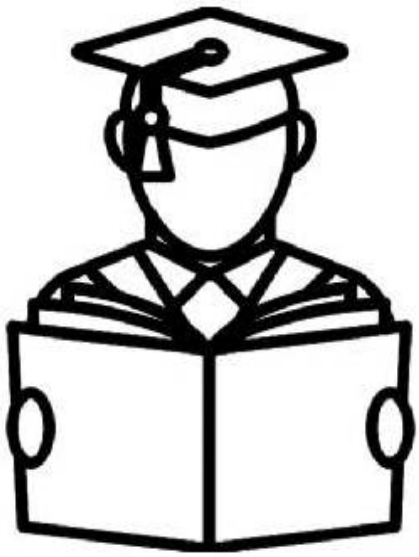
चौधरी PHOTOSTAT

"I don't love studying. I hate studying. I like learning. Learning is beautiful."



"An investment in knowledge pays the best interest."

Hi, My Name is

EVS

UGC NET

SUNDAY
01
JANUARY

Adiabatic – No outside heat is involved in warming or cooling of the air parcel

Week 1st - 1st Day

DECEMBER

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

JANUARY

M	T	W	T	F	S	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

AIR

- Atmospheric stability
- Global warming and GHE
- Air pollution
- Air pollution Modelling

9

ATMOSPHERIC STABILITY

10

* Lapse Rate – Change in temp. w.r.t. distance (altitude)

11

12 * Latent Heat – Heat required to change form (solid → liquid → gas)

1

* Adiabatic Processes but it doesn't inc. the

2 temp^r.

$$\Delta Q = 0$$

Latent heat of water is highest, exist in three forms, solid form is less dense than liquid forms.

Important

Adiabatic $\Delta Q = 0$
Isothermal – $\Delta T = 0$
Isobaric – $\Delta P = 0$
Isochoric – $\Delta V = 0$

* System → (1) Open, exchange of heat and material

2017

ALL MATERIAL AVAILABLE HERE

Hand Written Class Notes

JAM, GATE, NET for CSIR

MATHS, CHY, PHY, LIFE SCI .

NET for UGC

ENG , ECO , HIS , GEO , PSCY , COM ENV,.... Etc.

GATE , IES , PSUs for ENGG.

ME, EC, EE, CS, CE .

IAS , JEE , NEET(PMT).

चौधरी **PHOTO STAT**

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*** All INDIA post also available***

Earth (2.) Closed, exchange of heat and not material

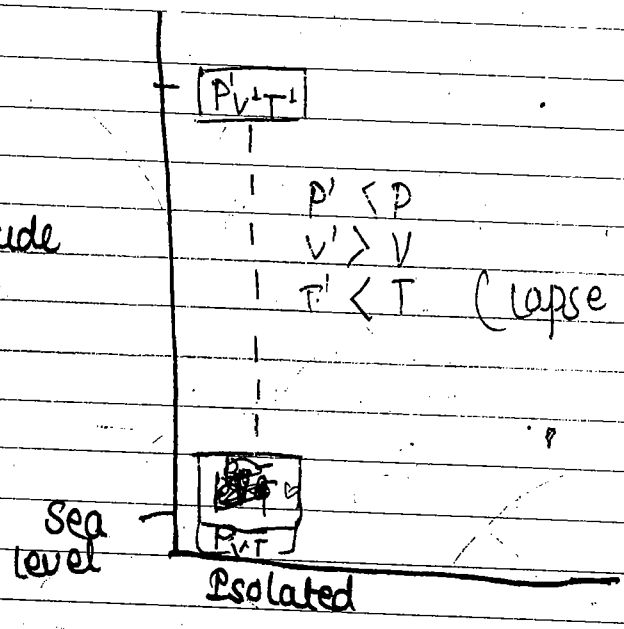
Thermo stat material (3.) Isolated No exchange of heat and no exchange of material.

- Decrease in pressure as the parcel ~~around~~ ascends in altitude.

~~10~~ Volume increase, work is done as volume changes.

Work needs energy that will be taken from temp.

The changes in temperature is k/a lapse rate.



Important

TUESDAY
03
JANUARY

Week 2nd - 3rd Day

DECEMBER

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

JANUARY

M	T	W	T	F	S	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

Air is a bad conductor of heat (more space in cotton quilts ∴ more air, less conduction of heat)

1. If air parcel is completely dry

DALR – Dry Adiabatic Lapse Rate

Volume → change → Energy

Temp. changes by 10°C/KM (dec)

2. If air is completely saturated

SALR – Saturated adiabatic lapse rate

Temperature changes – 6.4°C/KM as ascends

Adiabatic Lapse Rate –

If we move up an insulated balloon in the atmosphere it will expand due to decrease in the surrounding atm pressure, as the gas expands in the balloon temprature drops (with no heat exchange from the atmosphere, the process is adiabatic)

This decrease in temp inside an insulated air parcel with increase in the

2017

altitude is referred to as adiabatic lapse rate.

The decrease in pressure with height allows the air parcel to expand accordingly. As expansion is work an energy is required (air being a bad cond. of heat) negligible heat exchange occurs between the air parcel and the surrounding atmosphere. Therefore a change in volume proportional to decrease in temperature occurs. Since the process is adiabatic, this loss in temperature is reffered to as Adiabatic lapse rate.

(1.) When air parcel is completely dry (DALR)

All the energy required for change in volume is managed by the temp. of the air in the parcel. Its value is $10^{\circ}C$/km.

(2.) When air is completely saturated with water (SALR)

Because of release of latent heat by condensation of water vapours into water droplets offsets the adiabatic temp. loss and therefore its value is less than DALR.

Important

$SALR = 6.4^{\circ}C$/km.

