

**UNIT-1**

**ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY**

**1.1 INTRODUCTION**

Environment implies surroundings. All natural resources are essential for the survival of mankind –land, air, water and fauna. The degradation of the environment has become a serious problem and the pollution of water, air and soil leads to loss of valuable natural resources

Environment is a multidimensional system of complex interrelationships in a continuing state of change. The Environment is derived from the French word “environ” meaning “surroundings”.

Each and everything around us is called as Environment.

**Environment:**

The sum of living and nonliving things around us influencing one another

**Environmental science:**

It is the study of Environment its biotic and abiotic components and their interrelationship.

**Types of Environment**

Natural Environment

Man made Environment

**Natural Environment**

It consists of four systems: the atmosphere, hydrosphere, lithosphere and biosphere.

E.g.) soil, water, air

**Manmade Environment**

It is the most powerful Environmental agent

Man is modifying the Environment according to his own needs

Environmental Science & Engineering

Man applied the advanced scientific technologies to lead comfortable life

It affects the natural Environment rapidly (E.g.) house, road, school

**Components of environment:**

Consist of 3 components

1. A biotic (or) non living
2. Biotic (or) living
3. Energy component

**Abiotic component:** 3 categories atmosphere, lithosphere, hydrosphere.

**Atmosphere:** The air that covers the earth is known as atmosphere. It is 500 km from earth. It is essential for all living organisms. 78% N<sub>2</sub>, 21% O<sub>2</sub> and 1% other gases.

**Troposphere (1 to 15 km)**

75% atmospheric air

Contain moisture

**Stratosphere (18 to 50 km)**

- Consists of large amount of O<sub>3</sub>
- Free from moisture and clouds
- Prevents UV radiation from sun

**Mesosphere (50 to 85 km)**

Less ozone

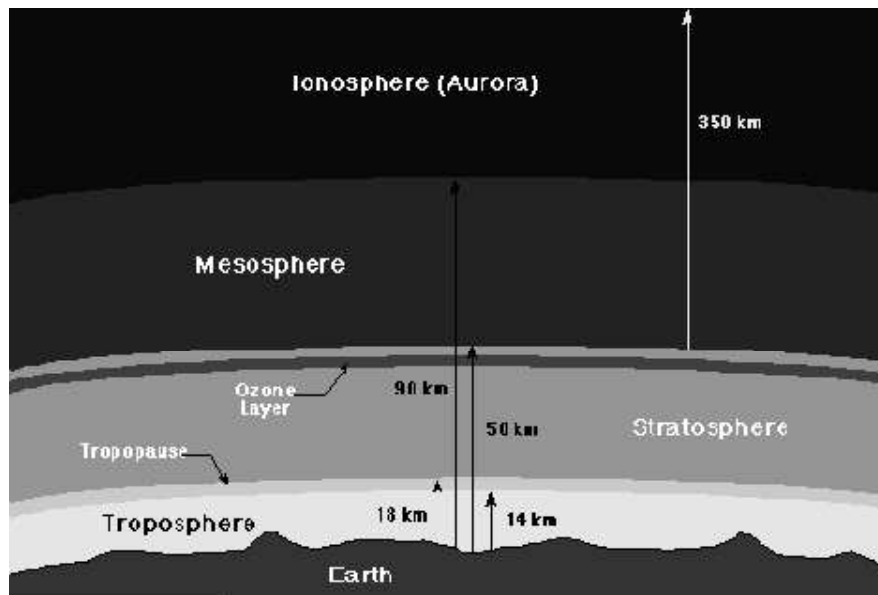
more nitrogen oxide

**Lithosphere:** It consists of soil and rock components of earth

**Hydrosphere:** The aquatic envelope of the earth. It includes oceans, lakes, streams, river and water vapour. In the hydrosphere 97% of water is not suitable for drinking and only 3% is fresh water.

**Biotic or living component:** (e.g.) Animals, plants and micro organisms.

**Biosphere:** Interaction of biological environment with physical environment is called biosphere. **Energy component:** Flow energy across biotic and Abiotic components. It plays an important role in living organisms. (e.g.) solar energy, nuclear energy, geo thermal energy etc.



**Fig: Structure of atmosphere**

### Scope of the Environment

New man introduced a three levels towards Environment Such as Environmental studies, Environment Science , Environmental engineering

Environmental study is an important tool to educate the people for preserving quality Environment .the main scope of Environmental studies include,

- To get an awareness to the total Environment and its related problems
- To motivate the active participation in Environmental protection
- To know the necessity of conservation of natural resources.

This study enables environmentally literate citizens to make appropriate judgment and decisions for the protection and improvement of the earth.

This study exposes the problems of over pollution, health, hygiene etc and the role of arts, science and technology in eliminating the evils from the society.

**Importance of Environmental studies**

Environmental studies concern with Environmental disturbances and minimizing of their impact through society

The air we breathe, the water we drink, the food we consume and land we live on are all contaminated by the industrial activities. There is no zero pollution industry. Because of the lack of self discipline and not worrying about our future generation, the valuable resources are polluted.

**To solve the above problems, the knowledge of Environmental studies is very important**

By Environmental studies ,people will understand the concept of “need of development without destruction of Environment”

Through this study, people can gain the knowledge of different types of Environment and the effects of different Environmental hazards.

Environmental studies inform the people about their effective role in protecting the Environment.

Environmental studies have a direct relation to the quality of life

Environmental education is an agent of change and a step toward community empowerment

**1.2 IMPORTANCE OF RISK AND HAZARDS IN THE ENVIRONMENT**

**HAZARD**

Hazard is any substance that can hurt you or make you ill.It is expressed in degree. Degree of hazard is the function of risk ,exposure, vulnerability and response  
Hazard =f( risk x exposure x vulnerability x response)

**Risk**

Risk is the frequency of events causing losses

**Types of hazards**

Hazard are of the following types

- a. physical hazards
- b. chemical hazards
- c. Biological hazards (or) Bio-hazards

**physical hazards**

Physical hazards are the substances (or) activities that threaten our physical safety. They will be present in most work places at one time or another. They can be detected through your senses of touch or sight.

