ToppersNotes

IES
GENERAL STUDIES

ENVIRONMENT & ENERGY
&
INFORMATION & COMMUNICATION & TECHNOLOGY
&
MATERIAL SCIENCE

VOLUME-II

Sierra Innovations Pvt. Ltd.

Contents

ENVIRONMENT & ENERGY

1. Basics of Environment
   - → Ecosystem & Ecology
   - → Biosphere
   - → Biodiversity
2. Conservation
   - → National
   - → International
3. Environment degradation & Pollution
4. Climate change
5. Environment Impact Assessment
6. Energy.

BASICS OF ENVIRONMENT

ENVIRONMENT (Organism perspective)

Environer – to encircle

- to surround an organism
- Sum total of all biotic & abiotic factors/influences to surrounding an organism, is Environment.

.....

GAIA HYPOTHESIS

- It believes at Earth is a living organism

  OR

  It says that Earth is a self sustaining or self-regulating system when it can be considered as living organism.
- by James Lovelock

BASIC UNIT FOR A LIVING ORGANISM

Cell

- Unicellular
- Multicellular

↓

No. of cells forms Tissues

↓

No. of tissues Organs

↓

No. of organs

↓

Organ system

↓

No. of organ system

Organism

SPECIES

- No. of Similar organism forms species.
- Species are the organisms having similar appearance normally but not necessarily.
- Organisms having similar appearance capable of interbreeding producing fertile offsprings.
- More than one organism of same species – POPULATION

~~EARTH CAN BE DIVIDED~~

Imp. ENVIRONMENT

- Lithosphere
- Hydrosphere
- Atmosphere
- Biosphere

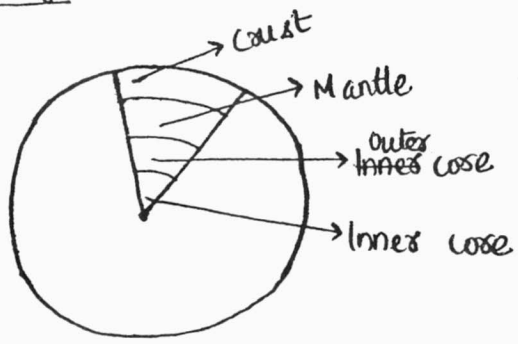
Isotope of Cobalt - treatment of Co
Phosphorus – blood related disorders
Iodine – goitre

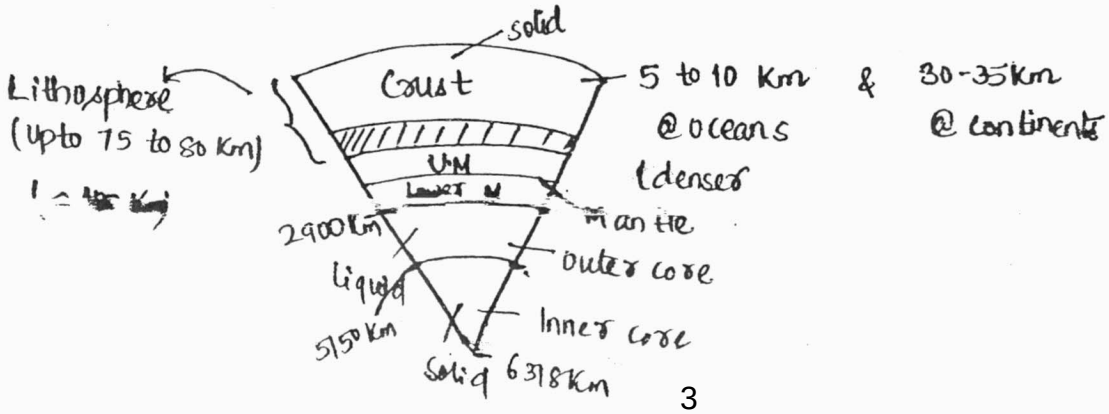
Indravati NP – Chhattisgarh
Cosbatt – Uttarakhand

NOTE: CRYOSPHERE : Frozen water

NOOSPHERE: The sphere of the people's thought (Not a physical sphere)

LITHOSPHERE





Ques. 1. Silicon is the second most abundant element in earth

II. Only certain part of lithosphere is feasible for life form

Ans. For Earth.