THURSDAY
05
JANUARY

Week 2nd - 5th Day

DECEMBER

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

JANUARY

M	T	W	T	F	S	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
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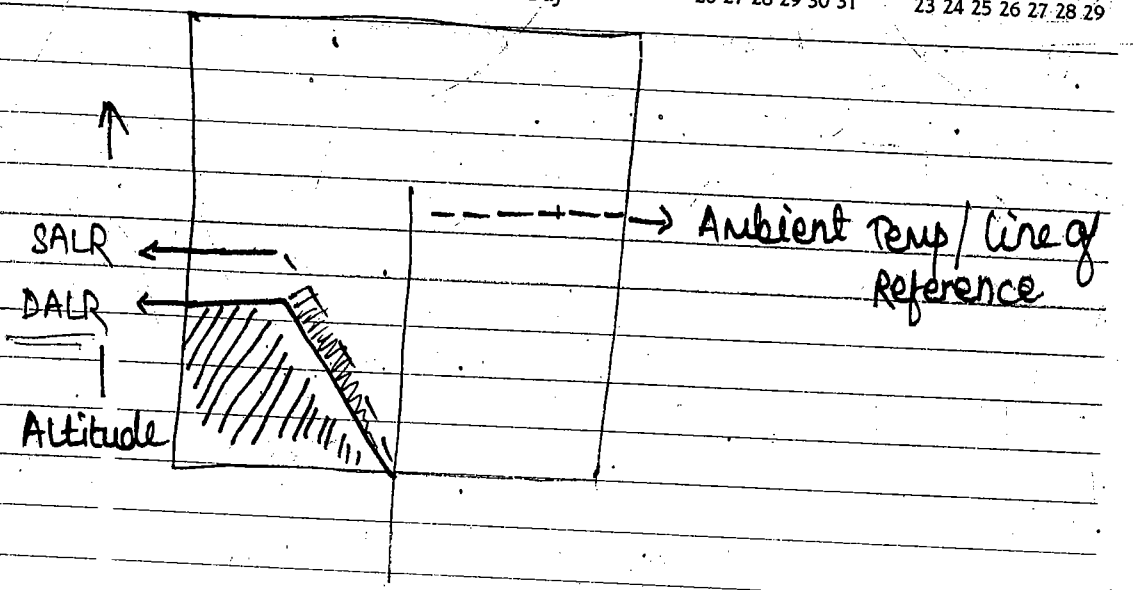

Environmental lapse rate —

It is the actual change in temp with height. Air can be fully, partially or not saturated at all given conditions.

(i) ELR > DALR
> 10°C / KM.

When ELR > DALR that is k/a completely stable Atmosphere.

(ii) Important DALR > ELR > SALR
that is k/a partial unstability / conditional.

(iii) ELR < SALR that is k/a complete stability.

(iv) Temp ↑ with altitude k/a Inversion.

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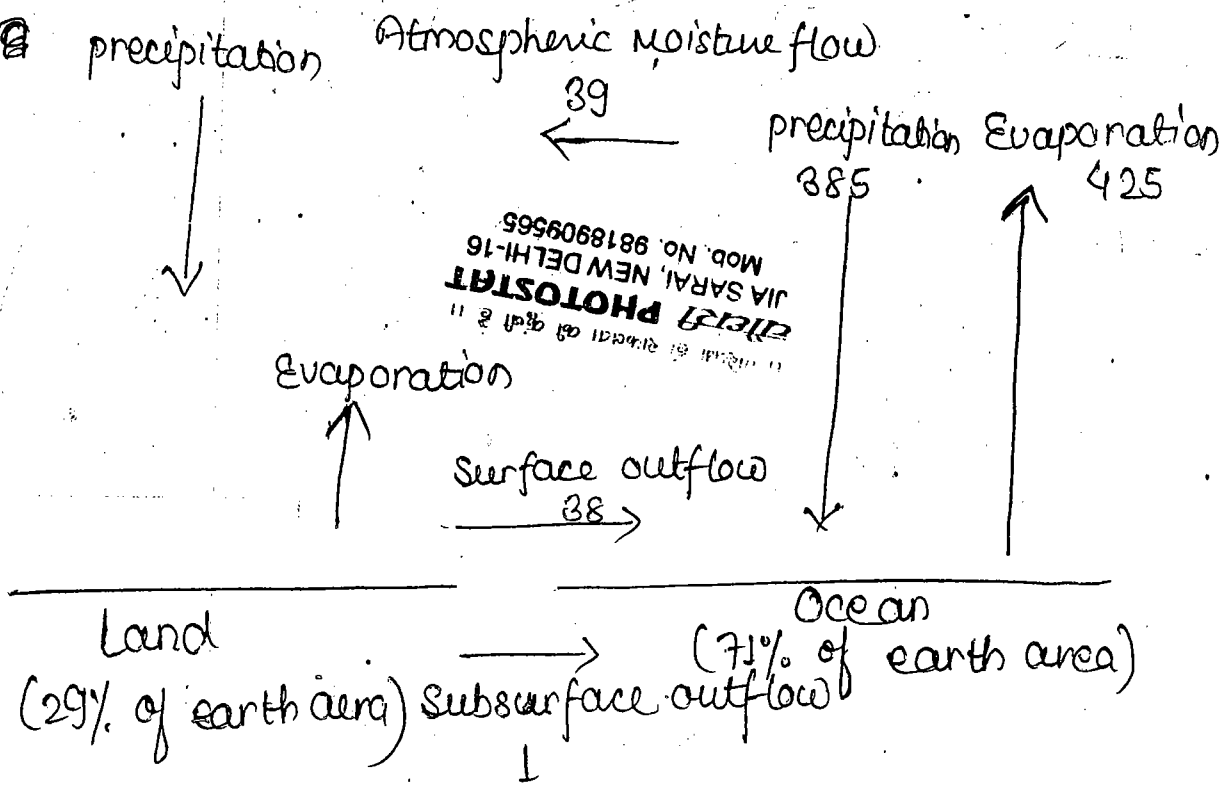
Water Balance

- A water balance can be established for any area of earth's surface by calculating the total precipitation input and the total of various outputs.



