Introduction to Ecology

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Factors affecting climatic & Weather conditions ;

1. Climatic factors
- Light.
- * Temperature.
- * Rainfall.
- Gases
- fire

2. Topographic factors (Lay of land)
- Latitude
- Altitude
- Direction of the mountain's
- slop of the mountain's.

3. Edaphic factors (Soil)
- pH
- Nutrient content
- Particle size.

Climatic Factors;

1. Light : Source of Energy (Electromagnetic radiation)

↳ Responsible for creation of climatic pattern.

Plants

- Photosynthesis.
- Photo-trophism
- Photo-morphogenesis.
- pigmentation

etc.

Animals

- Vision
- pigmentation
- Coral's pigmentation.

etc.

2 .Temperature : Measure of Heat in any System.

- **Effect on Plants**
  - Metabolism
  - Growth and development
  - Reproduction
  - Distribution of plants on globe
- **Effect on Animals**
  - Metabolism
  - Growth and development
  - Reproduction
  - Sex ratio
  - Distribution of plants on globe
    (Ectotherms and endotherms)

Endotherms / Homeotherms

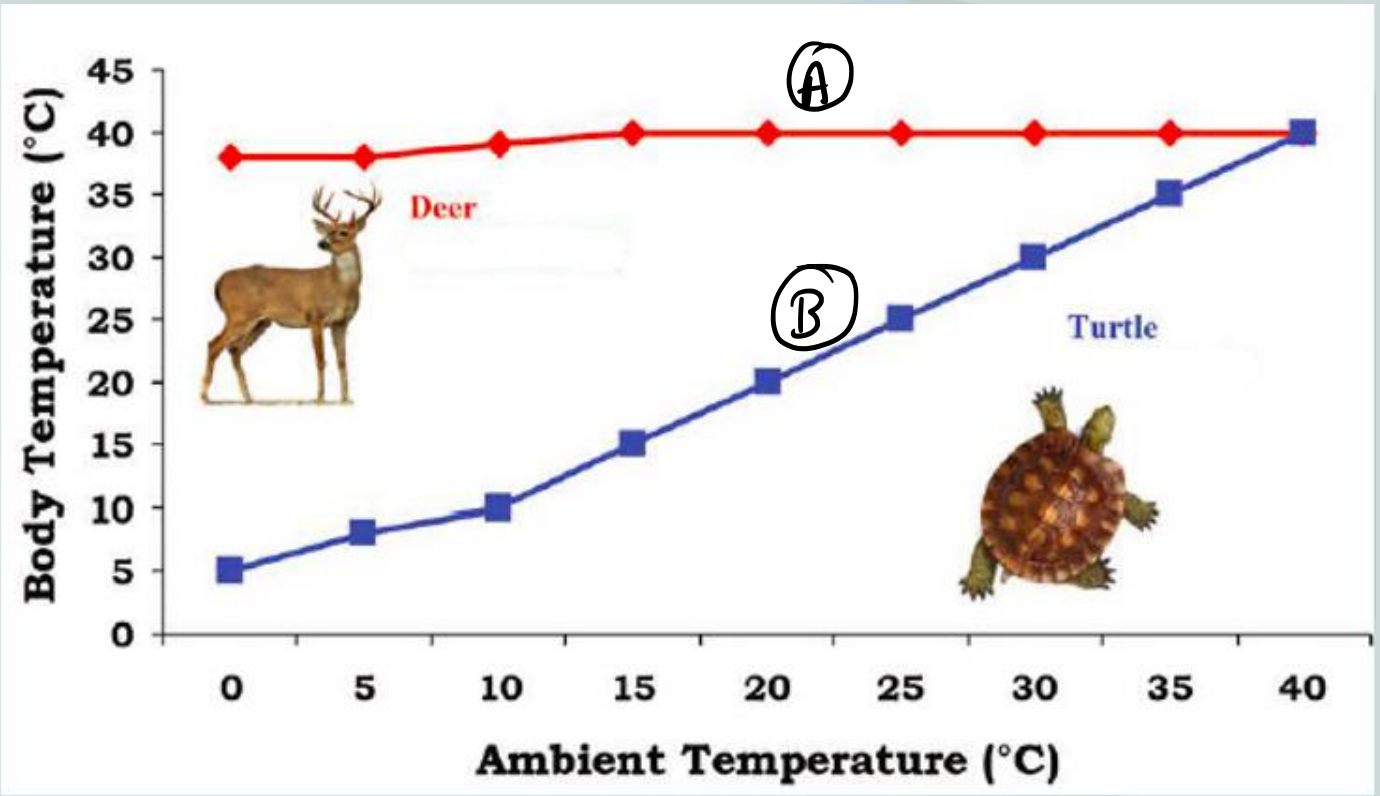
→ Regulate their internal body temp.