**Examples**

Cold, Heat, Noise, Ionizing radiation ( $\alpha, \beta, \gamma, X$ -ray), vibrations

**Table physical hazards and their health effects**

Sl.no	Physical Hazards	Health effect
1.	Radioactive radiations	Affects the cells in the body and the function of glands and organs
2.	UV radiations	Skin cancer
3.	Global warming	Increase in temperature causes famine, mortality.
4.	Chloro fluorocarbons	Damage O <sub>3</sub> layer, allows more UV rays, cause skin cancer.
5.	Noise	Painful and irreparable damage to human ear.

**CHEMICAL HAZARDS IN THE ENVIRONMENT**

Chemical hazards are systems, where chemical accidents like fire, explosions ,leakages could occur under certain circumstances. These are generally present when a worker is exposed to any chemical preparation in the work place in any form (solid, liquid, gas) . Chemical hazard causes illness, skin irritation or breathing problems. A large number of chemicals are introduced.in the environment by anthropogenic activities.

**Examples**

**Liquids Like** cleaning products, paints, acids, solvents

**Vapours and fumes** that come from welding or exposure to solvents.

**Gases** like acetylene , propane, carbon monoxide.

**Flammable materials** like gasoline , solvents and explosive chemicals

**chemical hazards and their health effects**

Sl.no	Chemical Hazards	Health effect
1.	Combustion of fossil fuels: Liberates SO <sub>2</sub> ,NO <sub>2</sub> ,CO <sub>2</sub> and particulate matters.	Asthma, bronchitics and other lung diseases.
2.	Industrial effluents(toxic)	Kill cells and cause cancer and death.
3.	Pesticides like DDT and Chlorinated pesticides	Affect the food chain
4.	Heavy metals like Hg, Cd, Pb, fluoride and nitrate.	Contaminate water ,cause ill effects

### **BIOLOGICAL HAZARDS IN THE ENVIRONMENT**

Materials derived from medical treatment of animal or human which cause harm to humans. Biological hazards are organisms, or by-products from an organism, that are harmful or potentially harmful to human beings. They include pathogenic bacteria, viruses and parasites, and also toxins (poisons) that are produced by organisms. Biological hazards are the cause of the majority of human diseases. For example, bacteria cause cholera, tuberculosis, leprosy and relapsing fever.

#### **Entry of biological hazards into body**

There are three major routes through which micro organism enter in our body.

- (i) Through the respiratory system
- (ii) transmission through contact with body fluids of the infected
- (iii) contact with contaminated objects

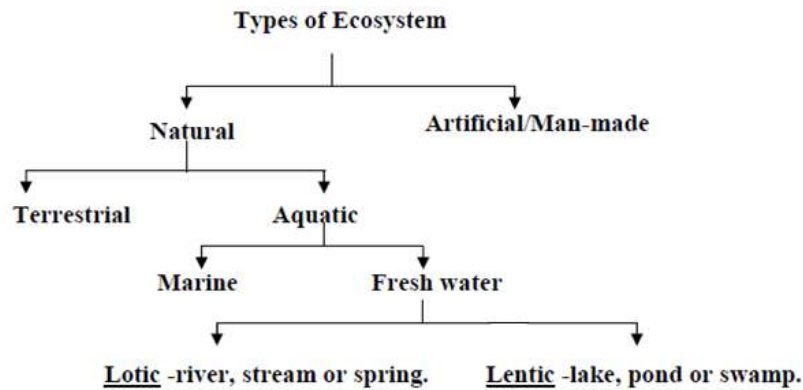
#### **Biological hazards and their health effects**

Biological Hazards	Health effect
Bacteria, viruses and parasites	Diarrhoea, malaria, parasitic worms, anaemia, respiratory disease, cholera.

### 1.3 CONCEPT OF AN ECOSYSTEM

**Definition:** Eco means Environment and the system means complex of coordinated units. Ecosystem is the basic fundamental unit of ecology which includes both the organisms and the non living Environment, each influencing the properties of other and each is necessary for the maintenance of life.

**Types of ecosystem:**



Natural ecosystem:

Natural ecosystems operate themselves under natural conditions

Terrestrial ecosystem

It is related to land

E.g.) grass land, forest, desert ecosystem

Aquatic ecosystem

This one related to water .this is further classified into two types

Fresh water ecosystem: E.g.) pond, lake, river

Marine ecosystem: e.g.) seas and sea shores

Artificial ecosystem

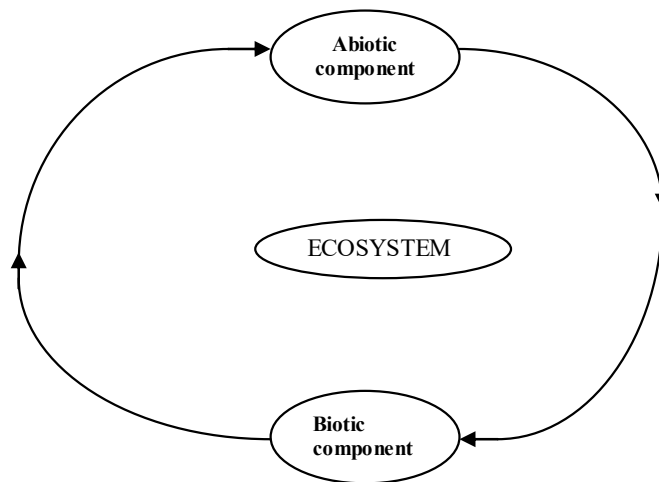
It is operated or maintained by man, E.g.) gardens, crop lands

### 1.4 STRUCTURE OF AN ECOSYSTEM

It has two major components,

abiotic(nonliving)components

biotic(living) components



Classifications of biotic components

producers

consumers

decomposers

**Producers:** The producers are the plants and some bacteria they have the capable of producing their own food by photo synthesis or by chemical synthesis

They capture energy from non organism source like light to synthesize organic food by the process of photosynthesis.eg) trees, herbs

**Consumers:** The consumers are animals that obtain their energy and protein directly by grazing, feeding on other animals or both.

Herbivores : plant eating

Carnivores : animal eating

Omnivores : eating all kinds of food



**Primary consumers:**

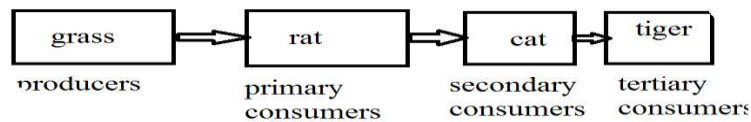
They are herbivores animals that dependent for their food on green plants.eg) insects, rabbit.