Global water Balance

* Green Water — Water that is stored in the soil and is taken up by plants and lost by evaporation.

* Blue water — Water that is found in rivers and lakes as well as ground-water that is used for agriculture,

industrial and domestic purposes.

Possible routes that raindrops may take on their way to and into the soil surface –

- Precipitation that reaches earth surface follows variety of pathways.

- The process of precipitation striking vegetation or other groundcover is called interception.
- Intercepted precipitation may be redistributed as throughfall and stemflow. Precipitation that falls directly to the ground, is coupled with drips onto the ground from vegetation is K/a throughfall.
- Intercepted water that drains across plant leaves and down to the plant stem is termed as stemflow.
- Water reaches the subsurface through infiltration, or penetration of the soil surface. It then permeates soils or rock through vertical movement called percolation.

Ground Water Resources

- Ground water is the part of hydrologic cycle that lies beneath the ground.
- Ground water is the largest potential source of freshwater in hydrologic cycle - larger than

all surface reservoirs, lakes and streams ~~are~~ combined.

- Between Earth's surface and a depth of 3 km (10,000 ft) worldwide, some 8,340,000 km^3 (2,000,000 mi^3) of water resides.

Water Balance

- The water balance approach allows an examination of the hydrologic cycle for any period of time.
- The purpose of water balance is to describe the various ways in which the water supply is expanded.
- The water balance is a method by which we can account for the hydrologic cycle of a specific area, with ~~emphasis~~ significance on plant and soil moisture.

- Water input and output is in balance globally

$$P = R + ET$$

- Water input and output is not always in balance locally

so,

$$P = R + ET + \Delta S$$

P = precipitation.

R = Discharge

ET is evapotranspiration

ΔS is the change in water storage.

$$P = R + ET + \frac{dS}{dt}$$

The water balance method has four characteristic features —

- A water balance can be assessed for any subsystem of the hydrologic cycle, for any size of area, and for any period of time.
- A water balance can serve to check whether all flow and storage components involved has been considered quantitatively.
- By water balance we can calculate the unknown value of the balance equation, provided that the other components are known with sufficient accuracy.
- A water balance can be regarded as a model of the complete hydrologic process under study, which means it can be used to predict what effect the changes imposed on certain components of the system or subsystem.

Ice-sheets & Fluctuation of Sea level.

- Ice sheets in Greenland and Antarctica are immense and thick masses of ice that blanket the underlying land surface.

- Much of the ice in these ice sheets is over 2KM thick, and the thickest ice in East Antarctica is about 4.8 KM thick.

- This volume of ice constitutes approximately 70% of all the freshwater on Earth.

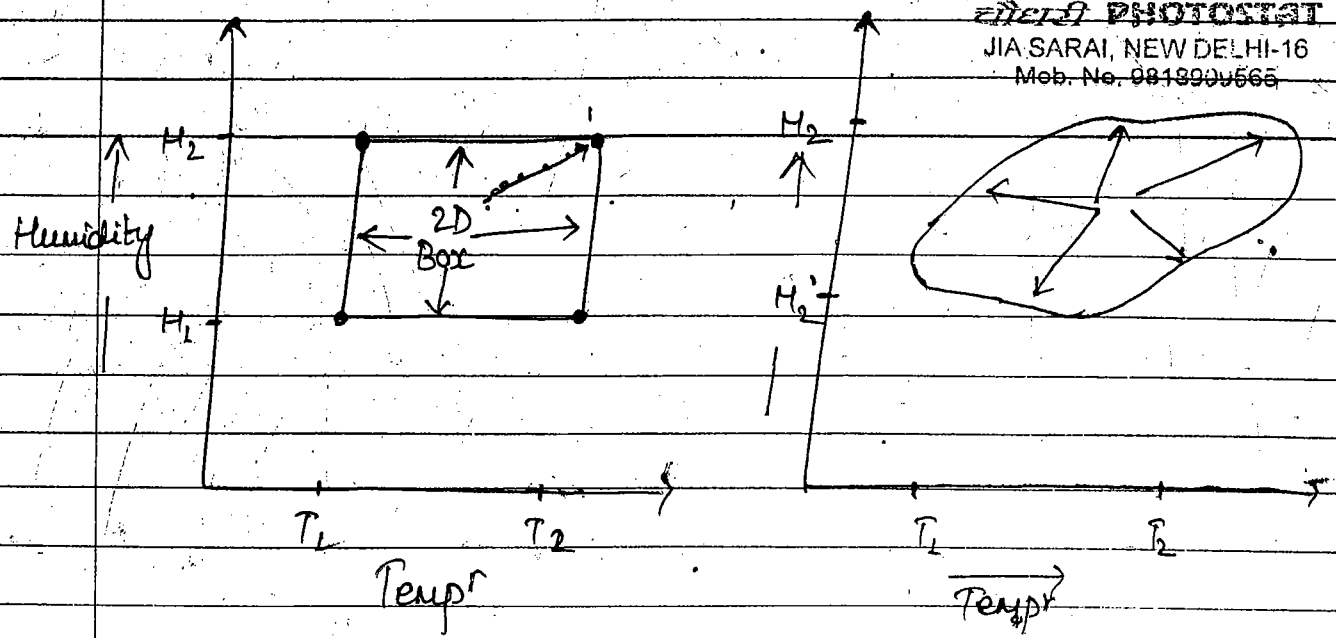
- Ice sheets are formed mainly from snowfall which, at temp^r that are typically well below the Melting point, turns into ice over decades to century.

