MAN AND BIOSPHERE

ELEMENTARY ASPECTS OF ECOSYSTEM

- All the parts **of** the earth that are inhabited by **living** organisms constitute the - **Biosphere**
- Study of relationships between organisms and their biotic and physical surroundings is referred to as **Ecology or Environmental biology**

Reasons for the loss of ecological balance are

1) Over exploitation of ecosystems for standing crops. 2) Over utilization of physical resources

3) Habitat alteration 4) Habitat destruction

- Book written by **Eugene** Odum**- Fundamentals of** Ecology
- The term Ecology" was first used by Ernst Haeckel. Ecology is defined as "the study of organisms in relation to surroundings in which they live by -Ernst Haeckel
- **The** word Ecology was derived from the Greek **word** 'OIKOS' meaning habitation or home. **LOGOS** means studies.

Divisions of ecology:

Autecology:

Study of interrelationships between individual organisms of a same species or population and their environment is called Autecology**/Species** ecology

Synecology:

Study of inter relationships between different species **of** organisms and their environment is called **Synecology** / (Ecology **of communities)**

Earth and the environment

- Average diameter of the earth is approximately 12742 km
- **Physical** components **of** the earth are A**tmosphere, Hydrosphere** and G**eological layers**.
- **Gaseous** envelope surrounding the **earth** constitutes the **-Atmosphere**

Four distinct layers are recognised in the atmosphere they are

1) Troposphere 2) Stratosphere

3) Ionosphere 4) Exosphere

1) Troposphere:

- The lowest layer closer to **the** earth's surface is **Troposphere**
- It extends **up to** the height of **8** to **10** km **above the** earth surface at poles and **16** to **18** km at the equator.
- The **pressure** and **temperature** of the **air decrease gradually as -Height increases from earth's surface**
- Troposphere is the densest **and** the most turbulent layer with atmospheric phenomena
- **75%** of mass of the atmosphere is present in **Troposphere**
- **Temperature at tropopause is 57^0C**
- The average atmospheric pressure on the surface of the earth is **1014** millibars / 1 atm
- There is gradual decrease in pressure and temperature as height increases from the earth's surface in the troposphere.

2) **Stratosphere**

- The layer of atmosphere that lies above the troposphere is **stratosphere**
- Stratosphere is the Part of atmosphere that extends up to 50-55 **km** above the earth's surface. Stratosphere contains **Ozone shield**
- Stratosphere begins from Tropopause
- Ozone shield protects the organisms on the earth by absorbing Ultraviolet radiation
- In stratosphere as the altitude increase there is increase in temperature

3) **Ionosphere**

- Part of the atmosphere that extends upto 30 to 500 km is -Ionosphere
- Part of the atmosphere in which ions and free electrons exist to reflect electromagnetic waves is -Ionosphere
- Substances present in ionic state due to the effect of ionizing radiation in ionosphere are Oxygen, Nitrogen and Nitric oxide.
- Telecommunications are possible over long distances as shorter radio waves are reflected in Ionosphere
- Parts of ionosphere are '**mesosphere** and **thermosphere**
- The layer of the earth's atmosphere that lies above the stratosphere and below the thermosphere is Mesosphere
- Mesosphere is located above the earth's surface between 50 to 80 km
- Temperature decreases as altitude increases in Ionosphere
- The layer of the earth's atmosphere above the mesosphere and directly below the exosphere is Thermosphere.
- Ionization occurs in thermosphere layer due to Ultraviolet radiation