1. Iron
2. Oxygen
3. Si

For Crust

1. Oxygen
2. Silicon
3. Aluminium.

ATMOSPHERE

The plates movement is taken place in the level of Lithosphere

ATMOSPHERE

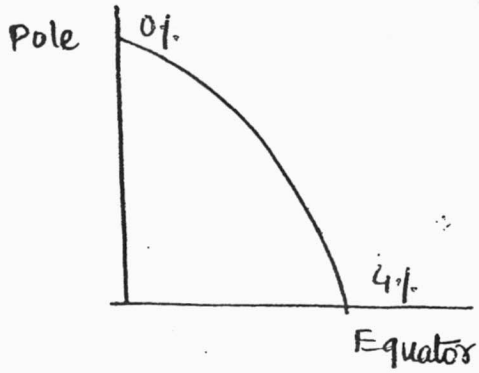
Nitrogen - 78.08%.

Oxygen - 20.95%

Argon - ~~.93%~~ .93%

CO_2 - .0406%.

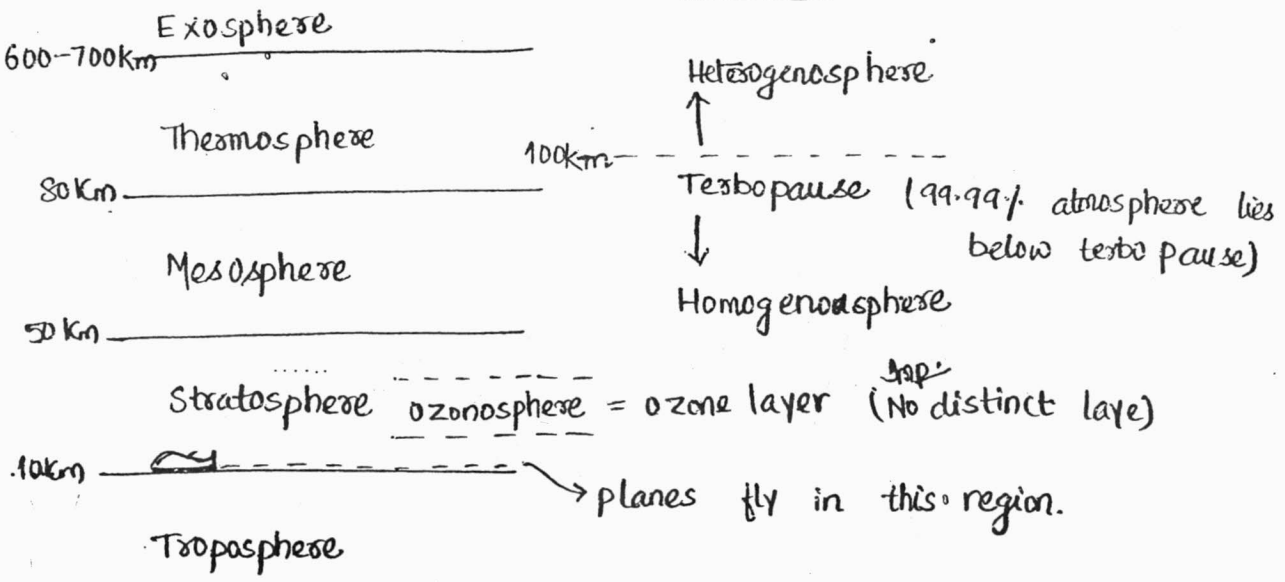
H_2O (water vapour) - varies - 0 - 4%.