- Because the climate over the ice sheets is so cold, the air can hold only a small amount of moisture and the snowfall rates are very low.

- In the centre of Antarctica the annual snowfall represents less than 5CM/yr of water, and the average over the total Antarctic ice sheets is only about 15CM/yr.

- The loss of about 390 KM^3 of ice from the ice sheets (about 360 million megalitre of freshwater) will add 1mm to

Multifactor or Higher Volume Niche –



(Independent)
Fig A.

(Interdependent)
Fig B.

- The concept of multifactor or hyper volume niche was given by Hutchinson.
- Multifactor niche takes into account set of diff. factors required for survival of any given species.
- Suppose if we measure range of some environmental variables or factors over which a particular species can survive and reproduce and this range is placed on the graph
- If range taken are temp^r and humidity i.e temp^r on X-axis & humidity on

Date

- Y-axis. Then the space enclosed with represent niche of that species.

- If temp^r and humidity are independent the space enclosed will be a 2-D box as shown in fig (A).

- But as temp^r and humidity are not independent but they are interdependent so under such cond^n instead of 2-D box space enclose will be in elliptical form depending upon extent of interdependency.

- Suppose if third variable nutrient is taken as all the three variables are interacting with each other then the space enclosed will be volumetric figure having 3 dimension as shown in fig - C

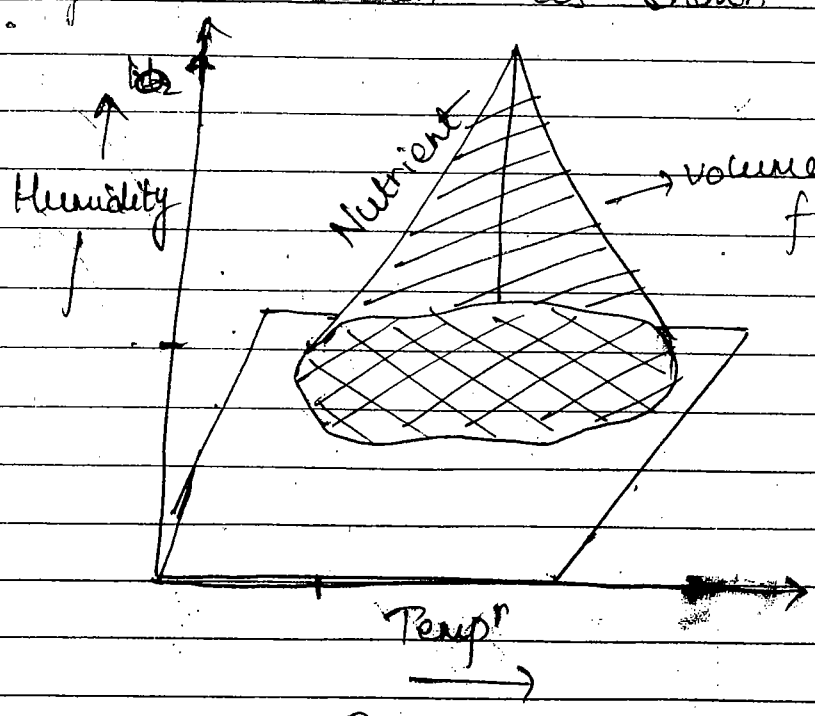


Fig - C

- If now fourth variable is taken say soil quality / edaphic status then space enclosed will be hypervolume with 4-Dimensions. (not possible to draw)
- Since large no. of factors are taken that include both biotic and abiotic that affects popu. niche is called n-dimensional hypervolume or simply multifactor niche.

⊙ Fundamental Vs Realised Niche -

(i) Fundamental Niche -

The niche space occupied by any given organism (species) in the -nce of competition and predation is c/a fundamental Niche.

In simple words all possible environmental biotic and abiotic range of cond^n in which an organism can live without competition and predation, thus fundamental niche is set of resources and physical factors required for survival and reproduction of individuals of a species.

Realized niche in general subset of fundamental niches as it shows actual environmental cond^n in which an organism lives under competition and predation.

When species are exposed to competition and predation they are more confined

Date

to a narrow zone simply c/a realised niche.

