

COD (Chemical Oxygen Demand) : The amount of oxygen which is required for the chemical decomposition of organic matter in sewage is known as chemical oxygen demand.

3.8. Name the various methods of purifying water.

Ans. Some of the purification methods are as follows :

1. Reverse Osmosis or RO Method
2. The UV Method
3. Distillation Method
4. Planted Filter Method

3.9. Define air pollution.

Ans. It is the presence of substances in the air (which generally originate from human activities) in sufficient concentrations and sufficient time, to interface with the comfort, health, safety or full use and enjoyment of property.

3.10. What are the major effects of air pollution ?

Ans. Following are the major effects of air pollution :

1. Air pollution causes chlorosis, necrosis and epinephy in plants.
2. Air pollution causes depletion of ozone in stratosphere.
3. Air pollution causes temperature inversion.

3.11. What are the causes of air pollutions ?

Ans. The air pollution may be due to natural disasters like dust storms, earthquakes and volcanic eruptions or man-made causes like toxic emissions from factories, power plants, vehicular traffic etc.

3.12. What is SPM ?

Ans. Suspended particulate matter (SPM) consists of solids in the air in the form of smoke, dust, and vapour that can remain suspended for extended periods and is also the main source of haze which reduces visibility.

3.13. What is the soil / land pollution ?

Ans. Soil or land pollution can be defined as the introduction of substances, biological organisms or energy into the soil that lead to a change in the quality of soil so that plant growth and animal health is adversely affected.

3.14. What are various sources of soil / land pollution ?

Ans. Following are various sources of soil / land pollution :

1. Faulty Agricultural Practices
2. Mining
3. Solid Wastes from Homes and Industries
4. Acid Rain

3.15. What are the effects of soil pollution ?

Ans. Following are the major effects of soil pollution :

1. It affects human health.
2. Reduce soil productivity.
3. Contaminates ground water.

3.16. Define noise pollution.

Ans. It is defined as environmental noise or an unwanted sound that is annoying, distracting, or physically harmful. Harms include hearing loss, stress, sleeplessness, etc. Noise pollution is also known as sound pollution.

3.17. Define solid waste.

Ans. The waste materials which have been rejected for further use and which can neither readily escape into the atmosphere nor can be transported by water into streams are called solid waste.

3.18. What are the major types of solid waste ?

Ans. The various types of solid wastes are as follows :

i. Municipal wastes.	ii. Special wastes.
iii. Domestic wastes.	iv. Agricultural wastes.
v. Industrial wastes.	vi. E-waste.

3.19. What are the methods of solid waste management ?

Ans. Solid waste can be disposed by any of the following method depending upon the nature of waste as open dumps, landfills, sanitary landfills, incineration plants and composting.



Current Environmental Issues (2 Marks Questions)

4.1. What is global warming ?

Ans. Global warming is the term which indicates the increase in the average temperature of the atmosphere. The increased volumes of carbon dioxide and other green house gases released by the burning of fossil fuels and other human activities, contribute to the warming of the earth.

4.2. What is greenhouse effect ?

Ans. Greenhouse effect is the process by which radiations from the sun are absorbed by the greenhouse gases and not reflected back into space. Due to this, the surface of the earth gets heated up.

4.3. Which are the green house gases that cause global warming ?

Ans. Following are the green house gases that cause global warming :

i. Water vapour (H_2O)	ii. Carbon dioxide (CO_2)
iii. Methane (CH_4)	iv. Nitrous oxide (N_2O)
v. Ozone (O_3)	vi. Chlorofluorocarbons (CFCs)
vii. Hydrofluorocarbons (HFCs)	

4.4. What is climate change ?

Ans. Climate change refers to the variation in earth's global climate or in regional climates over time. It describes changes in the averages state of the atmosphere over time scales ranging from a few decades to millions of years.

4.5. What is acid rain ?

Ans. It is rain which is unusually acidic caused mainly by atmospheric pollution with sulphur dioxide and nitrogen compounds. Oxides of nitrogen and sulphur dissolve in rain water to form sulphuric acid and nitric acid and come down as acid rain. The pH of acid rain is below 5.6.

4.6. How does ozone layer protect us ?

Ans. Ultraviolet (UV) radiations emitted from the sun are harmful to the skin and is the main cause of sunburn, excessive exposure can

also cause genetic damage, resulting in problems such as skin cancer. The ozone layer absorbs most of the harmful UV wavelengths and protects us.

4.7. Define ozone layer depletion.

Ans. The term ozone depletion is a slow, steady decline, of about 3 % per decade, in the total amount of ozone in the earth's stratosphere during the past twenty years and seasonal decrease in stratospheric ozone over the earth's polar regions during the same period.

4.8. What is ozone hole ?

Ans. When the level of ozone in the stratosphere falls below 200 DU, it is considered to represent the beginnings of an ozone hole.

4.9. What do you understand by population growth ?

Ans. An increase in the number of people that reside in a country, state, county, or city is known as population growth. It is the change in population per unit time. Population growth can be positive, static or negative.

4.10. What is exponential growth of population ?

Ans. Exponential growth of population means that the population growth rate is accelerating; that is, it is increasing at a greater and greater rate.

4.11. What is population explosion ?

Ans. A drastic growth in population beyond normal limits is called population explosion. Population explosion refers the sudden and rapid rise in the size of population, especially human population.

4.12. Define automobile pollution.

Ans. It may be defined as pollution which includes air and noise pollution caused by a vehicle powered by either spark ignition or compression ignition internal combustion engine or generating power to drive such vehicle by burning fuel.

