

TEST CODE : 5 3 3 5 1

FIAS - ATS2022 - GEO #1

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ForumIAS

GEOGRAPHY (OPTIONAL)

Name Of Candidate

Priyanka

Roll No.

1910103669

Time Allowed: Three Hours

Date:

20 Aug 2022

Maximum Marks: 250

INDEX TABLE

INSTRUCTION

Q. No.	Max. Marks	Marks Obtained
1		
2		
3		
4		
5		
6		
7		
8		
Total:	250	

1. Do furnish the appropriate details in the answer sheet (viz. Name, Roll No. Date).
2. There are FIVE questions in the question paper. Section A contains 3 Questions and Section B contains 2 questions.
3. All Questions are Compulsory.
4. The number of marks carried by a question/part is indicated against it.
5. Answers must be written in the medium authorized in the admission Certificate, which must be stated clearly on the cover of this Question-Cum-Answer (QCA) Booklet in the space provided.
6. Word limit in questions, if specified, should be adhered to.
7. Content is more important than content length.
8. Any page or portion of the page left blank in the Question-Cum Answer Booklet must be clearly Struck off.

Any specific messages for ForumIAS Mentors/ Evaluators with respect to your copy? Write it here.

Evaluator's Discretion:

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Start Time | 9 AM

End Time | 12 AM

Total Marks:

Mode Of Examination:

Online Offline

Evaluator's Discretion: This is the marks awarded at the discretion of the evaluator based on your overall impression, on the basis of (but not limited to) your handwriting, presentation, use of diagrams, flowcharts, facts and figures or absolutely anything that he/she liked in your copy.

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EG:

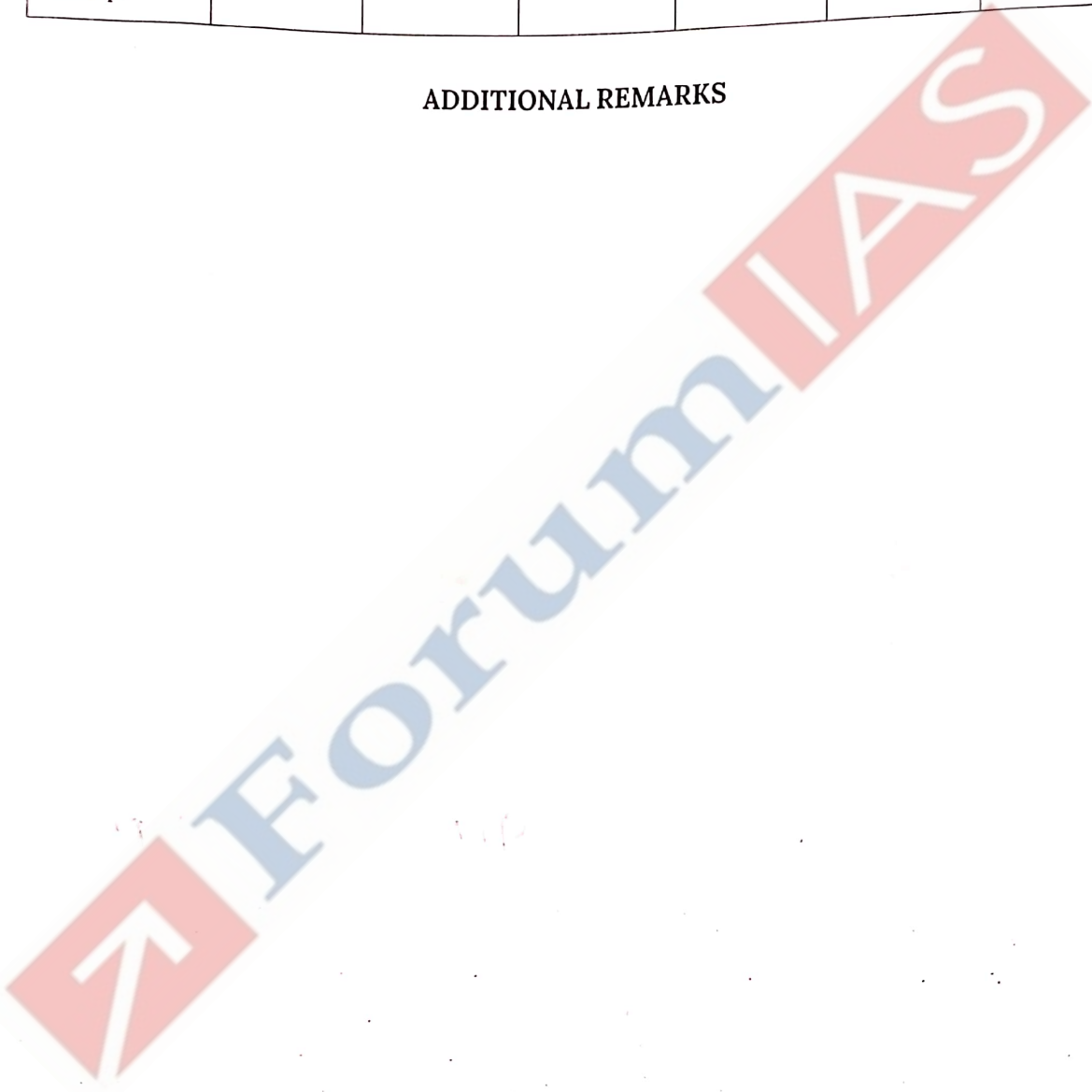
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Parameters	Excellent	Very Good	Good	Average	Poor	Very Poor
Language						
Structure						
Presentation						
Handwriting						
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Attempt						

ADDITIONAL REMARKS



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Section- A

(10 * 5 = 50 Marks)

Q.1) Answer the following in about 150 words each:

(10 Marks)

a) Write a short geographical note on Pingos.

Pingos are small sand deposited hills on the glacials rising abruptly on plate surface.

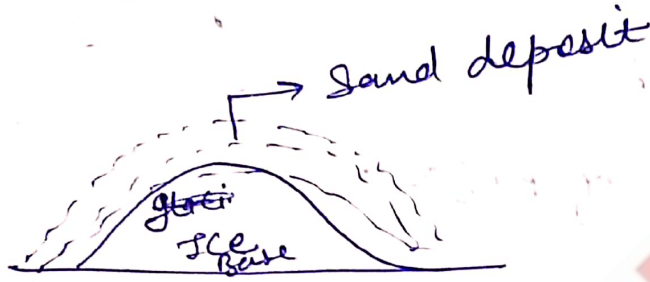


Fig: Pingo's structure.

Climatic Conditions

Pingos forms in periglacial area at the end of cycle of erosion

Structure of Pingo

Pingos are result of freezing of ice in extremely cold region of the world and the deposition of sand on these ice

Area of occurrence of Pingos

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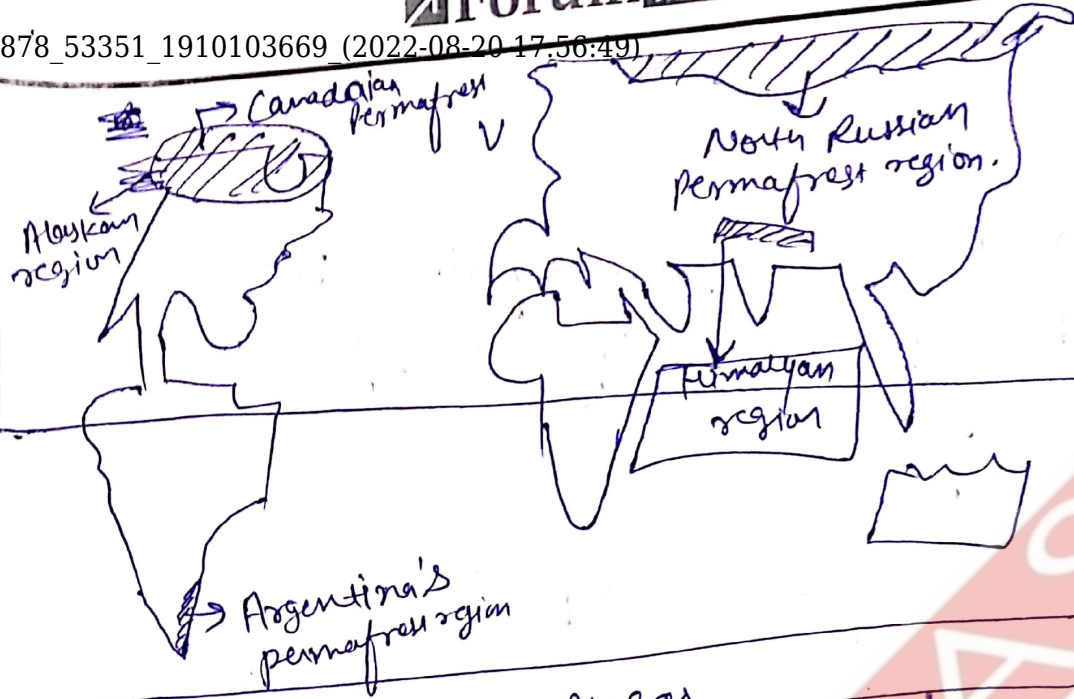


Fig: Distribution of Pingas

Pingas are important source of water in periglacial region.

Feedback
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b) Ex: 53351_1910103669 (2022-08-20, 17:56:49)

expressions of weathering and mass wasting (10 Marks)

Weathering refers to in situ disintegration and breaking of rocks through climatic agents, biological lifeforms etc. whereas mass wasting is detachment and downslope transport of soil and rock material under influence of gravity.

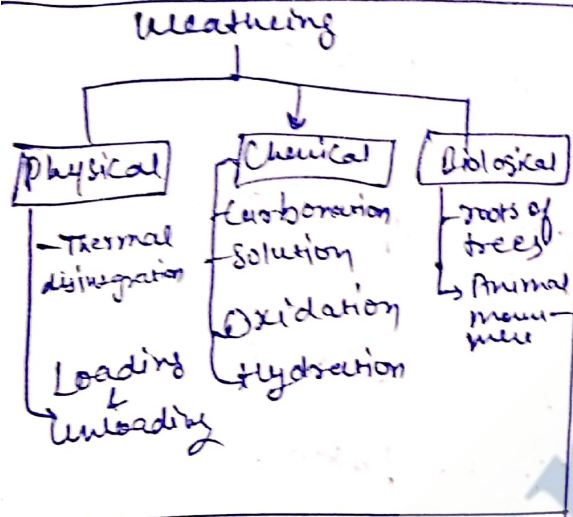


Fig: Weathering Classification

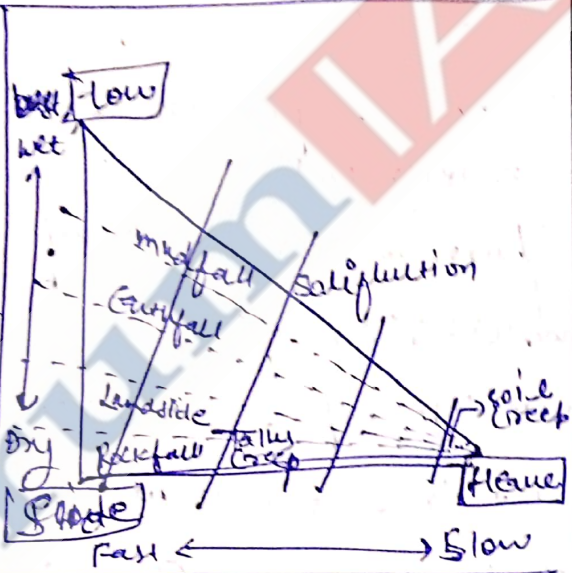


Fig: Type of Landslide

A) Geomorphic importance of weathering and mass movement

D) Formation of soil and development of soil profile

↳ weathering of parent rocks provide the basic layer of soil.

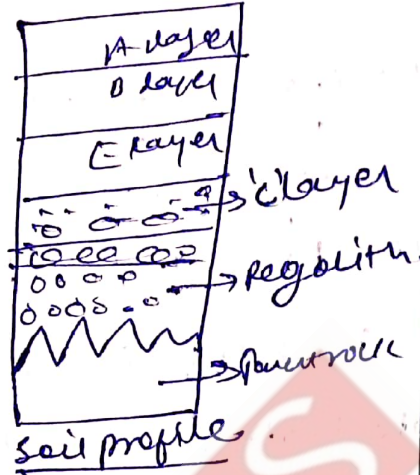
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→ weathering of material (Chemical weathering)

provide character to soil

② weathering of igneous rock → laterite soil

oxidation → ferrous mineral



② Development of Landform

Disintegrated debris transported by rivers over period time

↓
Erosion cycle → Landform develop.

③ Topographic expression of weathering and mass movement:

① Landform feature → scarp face slope in areas of mass wasting.

② Karst topography → solution of limestone result in → sink hole, Uvalde Lake.

③ Rockfall develops scree on surface.

The knowledge of weathering and mass wasting have great significance in applied geomorphology for slope management, river profile study etc.

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Explain how Bosche and Haldenhang lead to the Theory of Slope Replacement.