- Birds
- mammals.

Ectotherms / Heterotherms

→ Can not regulate their internal body temp.

- Plants
- Invertebrates
- fish
- Amphibian's
- Reptiles
- Humming bird.*


A
B
Deer
Turtle
Body Temperature (°C)
0
5
10
15
20
25
30
35
40
45
Ambient Temperature (°C)

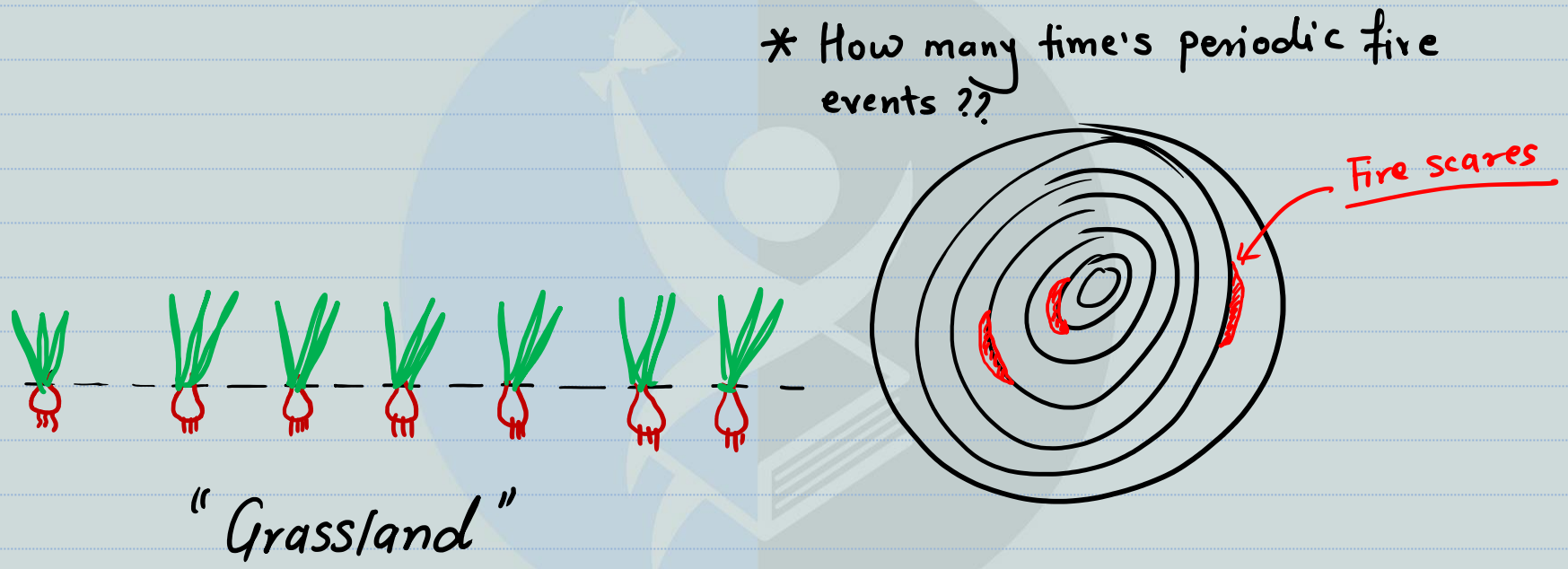
3. Rainfall / Water :

- Aquatic ecosystem.
- Terrestrial ecosystem.
- Xeric ecosystem.

- Hydrophytes.
- Measophytes
- Xerophytes.

- Hydrocoles
- Mesocoles
- Xerocoles.