4.13. Match the following :

AKTU 2015-16 (Sem-2), Marks 02

Urea	→ Bio-accumulation
Carbon dioxide	→ Ozone layer depletion
Chlorofluorocarbon	→ Global warming
DDT	→ Eutrophication
Urea	→ Eutrophication
Carbon dioxide	→ Global warming
Chlorofluorocarbon	→ Ozone layer depletion
DDT	→ Bio-accumulation



Environmental Protection (2 Marks Questions)

5.1. What is an environment policy ? Name some of the legislations present in India for environment protection.

Ans. An environmental policy is a statement about an organization's environmental position and values. The ISO 14001 standard states that an environmental policy is the organization's overall environmental performance intentions and direction formally expressed by top management.

5.2. What are the different Acts considered in environmental protection ?

Ans. Following are the various Acts in environmental protection :

- i. Wildlife (Protection) Act, 1972.
- ii. Forest (Conservation) Act, 1980 with Amendments made in 1988.
- iii. The Water (Prevention and Control of Pollution) Act, 1974.
- iv. The Air (Prevention and Control of Pollution) Act, 1981.
- v. The Environmental (Protection) Act, 1986.

5.3. What are the objectives of Environment (Protection) Act 1986 ?

Ans. The objectives of this Act are as follows :

- i. Protection and improvement of the environment,
- ii. Prevention of hazards to all living creatures (plants, animals and humans) and property, and
- iii. Maintenance of harmonious relationship between human and their environment.

5.4. Discuss the objectives of Forest (conservation) Act, 1980.

Ans. The objectives of this Act are given below :

- i. Protection and conservation of forests, and
- ii. To ensure judicious use of forest products.

5.5. What are the objectives of Water (prevention and control of pollution) Act, 1974 ?

Ans. The objectives of this Act are given below :

- Prevention and control of water pollution,
- Maintaining or restoring the wholesomeness of water, and
- Establishment of central and state boards for the prevention and control of water pollution.

5.6. Define Air Prevention Act.

AKTU 2015-16 (Sem-1), Marks 02

Ans: An Act to provide for the prevention, control and abatement of air pollution, for the establishment, with a view to carrying out the aforesaid purposes, of Boards, for conferring on and assigning to such Boards, power and functions relating thereto and for matters connected therewith.

5.7. What are the objectives of Air (prevention and control of pollution) Act, 1981 ?

Ans: The objectives of this Act are as follows :

- Prevention, control and abatement of air pollution,
- Maintaining the quality of air, and
- Establishment of boards for the prevention and control of air pollution.

5.8. Discuss the objectives of Wildlife Protection Act.

Ans: The objectives of this act are as follows :

- To maintain essential ecological processes and life supporting systems,
- To preserve biodiversity, and
- To ensure a continuous use of species, i.e., protection and conservation of wildlife.

5.9. What do you understand by NGOs ?

Ans: A non-governmental organization (NGO) is a legally constituted organization created by private organizations or people with no participation or representation of any government.

5.10. What is the role of NGOs for improvement of environment ?

Ans: Non Governmental Organizations (NGOs) provide different services like relief to the blind, the disabled and disadvantaged and helping the government in mother and child health care, including family planning programmers.

5.11. Enlist the various international environmental NGOs.

Ans: Following are the various international environmental NGOs :

- World Wide Fund for Nature.
- Green Peace Foundation.
- Conservation International.

5.12. How does the human population affect the environment ?

Ans: Following are the affect of human population on the environment :

- Generation of Waste
- Threat to Biodiversity
- Strain on Forests
- Land Degradation

5.13. Define the term environmental education.

Ans: Environmental education refers to organized efforts to teach about how natural environments function and particularly, how human beings can manage their behavior and ecosystem in order to live sustainably.

5.14. Discuss the importance of environmental education.

Ans: Following are the importance of environmental education :

- It helps in economy and welfare of human society.
- It helps us in finding ways to maintain ecological balance.
- It trains us to conserve our fast depleting natural resources.
- It helps to understand different food chains and the ecological balance in nature.

5.15. What is the importance of women's education in India ?

Ans: It not only helps in the development of half of the human resources, but in improving the quality of life at home and outside. Educated women can also help in the reduction of infant mortality rate and growth of the population.



B. Tech.
**(SEM. I) ODD SEMESTER THEORY
EXAMINATION, 2013-14**
ENVIRONMENT AND ECOLOGY

Time : 2 Hours

Max. Marks : 50

Notes : Attempt all Sections.

SECTION - A

1. Attempt all five parts. Each part carries equal marks : $(5 \times 2 = 10)$

a. Write a note on ecosystem.

Ans. Refer Q. 1.5, Page SQ-1N, Unit-1, Two Marks Questions.

b. Define sustainable development.

Ans. Refer Q. 1.17, Page SQ-4N, Unit-1, Two Marks Questions.

c. Write the segments of environment.

Ans. Refer Q. 1.2, Page SQ-1N, Unit-1, Two Marks Questions.

d. What do you mean by Eutrophication ?

Ans. Eutrophication is the process in which the water body becomes overly enriched with nutrients, leading to an increase in the production of algae and macrophytes.

e. Define Water Pollution.

Ans. Refer Q. 3.5, Page SQ-9N, Unit-3, Two Marks Questions.**SECTION - B**

2. Answer any two parts of the following : $(2 \times 5 = 10)$

a. Write an explanatory note on the multidisciplinary nature of environmental science.

