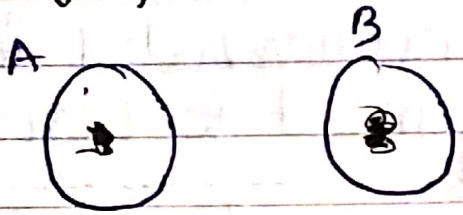
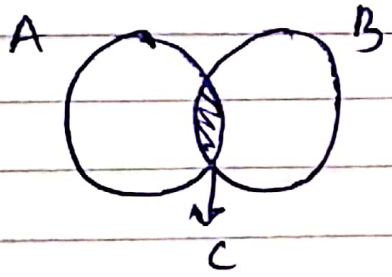
Ecosystem biodiversity
Variety of ecosystem on earth.

Measurement of biodiversity

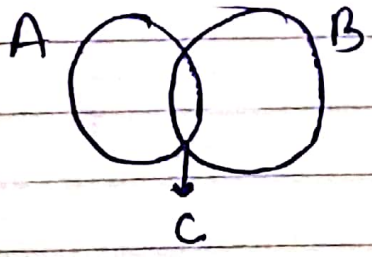
1. Alpha (α) biodiversity



2. Beta (β) $(A-C)+(B-C)$



3. Gamma (γ) $A-C+B$
$A+B-C$



Natural Resources & Biodiversity

Biodiversity → variety
↳ Life

- Variety of life forms present on Earth.
- Walter G Rosen in 1985
- Plants animals & micro-organism
- 1.8 million of species are known to us.

LEVEL OF BIODIVERSITY

1. Genetic biodiversity
- variety of genes within a species
- It is least visible and studied biodiversity.

2 Species biodiversity.
- variety of species within an area of a ecosystem.

Pond Ecosystem

Abiotic
Water, DO,
sunlight, nutrients

Biotic
Phytoplanktons
↓
Zooplanktons
↓
Small fish
↓
Benthic organisms
(Snakes, big fish)
↓
Decomposers

Ocean Ecosystem

Abiotic
Dissolved salts

Biotic
Phytoplanktons
↓
Crustaceans, molluscs
↓
Echinoderms
↓
Sharks, dolphins

Abiotic
nutrients

Biotic
Grass
↓
Buffalos, sheep, goat, cow, deer, antrops.
↓
Frog, snakes, Lizard
↓
hawk, Lion → Bacteria

Desert Ecosystem → 17% of total land
less than 25cm

Abiotic
soil, minerals
temp

biotic
shrubs (cactus)
↓
rodent, camel,
↓
Reptiles - snakes
bacteria

Natural

Terrestrial

- Grassland
- Forest
- Desert
- Pond
- Ocean

Aquatic

- Saline water (marine)
- Fresh water
  - Lantic (static water)
  - Lotic (flow water)

Forest Ecosystem → 40% of earth's land

Abiotic
- soil (nutrients)
- temp.

Biotic
- → Herbs, Shrubs, trees.
- → Deer, rabbit, zebra
- → Snake, fox, wolf, Hyena
- → Lion, Tiger, bacteria

Grassland Ecosystem → 24% earth's surface

Rainfall → 25-75 cm

Xerosere → succession starts in a dry area with little moisture

Lithosere → succession on rocks

Psammosere → succession on sand

Halosere → succession takes place in saline environment (salt marsh)

Steps involved in ecological succession

1. Nudation formation of new bare area.
2. Invasion establishement of species through migra
3. Competition and co-action they influence
   ↳ fight for water & food
4. ~~Reaction~~
5. Stabilization
4. Reaction

Types of ecosystem

- Natural Ecosystem
  1) Stable
  2) Does not cause pollution
- Man made ecosystem
  2) fragile
  3) Pollution

Primary ecological succession

Succession take place at barren and uninhabitat area i-e un-occupied by any earthen community
Eg Area exposed by retreating glacier

Secondary ecological succession

In the previously occupied area but somehow this area get disturbed
Eg. Forest fire, deforestation, overgrazing.

It take less time than primary one.

Succession on the basis of moisture content
Hydrosere → succession starts in region where water is in plenty like lake, pond.

Ecological Succession

The systematic and orderly development in an area till the establishment of biotic components most stable community is formed as

Pioneer community → first community that invades an area.