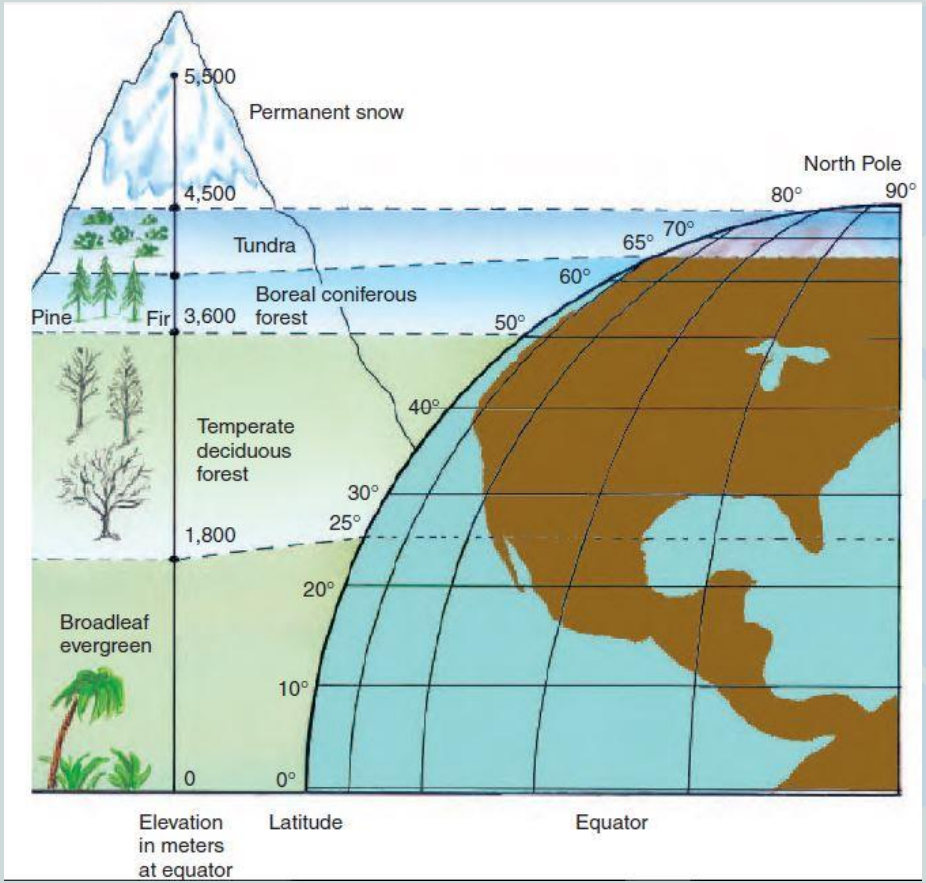
4. Fire : Is responsible for dominance of grasses in Grassland.



Topographic factors; "Lay of land"