**Secondary consumers:**

They are carnivores which feed on the primary consumers e.g.) fish, frog, cat

**Tertiary consumers:**

They feed on secondary consumers e.g.) tigers, lion etc



**Decomposers:**

Decomposers are fungi and bacteria that decompose the organic matter of producers and consumers into inorganic substances that can be reused as food by the producers, thus the decomposers are the “recycles of the biosphere”

**Abiotic components**

The nonliving components of an ecosystem collectively form a community called abiotic components e.g.) soil, water

Two types

**1. Chemical components**

They are the sources of essential nutrients

Inorganic substance:Al,Cu,C etc

Organic substances:fat,glucose

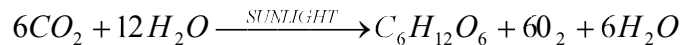
**2. Physical components**

They are useful for the growth and maintenance of its member. Physical components are temperature, humidity, energy, climate and raw materials

**Functions of an ecosystem**

Primary function

The plants capture the solar energy and converted into carbohydrate through the process of photosynthesis



Secondary function: It distributing energy in the form of food to all consumers

Tertiary function

All living organisms die at a particular stage. These dead organisms are composed to initiate the third function of an ecosystem namely “cycling”

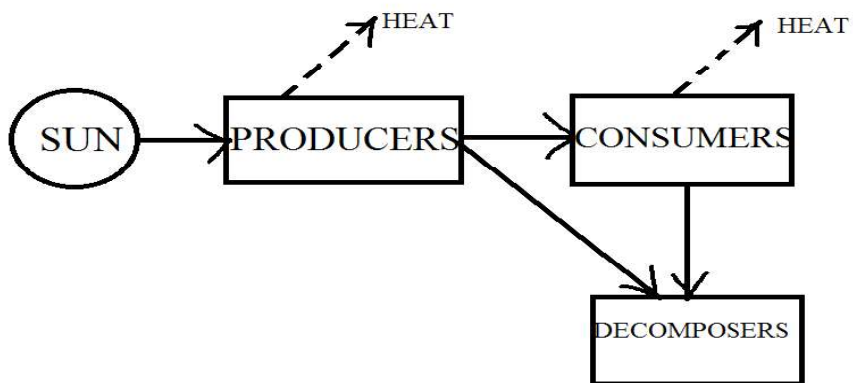
**Energy flow in the ecosystem**

It shows how both energy and inorganic nutrients flow through the ecosystem

Energy flows through the ecosystem in the form of carbon-carbon bonds

When the respiration occurs, the carbon-carbon bonds are broken and the carbon is combined with the oxygen to form carbon di oxide. This process releases the energy, which is either used by the organism (to move its muscles, digest food or excrete wastes, etc) or the energy may be lost as a heat. The dotted arrows represent the movement of their energy.

All energy comes from the sun ,and that the ultimate fate of all energy in ecosystems is to be lost as heat .Energy does not recycle



### **Energy flow through atmosphere to an ecosystem**

Sun is the ultimate source of energy its radiation travel through the space in the form of waves and reaches the earth's atmosphere. The atmosphere absorbs 50% of the radiations and allow the remaining to reach the earth surface. Of the solar radiation reached the earth surface some of which is absorbed by organisms to produce organic matter through photosynthesis

### **Photosynthetic equation**



The plants are used by herbivores and herbivores are used by carnivores as their food. In this way energy is transferred from one organism to another and so on. The conversion of solar energy is governed by law of thermodynamics.

### **Energy flow in thermodynamics**

**First law of thermodynamics:** Energy can neither be created nor destroyed, but it can be converted from one form to another

### **Illustration**

Energy for an ecosystem comes from sun. It is absorbed by plants, wherein it is converted into stored chemical energy

i.e.) solar energy is converted into chemical energy

### **Second law thermodynamics**

Whenever energy is transformed, there is a loss of energy through the release of heat.

### **Illustration**

The loss of energy takes place through respiration, running, hunting etc

## **1.5 OXYGEN CYCLE AND NITROGEN CYCLE**

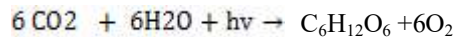
### **OXYGEN CYCLE**

Oxygen is an important element to life on Earth. It is the most common element of the human body. It makes up about 65% of the mass of the human body. Most of this is in the form of water (H<sub>2</sub>O). Oxygen also makes up about 30% of the Earth and 20% of the atmosphere. Oxygen cycle is the cycle that helps move oxygen through three main regions of the earth.i.e., The Atmosphere, The Biosphere, The lithosphere

**The Atmosphere:**

It is the region of gases that lies above the earth's surface. It is the largest reservoirs of free oxygen on earth. In the atmosphere oxygen is released by the process called Photosynthesis.

Plants mark the beginning of the oxygen cycle. During Photosynthesis plants convert CO<sub>2</sub> and water into Carbohydrate and O<sub>2</sub>.



This means that plants breathing CO<sub>2</sub> and breath out Oxygen.

**The Biosphere:**

It is the sum of all the earth's Eco system. In the Biosphere the main cycles are Respiration and Photosynthesis. Animals and Humans Breath in Oxygen and Breath out CO<sub>2</sub>.



**The lithosphere:**

The largest reservoir of oxygen is lithosphere. Here oxygen is present as silicates and oxides. When oxygen bearing mineral is exposed to the elements a chemical reaction occurs that wears it down and produces free oxygen. Thus these are the main Oxygen cycle and each play an important role in helping to project time maintain life on the earth.

**Processes That Use Oxygen**

Breathing - The scientific name for breathing is respiration. All animals and plants use up oxygen when they breathe. They breathe in oxygen and breathe out carbon dioxide.

Decomposing - When plants and animals die, they decompose. This process uses up oxygen and releases carbon dioxide.

Rusting - This is also called oxidation. When things rust they use up oxygen.