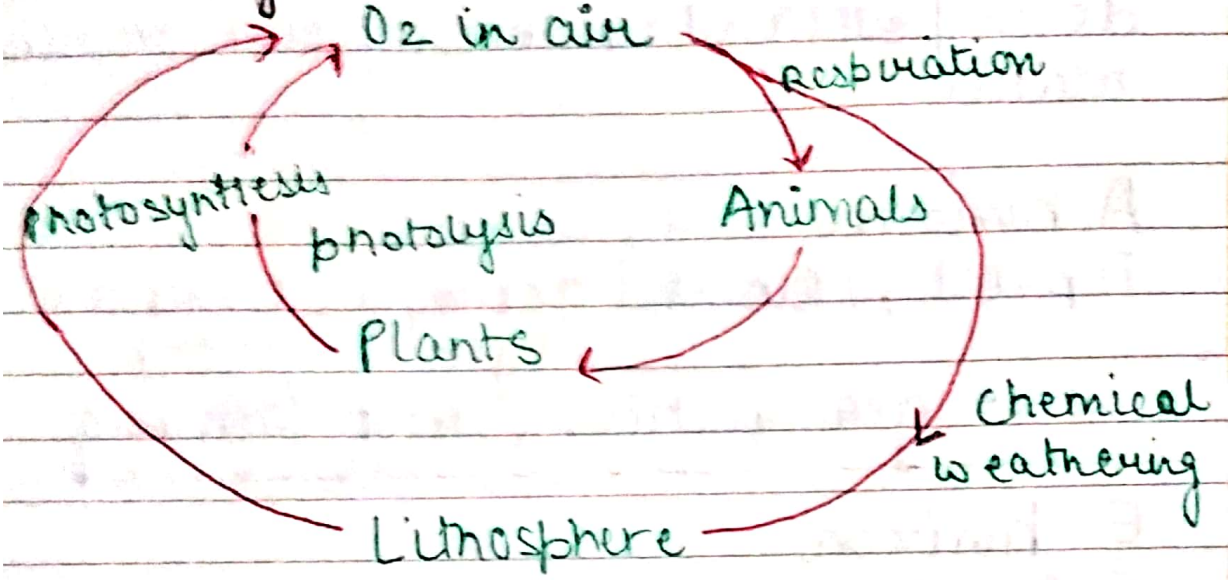
Seral communities → intermediate communities

Climax communities → the most stable communities.

Cause of ecological succession

- Biotic Factor
  overgrazing, destruction of natural vegetation
- Climatic factor
  flood, rainfall
- [illegible] factor

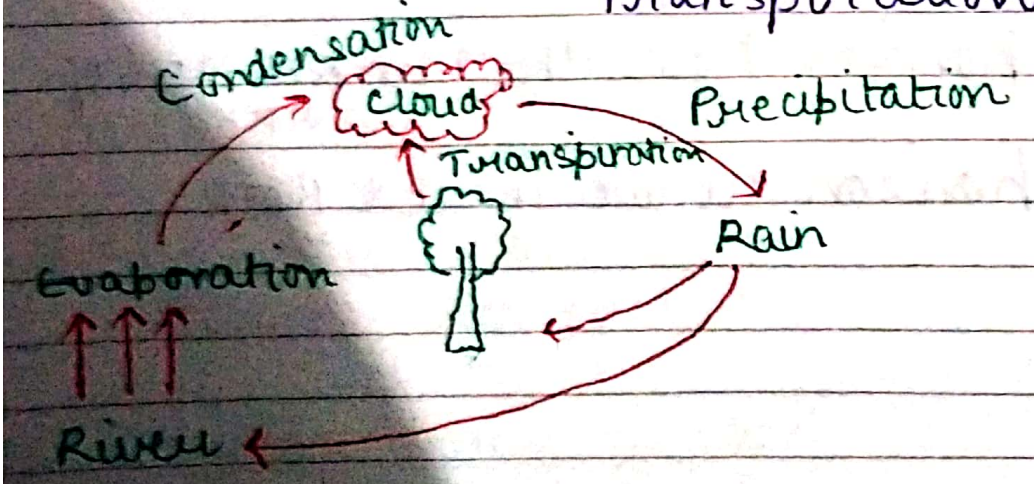
O_2 cycle



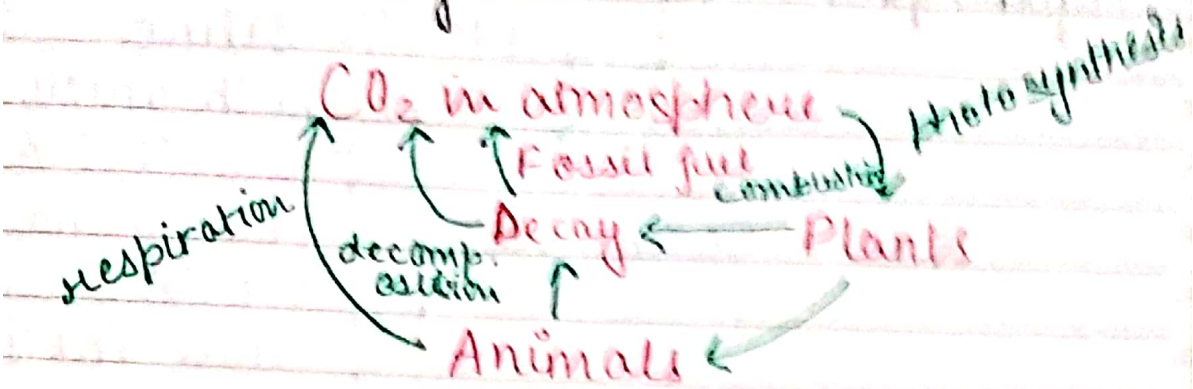
photosynthesis $\begin{cases} 2H_2O \rightarrow 4H + O_2 \\ 2N_2O \rightarrow 4N + O_2 \end{cases}$