Ans. Refer Q. 1.6, Page 1-8N, Unit-1.

b. "EIA is an instrument for sustainable development". Comment.

Ans. Refer Q. 1.34, Page 1-33N, Unit-1.

c. What are biogeochemical cycle ? Describe the nitrogen cycle with the help of neat sketch.

Ans. **Biogeochemical Cycles :** Nutrients like carbon, nitrogen, sulphur, oxygen, hydrogen, phosphorus etc., move in circular path through biotic and abiotic components are therefore known as biogeochemical cycles.

Nitrogen Cycle : Refer Q. 2.17, Page 2-18N, Unit-2.**SECTION - C**

3. Attempt any one of the following : $(1 \times 10 = 10)$

a. "Environment education can play an important role in environment protection". Comment on the statement.

Ans. Refer Q. 5.17, Page 5-18N, Unit-5.

b. Define the term disaster. Explain the various measures taken during disaster management in the Indian perspective.

Ans. This question is out of syllabus from session 2022-23.

4. Attempt any one of the following : $(1 \times 10 = 10)$

a. "Greenhouse effect at its natural level is very essential for life to exist on this marvelous planet-Earth". Justify the statement.

Ans. Refer Q. 4.3, Page 4-4N, Unit-4.

b. Explain the term 'Population Explosion'. Enumerate and discuss its effects on environment.

Ans. Refer Q. 4.13, Page 4-13N, Unit-4.

5. Attempt any one of the following : $(1 \times 10 = 10)$

a. What do you understand by the term 'solid-waste management' ? Name and briefly discuss the basic functional elements of solid-waste management.

Ans. **Solid Waste Management :** It refers to the supervised handling of waste material from generation at the source through the recovery processes to disposal.**Basic Functional Elements :** Refer Q. 3.25, Page 3-24N, Unit-3.

b. What is water pollution ? What are its effects on human health ? Discuss in brief about the water borne and water induced diseases.

Ans. **Water Pollution :** Refer Q. 3.5, Page 3-5N, Unit-3.**Effects :** Refer Q. 3.6, Page 3-6N, Unit-3.**Water Borne and Water Induced Diseases :** Refer Q. 2.8, Page 2-7N, Unit-2.

B. Tech.
**(SEM. II) EVEN SEMESTER THEORY
EXAMINATION, 2013-14**
ENVIRONMENT & ECOLOGY

Time : 3 Hours

Max. Marks : 50

SECTION - A

1. Answer all the following questions. Each carries equal marks. $(5 \times 2 = 10)$

- a. Differentiate between point richness and alpha richness.

Ans. This question is out of syllabus from session 2022-23.

- b. What is meant by biomagnifications ? How pesticide will deteriorate the ecosystem ?

Ans. Refer Q. 1.8, Page SQ-2N, Unit-1, Two Marks Questions.

- c. What is solar pond ?

Ans. This question is out of syllabus from session 2022-23.

- d. What are primary and secondary air pollutants ?

Ans. Refer Q. 3.4, Page SQ-8N, Unit-3, Two Marks Questions.

- e. Write about earthquake disaster.

Ans. This question is out of syllabus from session 2022-23.

SECTION - B

2. Attempt any two parts of the following : $(2 \times 5 = 10)$

- a. i. Define the term biodiversity. "India is Mega diversity Nation", comment on this statement.

Ans. This question is out of syllabus from session 2022-23.

- ii. What is ecological pyramid ? Discuss different types of pyramid with suitable example.

Ans. Refer Q. 1.16, Page 1-16N, Unit-1.

- b. i. What is an environment policy ? Name some of the legislations present in India for environment protection.

Ans. Refer Q. 5.1, Page 5-2N, Unit-5.

- ii. Define sustainable development. Explain the equitable use of resources for sustainable lifestyle.

Ans. Refer Q. 1.37, Page 1-35N, Unit-1.

- c. i. Differentiate between water borne diseases and water induced diseases with suitable example.

Ans. Refer Q. 2.8, Page 2-7N, Unit-2.

- ii. What do you mean by migration of people ? What are the basic steps taken for rehabilitation and resettlement of migrated people ?

Ans. This question is out of syllabus from session 2022-23.

SECTION - C

Attempt all three questions in this section. Each question carries equal marks.

3. Attempt any one part of the following : $(1 \times 10 = 10)$

- a. i. Define the term ecosystem. Name the functional and metabolically similar group of organisms that are must for the long term survival of an ecosystem. Also give an account of their role and functions in an ecosystem.

Ans. Ecosystem : Refer Q. 1.9, Page 1-11N, Unit-1.

Functional and Metabolically Similar Group : Refer Q. 1.11, Page 1-12N, Unit-1.

- ii. What do you mean by the term fossils and fossil fuel ? What are the different types of fossil fuel based energy ? Briefly explain them.

Ans. Refer Q. 2.27, Page 2-29N, Unit-2.

- b. i. What is natural resource ? Discuss the major reasons for depletion of natural resources. How can we achieve sustainability in resource use ?

Ans. Refer Q. 2.3, Page 2-3N, Unit-2.

- ii. What is waste ? Discuss different types of solid wastes. Briefly discuss the various criteria for selecting an environmentally safe site for waste disposal.

Ans. Refer Q. 3.21, Page 3-20N, Unit-3.