Combustion - There are three things needed for fire: oxygen, fuel, and heat. Without oxygen you can't have a fire. When things burn, they use up oxygen and replace it with carbon dioxide

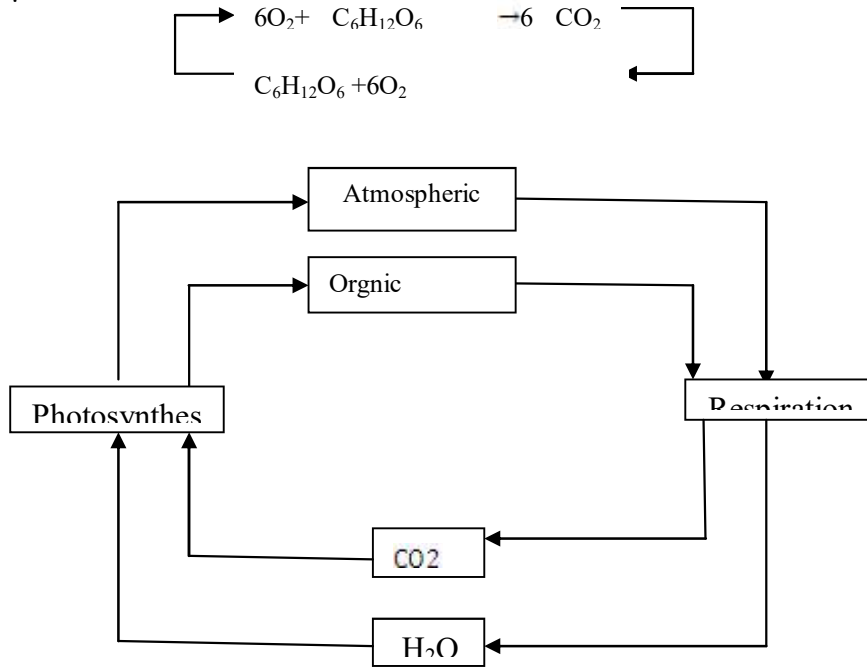


Fig:Oxygen cycle

**Processes That Produce Oxygen**

1.Plants - Plants create the majority of the oxygen we breathe through a process called photosynthesis. In this process plants use carbon dioxide, sunlight, and water to create energy. In the process they also create oxygen which they release into the air.

2. Sunlight - Some oxygen is produced when sunlight reacts with water vapor in the atmosphere.

**NITROGEN CYCLE**

The nitrogen cycle is the process by which nitrogen is converted between its various chemical forms. This transformation can be carried out via both biological and non-biological processes. Important processes in the nitrogen cycle include fixation, mineralization, nitrification, and denitrification. The majority of Earth's atmosphere (approximately 78%) is nitrogen, making it the largest pool of nitrogen. However, atmospheric nitrogen is unavailable for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems.

Nitrogen is present in the environment in a wide variety of chemical forms including organic nitrogen, ammonium ( $\text{NH}_4^+$ ), nitrite ( $\text{NO}_2^-$ ), nitrate ( $\text{NO}_3^-$ ), and nitrogen gas ( $\text{N}_2$ ). The organic nitrogen may be in the form of any living organism, or humus, and in the intermediate products of organic matter decomposition or humus built up.

The processes of the nitrogen cycle transform nitrogen from one chemical form to another. Many of the processes are carried out by microbes either to produce energy or to accumulate nitrogen in the form needed for growth. The diagram above shows how these processes fit together to form the nitrogen cycle.

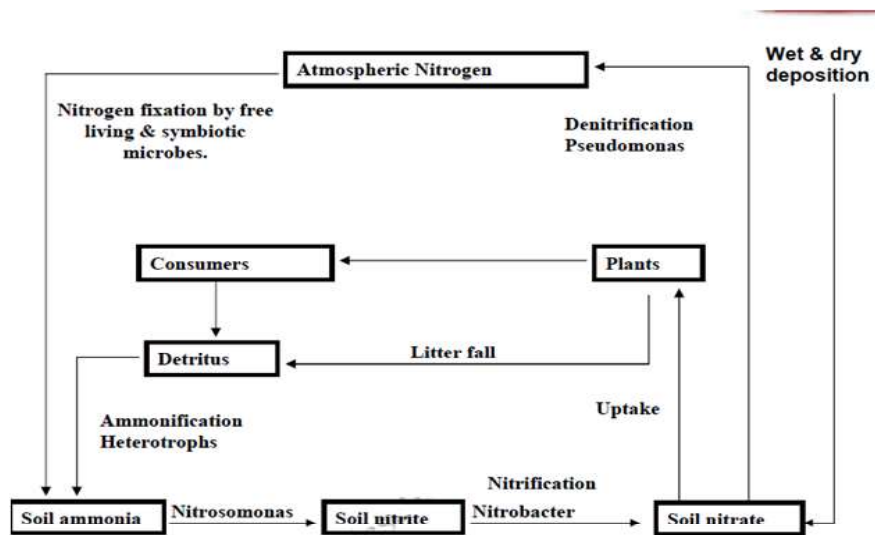


Fig: Nitrogen Cycle

### Nitrification

The conversion of ammonia into nitrates is termed as nitrification. This is brought about by nitrifying bacteria.

### Denitrification

The conversion of nitrates into nitrogen ( $\text{N}_2$ ) is termed as denitrification. This process is brought about by denitrifying bacteria.

### 1.6 ECOLOGICAL SUCCESSION

The progressive replacement of one community by another till the development of stable community in a particular area is called ecological succession.

#### Stages

Pioneer community

The first group of organism, which establishes their community in the area is called pioneer community.

Seral or seres stage

The various developmental stages of community are called “seres”.

#### Types of ecological succession

Two types are available

#### Primary succession

It involves the gradual establishment of biotic communities on a lifeless ground

Hydrarch or hydrosere

Establishment starts in a watery area like Pond, Lake

Xerarch or xerosere

Establishment starts in a dry area like desert and rock.

#### Secondary succession:

It involves the establishment of biotic communities in an area, where some type of biotic community is already present

Process of ecological succession

**1. Nudation** –it is the development of a bare area

**2. invasion**-it is the establishment of one or more species on a bare area through migration followed by establishment

**Migration:**Migration of seeds brought about by wind, water or birds

**Establishment:** The seed then generate and grow on the land and establishes their pioneer communities

### 3. Competition

As per number of individual species grows, there is a competition with the same species and between different species for space, water and nutrients

### 4. Reaction

The living organisms, take water, nutrients and grow then modify the environment is known as reaction

## 1.7 FOREST ECOSYSTEM

A forest ecosystem is the one in which a tall and dense trees grows that support many animals and birds.