Water cycle

Evaporation
Condensation
Precipitation
Transpiration

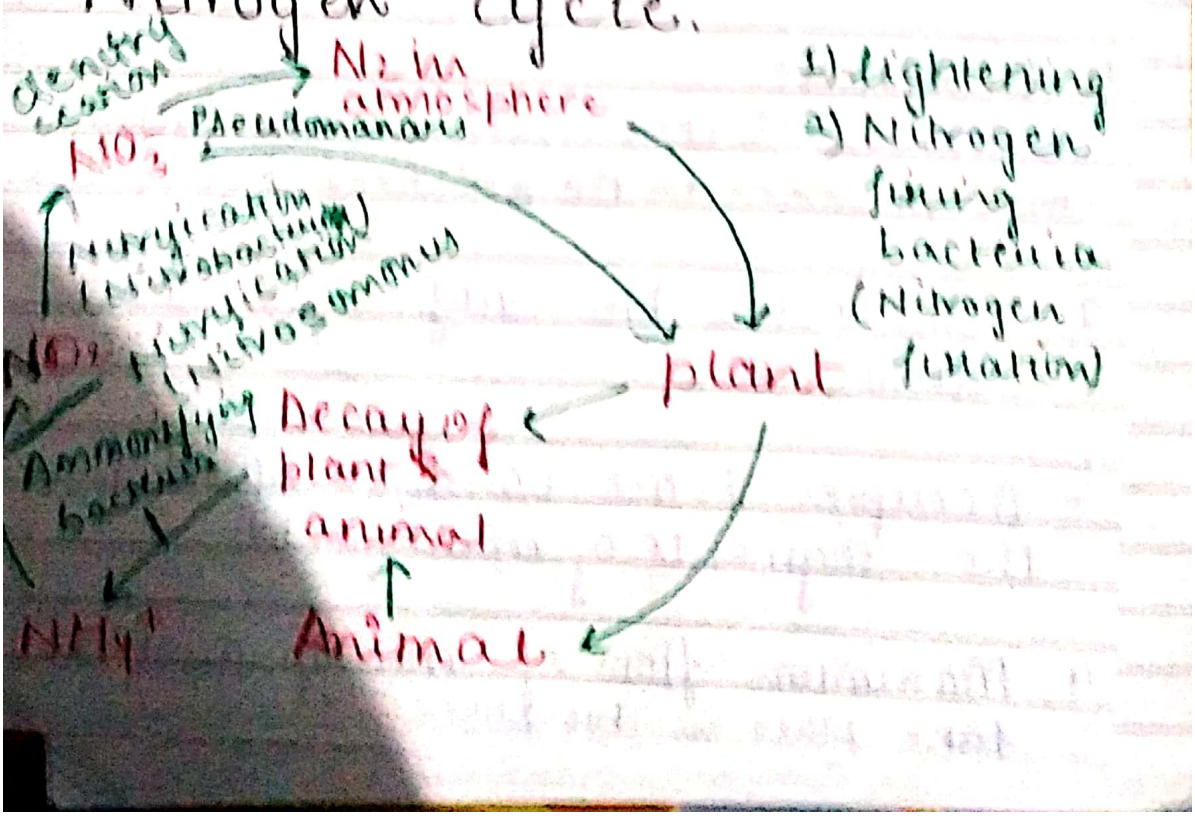


Carbon cycle



1. Photosynthesis
2. Respiration
3. Decomposition
4. Combustion

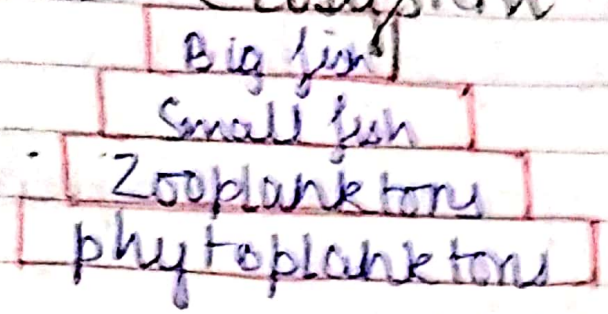
Nitrogen cycle.



always upright

Pyramid of energy.

Pond ecosystem



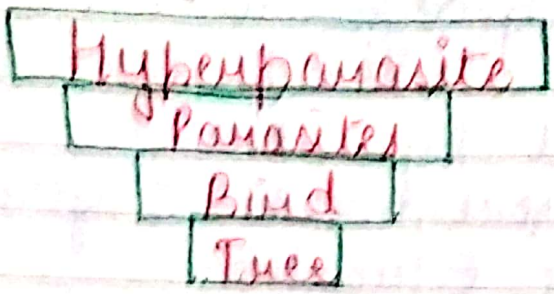
Biogeochemical cycles
The circulation of chemicals like C, N, O, S, P through the biological and physical world.

Gaseous biogeochemical cycle
Reservoirs can be either in atmosphere or hydrosphere. eg. C, H_2O, O, N cycle.