STRATIFICATION

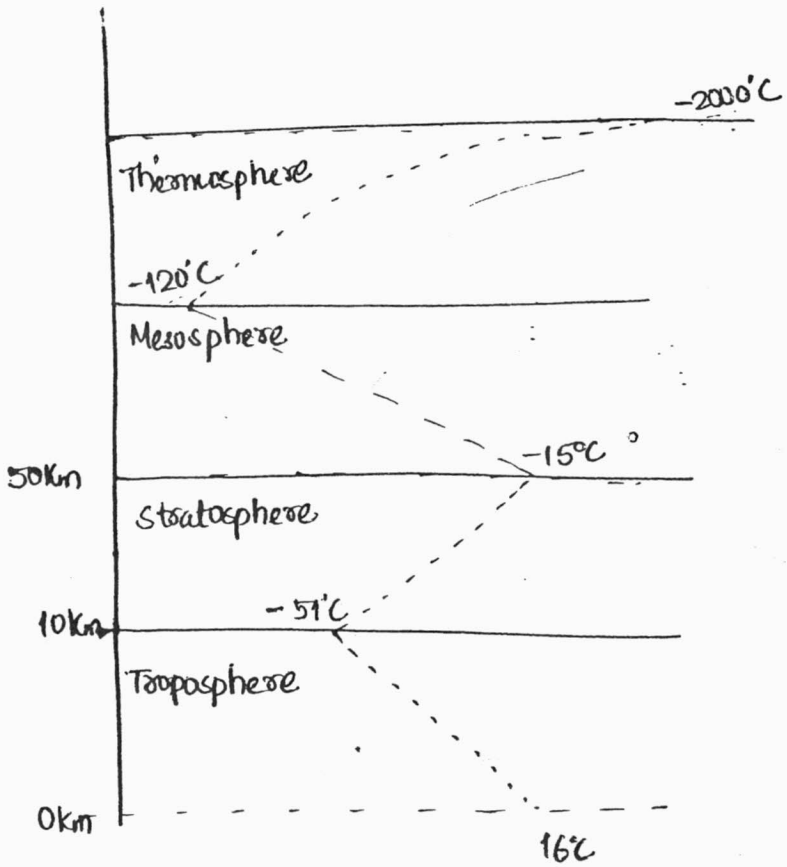
LAYERS OF ATMOSPHERE

After this, exosphere fades into vacuum. Seen 10000 Km



Ionosphere: 60 – 1000 Km.

VARIATION OF TEMPERATURE



Thermal Inversion

Temperature increase with increase in altitude

MISCALLANEOUS

Around 2/3rd 3/4th of the mass of Earth atmosphere is confined to Troposphere

Around 20% in ~~Troposph~~ stratosphere

Around 95% of so of total water vapours confined to Troposphere

Most of the dust etc confined to troposphere

Most of the whea weather events takes place in Troposphere

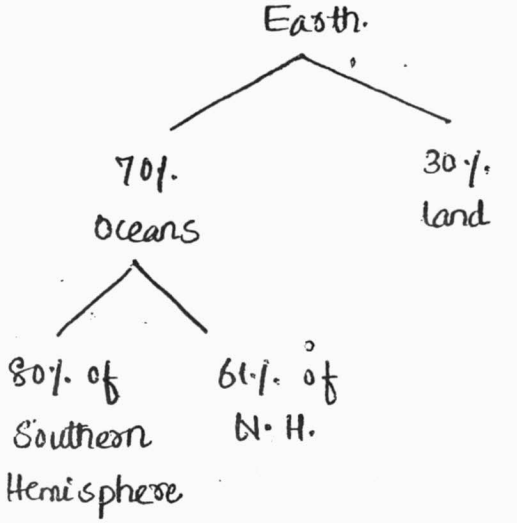
Weather baloons under the ~~baloons~~ recently launched project of Google X called project loon are placed in stratosphere.