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(10 Marks)

Penck presented his slope development model where he used the process of slope replacement. According to him the steep slope replaced by gentler slope from below and gentler slope grew at the cost of steeper slope.

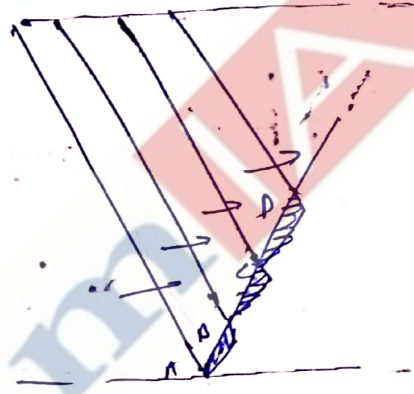
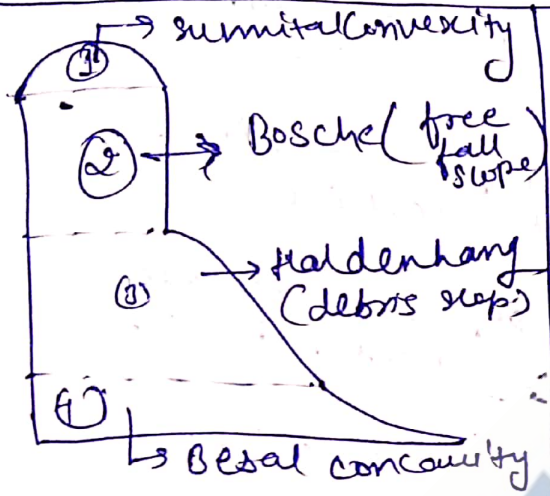


Fig: element of slope

Fig: Slope replacement through backwashing

Role of Bosche and Haldenhang in the development of Slope Replacement Theory

① First phase the accumulation of debris at the lower segment led to development of Haldenhang

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② Second phase with continuation of debris accumulation the debris slope grew from below replacing Bosch with gentler slope

→ with each phase the upper steeper debris slope replaced by gentler debris slope.

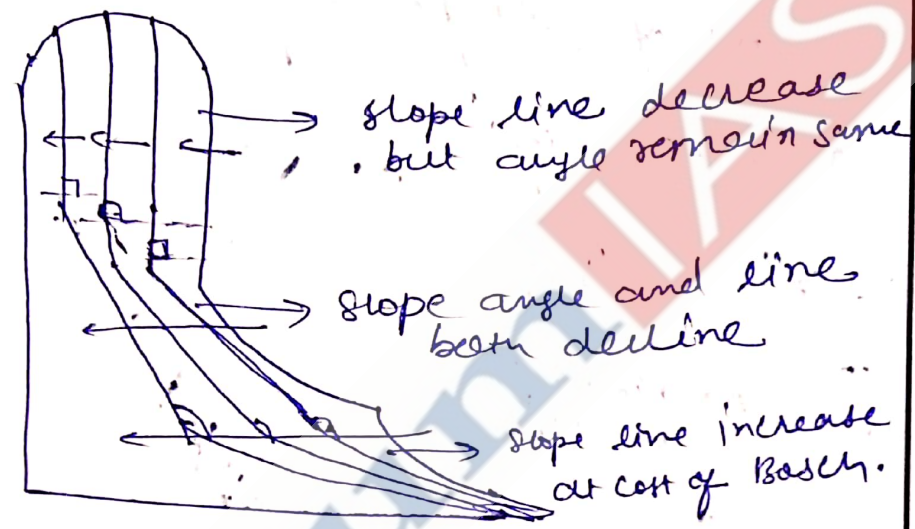


Fig: slope replacement by backwasting.

The concept of slope replacement and debris limited slope of fence later used by King in his parallel repeat model of slope development.

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Discuss in brief the different stages of the hydrological cycle and the effect of climate change on it.

(10 Marks)

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Hydrological cycle refers to the cyclic movement of water from earth surface to atmosphere and back to earth through the process of precipitation, condensation, evaporation, runoff etc

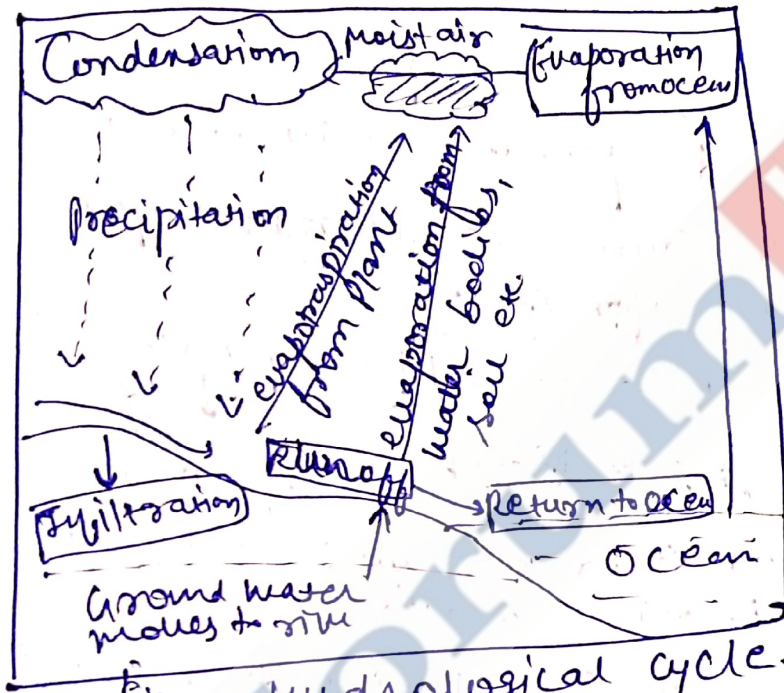


Fig: hydrological cycle.

Different stages of hydrological cycle

1) Evaporation & Evapotranspiration from earth due to insolation and heating of water bodies, oceans, etc. The water vapour goes to atmosphere.

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② Condensation and precipitation: When water vapour Condense and form water clouds; if the water droplets become bigger than water fall on earth in form of precipitation.

③ Runoff: water return back to oceans, water bodies after precipitation.

Impact of Climate Change

Component	Impact
Evaporation and Transpiration	As <u>temperature</u> will rise, it will cause accelerated evaporation and transpiration.
Precipitation	High moisture → High humidity ↓ High precipitation → formation of cloud ↓ Erratic in nature due to change in climatic condition
Run-off	High runoff → High intensity rainfall will not allow much infiltration

Alteration in hydrological cycle have cascading impact on local weather, biodiversity as it directly impact climate and vegetation type of an area.

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e) Discuss the distribution of salinity patterns in the Indian Ocean? (10 Marks)

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Salinity refers to the amount of salt (in gm) dissolved in 1000 gm (1 kg) water.

→ Salinity around 35‰ is considered normal salinity for all ocean.

Horizontal distribution of Salinity in Indian ocean

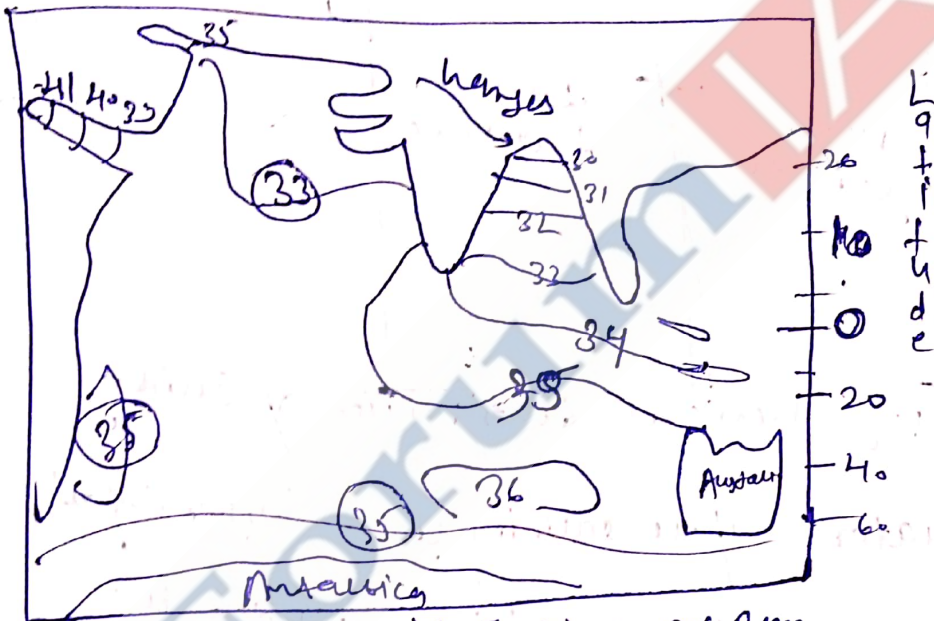


Fig: Isohalines of Indian Ocean

① Latitudinal distribution

(i) Near equator - 35‰ because high rainfall, reduced albedo (high clouds)

(ii) ~~High~~ Increase salinity with increase in latitudes as with latitude temperature

And resultant evaporation increases.

(Q2) Regional variation

- (i) High salinity in Red sea (40‰) — low mixing of current & low river discharge
- (ii) Low salinity → Bay of Bengal as Ganga-Brahmaputra add fresh water

Vertical distribution of salinity

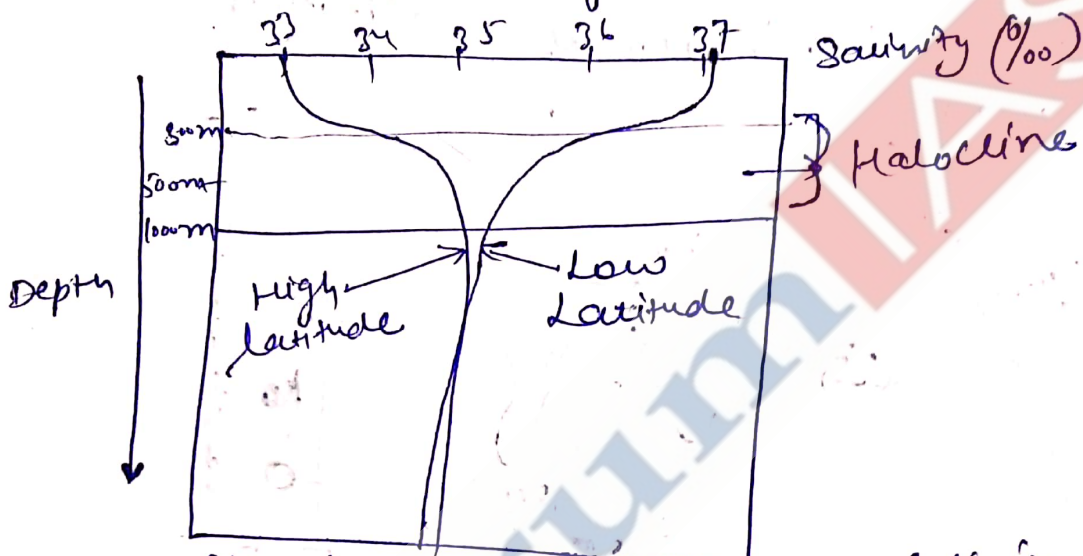


Fig: Vertical distribution of salinity

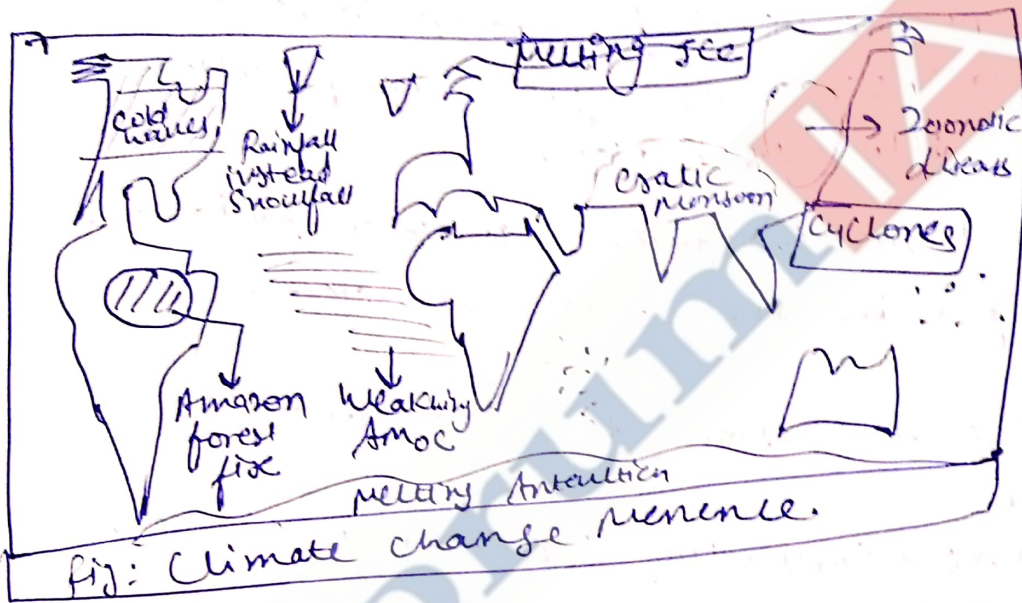
- (i) At equator, surface salinity low → High rainfall
- (ii) Mid and high latitude → high salinity due to high temperature, on surface change in
- (iii) Halocline → zone of rapid fall in salinity at
- (iv) Salinity increase with depth: true for all oceans.