Sedimentary biogeochemical cycle
Reservoir is in lithosphere eg S, P.

inverted

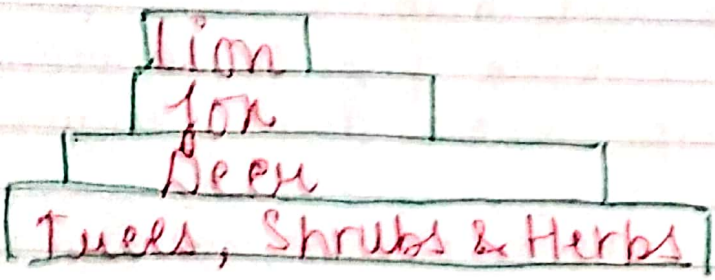
Tree ecosystem



Pyramid of Biomass

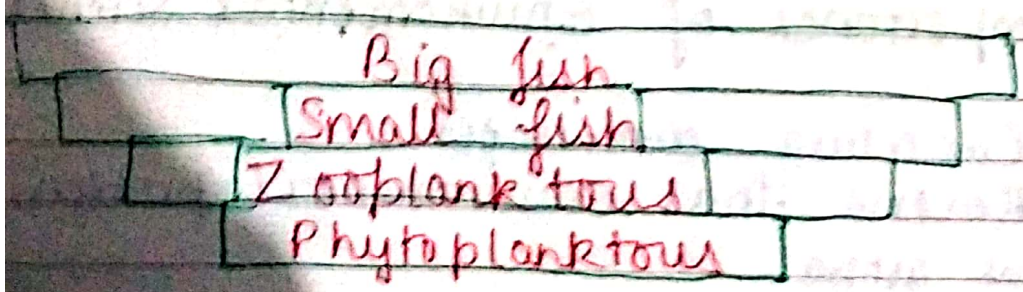
upright inverted

(i) Forest ecosystem



inverted

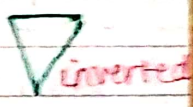
Phytoplanktons → They float in water



Ecological pyramids

Graphical representation of structure and function of an ecosystem.

1. Pyramid of numbers.
2. Pyramid of energy.
3. Pyramid of biomass.



or

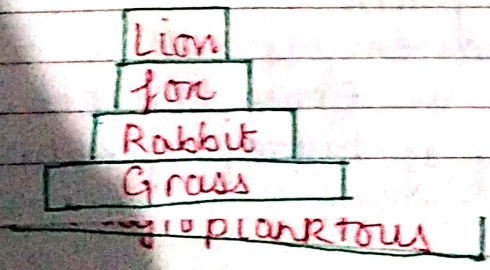
Graphical representation of a number of individuals or biomass or accumulated energy present per unit area in each trophic level of a food chain in an ecosystem.

1 Pyramid of numbers.

upright inverted

Grassland ecosystem

grass → rabbit → fox → lion

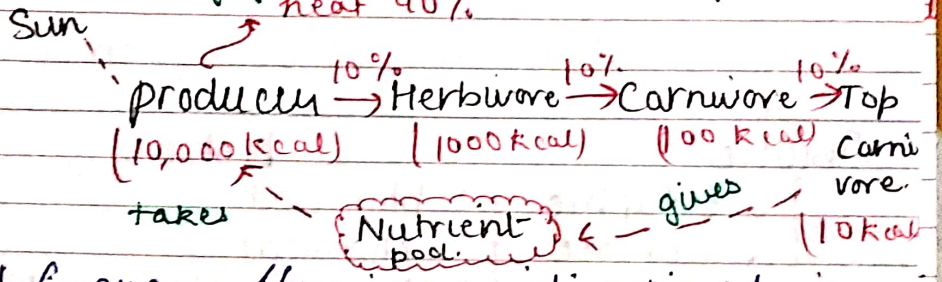


Function
1. Food chain & food web
2. Ecosystem

Significance of food chain & food web

1. It maintain the flow of energy and matter.
2. It maintain ecological balance by regulating population size.
3. It cause biomagnification.

Energy and nutrient flow.



1. Energy flow is unidirectional in nature.
2. Loss of energy from one trophic level to next trophic level.

1. Nutrient flow is cyclic in nature
2. No loss of nutrients take place.

Holoplanktons

Detritus food chain -

Dead organic matter

Detrivore → feed on dead or detritus

Detritus → Detrivore → Carnivore → top carnivore

Parasitic food chain

Green plant → Herbivore → parasite → hyperparasite

Food Web.

Network of Food chain interconnect at various tropic level to obtain energy and nutrients

Grass → Cow → Tiger
Grass → Deer → Fox
Grass → Grasshopper → Frog → snake → Eagle
Grass → bird → Eagle

PLANKTONS

Functions

1. Food chain & Food web
2. Energy flow
3. Nutrient flow → Biogeochemical cycle.

Food chain

Sequence of feeding relationship in an ecosystem to obtain energy and nutrient.