4. Attempt any one part of the following : $(1 \times 10 = 10)$

- a. i. What are the major causes of threats of biodiversity ? Discuss the strategies and conversion of biodiversity.

Ans. This question is out of syllabus from session 2022-23.

- ii. What is acid rain ? How is it formed ? Discuss effect and remedial measures of acid rain.

Ans. Refer Q. 4.6, Page 4-6N, Unit-4.

- b. i. What is air pollution ? Differentiate line source and point source of air pollution. How can you control air pollution as special reference to particulate matter ?

Ans. Air Pollution : Refer Q. 3.10, Page 3-9N, Unit-3.
Difference and Control Measures : Refer Q. 3.15, Page 3-14N, Unit-3.

- ii. What is "water shed" ? Explain with reasons the importance of water management in our national policy.

Ans. This question is out of syllabus from session 2022-23.

5. Attempt any one part of the following : (1 × 10 = 10)

- a. i. What is biogeochemical cycle ? Discuss in brief the different steps of nitrogen cycle with neat and clean flow chart.

Ans. Biogeochemical Cycles : Nutrients like carbon, nitrogen, sulphur, oxygen, hydrogen, phosphorus etc., move in circular path through biotic and abiotic components are therefore known as biogeochemical cycles.

Nitrogen Cycle : Refer Q. 2.17, Page 2-18N, Unit-2.

- ii. What is arsenicosis ? Discuss about cause and effects of arsenicosis. Write about removal techniques of arsenic from drinking water.

Ans. Arsenicosis : Arsenic poisoning, or arsenicosis, occurs after the ingestion or inhalation of high levels of arsenic.

Cause : The most common reason is contaminated drinking water.

Effects : If arsenic poisoning occurs over a brief period of time, symptoms may include vomiting, abdominal pain, encephalopathy, and watery diarrhea. Long-term exposure can result in thickening of the skin, darker skin, abdominal pain, diarrhea, heart disease, numbness, and cancer.

Arsenic removal techniques : Refer Q. 2.13, Page 2-13N, Unit-2.

- b. i. What is e-NGOs ? Describe the role of NGOs in environment protection with reference to India.

Ans. e-NGOs : It stands for environmental non government organization. It is basically a non-profit citizen groups voluntarily organized on a local, national or international level.

Role of NGOs : Refer Q. 5.8, Page 5-10N, Unit-5.

- ii. What are the main objectives of "Water (Prevention and Control of Pollution) Act, 1974" ? Write the functions of CPCB in "The Water (Prevention and Control of Pollution) Act, 1974".

Ans. Refer Q. 5.4, Page 5-5N, Unit-5.



B. Tech.

(SEM. I) ODD SEMESTER THEORY EXAMINATION, 2014-15 ENVIRONMENT & ECOLOGY

Time : 3 Hours

Max. Marks : 50

1. Attempt any four parts : (4 × 3 ½ = 14)

- a. Write the necessity of public awareness on ecosystem.

Ans. Refer Q. 1.8, Page 1-10N, Unit-1.

- b. Write a note on global warming.

Ans. Refer Q. 4.1, Page 4-2N, Unit-4.

- c. What are the effects of industrial growth ?

Ans. This question is out of syllabus from session 2022-23.

- d. Write the disadvantages of thermal pollution.

Ans. This question is out of syllabus from session 2022-23.

- e. What is bio indicator ? How it is used to monitor the environment ?

Ans. This question is out of syllabus from session 2022-23.

- f. Write role of individual for the protection of environment.

Ans. This question is out of syllabus from session 2022-23.

2. Attempt any two parts : (2 × 6 = 12)

- a. Write in detail about food web and food chain.

Ans. Refer Q. 1.15, Page 1-16N, Unit-1.

- b. Write a note on Y-shaped model energy flow.

Ans. Refer Q. 1.18, Page 1-19N, Unit-1.

- c. What is nitrogen cycle and phosphorus cycle ? Justify the ecological significance.

Ans. Nitrogen cycle : Refer Q. 2.17, Page 2-18N, Unit-2.

Phosphorus cycle : Refer Q. 2.19, Page 2-20N, Unit-2.

3. Attempt any two parts : (2 × 6 = 12)

- a. Write the various factors which influence the deforestation and list out the impacts of deforestation.

Ans. Refer Q. 2.37, Page 2-42N, Unit-2.

b. Write in detail about effects and disposal methods of nuclear pollution.

Ans: This question is out of syllabus from session 2022-23.

c. What is noise pollution ? Explain in detail of its various sources, effects and control measures.

Ans: Refer Q. 3.19, Page 3-18N, Unit-3.

4. Attempt any two parts : (2 x 6 = 12)

a. What is ozone layer formation and depletion ? Explain its various effects on human health.

Ans: Ozone Layer Formation and Depletion : Refer Q. 4.6, Page 4-8N, Unit-4.

Effects : Refer Q. 4.9, Page 4-9N, Unit-4.

b. Write in detail about Forest Act.

Ans: Refer Q. 5.3, Page 5-4N, Unit-5.

c. Discuss the case study Tsunami effects.

Ans: This question is out of syllabus from session 2022-23.



B. Tech.

(SEM. II) EVEN SEMESTER THEORY EXAMINATION, 2014-15 ENVIRONMENT & ECOLOGY

Time : 3 Hours

Max. Marks : 50

Note : Attempt all questions. All questions carry equal marks.

1. Attempt any four parts of the following : (4 x 3.5 = 14)

a. Elaborate the statement "Multidisciplinary nature of Environmental science".