Salinity level indicates health of ocean over period of time such as T-S diagram tracking.

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138878_53351_1910103669_(2022-08-20_17:56:49) pillars to fight the menace of climate change". In the light of the above statement, critically analyze the role of humans in responding to the evil of climate change. (20 Marks)

According to IPCC the ongoing Anthropocene epoch is result of human activities. Since 1800s, the GHG, deforestation, land-use pattern has culminated in anthropogenic climate change.



Mitigation refers to efforts for reducing the severity of climatic hazard.

eg Mangroves in Coastal areas to reduce severity of tropical cyclone

Adaptation altering behaviour and socio-cultural practices according to climate

eg Drought and heat resistant crops

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Role of Human in responding to the effects of Climate Change

(A) Positive role

(I) International level

(i) Adoption of UNFCCC to reduce GHG and temperature increase

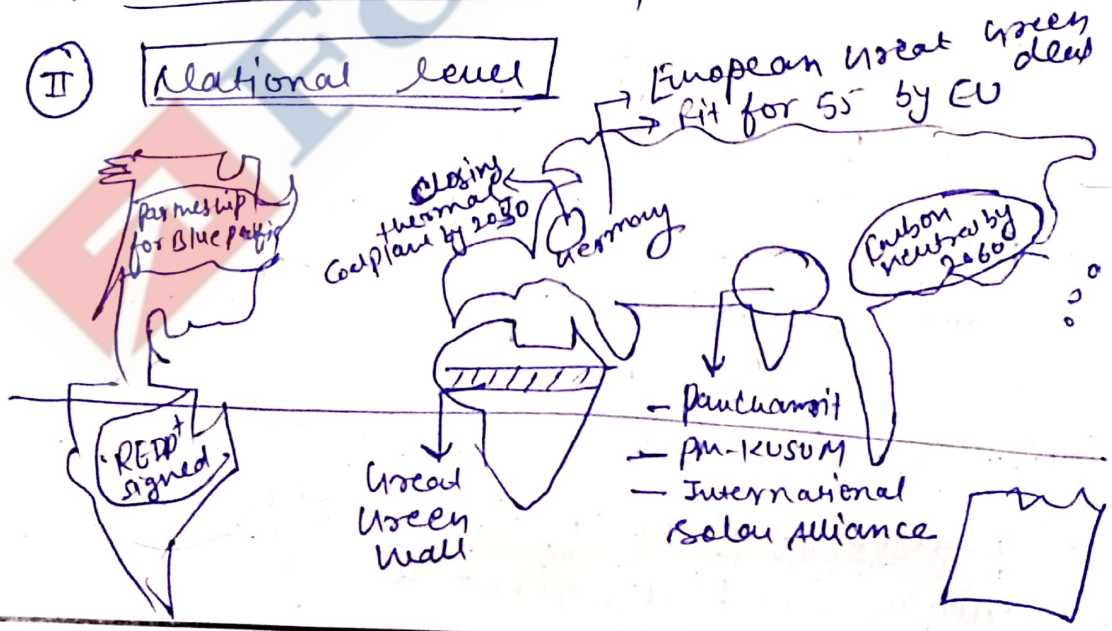
- Kyoto Protocol on GHG
- REDD & REDD+ for forest conservation
- INDCs to limit global temperature below 2°C by 2100.

(ii) Great Vrid Initiative under Solar Alliance for greening the energy ecosystem.

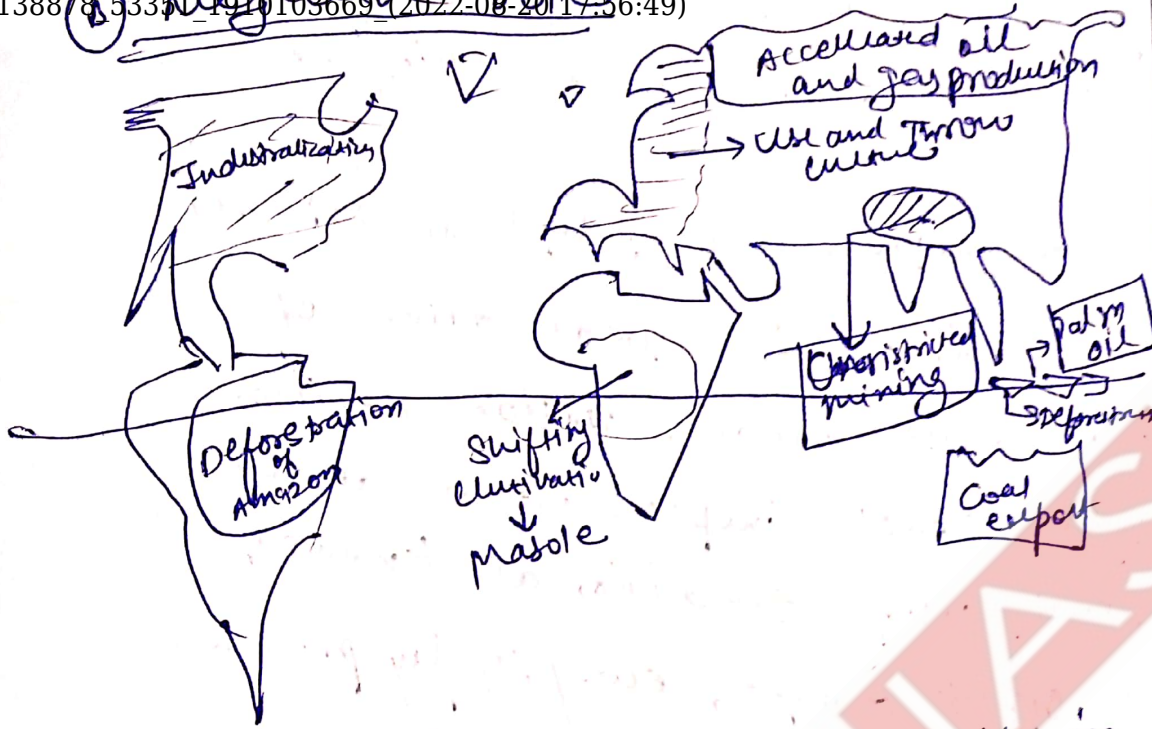
(iii) UNCCD to restore degraded and deserted land.

(iv) Ramsar Convention to protect wetland.

(II) National level



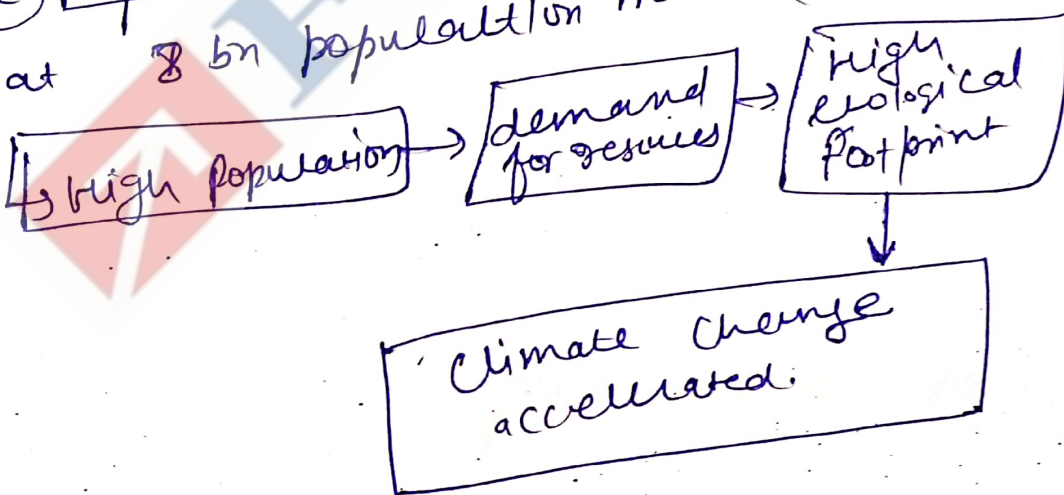
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① Rapid industrialization specially in developing countries

eg) Relaxed PDS norms in almost all sector by India.

② Population growth world reached at 8 bn population mark (UN report 2022)



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③ Deforestation in Amazon, Congo forest for Agriculture, animal ranching etc.

To mitigate and Adapt the Climate Change mitigation, the localization of SDGs is most where action decision at higher level implemented at the local level using traditional knowledge such as organic farming, eco-friendly production etc.

(Don't
anything

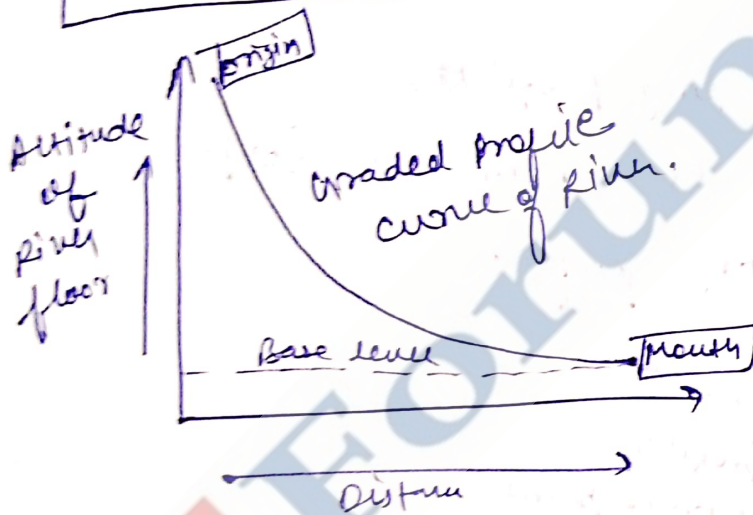
b) Es
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138878_53351_1910103669_2022-08-20_1756149) Also, highlight the factors through which rivers reach a state of self-regulation and maintain stable channel characteristics. (15 Marks)

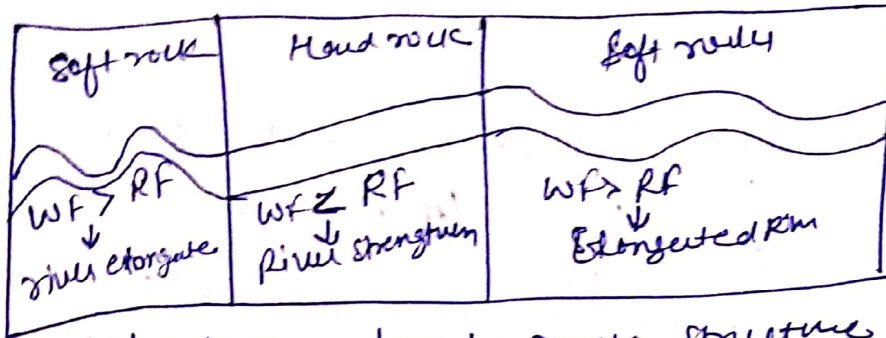
The Concept of Grade was given by Crubert. According to Gilbert, a river attains grade when energy available in river become equal to work to be done by river.

Capacity (energy) of erosion of river = Amount of erosion energy require for erosion and Transport



Steady state means the tendency of river to remain equilibrium over a period of time in an open system. Therefore the river took straight, serious and meandering path to maintain grade.

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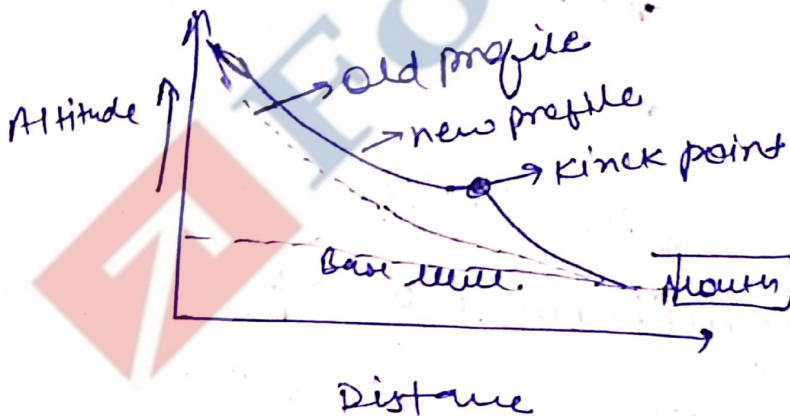
RF = Resisting forces due to rock structure
 WF = working force → energy available with river.