1. Latitude : Equator (0°) to poles (90°) move.
2. Altitude : Sea level to height (mountain's)

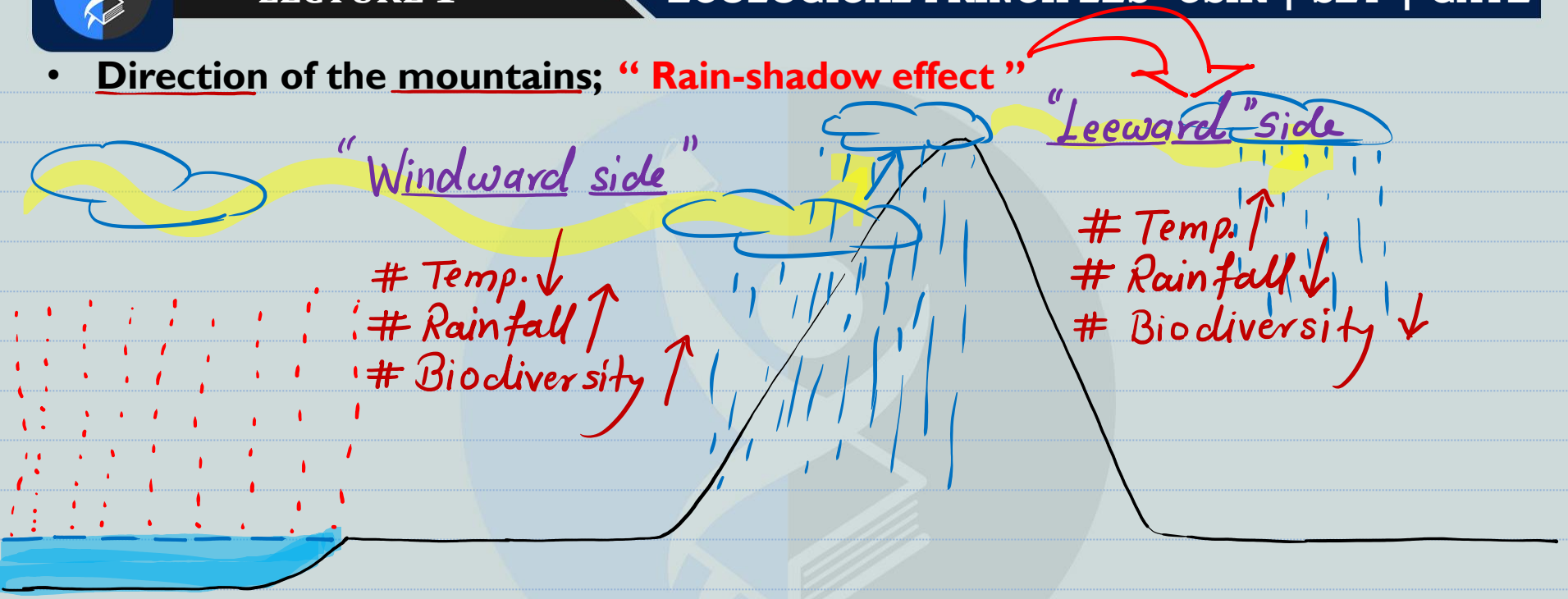
"Change in altitude and latitude give's you same effect."