Ans: Refer Q. 1.6, Page 1-8N, Unit-1.

b. How would you broadly divide major layer or regions of the atmosphere ? State respective altitude and temperature ranges.

Ans: Refer Q. 1.2, Page 1-3N, Unit-1.

c. What are the basic components of ecosystem ?

Ans: Refer Q. 1.9, Page 1-11N, Unit-1.

d. Discuss the various level of the Bio-diversity.

Ans: This question is out of syllabus from session 2022-23.

e. Briefly describe the need of public awareness about the environment.

Ans: Refer Q. 1.8, Page 1-10N, Unit-1.

f. What are non-conventional energy resources ? Discuss any two of them.

Ans: Refer Q. 2.22, Page 2-24N, Unit-2.

2. Attempt any two parts of the following : (6 x 2 = 12)

a. i. What are ecological pyramids ? Describe energy pyramid.

Ans: Refer Q. 1.16, Page 1-16N, Unit-1.

ii. Write in detail about the function of ecosystem.

Ans: Refer Q. 1.11, Page 1-12N, Unit-1.

b. What is Environmental Impact Assessment ? Discuss its importance in planning and implementation of engineering projects.

Ans: Refer Q. 1.33, Page 1-32N, Unit-1.

- c. Define pollution and pollutants. Discuss the adverse effects and control measures of water pollution.

Ans. Pollution and Pollutants : Refer Q. 3.1, Page 3-2N, Unit-3.
Adverse Effects and Control Measures : Refer Q. 3.6, Page 3-6N, Unit-3.

3. Attempt any two parts of the following : (2 x 6 = 12)

- a. Explain in detail carbon and nitrogen cycle.

Ans. Refer Q. 2.18, Page 2-20N, Unit-2.

- b. Write a short note on sustainable development.

Ans. Refer Q. 1.36, Page 1-34N, Unit-1.

- c. What are air borne diseases ? Is it come under the disease caused by air pollution ?

Ans.

1. Some germs may be present in the air. When we breathe this air, the germs enter our nose, throat and lungs and affect these parts.
2. From these parts, they can spread to other parts of our body through our blood.
3. The diseases that spread through air are called air-borne diseases.
4. Common cold, conjunctivitis, diphtheria, measles, mumps, tuberculosis (TB), pneumonia and whooping cough are some of the air-borne diseases.
5. Yes, air borne diseases comes under the disease caused by air pollution.

4. Attempt any two parts of the following : (2 x 6 = 12)

- a. What is meant by ozone depletion ? How CFCs and other ozone depleting substances affect ozone shield ?

Ans. Refer Q. 4.8, Page 4-8N, Unit-4.

- b. Why do we refer Environmental Protection Act, 1986 as an Umbrella Act ? Discuss the Environmental Protection rules 1986.

Ans. Refer Q. 5.2, Page 5-2N, Unit-5.

- c. What are bio-indicators ? Discuss the various types of bio-indicators.

Ans. This question is out of syllabus from session 2022-23.



B. Tech.

(SEM. I) ODD SEMESTER THEORY EXAMINATION, 2015-16 ENVIRONMENT & ECOLOGY

Time : 3 Hours

Max. Marks : 100

Section-A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (10 x 2 = 20)

- a. What do you understand by the term "Biotic and Abiotic" with examples ?

Ans. Refer Q. 1.6, Page SQ-2N, Unit-1, Two Marks Questions.

- b. Explain the term "Pollutant". Give examples.

Ans. Refer Q. 3.3, Page SQ-8N, Unit-3, Two Marks Questions.

- c. What is Bio-accumulation ?

Ans. Refer Q. 1.18, Page SQ-4N, Unit-1, Two Marks Questions.

- d. Define food chain with example.

Ans. Refer Q. 1.9, Page SQ-2N, Unit-1, Two Marks Questions.

- e. Define BAP and its source.

Ans. This question is out of syllabus from session 2022-23.

- f. What is Urban-Sprawling ?

Ans. This question is out of syllabus from session 2022-23.

- g. Explain flood and its main cause.

Ans. Flood is an overflowing of water onto land that is normally dry. A flood is caused by continuous heavy rain, bad drainage facility, poor design in the construction of dams/embankments, etc.

- h. Define Air Prevention Act.

Ans. Refer Q. 5.6, Page SQ-14N, Unit-5, Two Marks Questions.

- i. What is migration and its types ?

Ans. This question is out of syllabus from session 2022-23.

- j. Differentiate between photoautograph and chemoautograph.

Ans. Refer Q. 2.17, Page SQ-7N, Unit-2, Two Marks Questions.

Section-B

Note : Attempt any five questions from this section : $(5 \times 10 = 50)$

2. Define ecological pyramids and their types. Explain food web with appropriate example.

Ans. Ecological Pyramids : Refer Q. 1.16, Page 1-16N, Unit-1.
Food Web : Refer Q. 1.14, Page 1-15N, Unit-1.

3. What are the different ways to restore the damage of ecosystem ? Explain in-situ approach for conservation of ecosystem.

Ans. This question is out of syllabus from session 2022-23.

4. Explain different sources of water pollution. How water pollution affect the marine life.

Ans. Sources : Refer Q. 3.6, Page 3-6N, Unit-3.

Water pollution affect the marine life in following ways :

1. The increased concentration of chemicals, such as nitrogen and phosphorus, in the water promotes the growth of algal blooms, which can be toxic to marine life.
2. Marine species ingest or are entangled by plastic debris, which causes severe injuries and death.