HYDROSPHERE

97.5% of total — Saline water

2.5% of total — fresh water

(.25% of total fresh water is accessible)



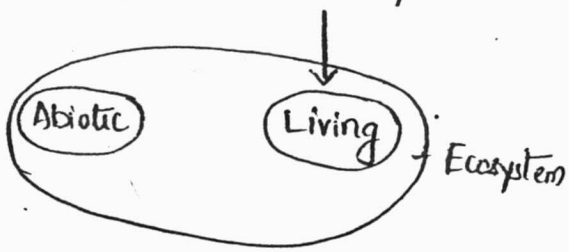
WATER	DISSOLVED SALTS
Fresh water	Upto .5 PPT (parts per thousand)
Brackish "	.5 to 30 ppt
Saline	30 to 50 ppt → Avg. salinity = 35 ppt.
Brine	~~35~~ & above

BIOSPHERE

↓

Life area

Thin part of Earth where life exists.
Small portion of Earth supports life
No. of organisms of same species = population
No. of different populations of different species = community



ECOSYSTEM

→ Interaction within species, with species & with surroundings.

- ✓ Living
- ✓ Non-living
- ✓ Interaction
- ✓ Place.

} — Together as one integerated unit.

→ Term 'ecosystem' given by Arthur G. Tansley.

→ It is an integrated relationship b/w the species, within the species & with their surrounding

Ecosystem
↓
Basic unit of relationship
Living — Non-living

No. of ecosystem combined on the basis of common feature
↓
Biome
↓
No. of biomes
Biosphere.

Organism | Population | Community | Ecosystem | Biomes | Biosphere

Living (Biotic) — Biotic + Abiotic

ECOLOGY

~~Study~~ Oikos + Logos
↓ ↓
Home Study

Term by : Earnst Haeckel

Study of relationship between organisms & their surroundings.

Andrewartha & Birch definition : Study of distribution & abundance of species.

Odum : Study of ecosystem
structure of structure & functions of Ecosystem.

Study at the level of population = Autecology (organism)
Study at the level of community = Synecology.
(Biosphere, biome, Ecosystem, Community).

BIOCENOSIS (COMMUNITY)

Assembalage of various species.

Animal species → Zoocenosis
Plant species → Phytocenosis
Microbial species → Microbiocenosis.

ECOSYSTEM SERVICES

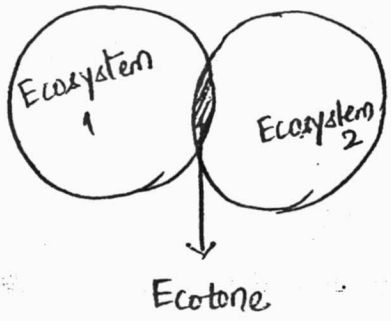
The benifits obtained from the nature as per Millenium Ecosystem Assessment 2005, there are 4 types of services

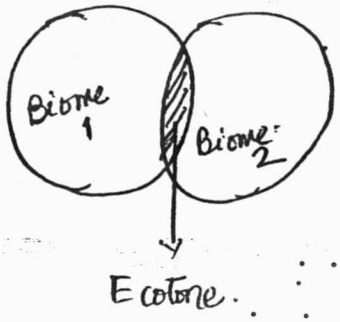
Imp.

- ✓ Provisioning services → food, wood, medicines
- ✓ Regulating services → Climate regulation, flood management, water purif
- ✓ Supporting services → Nutrient cycling
- ✓ Cultural services → Tourism, spiritual appreciation.