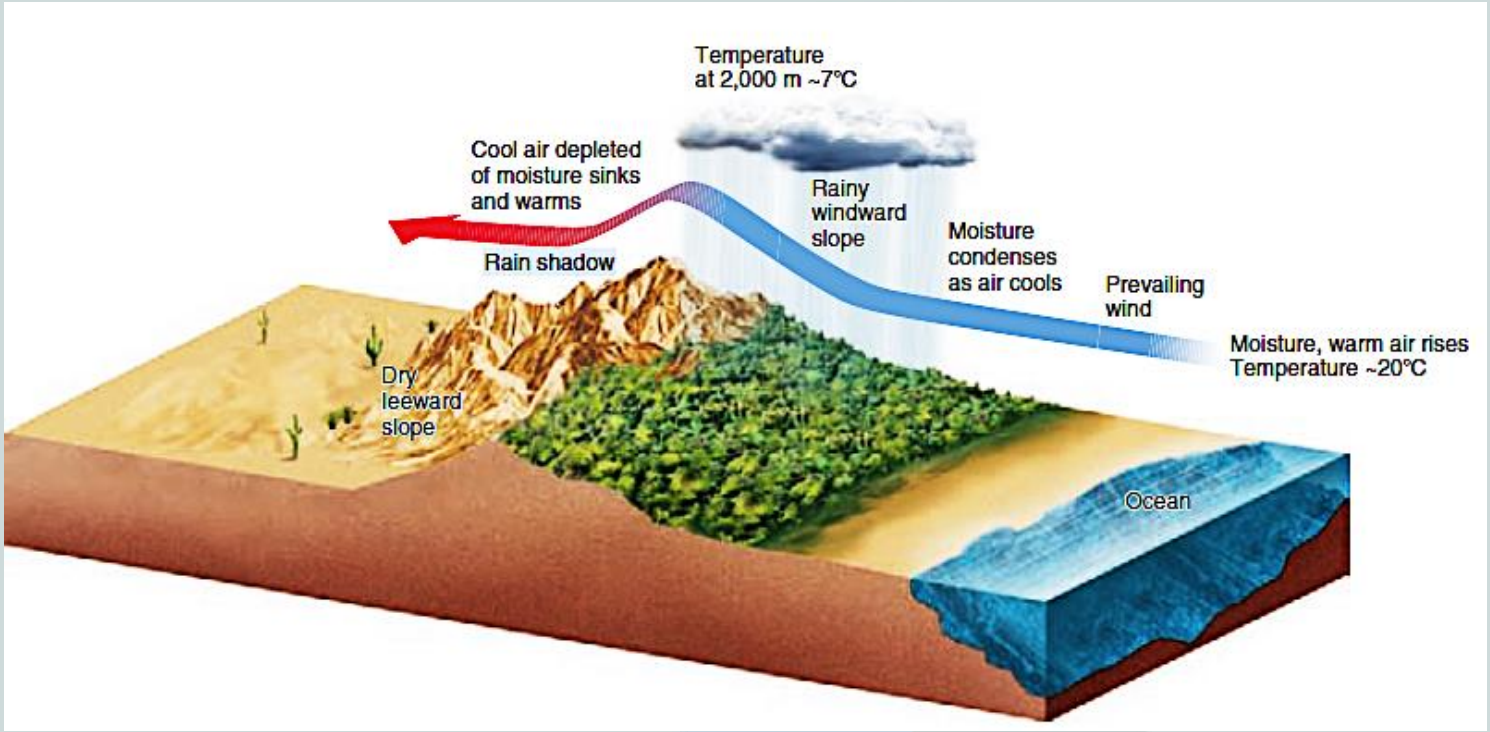


Temp. ↓
Rainfall ↓
Biodiversity ↓

Temp. ↑
Rainfall ↑
Biodiversity ↑

- **Direction of the mountains; " Rain-shadow effect "**




Temperature
at 2,000 m ~7°C
Cool air depleted
of moisture sinks
and warms
Rainy
windward
slope
Moisture
condenses
as air cools
Prevailing
wind
Rain shadow
Moisture, warm air rises
Temperature ~20°C
Dry
leeward
slope
Ocean

What is the rain-shadow effect in mountainous regions?

A) A phenomenon where rain clouds form on the eastern slopes of mountains

B) The enhanced precipitation on the windward slopes and lower precipitation on the leeward slopes

C) The warming of air as it moves down the eastern slopes of mountains

D) The pooling of cold air in low-lying areas during clear, calm nights

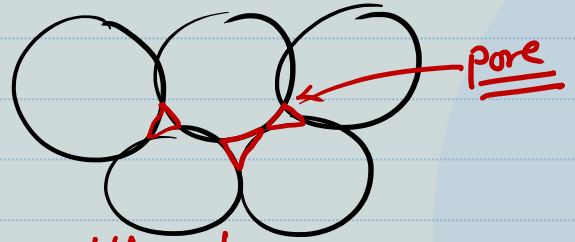
- **Slope of the mountains;**



Edaphic Factors; "Soil"

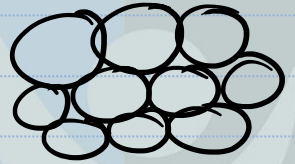
1. Particle size:

"Best particle size."



- WHC ↓
- Aeration ↑

e.g: Sand
Gravels



- WHC- moderate
- Aeration- moderate

e.g. "Silt"



- WHC ↑
- Aeration ↓ (Anaerobic)

e.g. "Clay"

2. Soil pH:

"Best"

Highly Acidic (pH = 2 or 3)

- Micro-flora ↓
- Nutrient's availability ↓

moderate - Acidic/Basic
(pH = 5.8 – 7.8)

- Micro-flora ↑
- Nutrient availability ↑

e.g. "MS - media"
5.8

Highly Basic (pH = 10)

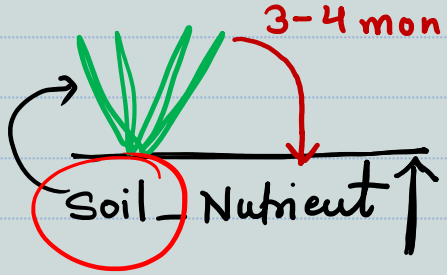
- Micro-flora ↓
- Nutrients avai. ↓

3. Nutrient content in soil:

I. High Nutrient (Grassland)

II. Moderate (Temperate forest)

III. Low Nutrient (Tropical Rainforest)



Equator ⟶ Pole
0° 90°

Plain area ⟶ Mountain top.

Lower depth ⟶ Deep (depth)

Temperature ↓
Rainfall ↓
Biodiversity ↓
Biomass ↓
Height of the trees ↓
Arborial Animal's ↓
Stratification in forest ↓
Day length ↑

Living organisms

Trophic level : Group of diff. species with similar Ecological role.