Producers → Herbivores → Carnivores
1st trophic level — 2nd — 3rd ↓ top carnivores 4th

Types of food chain

1. Grazing food chain
2. Detritus " "
3. Parasitic " "

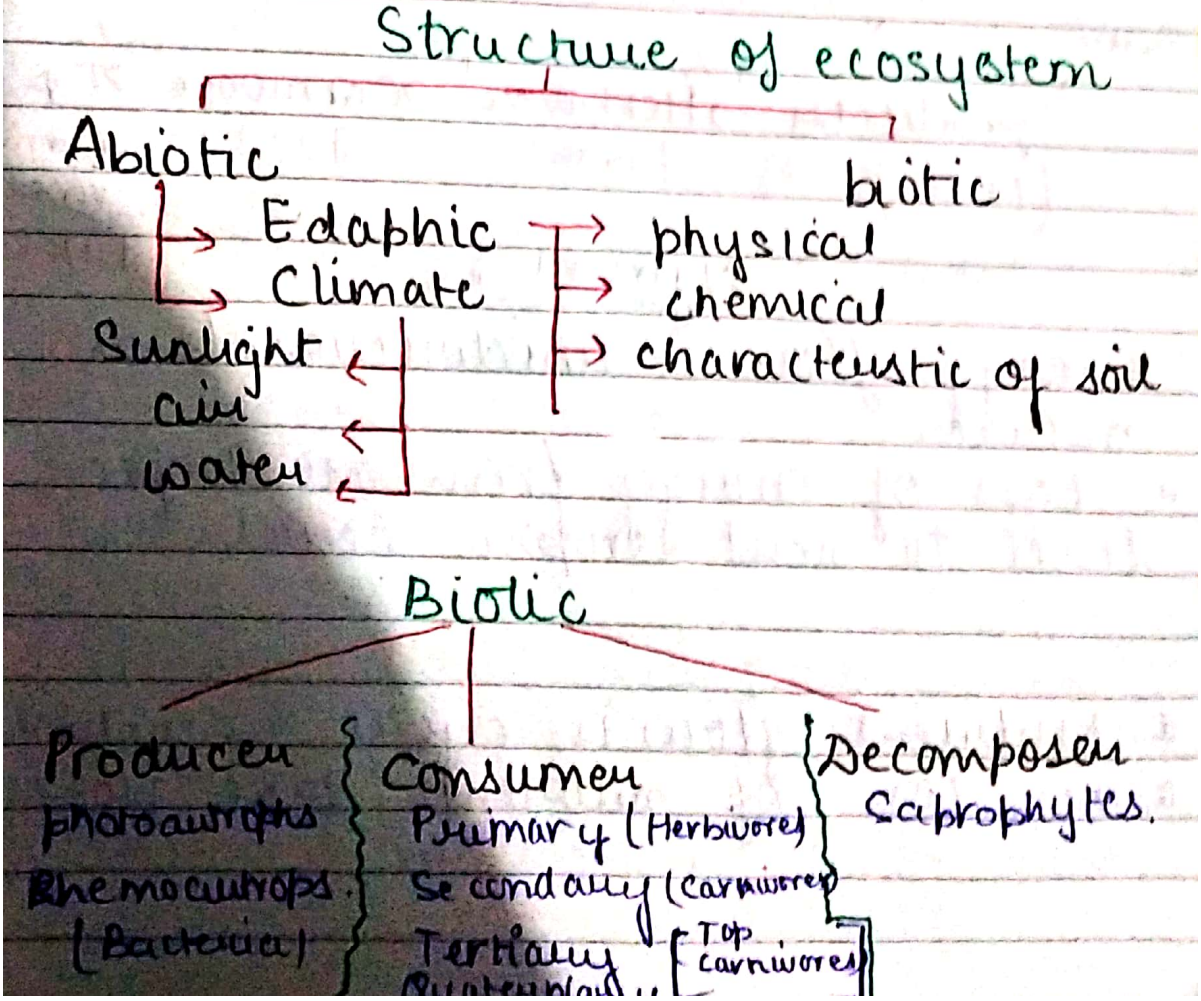
Grazing food chain - start with green plant

Grass → Grasshopper → frog → hawk.

In 1935 → termed introduced by A.G Tansley.

Group of biotic communities interacting with each other and its surroundings through which flow of energy and matter take place.

Structure and function



3. Discuss sustainable ways of living.
4. Efficient use of natural resources.
5. Ways to conserve Biodiversity.
6. Impact of development on environment.

Scope of environmental Science

1. Natural resources - management and conservation.
2. Ecology
3. Biodiversity and its conservation.
4. Environmental pollution and its mitigation → reduction
5. Disasters
6. Social issues related to dulopement
7. Population and its impact on environment.

Ecosystem

Study of ecosystem is called ecology, came in Ernst Haeckel in 1866. study of history of nature

Objective of Environmental Science

→ held in Georgia in 1977 (USSR)

→ Organised by UNESCO

→ Inter-Governmental Conference on Environment Education.

→ Environmentalist universally adopted 5 objectives.

1. Awareness and sensitivity about the environment challenges.
2. Knowledge and understanding
3. Attitude concern for the environment and it help in maintaining environment quality.
4. Skills to solve environmental problems.
5. Participation for exercising existing knowledge.