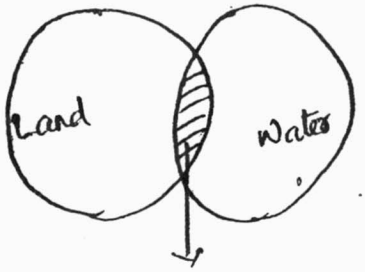
(w.r.t. coral)

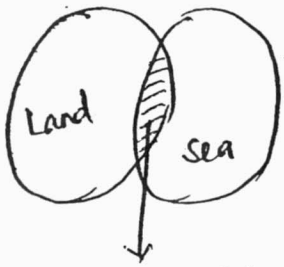
ECOTONE

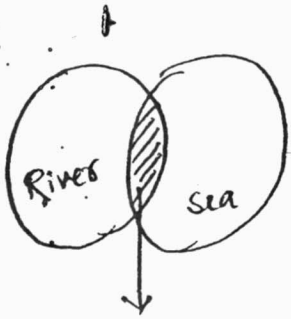


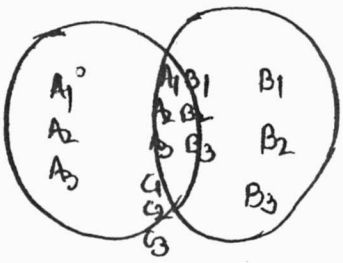


Ex.









Imp.

EDGE EFFCT

Due to overlapping areas of the edges, the high diversity exist in Ecotones, called as Edge Effect.

The species called as Edge species.

SPECIATION

An evolutionary process through which new species arrives i.e. is a speciation.

NOTE: In ecotone, the ecological tension.

ECOLOGICAL SUCCESSION

Base Area → No life exist in past — first life } Primary succession
↓
Formed after volcanic eruption

Life — destroyed — barea area — Life } Secondary succession.
Ex. wildlife

AUTOGENIC SUCCESSION → Induced by Biocommunity.
ALLOGENIC " → " by living component
↳ Induced by Abiotic ~~components~~ factors
Ex. physical factors.

Mainly

Xerosphere : No water (wet) → Ex: Bare area → Lichens → Mosses → small grass → permanent grass → shrubs → soft wood plants → Hard wood plants.
(Pioneers)

Hydrosere : water

Ex:
Phytoplanktons → submerged vegetation → Rooted → Meadows → Trees → Climax trees.

Pioneer → seral → Climax.
↓ ↓ ↓
Initial Intermediate Last.

IMPORTANT STAGES OF ECOLOGICAL SUCCESSION

- Bare area – Nudation
- Invasion
- Competation
- Modification
- Stability.

INTERACTION B/N AND WITHIN THE SPECIFIES

Mutualism → ⊕ · ⊕ ⟶ Ecological Facilitation

Competition → ⊖ ⊖

Predator → Predator ⊕ Prey ⊖ ⟶ Not symbiotic.

Ex. ~~lion~~ lion. ~~goat~~ goat

Parasitism → Parasite ⊕ Host ⊖

Headlice

Commensalism → ⊕ ⊘ ⓪ ⟶ Ecological Faciliation

Amensalism → ⊖ ⓪

Ques: Conservation ~~of~~ effort by the human for protecting nature is the ~~responsibiti~~ relationship b/w human & nature of the nature.

a) Commencalism

b) Mutualism

c)

d)

MUTUALISM

Human gut & bacteria

↓

Gut flora maintained or digestion services provided by certain bacteria

↓

to get habitat & nutrition support.

CORAL —— ZOOXANTHAELAE

↓ ↓

Animal Algae

↓ ↓

Habitat Food

SEA ANNEMONE ——— Anemone Fish

↓ ↓

Animal Protects against Predator

↓

Food, protecting against predator.

MYCORRHIZAE

↙ ↘

Fungi Root

↳ Esp. of Vascular plants

LICHENS

↓

Fungi ——— Algae

↓ ↓

Shelter Food.

COMMENSALISM = Charity

Common myna ——— Cattle

(bird)

↓

benifited from the insect coming out because of surface / ground disturbed by cattle's hoofs.

Cattle Egret ——— Cattle

(bird)

Remora ——— Shark

(small fish)

AMENSALISM

Bread mold

↓

Releases Penicilin

↓

Kills bacteria

Walnut Tree

↓

Releases chemical

↓

Acts as a weed killer
(kills plants)

SYNBIOTIC (living together)

Strict approach

↓

Earlier

↓

living together & dependent on each other.