T_4 • Tert. Consumer's
T_3 • Sec. Consumers
T_2 • P. Consumer

} Consumer's (All Heterotrophs)

T_1 • Producer : All auto-troph's.

Decomposer's : Micro-Heterotrophs

Omnivore : Plant + Animal source.

1. Producer's : Auto-trophs.

Inorganic material —Energy→ Organic material.

Energy → Light (Photo-autotrophs)

Energy → Chemical's (Chemo-auto-trophs)

2. Consumer's : Hetero-troph's

Orgaic —"Consumption"→ Orgaic

- Primary consumers : Herbivore
- Secondary Consumers : Pri. Carnivore
- Tertiary consumers : Seco. Carnivore

3. Decomposer's: Micro-Heterotrophs.

Organic —Decomposition.→ Inorganic

↓

Return back to Abiotic portion.

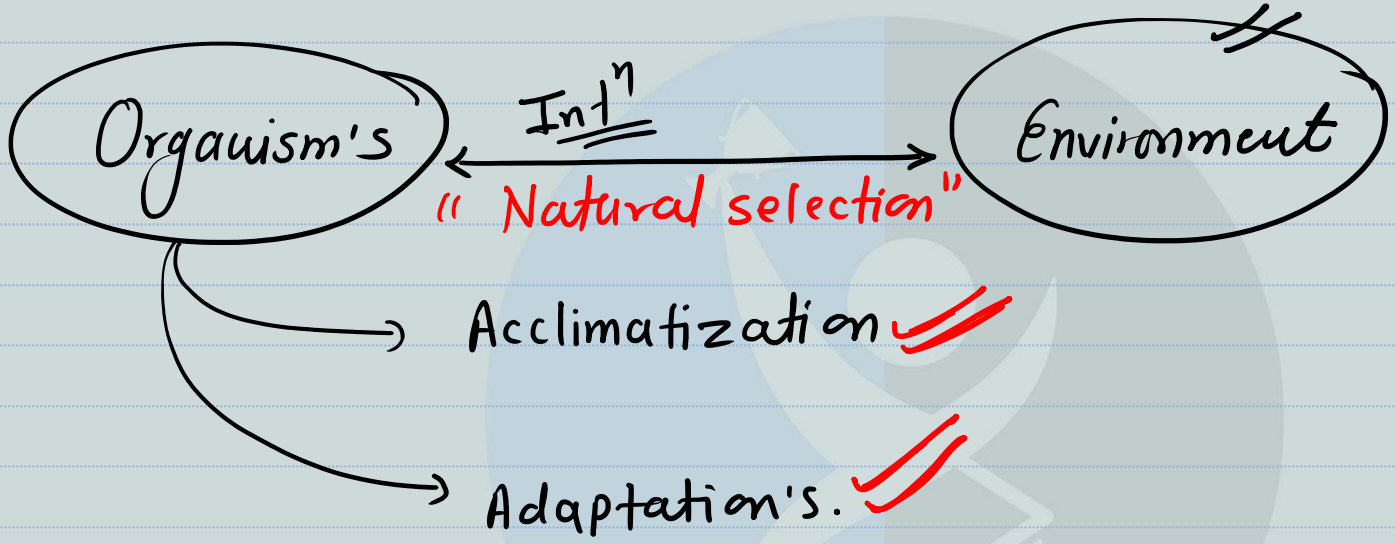
Soil in naturally growing vegetation is-

(1) Acidic due to decomposition of organic matter

(2) Basic due to Bicarbonate in soil X

(3) Neutral due to silicate buffer X

(4) Acidic due to Sulphuric acid X


Orgauism's
Inf^n
Environment
" Natural selection"
Acclimatization
Adaptation's.

- **Various Rules in Ecology**

Rule	Definition
Bergmann's Rule	Within a species of endothermic animals, individuals living in colder environments tend to have larger body sizes than those living in warmer environments.
Richards Hesse's Rule	Within a species of endothermic animals, populations living in more humid environments tend to have smaller heart sizes than those living in drier environments.
Allen's Rule	Within a species of endothermic animals, individuals living in colder environments tend to have shorter limbs and appendages than those living in warmer environments.
Gloger's Rule	Within a species, populations living in more humid environments tend to have darker skin or feathers than those living in drier environments.