### 1. Tropical rain forest

They found near equator

It characterized by high temperature

They have broad leaf trees like tiger, lion etc

### 2. Tropical deciduous forest

They found little away from equator

It characterized by warm climate and rain only during rainy monsoon.

They have different types of deciduous trees like maple, oak and animal like fox

### 3. Tropical scrub forests

These are characterized by a dry climate

They have small deciduous trees like deer, fox etc



**4. Temperate rain forest**

They found in temperate area with adequate rainfall

They are characterized by coniferous trees like pine

**5. Temperate deciduous forest**

They found in moderate temperature areas

They have broad leaf deciduous trees like oak, hickory and animals like deer, fox

**Characteristics of forest ecosystems:**

Forest is characterized by warm temperature and adequate rainfall.

Forest maintains climate and rainfall

It support many wild animals and protect biodiversity

The soil rich in organic matter and nutrients ,which support the growth of trees

**1. Abiotic components**

E.g.) climatic factors (temperature, light)

The biotic components are inorganic and organic substances found in the soil and atmosphere.

**2. Biotic components:**

Producers: plants absorb sunlight and produce food through photosynthesis

Consumers:

Primary consumers: they depend on the plants for their food e.g.) ant

Secondary Consumers: they depend on the herbivores for their food e.g.) birds, snake.

**1.8 GRASSLAND ECOSYSTEM**

It is characterized by Hot and dry conditions

Treeless desert likeshrub,grasses

**Types of grassland ecosystem**

1. Tropical grass land
2. Temperate grasslands
3. Polar grasslands

**Features of different types of grasslands**

**1. Tropical grassland**

They found near the borders of the tropical rain forest

It characterized by high temperature

example savannas in Africa

Animals – Zebra, giraffes etc

**2. Temperate grasslands**

They are usually found in the centers of continents, on flat, sloped hills.

They are characterized by very cold winter and hot summers

soil is quite fertile

Cleaned for agriculture.

**3. Polar grasslands**

They are found in arctic polar regions

They are characterized by severe cold and strong wind along with snow

A thick layer of ice remains frozen under the soil surface throughout the year known as permafrost

**Characteristics of grassland ecosystem**

It is a plain land occupied by grass

Soil is very rich in nutrients and organic matter

It is characterized by low or uneven rainfall

**Structure and function of the grassland ecosystems**

Abiotic components: carbon di oxide, water

Biotic components

Producers: shrubs, grasses

Consumers:

Primary consumers: cows, sheep

Secondary consumers: snake

Tertiary consumers: Hawks, eagle

Decomposers-fungi, bacteria

**1.9 DESERT ECOSYSTEMS:**

Desert occupies about 35%of our world's landarea.it is characterized by less than 25cm rain fall

**Types of desert ecosystems**

1. Tropical desert
2. Temperate desert
3. Cold desert

**Features of different types of deserts**

**1. Tropical desert**

Tropical deserts are found in Sahara and Thar Desert

**2. Temperate deserts**

They are found in south California

It characterized by very hot summer and very cold winter time

**3. Cold desert:** They are found in Gobi desert

**Characteristics of desert ecosystem**

Desert air is dry and the climate is hot

Annual rain fall is less than 25cm

Soil is very poor in nutrients

Vegetation is poor

**Structure and functions of desert ecosystem**

**Abiotic components**

Temperature, rainfall

**Biotic components**

**1. Producers:**

In desert mostly succulent plants are found (e.g. cactus)

They have water inside them to stay alive

They have waxy layer on the outside to protect them from the sun

**2. Consumers**

These animals dig holes in the ground to live in

They come out night to find food

Most of the animals can extract water from the seeds then drink

**3. Decomposers:** bacteria

**1.10 AQUATIC ECOSYSTEM**

Aquatic ecosystem exist in pond, lake, river etc

Fresh water life zones

E.g.) ponds, streams, lakes

Salt water life zones: e.g.) oceans, estuaries

### 1.11 POND ECOSYSTEM

A pond is a fresh water aquatic ecosystem, where water is stagnant

#### Characteristics of pond

Pond is a temporary water body system

It is a stagnant fresh water body

#### Structure and function of pond ecosystem

**Abiotic components** E.g.) temperature, light

#### Biotic components

##### Producers

Phytoplankton-these are microscopic aquatic plants, which freely float on the surface of water E.g.) algae, pandorina

##### Consumers

Primary consumers: protozoa, ciliates

Secondary consumers: water beetles

Tertiary consumers: game fish

**Decomposers:** bacteria

### 1.12 LAKE ECOSYSTEM

Lakes are large natural water bodies

Types of lakes

Oligotropic lakes: they have low nutrient concentrations

Eutropic lakes: they are over nourished by nutrients like N and P

Dystrophic lakes: they have low pH, high humic acid contents

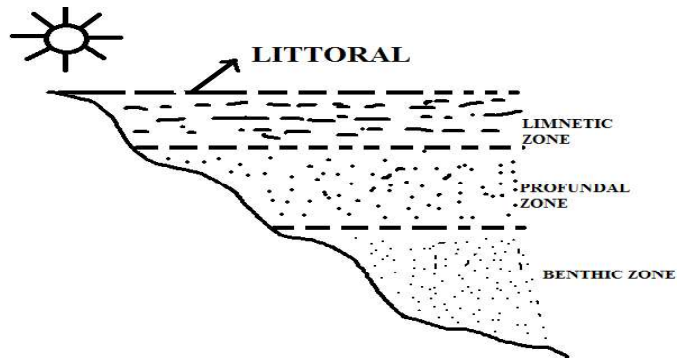
Volcanic lakes: they receive water from magma

Meromictics lakes: they rich in salts

Artificial lakes: they are created due to construction of dams

### Zones of lake

Depending upon their depth and distance from the shore ,lakes consists of 4 distinct zones



Littoral zone: it has shallow water and it is the top layer of the lake

Limnetic zone: effective penetration of solar light takes place

Profundal zone: the deep open water, where it is too dark

Benthic zone: it found at the bottom of the lake

### Structure and function of Lake Ecosystem

Abiotic components: temperature, light

Biotic components: green plants

Consumers:

Primary consumers: they feed on phytoplankton

Secondary consumers::they feed on zooplankton

Tertiary consumers: they feed on small fishes

Decomposers: they decompose the dead plants and animals

### 1.13 RIVER OR STREAM ECOSYSTEM

#### Characteristics of river

- It is a fresh water and free flowing water system
- River deposits large amount of nutrients

#### Structure and functions of an ecosystem

Abiotic components: temperature, light

Producers: phytoplankton

Consumers:

Primary consumers: snails

Secondary consumers :birds

Decomposers: bacteria and fungi

### 1.14 OCEAN ECOSYSTEM

Oceans cover more than two thirds of the earth's surface

The ocean environment is characterized by its high concentration of salts and minerals

#### Zones of oceans

Coastal zone: it is relatively warm, nutrient rich shallow water

Open sea: it is the deeper part of the ocean.it is vertically divided into three regions

Euphotic zone: It receives abundant light and shows high photosynthesis activity

Bathyal zone: it receives dim light

Abyssal zone :it is dark zone and very deep

#### Characteristics:

It occupies a large surface area

It is rich in biodiversity

It moderate the temperature of the earth

**Structure of an ocean ecosystem**

Abiotic components: Nacl, K, Ca

Biotic components:

Producers: phytoplankton and marine plants

Consumers:

Primary consumers: fish

Secondary consumers: mackerel

Tertiary consumers :cod

Decomposers: bacteria

**1.15 ESTUARINE ECOSYSTEM**

An estuary is a partially enclosed coastal area at the mouth of the river ,where sea water mixes with fresh water

**Characteristics:**

Estuaries are transition zones, where they are strongly affected by tides of the sea

Water characteristics are periodically changed

The living organisms in estuarine ecosystems have wide tolerance

Salinity remains highest during the summer and lowest during winter

**Structure and functions:**

Abiotic components: Temperature, pH

Biotic components:

Producers: seaweeds, sea grasses

Consumers: oysters, crabs



Decomposers: bacteria

### 1.16 BIODIVERSITY

The variety and variability among all groups of living organisms and the habitats in which they live is known as biodiversity

It is the abbreviated word of 'biological diversity' (bio-life or living organisms, diversity-variety). Thus biodiversity is the total variety of life on our planet, the total number of races, varieties and species. The sum of total of various types of microbes, plants and animals in an ecosystem is also known as bio diversity

#### Levels of biodiversity:

Genetic diversity

Species diversity

Ecosystem diversity

#### Genetic diversity

It refers to the variations of genes within species. This covers genetic variation between distinct populations of the same species

Example) teak Wood: in teak wood we are having more number of varieties

E.g.) Indian teak, Burma teak

#### Species diversity:

It is the diversity between different species. The sums of variety of all group of living organisms at the species level is known as species diversity.

The biotic components is composed of a large number of species of plants, animals and microorganisms which interact with each other and with the abiotic components of the environment

e.g.) plant species: wheat, rice, mango etc.

Animal species: deer, elephant

**Ecosystem diversity:**

- It is a set of biotic components interacting with one another and with abiotic components (soil, air, water etc.)
- The diversity at the ecological or habitat level is known as ecosystem diversity  
e.g.) river ecosystem, ocean ecosystem

**1.17 BIOGEOGRAPHICAL CLASSIFICATION OF INDIA**

It based on scientific facts is to enable conservation planning, both at the national and state levels

Four levels:

Biogeographic zone: it is a large distinctive unit of similar ecology, biome representation, community and species, e.g.) Himalaya

The biotic province: Giving weight to particular community separated by dispersal barriers

The land region: Including different land forms

e.g.) Aravalli Mountains

The biome: a biome is an ecological unit not a biogeographic unit

India is classified into 10 biogeographic zones

Trans-Himalaya with 2 provinces

The Himalaya with 4 provinces

The Indian desert with 4 provinces

The semi-arid zone with 2 provinces

The Western Ghats with 2 provinces

Deccan peninsula with 5 provinces

The gangetic plain with 2 provinces

The coasts with 3 provinces

North east India with 2 provinces

The Islands with 2 provinces

### 1.18 VALUES OF BIODIVERSITY

Basic needs of human being are commonly fulfilled by the species and the ecosystems

Classification of values of biodiversity

#### **Consumptive use value:**

These are direct use values

Direct values are concerned with the satisfaction received directly

Foods, oil, fruits and herbals are very essential for human being

Trees are used as fuel in village areas

Animals satisfy our needs by providing milk, woolen cloths, leather etc.

Marine fishes are very useful to people for feeding purposes.

Drugs:

Germany alone uses more than 2,500 species of plants for medicinal purpose in homeopathy and other systems of medicines

India uses 3000 species of plants in Ayurveda, homeopathy and unani systems of medicines

#### **Productive use values:**

Productive uses of such biological resource products are fuel, fish, animal's skins, medicinal plants, honey etc.

The financial value of wild species is important to the economics of many region

Some plants used for medicinal purposes

Marine animals are used as not only food and also raw materials for many manufacturing products

Plant product	Industry
Wood	Paper and pulp industry, railway sleeper industry
Cotton	Textile industry
Fruits, vegetables	Food industry

Animal product	Industry
Leather	Bag industry
Ivory	Art and crafts
Silk	Textile industry

**Social values:**

Biodiversity is very important, particularly in the nations like India for its religious, spiritual and other cultural users

Example:

Holy plants: many plants are considered as holy plants in our country

e.g.) tulsi, peepal, lotus etc.

Holy animals: e.g.) cow, snake, bull, rat etc.

**Ethical values:**

It involves ethical issues like “all life must be preserved”

People give religious value to some of the plants and animals

Killing of any living organisms is considered unethical by some people

**Aesthetic values:**

The beautiful nature of plants and animals insist us to protect the biodiversity

The most important aesthetic value of biodiversity is eco-tourism

Example:

people from far place spend a lot of time and money to visit the beautiful areas, where they can the aesthetic value of biodiversity is known as eco-tourism

**Option value:**

The option value of species is its potential to provide our economic benefit to human society

Example:

The growing biotechnology field is finding species for compounds cure the diseases of cancer.