Fig: Concept of Urade & Steady state by Gilbert

Factors through which rivers reach a state of self-regulation and maintain Channel Characteristics

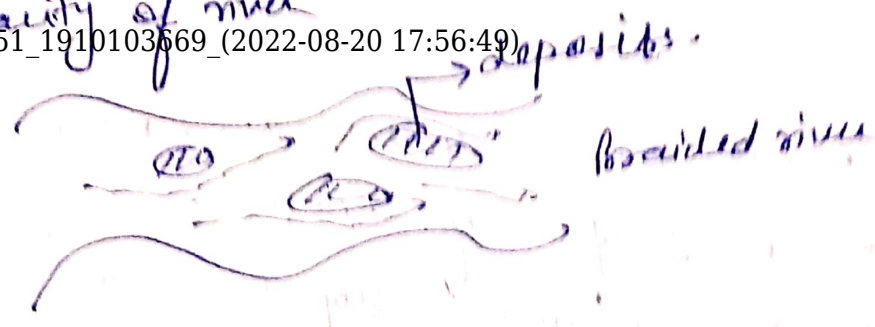
① Maintenance of long profile

↳ knick point → river elongates its path to maintain long profile.



② Braided river if the sediment load is higher than the transport

Capacity of river
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3) Rock structure



- High sedimentation
- Low transport capacity

Meandering river

- Low sediment load
- High transport energy

Straight and fast river

Beside these factors, the hydrologic geometry properties of river i.e. shape, discharge, sediment load etc. decides river profile and it is unique for every river.

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c) Bring out the classification of ocean deposits, and analyze in brief the distribution of ocean deposits in the Atlantic Ocean? (15 Marks)

Ocean deposits are unconsolidated marine deposits found on surface of ocean ranging from continental shelves, slopes and deep sea abyssal plains :

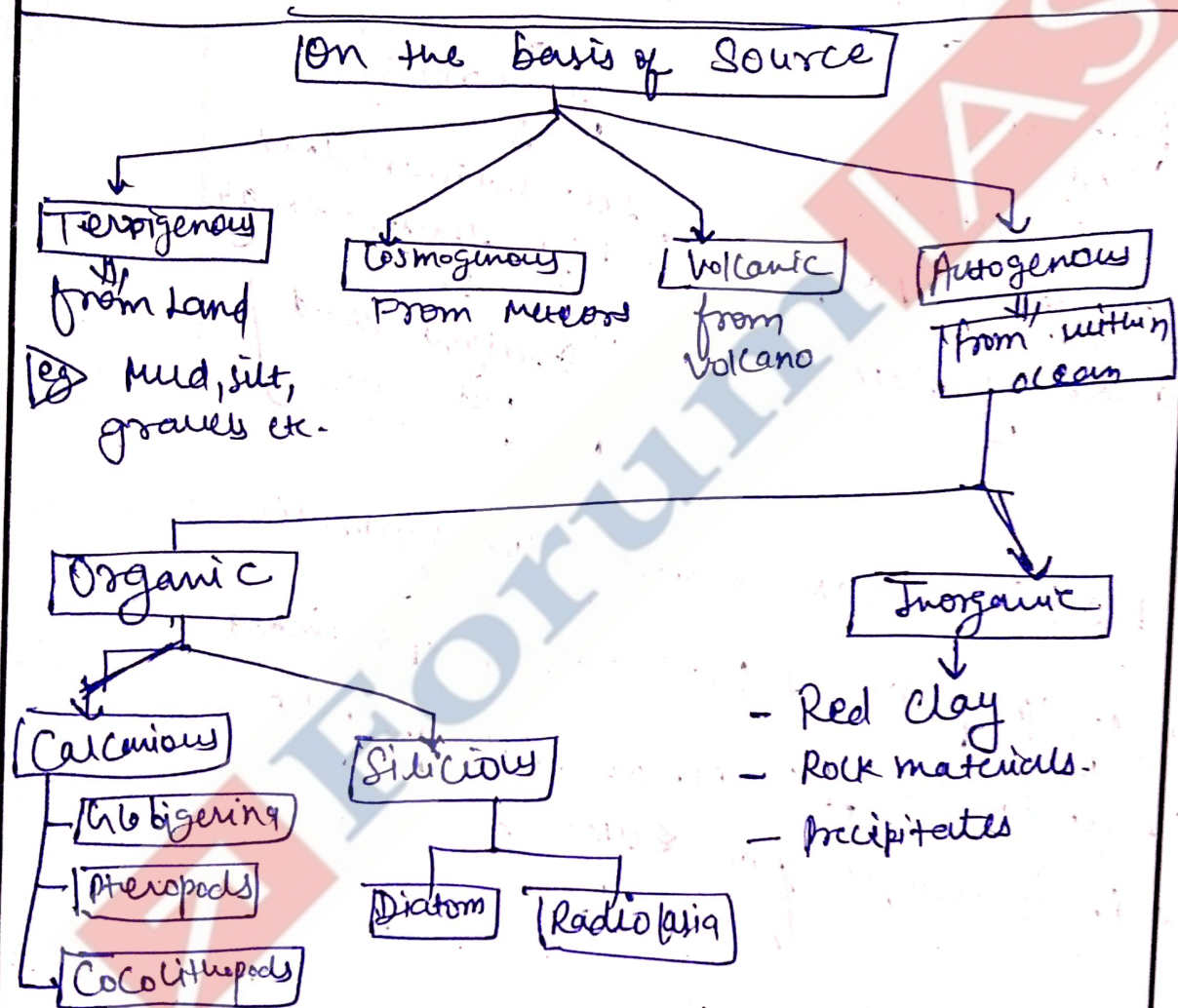
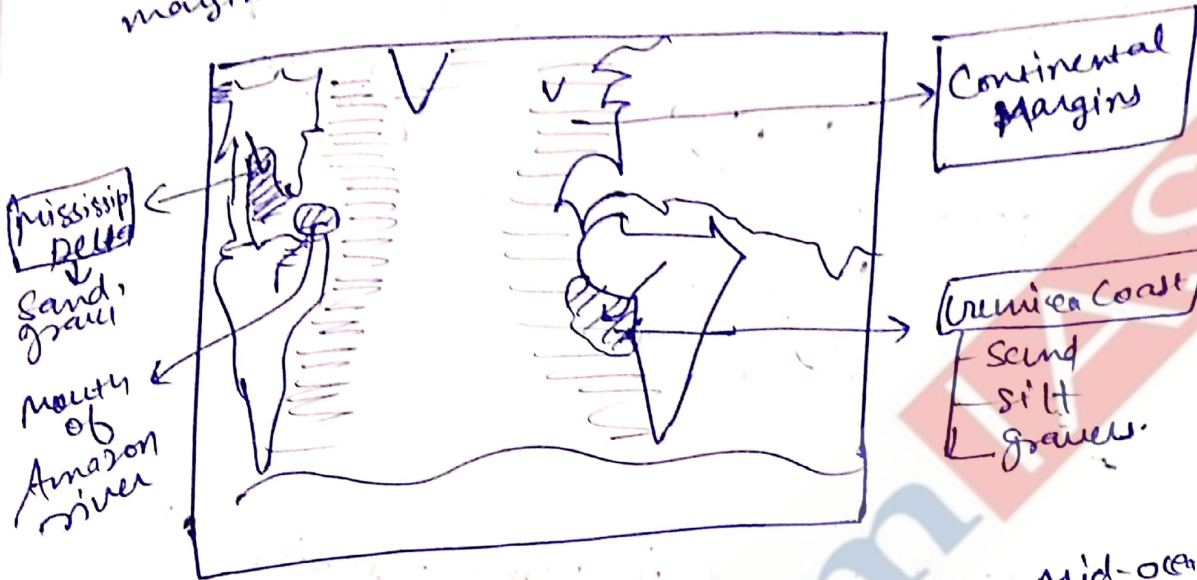


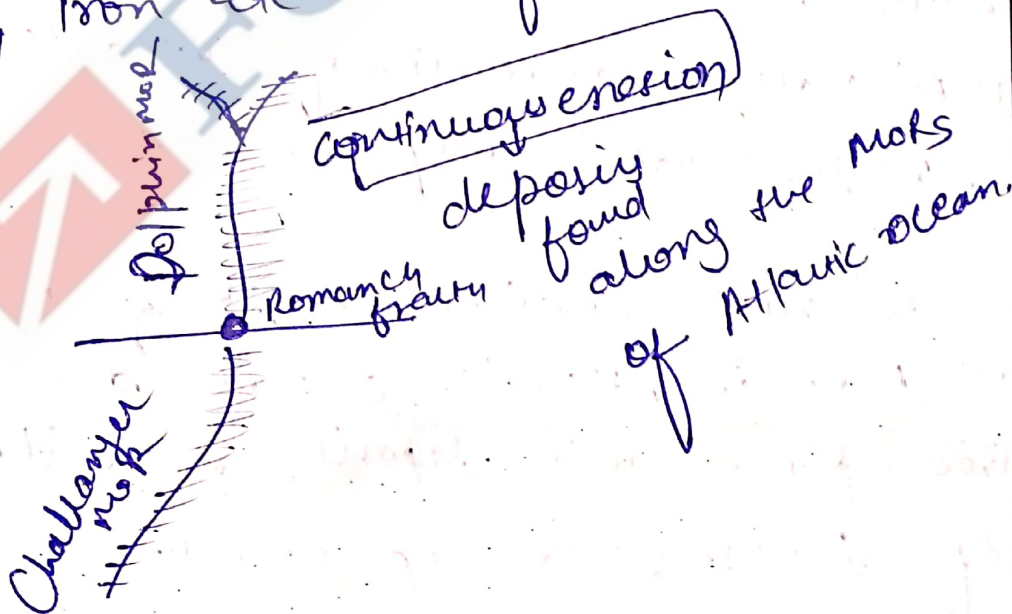
Fig: Classification of oceanic deposits

Distribution of Oceanic Deposits in Atlantic Ocean

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 (A) Terrestrial Deposits: Atlantic ocean have wide Continental shelves due to its passive Continental margins and deposition of sand, gravel by rivers on these the margins.

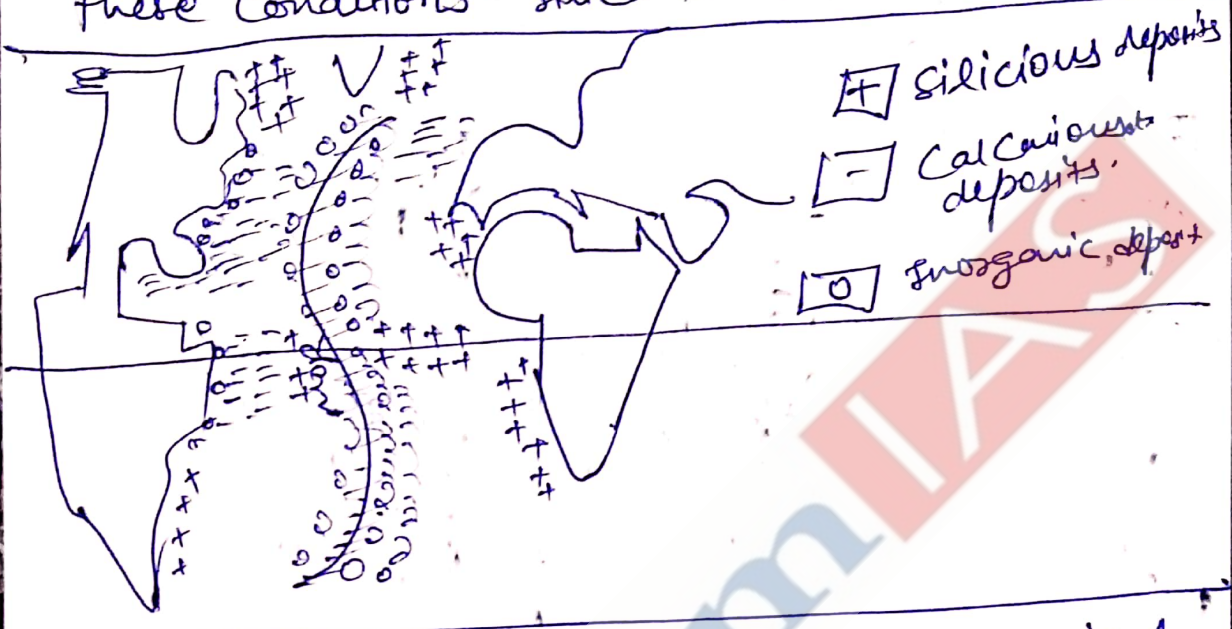


(B) Volcanic Deposits - along the mid-oceanic ridges due to continuous erosion of MOR, the basaltic minerals like Copper, Iron etc. are found along MOR.



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- (c) Autogenous deposits
- (1) Siliceous deposits associated with cool temperate region, upwelling regions as in these conditions silica is less mobile



(2) Calcareous deposits : found in warm tropical and subtropical areas where water is saturated from calcareous minerals.

(3) Red Clay : on deep abyssal plains along the MOR.

(4) Rock minerals → denudation of volcanic peaks, ranges, craters in deep sea basin

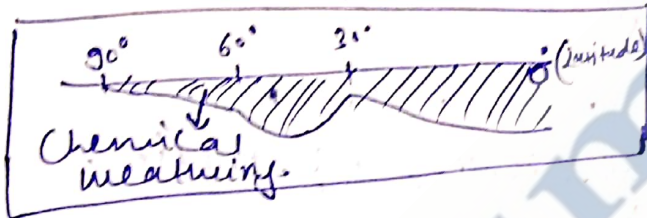
The wide continental shelf and extensive MORs in Atlantic ocean are rich source for oceanic deposits. make it one richer of richest ocean of world.