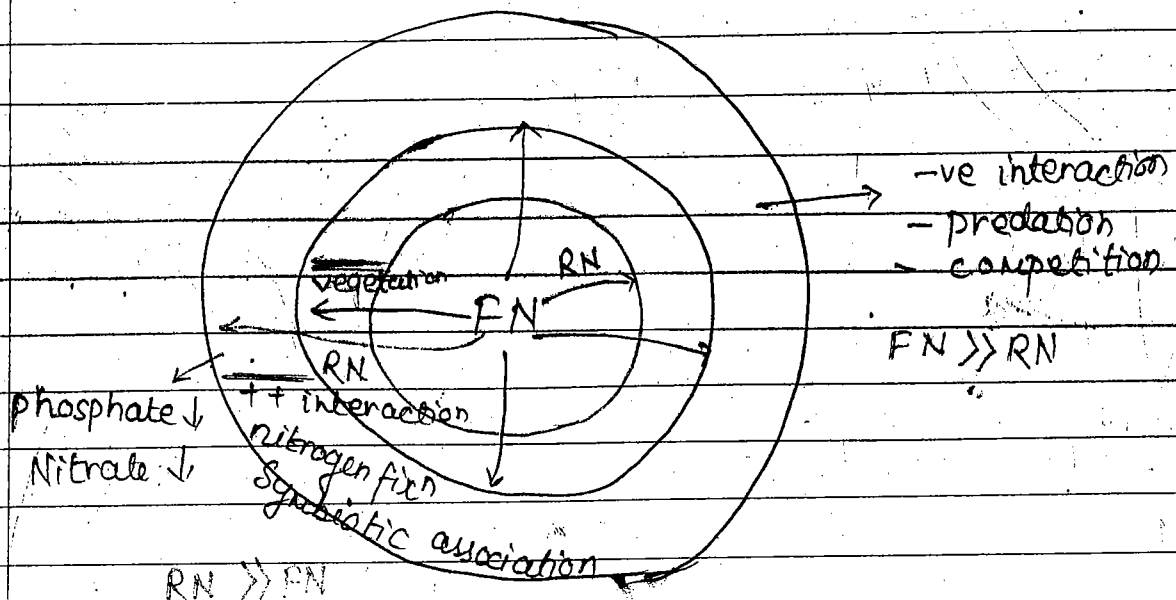


Fig - A

- Plant ecologist Pandey performed experiment on fundamental and realised niche by taking 2 species of Gallium — Gallium serratile (Heat bed stock) and Gallium pusillum generally c/a slender bed stock.

- Gallium o. serratile has strong affinity for acidic soil. And G. pusillum has strong affinity for calcareous soil.

- When both sp. were grown together G. pusillum was excluded in acidic soil whereas & G. serratile was excluded in calcareous soil and thus ~~fundamental~~ realised

niche becomes narrow and form realised niche.

Gallicum sexatile — Acidic soil
G. Puniticum — Calcareous soil

Case I

G. sexatile	G. puniticum		G. sexatile	G. Puniticum
acidic soil			Calcareous soil	

Case II

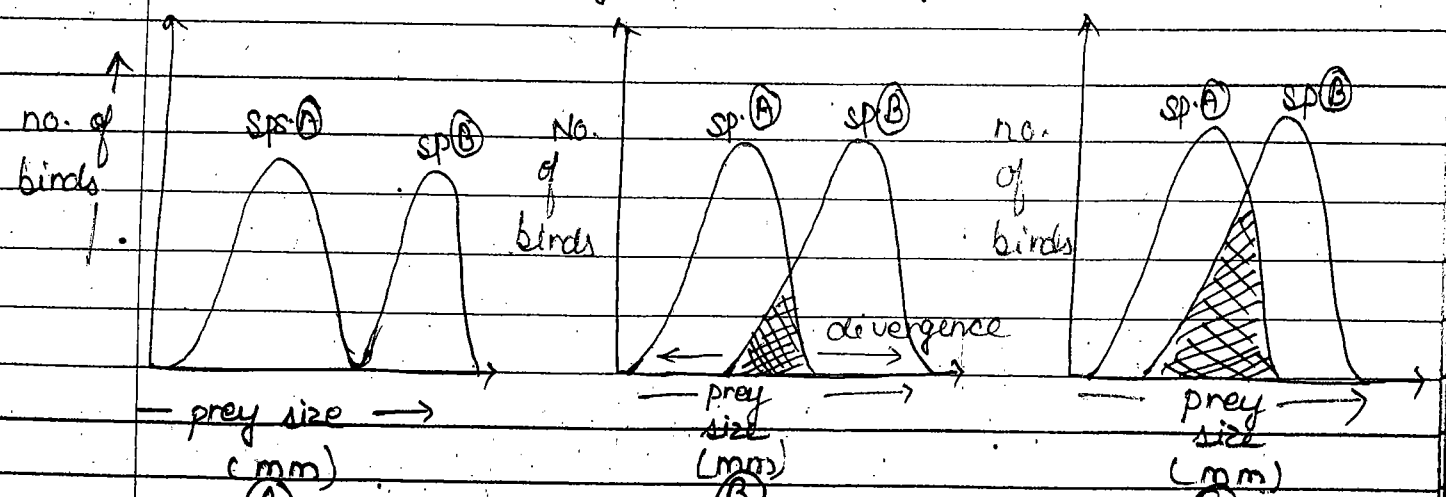
G. sexatile	G. puniticum
acidic soil	Calcareous soil

} competitive exclusion occur

Tansley Experiment

NOTE →

In case of +ve-+ve interactions like mycorrhizal, phycorrhizal and association with Nitrogen-fixing symbiots FRN becomes broader than ~~&~~ FN.



Niche Overlapping and Nich divergence

Page No.
Date

Fig (A) → Insect eaters
→ But diff trophic niche
→ @ No comp. for food

- Niche overlapping leads to competition and cause elimination
- Niche divergence leads to coexistance and increase resource use efficiency

Niche Segregation / Niche differentiation / Niche partitioning.

- The differentiation of niche enables two similar species to co-exist in a community
- Species that shares the same habitat and have similar needs frequently uses resources in somewhat different way so that they do not come into direct compet. for atleast those resources which are limiting ~~for~~ as a result species can overlap on several dimension but still not have direct intense competetion.

For eg -
① Root system of desert shrubs have differential penetration. Some specialize on ephimeral source of water like rainfall and they have surface roots whereas others relies on relatively permanent source of deeper water and they have differential penetration

Page No.
Date 09 Aug 19

Water

Imp.