5. What are the different effects of air pollution on human, plants and materials ?

Ans. Refer Q. 3.11, Page 3-11N, Unit-3.

6. Define Urban-Sprawling and positive and negative effects of urbanization.

Ans. This question is out of syllabus from session 2022-23.

7. Draw and explain Nitrogen Cycle. Explain Nitrification and de-nitrification process.

Ans. Refer Q. 2.17, Page 2-18N, Unit-2.

8. Explain the need of education for controlling the pollution. What are bio-indicator and their types ?

Ans. Need of education : Refer Q. 5.13, Page 5-15N, Unit-5.
Bio-Indicator : This question is out of syllabus from session 2022-23.

9. What are the different roles of individual for controlling different kinds of pollution ?

Ans. This question is out of syllabus from session 2022-23.

Section-C

Note : Attempt any two question from this section : $(2 \times 15 = 30)$

10. a. Explain source, cause and effect of acid rain. How it can be controlled ?

Ans. Refer Q. 4.6, Page 4-6N, Unit-4.

b. Explain the need and function of NGO's for pollution control.

Ans. Refer Q. 5.9, Page 5-11N, Unit-5.

11. a. Define ecosystem, its structure concept and function with examples.

Ans. Ecosystem : Refer Q. 1.9, Page 1-11N, Unit-1.

Structure and Functions : Refer Q. 1.11, Page 1-12N, Unit-1.

b. Explain the principle and working of solar cell with diagram.

Ans. Refer Q. 2.30, Page 2-33N, Unit-2.

12. Explain :

a. Tuberculosis.

Ans.

1. It is a disease that mostly spreads through air.
2. A person suffering from tuberculosis coughs constantly.
3. If he spits out his sputum in open places or coughs with uncovered mouth, the TB germs spread in air.
4. Healthy people who are around may inhale this contaminated air and may get the disease.
5. Hence, TB patients are advised not to spit in a public place.
6. TB patients must spit only in a spittoon with a lid. Also TB patients must always cover our mouth and the nose with a handkerchief whenever sneezing or coughing.

b. Wet-scrubber.

Ans. Refer Q. 3.15, Page 3-14N, Unit-3.



B. Tech.
**(SEM. II) EVEN SEMESTER THEORY
EXAMINATION, 2015-16**
ENVIRONMENT & ECOLOGY

Time : 3 Hours

Max. Marks : 50

Note : Attempt all sections.

Section-A

1. Attempt all parts. All carry equal marks. Write answer of each part in short. $(10 \times 2 = 20)$

a. Define ecosystem and name their components.

Ans. Refer Q. 1.5, Page SQ-1N, Unit-1, Two Marks Questions.

b. Define BOD and COD.

Ans. Refer Q. 3.7, Page SQ-9N, Unit-3, Two Marks Questions.

c. Define earthquake and Richter scale.

Ans. This question is out of syllabus from session 2022-23.

d. What is catchment process in marine pollution ?

Ans. This question is out of syllabus from session 2022-23.

e. What are primary and secondary pollutants ? Give example.

Ans. Refer Q. 3.4, Page SQ-8N, Unit-3, Two Marks Questions.

f. What is Blue Baby Syndrome ?

Ans. The presence of too much of nitrate in water may adversely affect the health of infants, causing a disease technically called 'methemoglobinemia' (commonly called blue baby syndrome). Children suffering from this disease may vomit, their skin colour may become dark, and may die in extreme cases.

g. What are conventional source of energy ? Give example.

Ans. Refer Q. 2.11, Page SQ-6N, Unit-2, Two Marks Questions.

h. What is bio-indicator ?

Ans. This question is out of syllabus from session 2022-23.

i. Define migration and its types.

Ans. This question is out of syllabus from session 2022-23.

j. Match the following :

Urea	Bio-accumulation
Carbon dioxide	Ozone layer depletion
Chlorofluorocarbon	Global warming.
DDT	Eutrophication.

Ans. Refer Q. 4.13, Page SQ-12N, Unit-4, Two Marks Questions.

Section-B

2. Attempt any five question from this section : $(5 \times 10 = 50)$
- a. Explain types of biodiversity. Explain different threats to biodiversity.

Ans. This question is out of syllabus from session 2022-23.

- b. Explain Pyramid, Bell and Urn shape of population with example.

Ans. Refer Q. 4.15, Page 4-15N, Unit-4.

- c. Write a case study of Earthquake in "Bhuj-Gujrat". Explain "Land-slide".

Ans. This question is out of syllabus from session 2022-23.

- d. What is Nalgonda Process and where it has been used ?

Ans. Refer Q. 2.11, Page 2-11N, Unit-2.

- e. Explain why Thermal power stations are the main source of pollution ?

Ans. Refer Q. 3.16, Page 3-15N, Unit-3.

- f. What is "Sustainable Development" and how it can be achieved ?

Ans. Sustainable Development : Refer Q. 1.36, Page 1-34N, Unit-1.
Achieve : Refer Q. 1.37, Page 1-35N, Unit-1.

- g. Explain source and effect of noise pollution.

Ans. Refer Q. 3.19, Page 3-18N, Unit-3.

- h. Explain the role of Central Board for Pollution Control and State Board for Pollution Control for controlling pollution.

Ans. Refer Q. 5.4, Page 5-5N, Unit-5.

Section-C

Attempt any two question from this section. $(2 \times 15 = 30)$

3. a. Give the difference between Immigration and Emigration. Explain reasons of Migration.