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 "Appreciation of world climates is necessary to a proper understanding of the varying importance of the different geomorphic processes" Elaborate. (20 Marks)

Use of term Normal for his cycle of erosion by Davis was severely criticised on ground that Climate variability leads to variability in geomorphic processes; thus, there are no normal cycle of erosion.

eg) with every 10°C rise in temperature, rate of Chemical weathering doubles



According to Peltier Climate

controls the operations of geomorphic processes directly or indirectly.

Directly

Annual rainfall, temperature etc.

eg) Mechanical weathering is more pronounced in area of desert with high diurnal range of temperature.

Indirectly

Type of vegetation

eg) Chelating agent from coniferous forest accelerate leaching of iron and Aluminium.

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On the basis of climate's role in geomorphic processes different type of landforms are formed and these unique topography called as morphogenic regions.

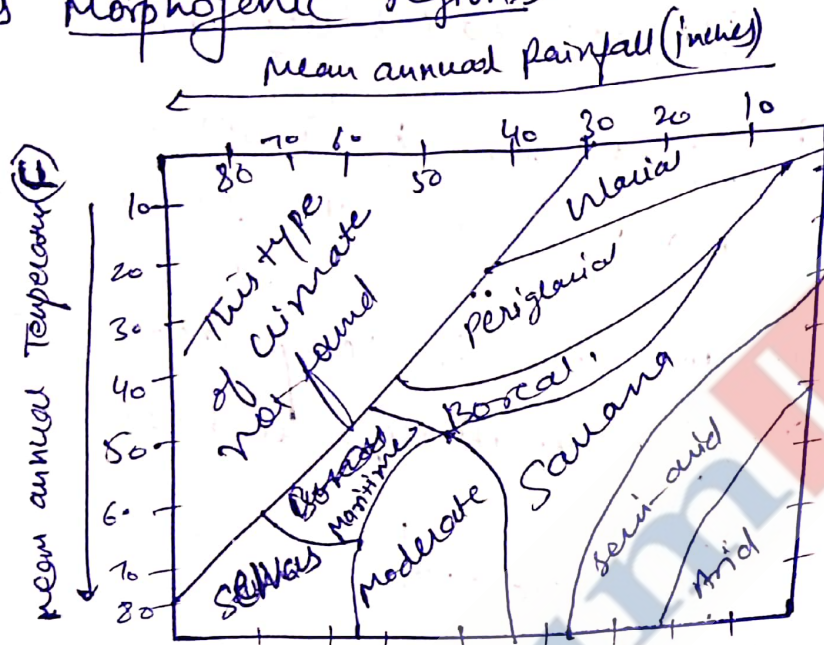


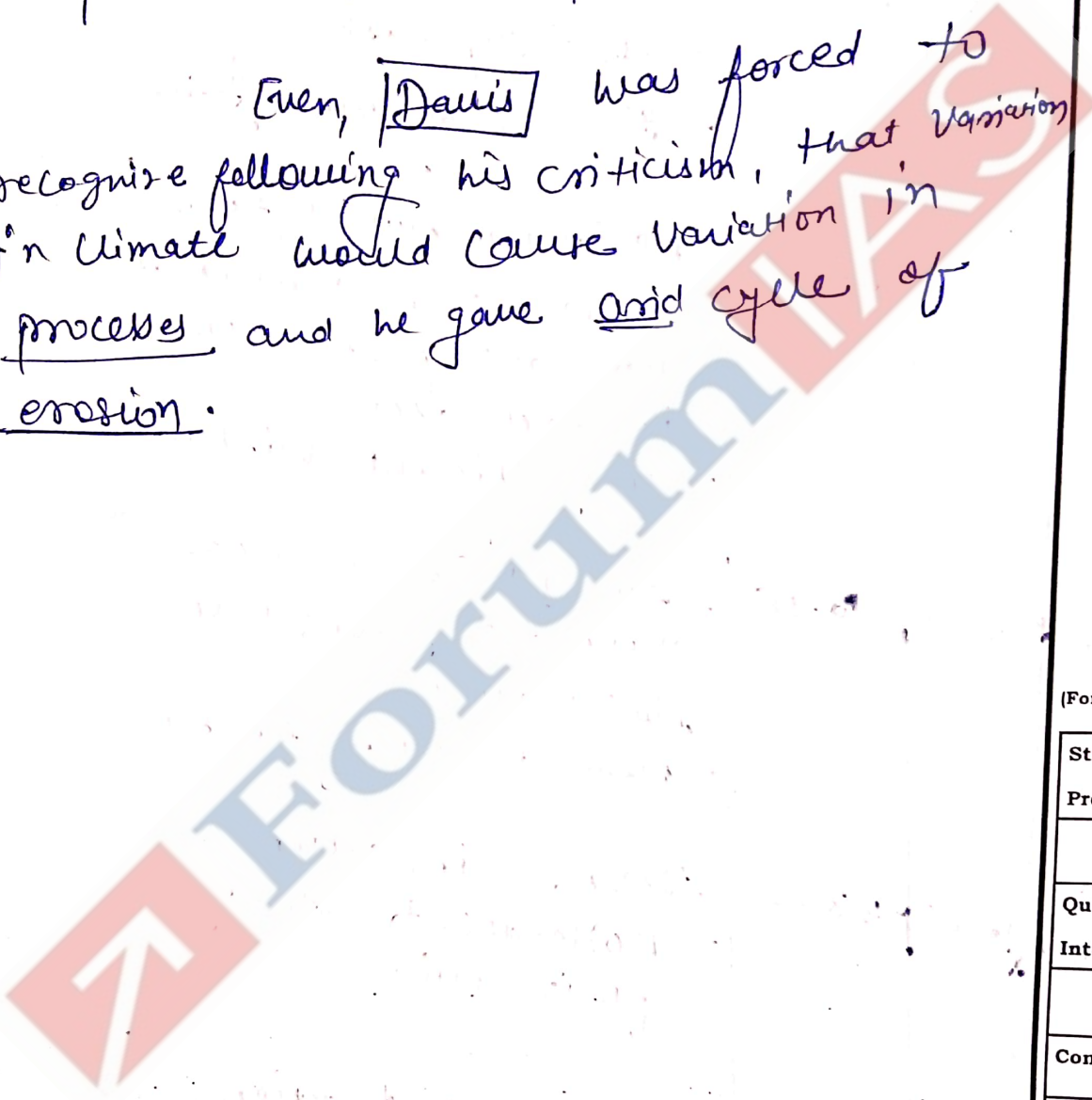
Fig: Morphogenic region by Peltier.

Climatic Regions	Rainfall (inches)	Temperature (F)	Morphological processes
① Pluvial	0-45	0-20	Pluvial erosion, wind erosion
② Periglacial	5-55	5-30	→ Strong mass movement → moderate to strong wind action → low fluvial action
③ Boreal	10-60	18-38	→ moderate frost action → moderate to low wind action → moderate fluvial action.

<p>④ Maritime</p>	<p>138878 53351 49 0105669 2022-08-20 17:56:40</p>		<p>Strong mass movement - Moderate to strong fluvial Action - wave action.</p>
<p>⑤ Savanna Savanna</p>	<p>35-90</p>	<p>60-85</p>	<p>Strong mass movement - low slope wash - Absence of wind Action.</p>
<p>⑥ Moderate</p>	<p>35-60</p>	<p>35-85</p>	<p>Maximum fluvial Action - Moderate mass movement - Moderate frost action in cooler areas. - insignificant wind action</p>
<p>⑦ Savanna</p>	<p>25-50</p>	<p>10-85</p>	<p>except Coastal areas there are strong to low fluvial action - moderate wind erosion</p>
<p>⑧ Semi-arid</p>	<p>10-25</p>	<p>38-85</p>	<p>Strong wind action - Moderate to strong fluvial action</p>
<p>⑨ Arid region</p>	<p>0-15</p>	<p>55-85</p>	<p>Strong wind Action - Low fluvial action</p>

from the above table it is clear that morphological regions are product of varied Climatic Conditions which decides the ~~morph~~ geomorphological processes.

Even, Davis was forced to recognise following his criticism, that variation in climate would cause variation in processes and he gave and cycle of erosion.

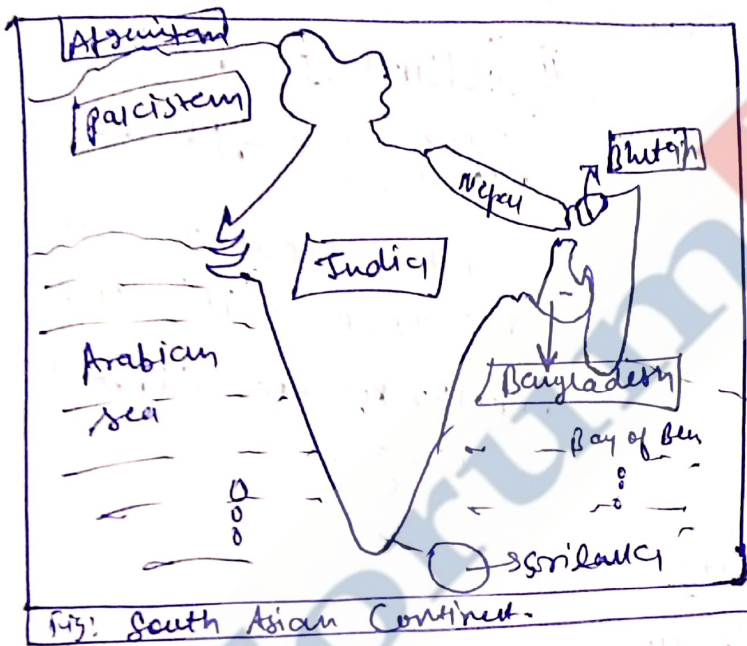


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b) Discuss various factors that have resulted in unprecedented Heat waves in the South Asian continent and also highlight the cascading effects of heat waves.

(15 Marks)

Heat wave is a phenomena where the temperature of an area rise above the maximum threshold and become fatal for human and other biological living beings.



Heat waves in South Asia The years 2017 to 2022 are progressively becoming hotter than previous years. As a result the heat waves are becoming more frequent and intensified.

↳ Northern plains of India and sindh plains of Pakistan facing severe heat waves.

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Factors for Heat waves

Natural Cause

- Forest fire
- Erratic rainfall
- weaker western disturbances
- Break in monsoon
↓
Flash drought & Heat waves.

Anthropogenic Cause

- ① Deforestation
- ② Land use pattern Change
- ③ Man-made fire
- ④ Pollution → GHGs
↓
Absorb Heat → Global Warming
- ⑤ Urban Heat Islands due to Concretisation.
- ⑥ Anthropogenic Climate Change.

Cascading Impact

① Impact on Health

- (i) Dizziness, Headache
- (ii) Dehydration and heat stroke

eg → Andhra Pradesh recorded highest death due to heat stroke in Country.

② Impact on Agriculture

- (i) Flash Drought → Loss of Production.
- (ii) Yield loss → by 30-35% for rice (IPCC)

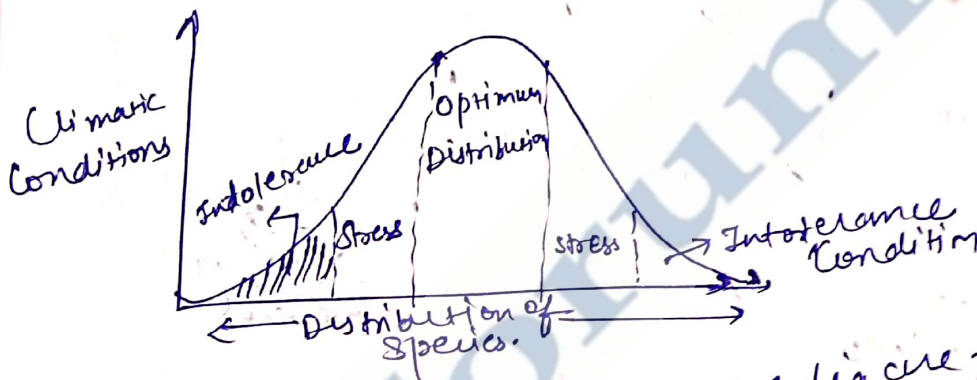
13887853351108669 (2022-08-20 17:56:49) → Crop failure

(3) Economic impact

- (i) Loss of manhours.
- (ii) Loss of agricultural raw materials.
- (iii) Demand for energy → inflation
→ Import of energy
→ power outage, etc.

(4) Impact on environment

- (i) Loss of Biodiversity → tolerance limit for stenotype species is very low
↓
Shelford's law of limiting factor



- (ii) Forest fire: 224 forest of India are fire prone and heat wave will enhance their vulnerability.
- (iii) Drying of lakes, river → Yamuna river in May 2022

Heat waves are not classified as disaster in India, therefore to cope with heat waves a Comprehensive policy is must as climate change will cause more heat waves in future.