Jordan's Rule	Within a species of fish, individuals living in colder waters tend to have larger gill surface areas than those living in warmer waters.
Bergmann's Rule (in reverse)	Within a species of ectothermic animals, individuals living in colder environments tend to have smaller body sizes than those living in warmer environments.
Rensch's Rule	Within a genus of animals, sexual size dimorphism (differences in body size between males and females) tends to be greater in larger species than in smaller species, with birds often cited as an example.
Cope's Rule	Within a lineage of animals, body size tends to increase over time.

1. Bergamann's Rule : Body size

	Equator	Poles
Body size :	Small	Large
Surface area : Volume ratio	High	Low

2. Richard Hesse's Rule : Heart size.

	Equator	Poles
Heart size :	Small	Large.

3. Allen's rule : Appendage (tail, limb, Ear pinnae)

Warm	Cold
→ Large size	– Small size.

4. Gloger's rule : Skin pigmentation

Warm + Humid	Cold + dry
– High pigmentation	– Less pigmentation.

5. Jordann's rule : fish.

Eq.	Pole
• Scale's thin	• Scale's thick.
• Number of vertebrae ↓	• No. of vertebrae ↑

6. Rensch's rule : Birds.

Wings :



7. Cope's rule : Evolutionary

" During the course of evolution Animals body size has increased. "

A general increase in the average body mass of animal population within a species with latitude is known as

(1) Allen's rule

(2) Allee effect

(3) Bergmann's rule

(4) Hamilton's rule

Individuals with greater mass have a smaller surface area to volume ratio, which helps to conserve heat. This is known as

(1) Liebig’s rule.

(2) Cope's rule.

(3) Gloger's rule

(4) Bergmann’s rule

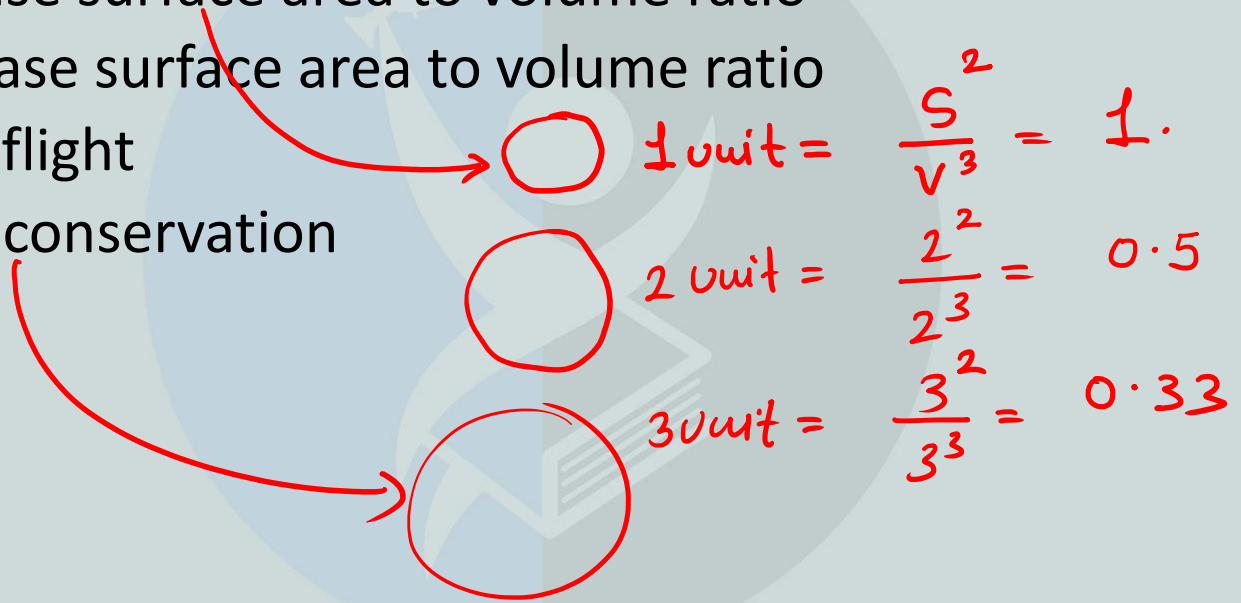
The birds in tropics are generally smaller in size because of-

(1) To increase surface area to volume ratio

(2) To decrease surface area to volume ratio

(3) For easy flight

(4) For heat conservation



HAPPY LEARNING

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