- Ans:** This question is out of syllabus from session 2022-23.
- b. **Describe "Renewable energy resource" with two examples and diagram.**
- Ans:** Refer Q. 2.22, Page 2-24N, Unit-2.
4. a. **Explain ozone formation its depletion and the role of CFC's in ozone depletion.**
- Ans:** **Ozone Formation and Depletion :** Refer Q. 4.7, Page 4-8N, Unit-4.
Role of CFS's : Refer Q. 4.8, Page 4-8N, Unit-4.
- b. **Describe the methods for controlling the water pollution.**
- Ans:** Refer Q. 3.6, Page 3-6N, Unit-3.
5. **What do you understand by term EIA ? How inventory and monitoring helps in controlling the pollution.**
- Ans:** **EIA :** Refer Q. 1.30, Page 1-28N, Unit-1.
Inventory and Monitoring : Refer Q. 1.35, Page 1-33N, Unit-1.

**B.Tech.**

**(SEM. III) ODD SEMESTER THEORY EXAMINATION, 2017-18
ENVIRONMENT & ECOLOGY**

Time : 3 Hours**Max. Marks : 70**

Note : Attempt all Sections. If required any missing data; then choose suitably.

SECTION - A

1. Attempt all questions in brief. (2 x 7 = 14)

- a. **Define the term environment.**

Ans: Refer Q. 1.1, Page SQ-1N, Unit-1, Two Marks Questions.

- b. **What is fluorosis ?**

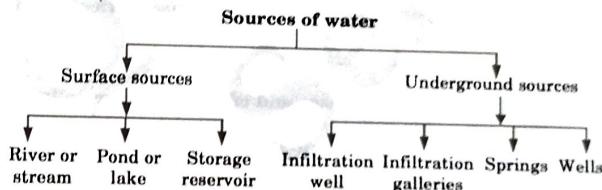
Ans: Refer Q. 2.6, Page SQ-5N, Unit-2, Two Marks Questions.

- c. **What is soil erosion ?**

Ans: Soil erosion is defined as the movement of soil components, especially surface litter and top soil from one place to another. Soil erosion results in the loss of fertility.

- d. **What are the various sources of water in nature ?**

Ans:



- e. **What are pollutants ? How can they classify ?**

Ans: Refer Q. 3.3 and Q. 3.4, Page SQ-8N, Unit-3, Two Marks Questions.

- f. **What is food web ?**

Ans: Refer Q. 1.10, Page SQ-3N, Unit-1, Two Marks Questions.

- g. **Name the ecological pyramid, which cannot be inverted.**

Ans: Pyramid of energy.

SECTION-B

2. Attempt any **three** of the following : $(7 \times 3 = 21)$

- a. Explain water related diseases. Discuss in details water borne and water induced diseases.

Ans. Refer Q. 2.8, Page 2-7N, Unit-2.

- b. What is deforestation ? Enumerate and discuss the various causes for deforestation.

Ans. Refer Q. 2.37, Page 2-42N, Unit-2.

- c. What is ecosystem ? How many components it have ? How does energy flow in an ecosystem ?

Ans. Ecosystem : Refer Q. 1.9, Page 1-11N, Unit-1.

Components of Ecosystem : Refer Q. 1.11, Page 1-12N, Unit-1.

Energy Flow : Refer Q. 1.17, Page 1-18N, Unit-1.

- d. What do understand by non conventional energy resources ? Discuss the solar energy in details.

Ans. Refer Q. 2.22, Page 2-24N, Unit-2.

- e. What is green house effect ? What are green house gases ? How it is correlated with global warming ?

Ans. Refer Q. 4.2, Page 4-3N, Unit-4.

SECTION-C

3. Attempt any **one** part of the following : $(7 \times 1 = 7)$

- a. What is air pollution ? Discuss its causes, effects and its remedial measures.

Ans. Refer Q. 3.13, Page 3-13N, Unit-3.

- b. What are the main causes and effects of water pollution ? How can water pollution be controlled ?

Ans. Refer Q. 3.7, Page 3-8N, Unit-3.

4. Attempt any **one** part of the following : $(7 \times 1 = 7)$

- a. Why do we refer Environmental Protection Act, 1986 as an Umbrella Act ? Discuss the Environmental Protection rules, 1986.

Ans. Refer Q. 5.2, Page 5-1N, Unit-5.

- b. What do you understand by sustainable development ? Discuss its various elements and goal.

Ans. Refer Q. 1.38, Page 1-35N, Unit-1.

5. Attempt any **one** part of the following : $(7 \times 1 = 7)$

- a. Explain the role of NGOs in environmental protection.
Ans. Refer Q. 5.8, Page 5-10N, Unit-5.

- b. What do you understand by Environment Impact Assessment ? What are various segments of propagation in it ?

Ans. Refer Q. 1.30, Page 1-28N, Unit-1.

6. Attempt any **one** part of the following : $(7 \times 1 = 7)$

- a. Explain in detail Carbon and nitrogen cycle.

Ans. Refer Q. 2.18, Page 2-20N, Unit-2.

- b. What are effects of transportation and agricultural activities on environment ?

Ans. Effects of transportation : Refer Q. 1.27, Page 1-26N, Unit-1.

Effects of agriculture : Refer Q. 1.24, Page 1-23N, Unit-1.

7. Attempt any **one** part of the following : $(7 \times 1 = 7)$

- a. Write in brief about electromagnetic radiation and hydrogen as the alternate future fuel.