**1.19 GLOBAL BIODIVERSITY:**

Total number of living species in the world is about 20 million. But of which only about 1.5 million species are found and given scientific names

**Biomass:**

It is the largest ecological units present in different ways.

**Tropical rain forest:** These are the earth's largest store house of biodiversity

Medicinal plants:

More than 25% of the world's prescription drugs are extracted from plants growing in tropical forests

Flowering plant

It has been estimated that nearly 1, 30,000 flowering plant species are available

**Temperate forests:**

They have much less biodiversity

Globally they have nearly,

1, 70,000 flowering

30,000 vertebrates

2, 50,000 other group of species

### 1.20 BIODIVERSITY AT NATIONAL LEVEL

Rank for India in biodiversity,

10 th rank among the plant rich countries of the world

6 th rank among the centers of biodiversity and agricultural crops

11 th rank among the endemic species of vertebrates

#### **Medicinal value:**

Generally more than 2500 medicinal plants are available in India

#### **Examples:**

Vembu and tulsi plants are well known for medicinal values

Keelanelli plant is very useful for the treatment of jaundice

The panda and snow leopard are found in the higher region of the Himalayas

77,000 species of animals are available in India

15,000 species of flowering plants available in India

India is the origin place of 168 species of crop plants

Inorder to protect the diversity, the government has set up 85 national parks and 447 wildlife sanctuaries

**Number of species in India**

Group	Number of species in India
Mammals	350
Birds	1224
Fishes	2546

**1.21 BIODIVERSITY AT LOCAL LEVEL**

The distribution of forests among different districts of state is very uneven

Salem district having more dense forest areas

In nilgiri most of its area under forest

**It characteristics into 4 types**

Point richness: it refers to the number of species that can be found at a single point

Alpha richness: it refers to the number of species found in a small homogeneous area. it is strongly correlated with physical variables

Beta richness: it refers to the rate of change in species composition across different habitats

Gamma richness: it refers to the rate of changes across large landscape

**Example**

The elephant sanctuaries at animalai

Tiger sanctuary at mundanthurai

**1.22 HOT SPOTS OF BIODIVERSITY**

The hotspots are the geographic areas which possess the high endemic species

According to world level 25 hot spots are available, in that India having 2 hotspots.

**Eastern Himalaya**

Indo –Burma region

Geographically these areas comprises Nepal, Bhutan, and neighboring state of northern India

Eastern Himalaya rich in wildplants, Eg) ginger, jute

**Western Ghats:**

The area comprises Maharashtra, Karnataka, Tamil nadu and Kerala

62%amphipiansand 50%lizard are endemic in Western Ghats

Some common plants: rhododendron, hypericum

Some common animals: blue bird, lizard hawk

**1.23 THREATS TO BIODIVERSITY**

**Habitat loss:**

Human disturb the natural habitat causes loss of biological biodiversity

Factors influencing habitat loss,

Deforestation activities (cutting trees for timber, removal of medicinal plants)

Production of hybrid seeds requires wild plants as raw material, farmers prefer hybrid reeds, many plant species become extinct

Increase in the production of pharmaceutical companies made several number of medicinal plants and species on the verge of extinction.

Removal of forest-cover for road laying and also due to soil erosion

Population explosion, construction of dam, discharge of industrial effluents use of pesticides.



**Fragmentation:**

Fragmentation is the reduction of habitat into smaller and smaller more scattered patches

**Poaching of wild life**

Poaching means hunting of animals or killing of animals.

Types of poaching

Commercial poaching: hunting and killing animals to sell their products is termed as commercial poaching

Subsistence poaching: killing of animals for food for their life survival is termed as subsistence poaching

**Factors influencing poaching**

Human population:

Increased human population has led to reduce forest resources and also degradation of wild life habitats

Commercial actives:

Organized crime has moved into illegal wild life smuggling because of the huge profits.

Examples: elephant population was halved by ivory poaching

Tiger: tiger population was decreased by poaching for their furs and bones

Male gorilla: it is hunted for its body parts, head and hands.

Fish: 100 million tons fish is not used for direct human consumption but used as animal feed sources

Sea shores: These valuable species are also illegally sold into the foreign market for want of money.

Example: The American passenger pigeon was the world's most abundant bird. In spite of this vast population, market hunting and habitat destruction caused the entire population to crash within 20 years.

**Remedy measures:**

Illegal hunting and trade of animals and animal products should be stopped immediately

We should not purchase fur coat, purse or bag made of crocodile skin or python skin

Biodiversity laws should be strengthened.

**1.24 MAN-WILD LIFE CONFLICTS:**

Rapidly growing human population often interferes with wild life creating man wild life conflicts

**Reasons for man-wild conflicts:**

Female animals attack the human if she feels that her new born cubs are in danger

The villages maintain electric wiring around their field. The elephants get injured, suffer in pain and turn violent

Human encroachment into the forest areas raises a conflict between man and the wildlife

Many tourists in the wild life areas disturbed by transport, resort and hunting

The glamour products obtained from wild life such skin, horns etc.

**Examples for man-wilds life conflicts**

In sampalpur, Orissa 195 humans were killed in the last 5 years by elephants

Two men were killed by leopards in powai, Mumbai

A total of 14 persons were killed during 19 attack by the leopards

**Remedial measures or conservation of biodiversity**

Solar power can be used instead of electric current to prevent the animals from

Adequate crop and cattle compensation schemes must be started

The development and constructional work in and around forest region must be stopped

### 1.25 ENDANGERED SPECIES OF INDIA

Animals which face the threat of extinction due to various unfavorable factors in their natural habitats are called endangered species.