Importance of Environmental Science

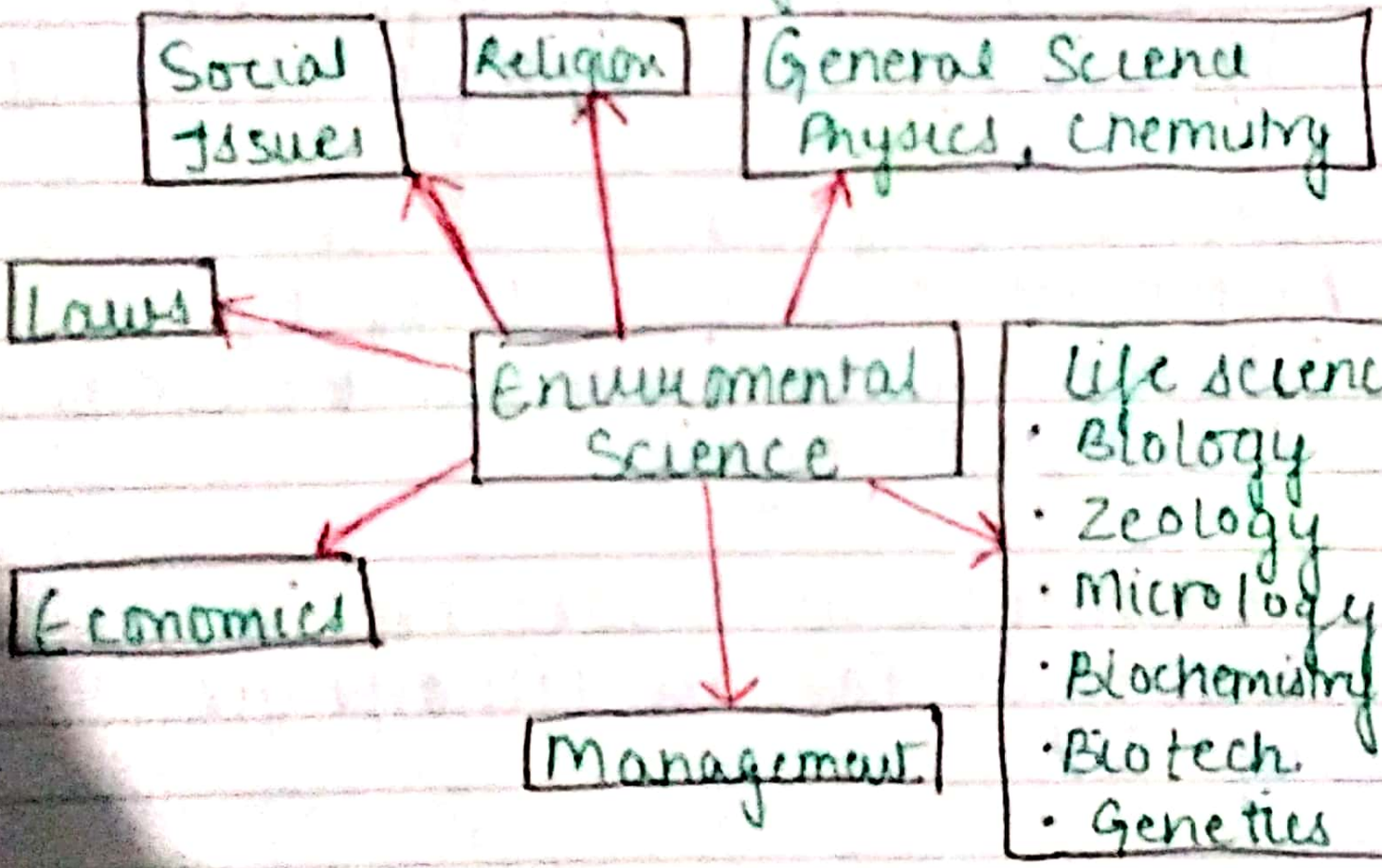
1. Creating awareness.
2. Realise that environmental problem is global.

7. Ecosystem operate in biosphere.

Environmental Science

Systematic study of environment

Multidisciplinary in nature



3. Hydrosphere 71%

- 97.5% saline
- 25% fresh water

Saline water:
- ocean 96.5%
- saline ground 0.93%
- saline lakes 0.07%

Fresh water:
- 68.6% → Glaciers
- 30.1% → Ground water
- 1.3% → Rivers, lakes, ponds

4. Biosphere

Edward Suess - All living things are present in biosphere

2. 3m below the surface to 30m above it.

3. Occupies least volume of all the segments of environment.

4. Maximum flow of energy and matter take place in biosphere.

O horizon
decomposed and undecomposed organic matter

A horizon
Topsoil, Humus (decomposed minerals organic matter)
seed germination, root forming

E horizon
Elimination layer.
sand and silt particles, transport organic matter and minerals.

B horizon
4. subsoil, consist of clay rich in
E minerals and organic matter
a

C horizon Regolith → broken piece of rock.
2.

R horizon unweathered Rock.

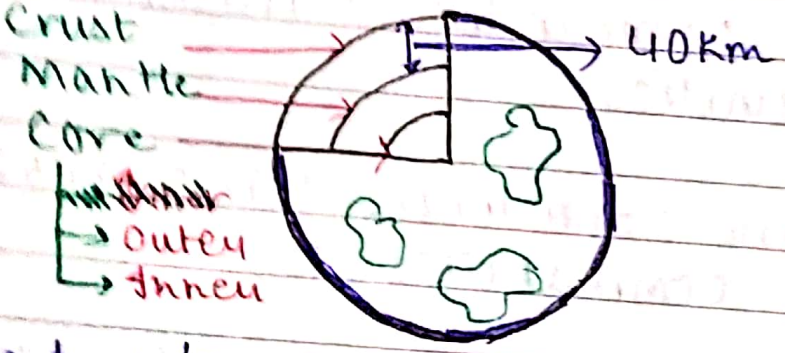
3. O
Or

4 N
flow of energy and matter take place in biosphere

5. Exosphere

1. 500Km - 1600Km
2. H and He.
3. Temp. rises upto 1600°C
4. Last layer of atmosphere.