Exosphere

- Part of atmosphere beyond the ionosphere where atmospheric pressure is low is **Exosphere**
- Liquid component of the earth is –Hydrosphere. 71% of the earth's surface is covered by - Water 97% of it is sea water and 3% fresh water.
- Geological layers of the earth - **Crust, Mantle** and **core**
- Geological composition of the earth (below surface)
- Lithosphere - 0 to 60 km
- Crust - 0 **to** 35 km
- Uppermost part of mantle 35 **to** 2900 **km**
- Atmosphere -100 **to** 700 **km**
- Outer core -2900 to 5100 km
- Inner core -5100 **to** 6378 **km**
- A product of melting mantle is The Crust (35 **Km thick)**
- Thin Oceanic crust is composed of- **Dense Iron & Magnesium** Silicate **Rocks**
- Thick continental crust is less dense and composed of **Na, K and Al Silicate Rocks**
- Crust is the habitat for a rich variety **of** organisms
- 70% of earth's volume is occupied by - Mantle
- Upper most layer of mantle just below the crust is composed of relatively cooled and strong material is- Lithosphere
- Mantle contains higher portion of iron and magnesium and smaller portion of silicon and aluminium
- Temperatue of mantle from top to bottom is 100^0 C to 4000° C
- The region of mantle extending below the lithosphere that cools by convection is called - Asthenosphere

CORE

- Part of the earth that starts from 2900 km beneath the surface and extends downward is the **Core.**
- Temperature of inner core is -6300^0C
- Radius of inner core is-1278 km
- Temperature of outer core is 4000^0C
- Radius of outer core is -3478km
- Inner core is composed of iron and some nickel Crystals
- Outer core is composed of molten iron with molten nickel and traces of lighter elements

ENVIRONMENT

- Sum total of all biotic and abiotic factors surrounding the organism is called Environment
- The temperature, pressure, humidity, rainfall, sunshine, cloud cover and wind at a given place and time is called **Weather**
- The average weather of an area over a long period is called **Climate**
- Climate of an area is mainly determined by temperature and rainfall
- Distribution of living orgamisms is influenced by the Climatic patterns

Climatic zones are:

Tropical - 0^0 to 20^0 latitude

Subtropical - 20^0 to 40^0 latitude

Temperate - 40° to 60° latitude

Polar - 60^0 to 80^0 lattitude

- Climate that prevails in the immediate surroundings of plants and animals is called Micro climate.
- In dense forests amount of light reaching the ground is reduced by -Foliage.
- Shade loving plants that live under the shade of tree are called **Sciophytes**
- The place where organisms live is called the Habitat
- Physical and abiotic factors that determine the environment in which an organism lives are Light, Temperature and Moisture.
- Functional role of an organism in an ecosystem is called Ecological Niche
- HIERARCHY AMONG THE LIVING ORGANISMS:
- Basic unit of study in ecology is organism
- A group of organisms of a single species living in a particular area is called **Population**

Eg: i) Frogs of the species Rana tigrina in a pond

ii) Slipper animalcules of Paramoecium caudutum in a pond,

iii) Deer of the species Axis axis in a forest

- Assemblage of the populations of different species of micro organisms, plants and animals living in a given habitat is called **biotic community**.
- Different population like, plants, deers, tigers, snakes, beetles, worms together form a Wood land community.

ECOSYSTEM

- The self sustained unit that is composed of biotic community integrated with physical environment through the transfer of energy and recycling of nutrients is – Ecosystem
- Unit of land having a mosaic of ecosystems surrounded by natural boundaries is called **Land scape**.
- The term Ecosystem was coined by A.G. Tansley
- The total life supporting environment is called Biosphere (or) Ecosphere
- A biotic community in a large area living in particular climatic condition constitutes - Biome

Eg:

i. Grass Land or coniferous forest
ii. Tundra is the Biome of Arctic region
iii. Taigas is the Biome of - Temperate region
iv. Rain forest is the Biome of - Tropical region

Structural components of ecosystem are abiotic and biotic components.

Functional aspects of an ecosystem include

i. Flow of energy through ecosystem
ii. Recycling of nutrients within the system.

- Abiotic and biotic components in an ecosystem are linked with each other through Flow of energy & recycling of nutrients with in the system.
- Flow of energy or recycling of materials is essential for a community to maintain its physical environment
- Abiotic physical factors are Temperature, rainfall light, pressure, solar radiation, geomagnetism, type of soil
- Abiotic chemical factors are Salinity, acidity, alkanity necessary inorganic nutrients.
- All living organisms in an ecosystem constitute Biotic factors
- Biotic factors are 1) Producers 2) Consumers and 3) Decomposers