Liberal/water approach

STRICT APPROACH: species are dependent on each other's services & resources.

Ex. Mutualism.

LIBERAL APPROACH: Persistently living together

Ex. Mutualism
Parasitism
Commensilism

Imp ECOLOGICAL FACILITATION – PROBIOSIS

Atleast one of the organism getting benifitted & other not suffering any loss.

Ex. Mutualism
Commensialism.

RESPONSE TO ENVIRONMENT

1. To confirm → Most of the species
2. To regulate → Mainly mammals, birds.
3. To migrate Ex. Siberian crane → during water
   Sociable Lapwing } bird.
4. To suspend Ex. During winter – hybernation (Rats, Bats, squirrel, bears)
   During summer – Aestivation
   (Water holding frog, some snails)
   Suspending grow – some diapause
   (some insect, some zooplankton)

Imp:

ECOLOGICAL NICHE

All those activities performed by an organism to survive & reproduce

Sum total of all functional roles of a species to be performed within an ecosystem.

OR

The food niche, the habitat niche, the reproduction niche & other niches combine are ecological niche.

OR

Whatever functional roles are to be carried out by a specy with an aim of survival & reproduction.

Under idealistic condition – a theoretical potential role is fundamental niche.

~~Under~~ But practically occupied by the specy is called Relise niche affected by factors like predition, competition etc.

Imp: Realise Niches is less than Fundamental Niche.

- ECOLOGICAL HABITAT → Address
  " NICHE → sum total of all functional roles (including habitat)
  ↓
  Profession.

- ECOLOGICAL HABITAT → Habitat of a population.
  BIOTOPE → habitat of a community

ES
Imp. ECOLOGICAL EFFICIENCY

10% energy transfer law or Trophical efficiency or Lindeman's law.

AUTOTROPHS – PRIMARY PRODUCERS

Producing own food.

using

Photosynthesis → Photo autotrophs
Ex. plants, algae

Chemosynthesis → Chemo autotrophs.
Ex. certain bacteria

CONSUMERS

↓

Heterotrophs

- Herbivores (Eating plants)
- Carnivores (eating animals)
- Omnivores (eating both)

DECOMPOSERS

↓

Detrivores

↓

Saprotrophes Ex. bacteria, fungi, maggots, termites.

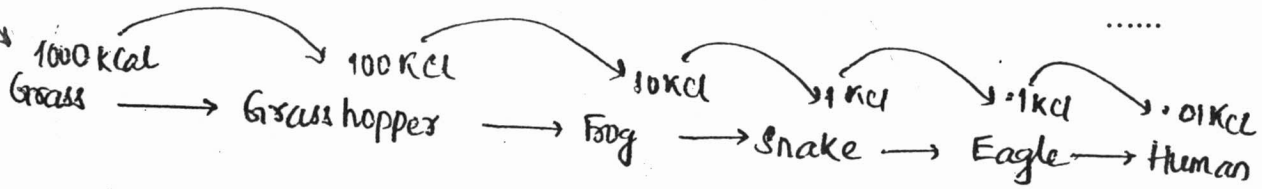
TOTAL PHOTOSYNTHESIS done by producers. = Gross primary production by producers.

Imp

2. Gross – Energy consumed by the in respiration process by the producer itself = Net Primary Production. only by producers.

FOOD CHAIN

Sunlight



Trophic: each step on food chain.

The amount of Energy transferred from the lower trophic to the higher trophic.

FOOD CHAIN

- terrestrial
- Marine

NOTE: Ecological Efficiency of marine/aquatic ecosystem is higher than that of terrestrial/land based ecosystems.

EXAMPLES OF FOOD CHAINS

Phytoplanktons → Zooplanktons → Small fishes → large fishes

Diatoms → Crustaceans → Herrings → Mackerd → Tuna → Human

Diatoms → Cocepods → Herrings.