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c) With suitable examples, bring out the impact of local winds on the climate of an area. (15 Marks)

The local winds also called as Tertiary winds circulations originate due to local condition of low and high pressure. Although local winds are limited in their area extent but they have profound influence on the area they influence.

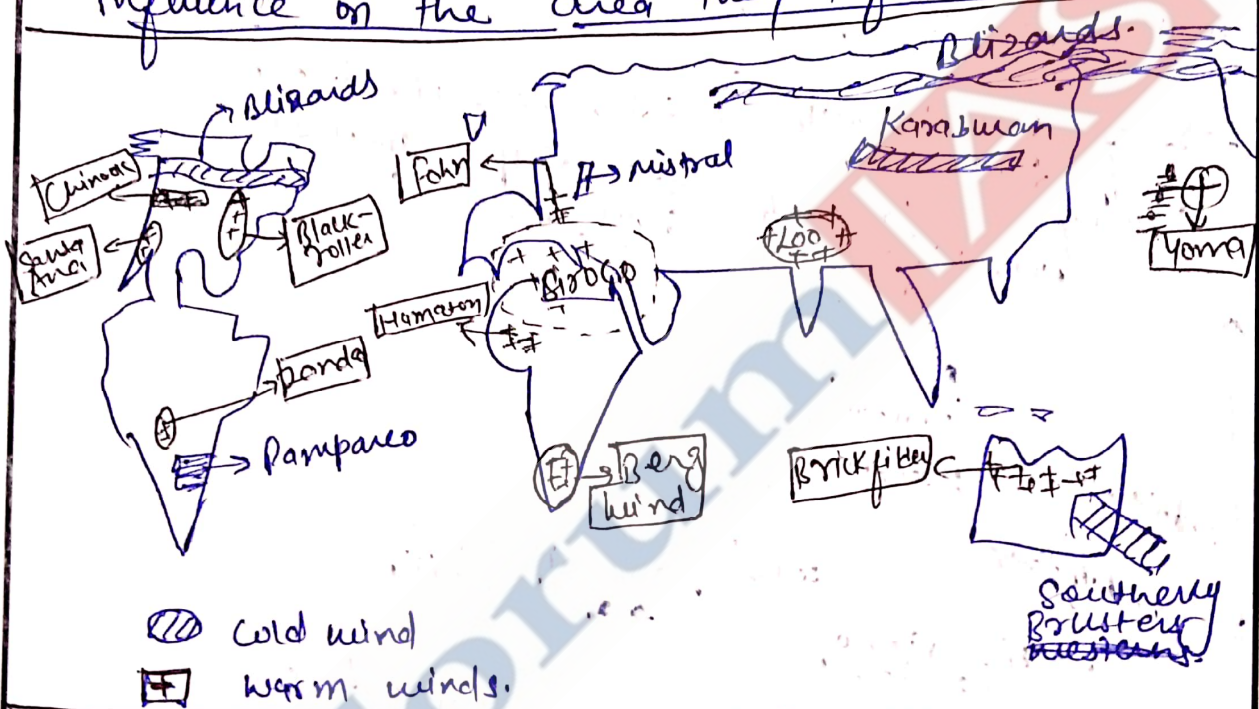


Fig: Cold and warm wind of World.

Impact of local wind on climate

[A] Impact of Periodic winds

(i) Sea Breeze

Flow during day-time
 Influence heating of land → Low pressure
 Cool air on land

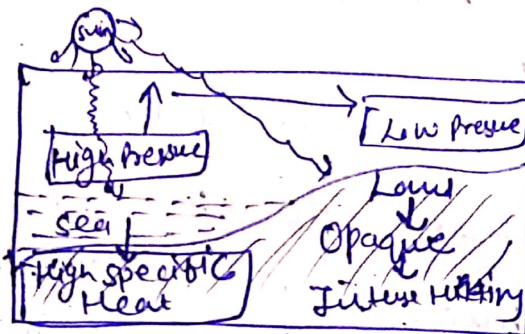
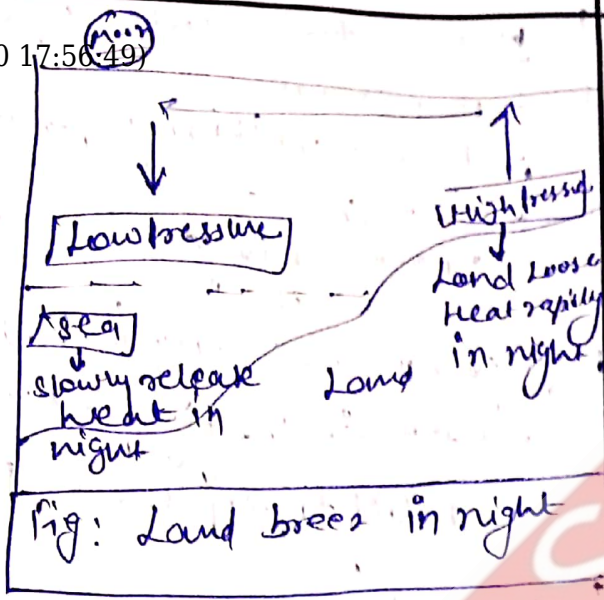


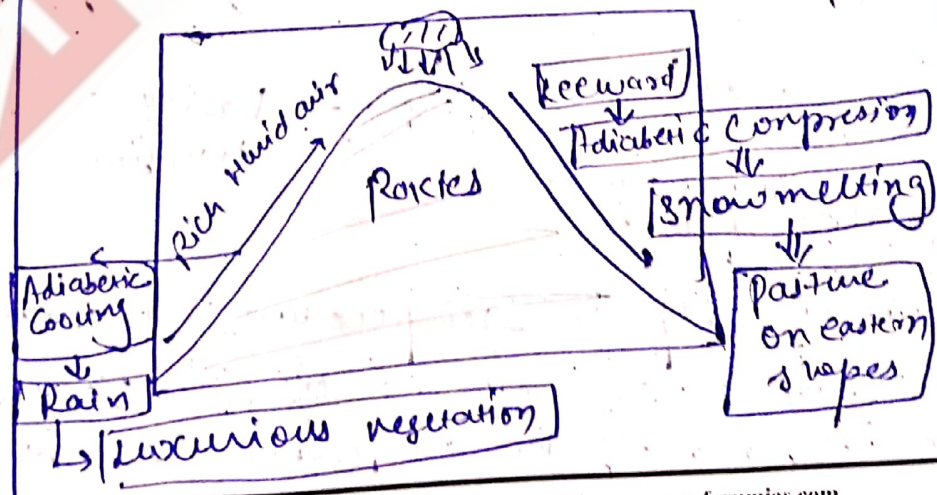
Fig: Sea breeze during day.

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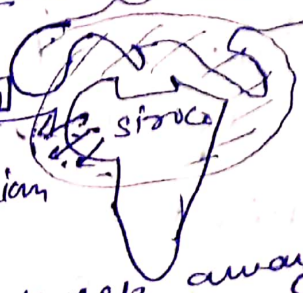
Land breeze
 During night, Land become super cool.
 ↓
 Develop high pressure
 ↓
 Winds move land towards sea
 ↓
 Temperature in vicinity in coastal area in early morning



(B) Impact of thermal winds

Thermal winds		Impact on climate
Warm winds	Loo	Hot and dry wind of northern Gangetic plains and Gangagetic plains - Increase temperature by 5-6°C - Cause <u>Andhis</u> → blind storm - Heat stroke → Loss of crop → Impact Health
	Chinook	Warm and Dry → Snow eater  The diagram shows a mountain range. On the windward side, 'Rich humid air' rises, leading to 'Adiabatic Cooling' and 'Rain', which results in 'Luxurious vegetation'. On the leeward side, the air descends, causing 'Adiabatic Compression' and 'Snow melting', leading to 'Pasture on eastern slopes'. The word 'Porches' is written in the middle of the mountain range.

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COOL WIND	Sierra Leone & West Africa	<p>warm dry winds of Sahara</p> <ul style="list-style-type: none"> Dust storm Reduce visibility Heat stroke → Rainfall in Mediterranean region of Europe <p>Thamton</p>  <p>Moisture in Gulf of Guinea area</p> <p>Relief to people → Doctor wind</p>
	Blizzard (USA/Russia)	frost bite, reduce visibility, Hyperthermia
	Mistral (Rhône valley)	Destroy crops → specially grass yards in Southern Europe
Buran (Siberia)	Snow storm → frost bites	

Valley winds

Up valley winds



Cool air → descends
warm air → ascends.

Super → avoid cultivation on valley floor.

Down valley winds



Super → Valley temperature inversion

Local winds helps in temperature distribution

on earth's surface and distorts the isotherms due to positive and negative temperature anomalies.

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Total

Section- B

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Q.4) Answer the following in about 150 words each. (10 * 5 = 50 Marks)

a) Modern Physical geography tries to interpret the natural environment as a dynamic entity. Elaborate the statement through systems approach to landform analysis.

(10 Marks)

The system approach introduced in geography by B.J.L. Berry and Richard Horton. ~~How~~
 Later it was used widely by physical geographers to interpret the natural environment as dynamic entity to simplify the complex phenomena.

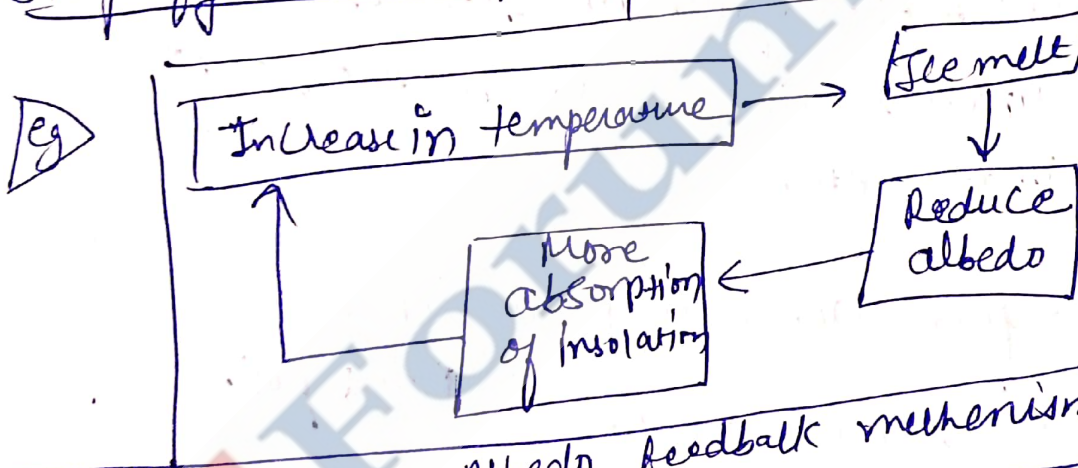
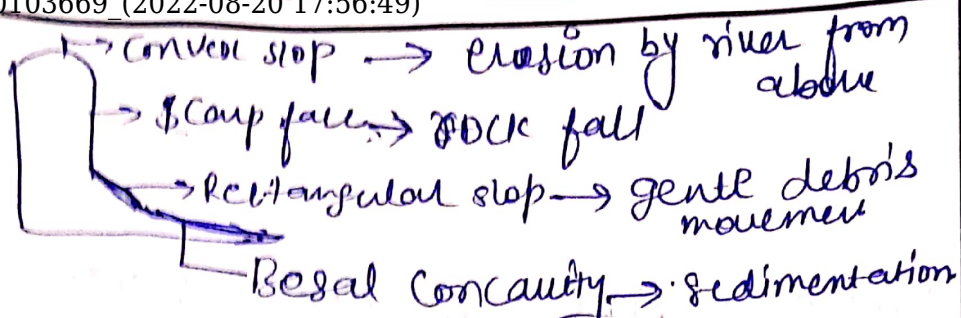


Fig:- Ice - Albedo feedback mechanism

⇒ Landform analysis as a dynamic entity

① Process-response system for slope development used by Schumm.

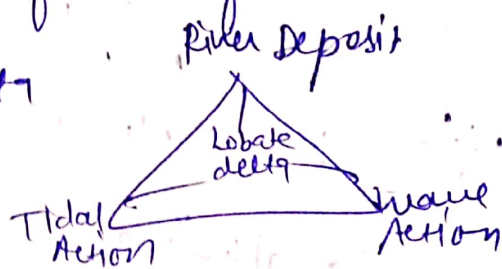


Here, processes are according to nature of landform.

(2) Hydrology River hydrology and geometry

W.T Gilbert used Steady state equilibrium ~~stability~~ later the concept of dynamic and metastable equilibrium etc. used the various dynamics like rock structure, river age, Climate etc.