Temp^ α 1 / solubility of any gas

(i.e- ~~chatele~~ Chatle's Principle)

Imp. Solubility of gas into water depends upon temp^ & pressure

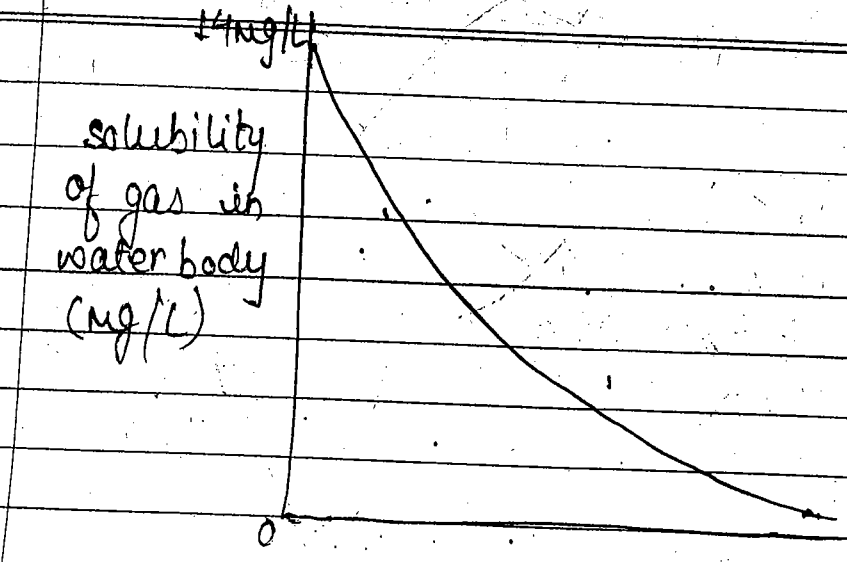
Solubility of any gas α Pressure (Henry's law).

DO — Dissolved oxygen is the amount of O_2 dissolved (mg) per liter of water.

- If DO is less than 8 mg/l, water is said to be contaminated & If DO is less than 4 mg/l it is said to be polluted

< 8 mg/l – contaminated (can be used by purification)

< 4 mg/l – Polluted (can't be used



* Normal DO range of pure water is ~ 15mg/l — 8mg/l

- The above graph tells us that solubility of a gas (here O_2) decreases as we increase the temp^r, hence hot water discharge from industries decreases the DO content of water stream.

- This is one of the reason why aquatic flora and fauna do not survive in the case thermal water pollution.

- Factors affecting DO —

① [Reaeration (Turbulence)(T_z) ∝ DO]

② Photosynthesis in water ∝ DO stream / body

$$CO_2 + H_2O \xrightarrow{h\nu} C_6H_{12}O_6 + O_2$$

(3.) Respiration in stream $\propto \frac{1}{DO}$

$$C_6H_{12}O_6 + O_2 \longrightarrow CO_2 + H_2O + \text{Energy}$$

(4) Amount of ~~biochemical~~ biodegradable component $\propto \frac{1}{DO}$ in water body

* Reaeration — Process where O_2 enters into water through the contact that water makes with the atmosphere.

- When the actual amount of O_2 in water is less than the saturation value at a given temp^r, atmospheric oxygen passes into water at a rate which is proportional to the deficit.

- By increasing the surface area in contact with the atmosphere the transfer of O_2 is increased. Thus a bubbling stream takes O_2 more easily than a stagnant pond.

* Solubility of gas & Henery's law —

Date

$S_g = K_H P_g$ — Henry's law

where

S_g = Solubility of gas into water (mg/l)

K_H = Henry's constant for a gas ($mol\ L^{-1}\ atm^{-1}$)

P_g = Partial pressure of a gas (atm)

1 atm = 76 cm of mercury
1 atm = 760 mm of mercury

Q-1 Given that K_H for O_2 at 25°C is $.0012630\ mol/l\ atm^{-1}$. The conc^n of O_2 is 21% in atm. Calculate the solubility of O_2 in water at 25°C at 1 atm pressure

$K_H = .0012630\ mol\ L^{-1}\ atm^{-1}$

conc^n = 21%

Temp^r = 25°

Pressure = 1 atm

partial pressure = $\frac{\text{atm pressure}}{100} \times \%\ \text{of gas in atm}$

$= \frac{1 \times 21}{100}$

$= 0.21$

$$S_g = K_H P_g$$

$$= 0.012630 \times 0.21$$

$$= 0.0265230 \text{ mol } L^{-1} \text{ atm}^{-1}$$

Pressure of gas at altitude H

As we go above pressure decreases

$$\text{pressure of gas} \propto \frac{1}{\text{altitude}(H)}$$

$$\boxed{P_H = P_0 - (1.15 \times 10^{-4}) \times H}$$

P_H = Pressure at altitude H
P_0 = Atmospheric pressure at sea level
H = Altitude in meter.

* Diurnal variation of DO in water stream –

The amount of DO is always highest in water body is super saturated with O_2 in afternoon and O_2 diffuses out instead of going into water due to highest rate of photosynthesis

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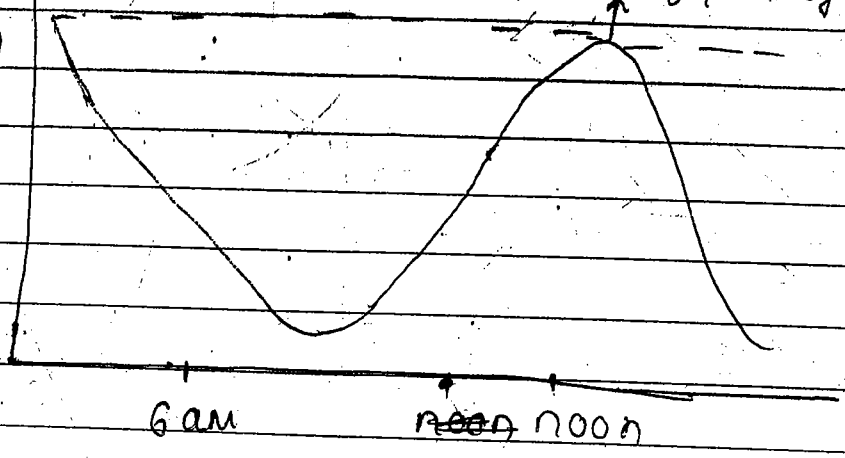
Water is supersaturated with O_2 in afternoon due to high rate of photosynthesis



DO an indicator species

In water with reduced DO contents sensitive organisms like fishes die but a few tolerant species (like insect larva tubifix, other annelid worms) can survive & thus may be recognised as indicator species for polluted water.