Ans. This question is out of syllabus from session 2022-23.

- b. What is the importance of environmental education and woman education in India ?

Ans. Importance of Environmental Education : Refer Q. 5.13, Page 5-15N, Unit-5.

Importance of Woman Education : Refer Q. 5.19, Page 5-20N, Unit-5.



B.Tech.
**(SEM. IV) ODD SEMESTER THEORY
EXAMINATION, 2017-18**
ENVIRONMENT AND ECOLOGY

Time : 3 Hours

Max Marks : 70

Note : Attempt all sections. If any missing data : then choose suitably.

SECTION-A

1. Attempt all questions in brief.

a. What do you understand by the term "Biotic and Abiotic" with examples ?

Ans: Refer Q. 1.6, Page SQ-2N, Unit-1, Two Marks Questions.

b. Explain the term "Pollutant". Give examples.

Ans: Refer Q. 3.3, Page SQ-8N, Unit-3, Two Marks Questions.

c. What is biomagnification ?

Ans: Biomagnification means gathering various unimportant and harmful substances by organisms at different levels of a food chain.

d. Define food chain with example.

Ans: Refer Q. 1.9, Page SQ-3N, Unit-1, Two Marks Questions.

e. Explain flood and its main causes.

Ans: Refer Q. 1(g), Page N, Solved Paper (2015-16) (Sem-1).

f. Define urban sprawl.

Ans: This question is out of syllabus from session 2022-23.

g. Define the term ecology and ecosystem.

Ans: Refer Q. 1.12, Page 1-13N, Unit-1.

SECTION-B

2. Attempt any three of the following :

(3 × 7 = 21)

a. What is meant by environment ? Enumerate and discuss its various components.

Ans: Refer Q. 1.1, Page 1-2N, Unit-1.

b. What is ecological pyramid ? Explain different types of ecological pyramids for different ecosystem with suitable examples.

Ans: Refer Q. 1.16, Page 1-16N, Unit-1.

c. What is global warming ? What are its causes and effect ? Discuss the measures to control it.

Ans: Refer Q. 4.1, Page 4-2N, Unit-4.

d. What is water pollution ? Explain the various causes, effects and controlling measures of water pollution.

Ans: Refer Q. 3.8, Page 3-8N, Unit-3.

e. Define biodiversity. Explain genetic diversity, species diversity and ecosystem diversity. Write the various importance of biodiversity.

Ans: This question is out of syllabus from session 2022-23.

SECTION-C

3. Attempt any one part of the following : (1 × 7 = 7)

a. i. What do you mean by solid waste ? Describe various methods of solid waste disposal.

Ans: Solid Waste : Refer Q. 3.21, Page 3-20N, Unit-3.
Methods : Refer Q. 3.23, Page 3-22N, Unit-3.

ii. What is sustainable development ? Describe the measures of sustainable development.

Ans: Refer Q. 1.39, Page 1-37N, Unit-1.

b. i. Define ecology and ecosystem. Explain the role of producers, consumers and decomposers in an ecosystem.

Ans: Refer Q. 1.12, Page 1-13N, Unit-1.

ii. Describe carbon cycle in detail.

Ans: Refer Q. 2.16, Page 2-17N, Unit-2.

4. Attempt any one part of the following : (1 × 7 = 7)

a. i. What do you mean by water borne disease ? Discuss kinds of disease, their cause effect on human being.

Ans: Refer Q. 2.9, Page 2-9N, Unit-2.

ii. Discuss the salient features of Environmental (Protection) Act 1986.

Ans: Refer Q. 5.2, Page 5-2N, Unit-5.

b. i. Explain the energy flow in the ecosystem.

Ans. Refer Q. 1.17, Page 1-18N, Unit-1.

ii. Discuss the need for public awareness for the conservation and protection of environment.

Ans. Refer Q. 1.8, Page 1-10N, Unit-1.

5. Attempt any one part of the following : (1 × 7 = 7)

a. i. "Hydrogen the fuel of the future" explain it.

Ans. This question is out of syllabus from session 2022-23.

ii. Explain the need and functions of NGO's for environmental conservation.

Ans. Refer Q. 5.8, Page 5-10N, Unit-5.

b. i. Explain the principle and working of solar cell with diagram.

Ans. Refer Q. 2.30, Page 2-33N, Unit-2.

ii. Explain the water (prevention and control of pollution) Act.

Ans. Refer Q. 5.4, Page 5-5N, Unit-5.

6. Attempt any one part of the following : (1 × 7 = 7)

a. What is biomass energy ? Explain the different methods of biogas production in India.

Ans. Refer Q. 2.32, Page 2-37N, Unit-2.

b. Discuss population explosion in Indian context. What are the major cause and effect of population explosion ?

Ans. Refer Q. 4.14, Page 4-14N, Unit-4.

7. Attempt any one part of the following : (1 × 7 = 7)

a. i. What is noise pollution ? Explain the different sources and effects of noise pollution.

Ans. Refer Q. 3.19, Page 3-18N, Unit-3.

ii. Write a short note on nuclear energy.

Ans. This question is out of syllabus from session 2022-23.

b. i. With the help of flow chart, describe the Environment Impact Assessment process.

Ans. Refer Q. 1.31, Page 1-30N, Unit-1.

ii. Briefly discuss the fluoride problem in drinking water.

Ans. Refer Q. 2.10, Page 2-10N, Unit-2.