(3) Delta formation - a function of various factor. eg Lobate Delta

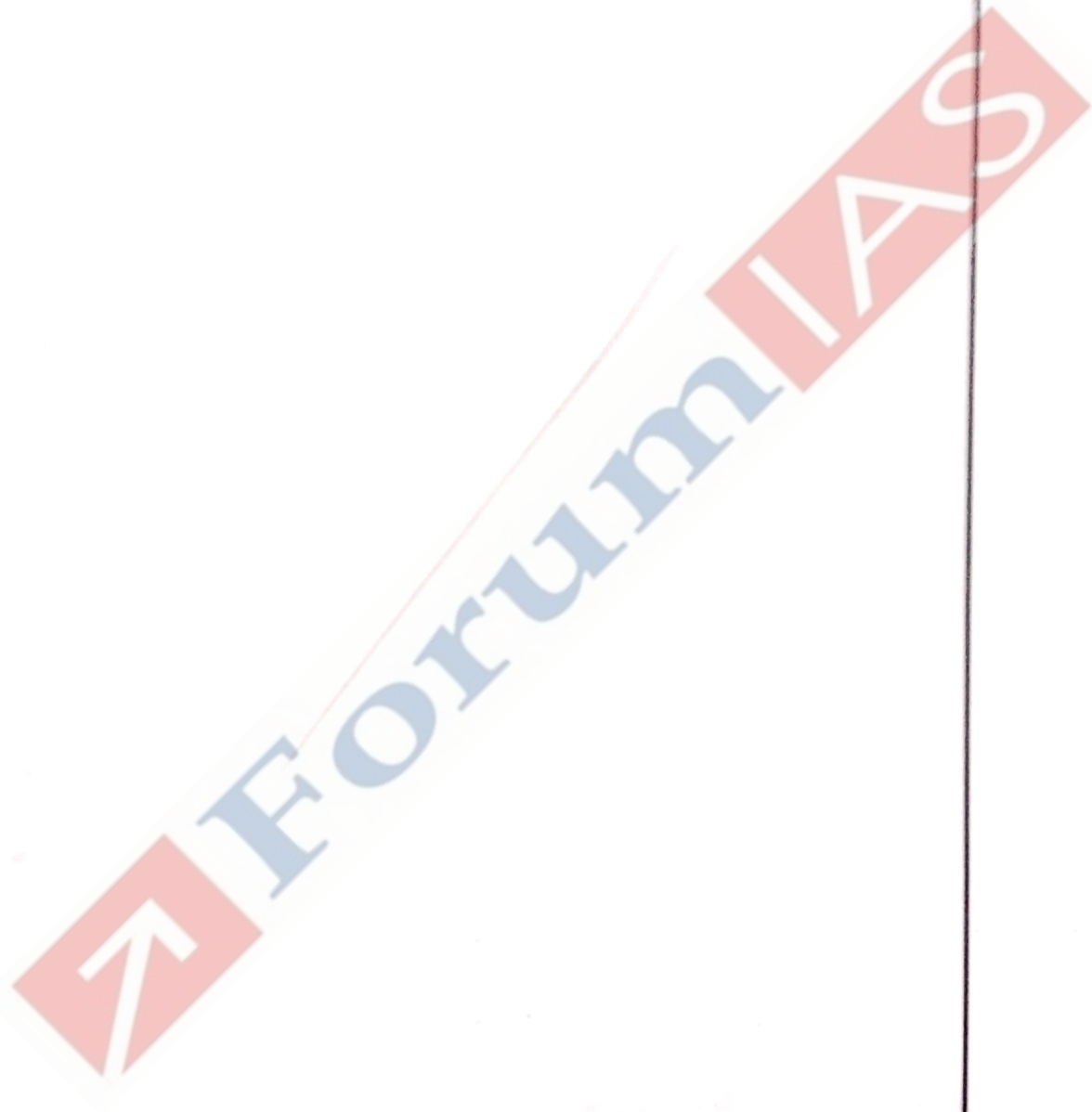


Therefore systems approach make physical geography more applied and expressive

(Don't write anything in this)

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138878_53351_1910103669_(2022-08-20 17:56:49) various theories. (10 Marks)



Discuss as to how frontogenesis contributes to weather instability. (10 Marks)
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The process of front formation is known as frontogenesis. According to Bjerknes there are 4 type of fronts and associated weather conditions

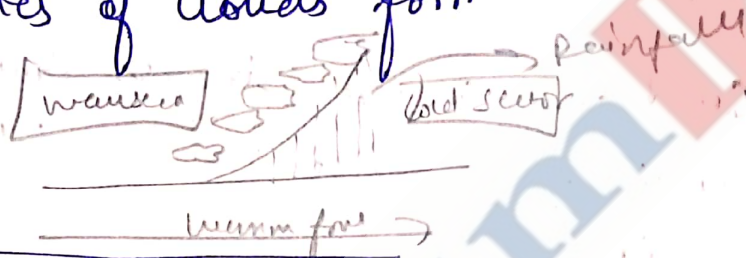
Type of front	Weather Instability
1) Stationary front	<p>Cold and warm airmass come <u>face to face</u> but neither one moving.</p> <div style="text-align: center;"> <p>Cold airmass Warm airmass</p> </div> <p>Quasi-stationary Condition</p> <p>→ Not significant for weather as it is a condition of stability.</p>
2) Cold front	<p>When cold front chasing the warm front behind and <u>become aggressive</u> then instability occurs.</p> <div style="text-align: center;"> <p>Warm sector Cold sector</p> <p>Mid-level cloud Cumulonimbus cloud</p> <p>precipitation</p> <p>Cold front marches</p> </div>

Sequence of weather →

- (i) Temperature → fall drastically
- (ii) Pressure → Increase significantly
- (iii) Clouds → Cumulonimbus, dark-bottom middle clouds
- (iv) Precipitation → Clear sky → heavy rain with thunder & hail storm

③ Warm front

Warm front moves ahead and the series of clouds form

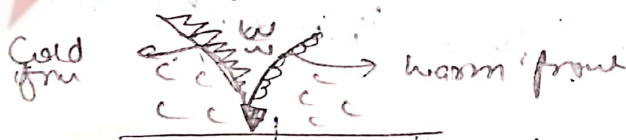


Sequence of weather

- (i) Temperature increase gradually
- (ii) Pressure will fall in area
- (iii) Clouds → layer of low to high clouds.
- (iv) Precipitation: Clear sky → Heavy rain → Drizzle

④ Occulted front

When cold front dive under warm front



Complex weather condition with rainfall, thunder etc

Fronts are the main reason behind complex weather in mid and high latitudes.

1) Expl
 ples?

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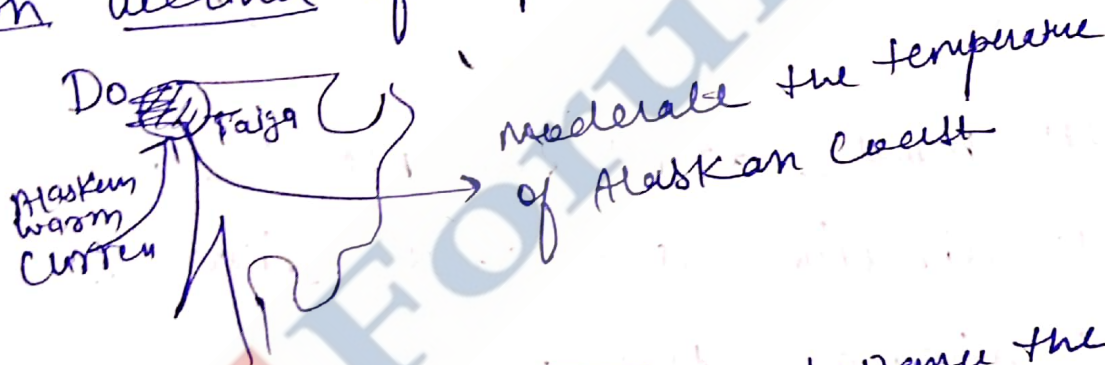
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d) Explain the significance of applied climatology to geographers with relevant examples? (10 Marks)

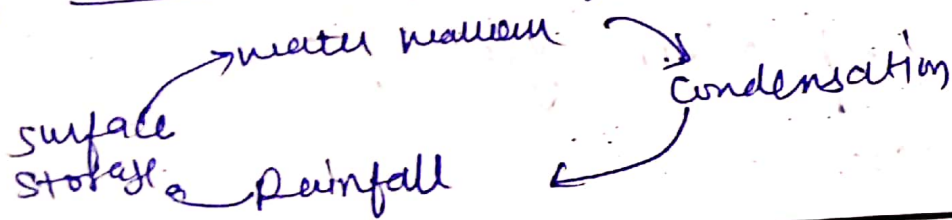
Applied Climatology refers to the study of impact on natural and cultural environment.

Significance of applied climatology for geographers

① Climate Classification :- Florenwardha in his Climate Classification scheme incorporated the impact of local climate on weather of a place.



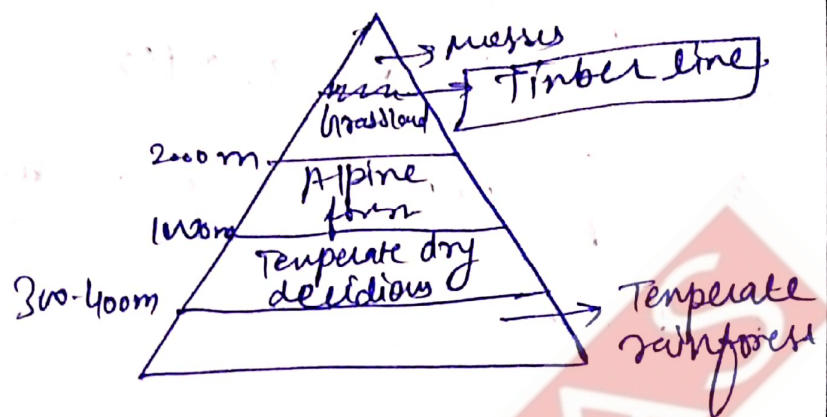
② Hydrology on earth for instance the Circular motion of water in form of water vapour, rainfall runoff etc.



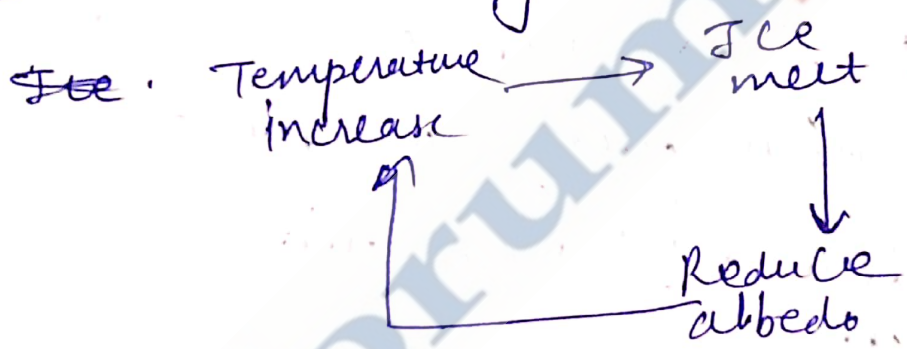
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③ Vegetation Classification according to altitude of a place

eg Himalayan vegetation



④ The Climate Change such as analysing the Ice-albedo cycle



Hence applied climatology gave deep insight related to human and environment interaction, and their impact on each other.

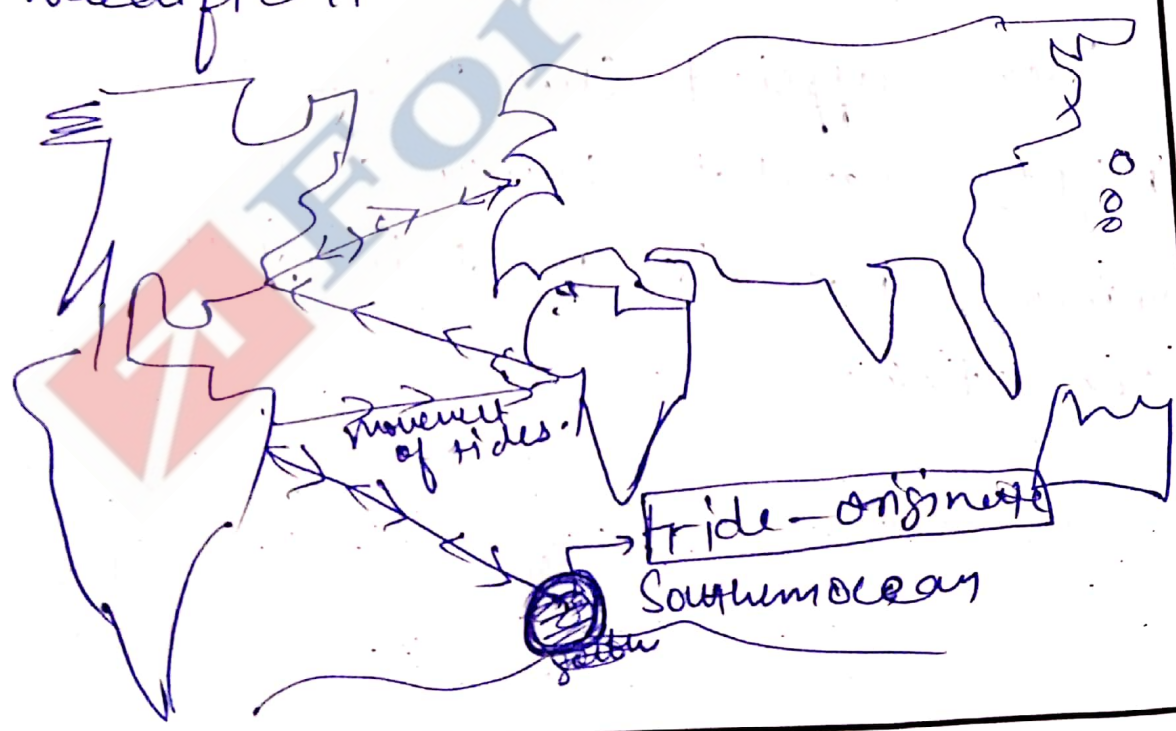
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e) "Tides are periodic rise and fall of column of oceanic/sea water but are due to stationary waves which originate independently in each ocean". Elaborate. (10 Marks)

Tide are periodic rise and fall of column of oceanic/sea water. They are global phenomena impact by the local factors.