Lithosphere - soil particles and underlying rocks up to a depth of 50Km.



Mantle has (Si, O_2, Fe, Mg)
Core has (Fe, Ni, Si)

Pedosphere - layer of soil particle

O → horizon
A → horizon
E → horizon
B → horizon
C → horizon
R → horizon

Xerosere → succession starts in a dry area with little moisture

$O_2 + O \xrightarrow[\text{radiate}]{UV} O_3$ (ozone)

4. Ozone protects from U.V radiation

5. Temp. increase in ozone layer
6. Narrow transition zone b/w Stratosphere & Mesosphere called Stratopause.
7. 19.9% of mass of atmosphere.

3. Mesosphere
   middle

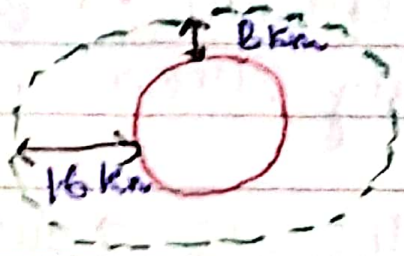
1. 50km - 80km
2. Temp. drops to (-90°C)
3. Meteors burn up in Mesosphere.
4. Narrow transition zone b/w mesosphere and Ionosphere called Mesopause.

4. Ionosphere / Thermosphere.
   High heat

1. 80 - 500km
2. Gases are in the form of ions.
3. Radiocommunication is happening just because of Ionosphere.
4. Temp. rises up to 1200°C.
5. Narrow transition zone b/w Ionosphere and Exosphere is called Ionopause.

Change

Troposphere



1. 0 – 11 Km
2. 8 Km – near to poles
   16 Km – near equator
3. 80% of mass of atmosphere is present in troposphere
4. Dusty and turbulent zone, weather changes and cloud formation.
5. Uniform drop in temp. i.e 65°C/km
   → Environment lapse rate.
   temp drops to (−56.5°C)
6. Narrow transition zone b/w troposphere and stratosphere called tropopause.

Layer

2. Stratosphere.

1. 11 km – 50 km
2. 11 – 20 km (9 km) → Isothermal Layer
   (Temp remain constant)
3. 20 Km – 50 km (30 km) → Ozone Layer

$$O_2 \xrightarrow[\text{radiate}]{UV} [O]$$

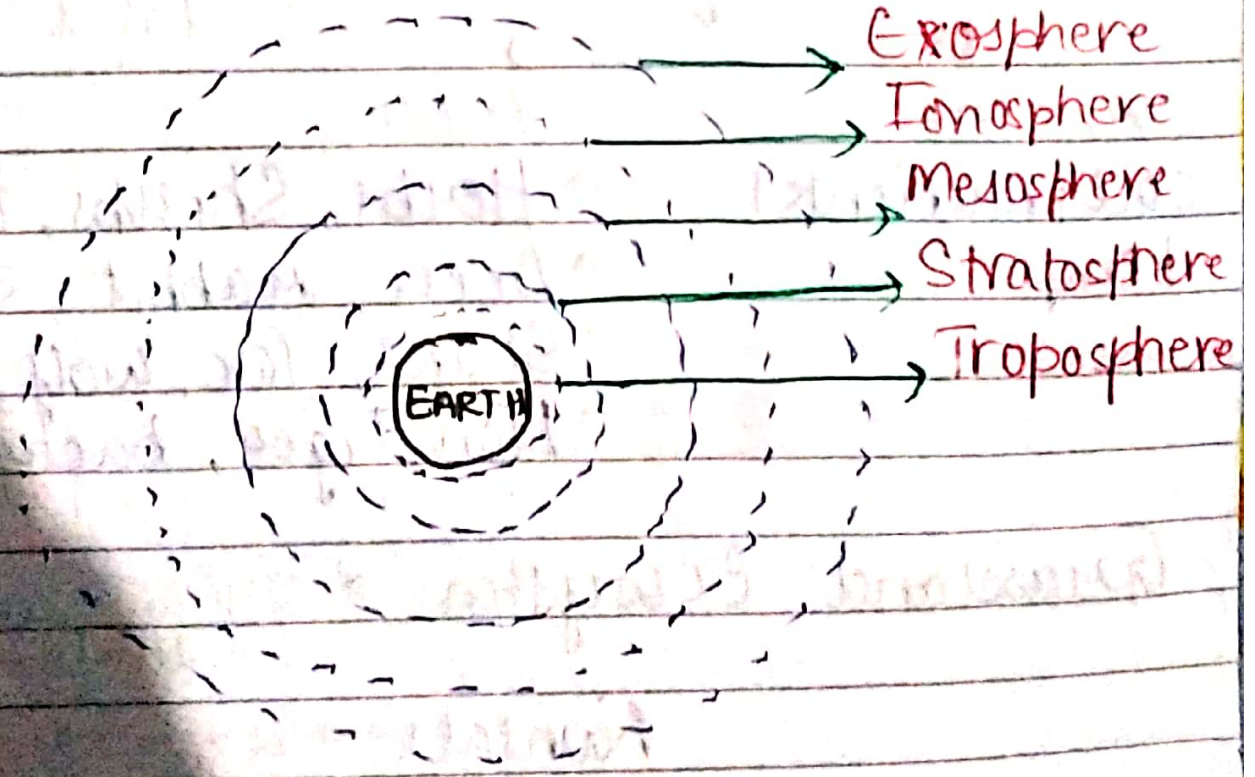
Segments of Environments.