24/July/17

Basics of Ecology and Environment

(A) Terms related to ecology

(1a) species
(2) Population
(3) Community
(4.) Factor
(5.) Environment
(6.) Ecosystem
(7.) Ecology
(8.) Earth ecology vs Synecology
(9.) Technoecosystem
(10) Ecological footprint
(11) Carbon sequestration
(12.) Carbon foot print
(13.) Carbon handprint
(14.) Ecotone / Principle of ~~ages~~ edges or edge effect
(15) Ecosystem services / Natural capital
(16.) Ecological equivalent
(17) Ecological Amplitude
(18.) Miscellaneous
19.) (19.) Ecological succession
- Autogenic Vs Allogenic
- Primary vs Secondary
- Pioneer / sere / seral & climax stage

Species concept –

- Species is basic unit of taxonomy and evolution.
- There are diff. concept of species like Morphological, genetic, sibling and biological.
- In ecology and environment biological sp. concept given by Mayr is used.
- A/C to Mayr, when individuals can interbreed or reproduce and can form fertile offspring, belongs to same species.

Let C is a herbivore then comp^n is for

1. Shelter
2. Food
3. Mate

Interspecific

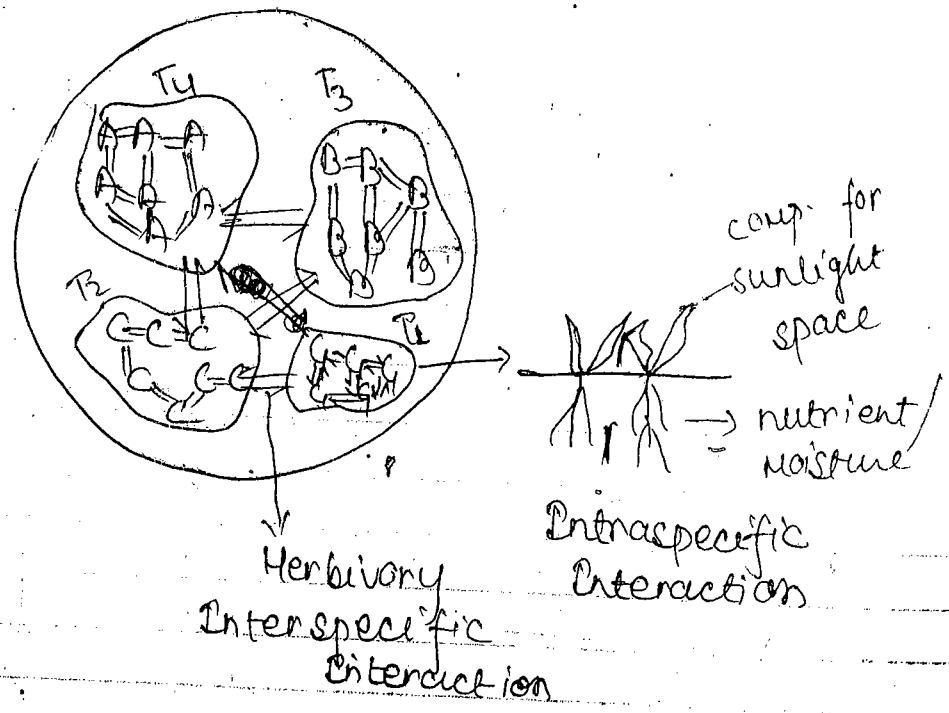


Fig – A

when rays [illegible]

Spoiled - Shape of earth is flattening over pole and bulging in equator due to rotation.