Red data book of India plants containing about 200 rare and endangered species is completed

In India, nearly 450 plant have been identified as endangered species

Important endangered species

Mammals: tiger, snow leopard, lion, Red fox, the buffalo, dancing deer

Birds: peacock, hooded crane, black necked crane

Reptiles: python, monitor lizard, estuarine crocodile

Amphibian: the viviparous toad, Indian salamander

#### Threatened species of India by taxonomic group

Taxonomic group	Number of threatened species
Mammals	86
Birds	70
Reptiles	25
plants	244

### 1.26 ENDEMIC SPECIES OF INDIA

The species which are found only in a particular region are known as endemic species. In India 47000 species of plants, 7000 species of animals are endemic

Examples for endemic species: Amphibians (frogs, toads), Reptiles (lizards, crocodiles)

#### Endemic species of animals

Group	Number of species
Land	878
Fresh water	89
Ares	70

#### Endemic species of plants

Group	Number of species
Pteridophyta	200
angiosperms	4950

### 1.27 CONSERVATION OF BIODIVERSITY

The conservation of diversity focuses not only on conservation but also sustainable use of biological resources. Today in world, there are 9800 protected areas and 1500 national parks

#### Need for conservation of biodiversity

Biodiversity if the foundation for sustainable development

Sources of resources of industries mostly from biodiversity

The most important direct use of species is used as food

Medical drugs and herbals are derived from plants

It is also preserves the genetic diversity of plants and animals

**Types**

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

**Insitu conservation:**

It involves protection of fauna and flora within its natural habitat, where the species normally occurs is called in situ conservation

**Methods of Insitu-conservation:**

Around 4% of the total geographical area of the country is used for Insitu conservation

<b>Insitu conservation</b>	<b>Numbers available</b>
Biosphere reserves	7
National parks	80
Wildlife sanctuaries	420
Botanical gardens	120

**1. Biosphere reserves:**

Biosphere reserves cover more than 5000 sq.km area. It is used to protect species for long time

<b>Name of biosphere</b>	<b>State</b>
Nanda Devi	Uttarpradesh
Manas	Assam
nilgiri	Karnataka, kerala, tamil nadu

Role of biosphere

- It gives long term survival of evolving ecosystem
- It protects endangered species
- It serves as a site of recreation and tourism

## 2. National park

It is usually a small reserve covering an area about 100 to 500 sq.kms

National park	State	Important wildlife
Kaziranga	Assam	One horned rhino
Bandipur	Karnataka	Elephant
Corbett	Uttar Pradesh	Tiger
sariska	Rajasthan	tiger

### Role of a national park

- It is used for enjoyment through tourism, without affecting the environment
- It is used to protect and develop the wildlife

## 3. Wildlife sanctuaries

At present, there are 492 wildlife sanctuaries in our country

Name of sanctuary	State	Major wild life
Vedanthangal bird sanctuary	Tamil nadu	Water birds
Wild ass sanctuary	Gujarat	Wild ass,wolf

Role:

- It protects animal only
- It allows the operations such as harvesting of timber, collection of forest products

## 4. Gene sanctuary

Where the plants are conserved

Example: in northern America, two gene sanctuaries are available

- a) One gene sanctuary for citrus
- b) One for pitcher plant

**Ex-situ conservation:**

It means conservation of species away from their natural habitat. It involves maintenance and breeding of endangered plant and animal species under partially or wholly controlled conditions in zoos, gardens and laboratories

Role:

- It involves maintenance and breeding of endangered plant and animal species
- It identifies those species which are at more risk of extinction

**Organizations of ex-situ conservation**

- i. National bureau of plant genetic resources

It is located in new delhi. it uses cryo preservation techniques to preserve agricultural and horticultural crops

**Cryo preservation technique**

It involves the preservation of seeds of some important crops by using liquid nitrogen at a temperature as low as  $196^{\circ}\text{C}$

National bureau on animal genetic resources (NBAGR)

It is located in Karnal, Haryana

National facility for plant tissue culture repository (NFPTCR)

It develops the facility for conservation of varieties of crop plants or trees by tissue culture

**Methods:**

1. Long term captive breeding

2. Shortage term propagation and release
3. Animal translocation and re introductions
4. Seed bank
5. Reproductive technology: embryo transfer technology, cloning

**Advantages:**

- Survival of endangered species is increasing due to special care and attention
- Egg pulling involves collecting wild eggs and then hatching them in zoos or research centre's

**Disadvantages**

- It is expensive method
- The freedom of wildlife is lost
- It can be adopted only for few selected species

**1.28 INDIA AS A MEGA DIVERSITY NATION**

India has uniquely rich diversity of plants and animals

Distribution of species in some groups of flora and fauna in India

Group-wise species distribution			
Plants	Number	Animals	number
Fungi	23,000	Amphibian	2546
Bacteria	850	Birds	1228
Algae	2500	Reptiles	428
bryophytes	2564	mammals	372

Origin of plant diversity

Nearly 5000 flowering plants and 166 crop plant species have their origin in India



Origin of marine diversity

More than 340 coral species of the world are found here

Biogeographically classification

1. Zones-similar ecology community
2. Provinces-it consist with particular community separated by barrier

E.g.) North -West and west Himalaya separated by Sutlej river

3. Land region-it consist of different landforms with in provinces
4. Biome-it is a ecological unit

Zones:

India has 10 zones and 26 provinces

Trans-Himalaya –Tibetan plateau

Himalayas-entire mountain

The Indian desert –arid area west to arawilli hill

The semi-arid- zone between desert and Deccan plateau

Gangetic plain-Ganges river area

North-east India –plains and non Himalayan hill

Deccan peninsula-Deccan plateau

Western Ghats

Islands-andaman,nicobar in bay of Bengal

Coasts-west, east coast and laksha deep

Biosphere reserves

13 biosphere reserves which includes 2 hot spots like Western Ghats and eastern Himalayas

e.g.) nilgiri-between Tamil nadu, kerala and Karnataka Manas-assam

World heritage sites

There are 5 national parks e.g.) Sunderbans-west Bengal

Ramsar wet lands: India has 6 wet lands

Trijunction: India is situated in the trijunction of these realms

- paleo-arctic
- afro-tropical
- indo-Malayan realms

## **TWO MARKS**

### **1. Define environment.**

Environment is defined as the sum of total of all the living and non-living things around us influencing one another.

### **2. What are all the categories of environment?**

The main categories of environment are biotic and abiotic environments. The abiotic environment can further be classified into atmosphere (air), lithosphere (soil), and hydrosphere (water). The biotic environment is called as biosphere.

### **3. Write the components of environment?**

Air (Atmosphere)

Land (Lithosphere)

Water (Hydrosphere)

### **4. Define ecosystem.**

A group of organisms interacting among themselves and with environment is known as ecosystem. Thus an ecosystem is a community of different species interacting with one another and with their nonliving environments exchanging energy and matter.