Layer of atmosphere

1. Troposphere
2. Stratosphere
3. Mesosphere
4. Ionosphere / Thermosphere
5. Exospace

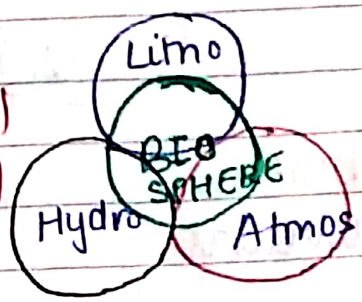
Significance of atmosphere

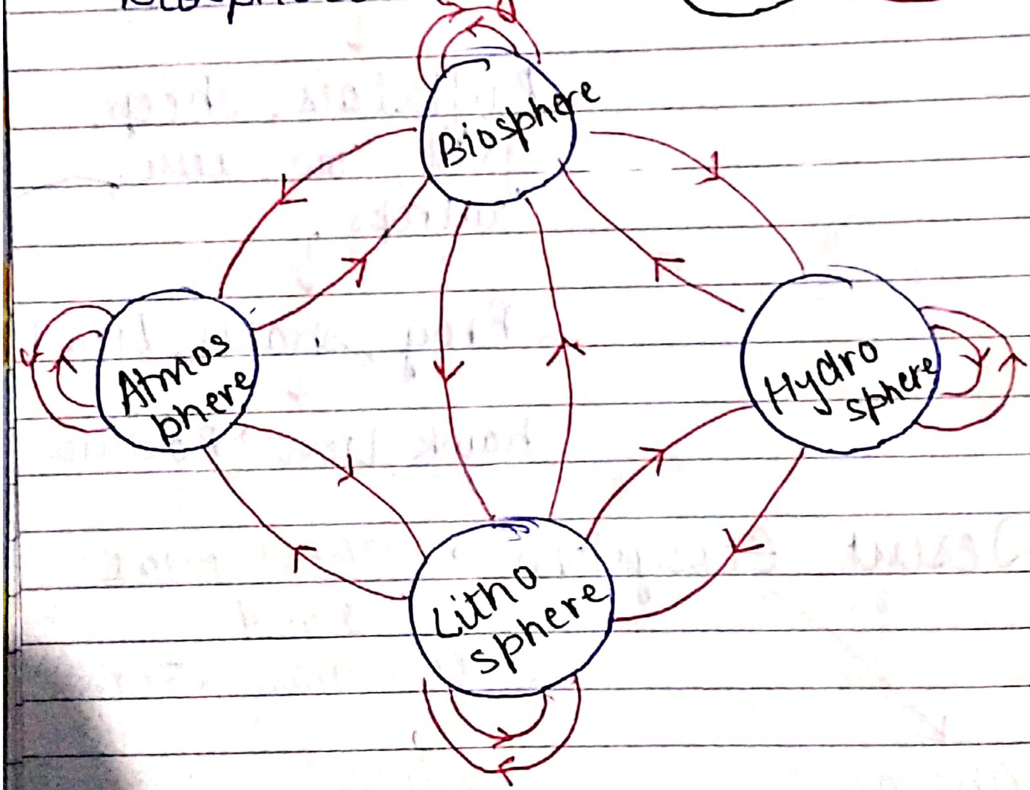
1. Maintain of green house gases.
2. Protect from UV rays.
3. For radio-communication (Ionosphere)
4. Protect from Meteor.



Segments of Environment

1. Atmosphere (air)
2. Lithosphere (Land)
3. Hydrosphere (water)
4. Biosphere. (Life)





Composition of air

1. N_2 78.08%
2. O_2 20.95%
3. Ar 0.93%
4. CO_2 0.03%
5. [He, Ne, Kr, Xe, H_2, CH_4, O_3, N_2O] trace amount

Dam buildings, construction of road, Industries.

Components

1. Biotic components
Living things → plants, animals, microorganisms

associate within the species
a. Interspecific relationship
b. Intraspecific relationship

associate among different species

2. Abiotic components
Non-Living → sunlight, air, water, soil, temp, rainfall, pressure, moisture

ABIOTIC COMPONENTS

Climatic factor → sunlight, temp, water, air, pressure

Edaphic factor → physical & chemical prop of soil.

Environment → to surround or incircle
All the living things and non living things that surrounds an organism forms an environment.

Environment Protection act 1986
Same total of air, water, soil, their relationship among themselves and with human being, other living things and property.

TYPES →
- Natural Environment
  - ↓
  - self regulating mechanism.
  - (Homeostatic mechanism)
  - STABLE
- Man Made Environment
  - ↓
  - Man is the most powerful environment agent
  - other name
  - Anthroprogenic.
  - UNSTABLE