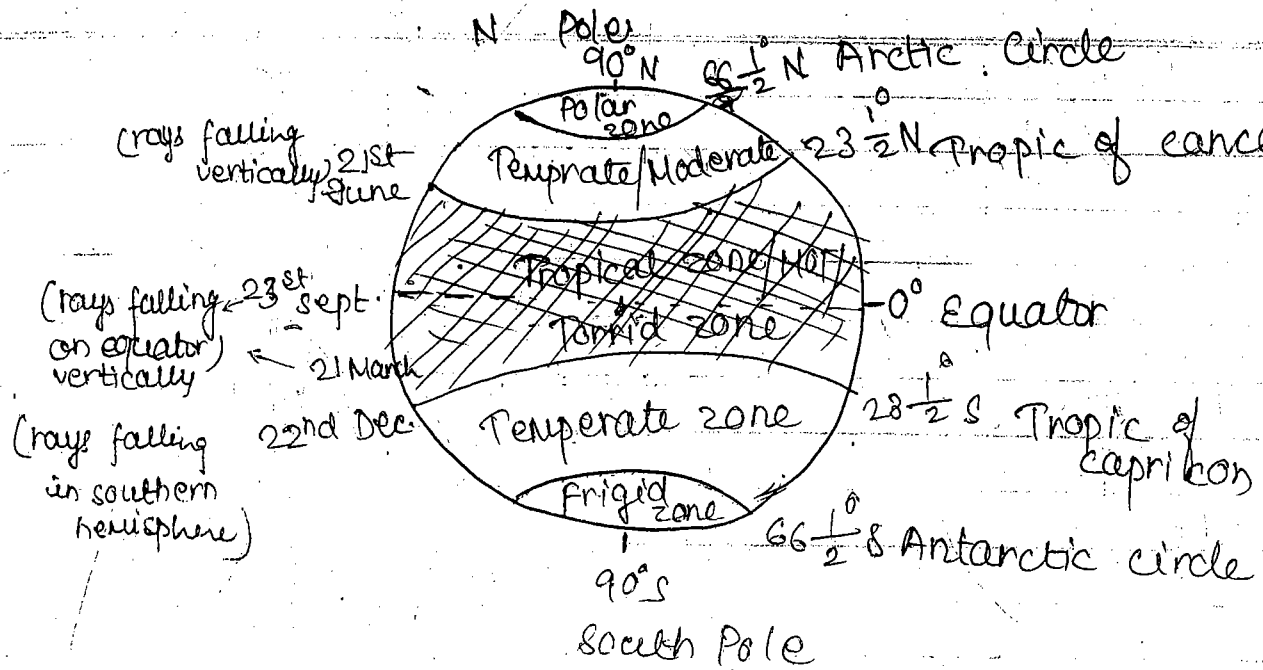


Fig - B.

Population — It is ~~some~~ sum of all individuals that belongs to a given species ~~int~~ in an area.

Community / Biocenosis — It is sum of all ~~pla~~ diff. populations i.e popu. of all plants (flora), animal (fauna) and microorganisms.

Thus community forms biotic component of the given locality.

Factor — Factor is any force, substance, or cond^n that affects individuals in any way. It can be biotic and abiotic both. For eg — light, temp^r, competition, Herbivory

Environment — It is sum of all different factors i.e both biotic and abiotic factors.

Atmosphere — It is gaseous envelope that surrounds ~~the~~ Earth surface & held by means of force of gravity, which is always max^m at surface of Earth

Ecosystem — British plant ecologist Tansley gave the term ecosystem.

Ecosystem is a system formed by interaction between interacting biotic and abiotic components.

- Sun is ~~the~~ the main source of energy

Ecology - German scientist Haeckel gave the term ecology.

- Reiter gave the term oekologie

- Ecology is study of str. and func^n of ecosystem.
- Dr. R.D Mishra is called as Father of Indian Ecology
- While performing ecological study when focus is on single or individual ~~etc~~ species it is called as ~~autoecology~~ autecology
- While performing ecological study when focus is on entire biotic component i.e entire community it is called as synecology.

Synecological approach gives two pictures of ecosystem

Latitudinal Division of Earth –

Earth can be broadly div. into following 3 zones –

① Tropical zone / Hot zone – which overlaps both hemisphere and lying within tropic of cancer to tropic of capricon.

→ It is hot and humid.

(2.) Temperate zone – / Moderate zone –

– It lying in bet^n tropics and circles in both hemisphere.

– It is called as moderate zone as climatic cond^n are moderate.

(3.) Polar zone or Frigid Zone –

– Sun rays are extremely slanting so summer is cool and winters are extremely freezes lies close to poles.

Biosphere and Biosphere - 2

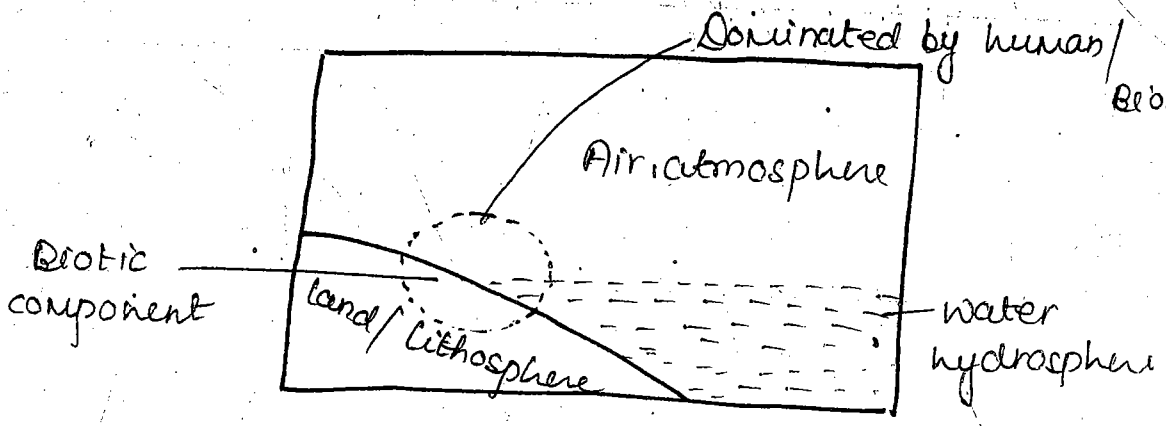


Fig - I

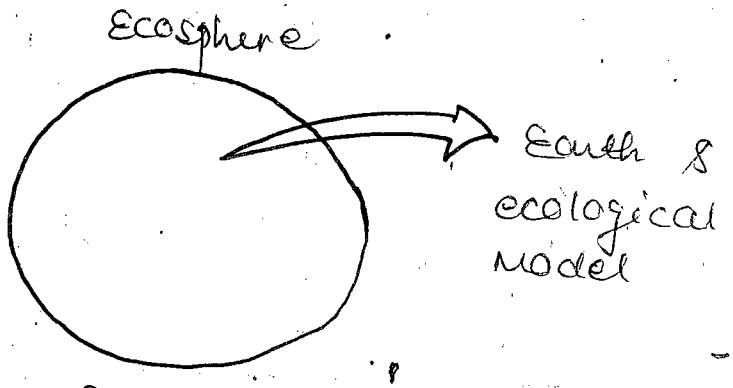


Fig II

- Biosphere is defined as zone of transition bet? lithosphere, Hydrosphere and Atmosphere having Biotic component.

When Biosphere is dominated by human is called as Biosphere - 2

⇒ ~~to which of the following is ?~~