Progressive wave theory of Whewell

According to Whewell tide originate in South part of southern ocean due to gravitational forces and move across different ocean with modification.

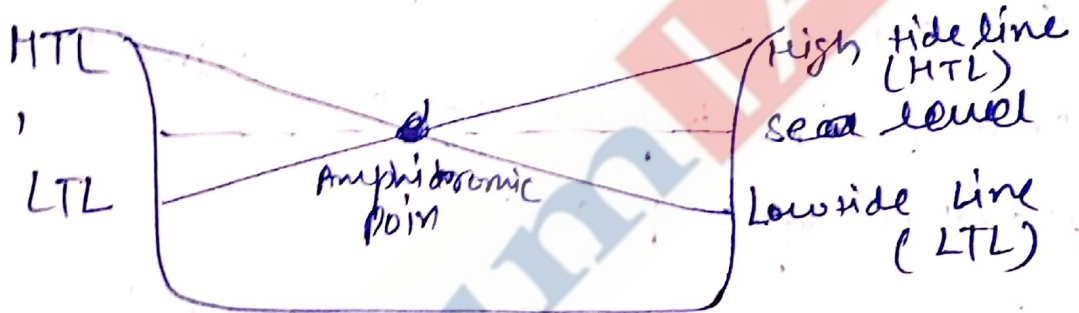


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Humboldt progressive wave theory don't account the local factors.

Stationary wave Theory of Hauris

According to Hauris tides originate individual water bodies independent to each other. Thus tides are local phenomena



The tides move around the Node in anti-clock direction and cause diurnal and semi-diurnal tides.

Both the theory have their own drawbacks thus combining them can help in explaining global and regional tides.

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Penck and Wood with his own". Elaborate (20 Marks)

[King] tried to revive historical paradigm in geomorphology in 1950s by presenting his [Savanna cycle of erosion] based on the concept of Pediplanation.

(A) Influence of Davis On broad principle of King:- King was believer of Time-Space substitution approach of Davis and this is well reflected in his Savanna cycle of erosion i.e. Landforms are product of evolution (Time based development)

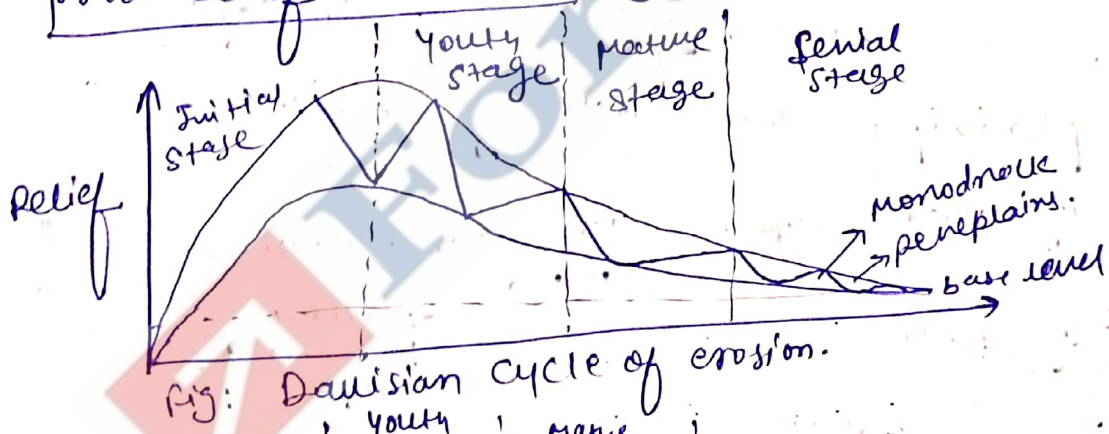


Fig: Davisian cycle of erosion.

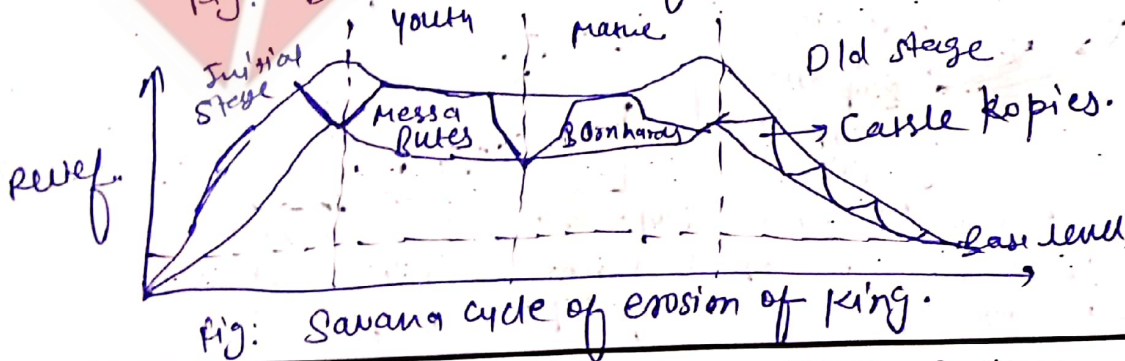


Fig: Savanna cycle of erosion of King.

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(P) Like Daviesian cycle of erosion, the cycle of ~~savanna~~ King for savanna region also passes through stages and try to achieve graded profile

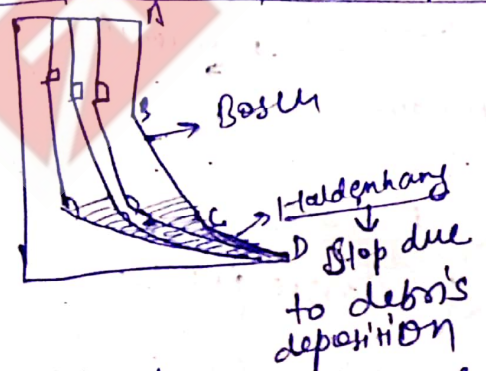
Youth → mature → old

(ii) River is main agent of denudation for Davis and King.

(B) Influence of Penck on details of slope development :

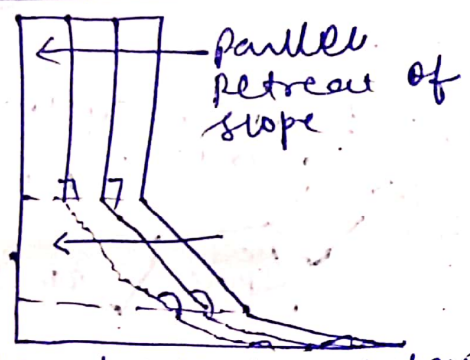
- King rejected the Daviesian idea of Down-wasting and transport limited step.
- King adopted Penck's idea of Debris Limited slope and slope replacement concept for explaining his cycle of erosion.

Penck's slope development



Slope of Haldenhang become gentler and lower slope develop on the crest of upper slope

King's slope development



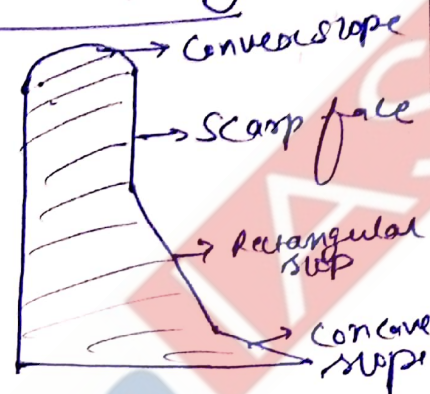
slope retreats from below but not on the crest of upper slope.

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Woods some ideas of Penck King was inspired from wood and also due to geological and climatic setting of his area of study.

(1) Woods influence ~~off~~ on icing

- Parallel Retreat
- 4 element of slope →



(2) Inspiration from geological setting i.e. plateau region of South Africa

It was surrounded by passive margins and reached to stage of peneplain. Thus he comes to conclusion that Slope development is time dependent

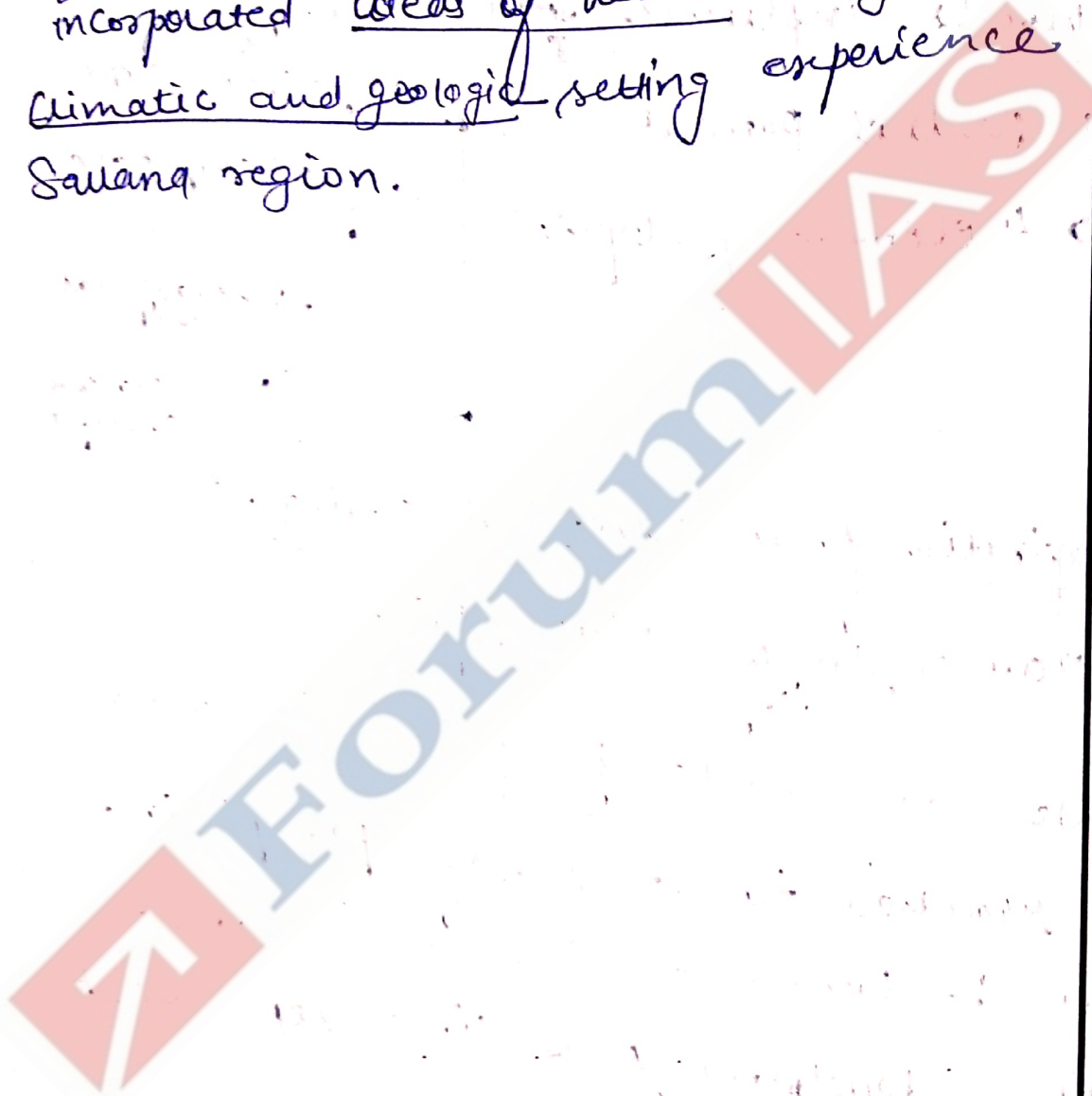
(3) Climatic setting i.e. arid and semi-arid savanna region of South Africa

rate of denudation is medium to

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low, the choice of debris - limited
stop was obvious.

Therefore it can be concluded that beside Davis and Penck King was also incorporated ideas of wood along with the climatic and geologic setting experience in Sauvage region.



anything

b) At
pled

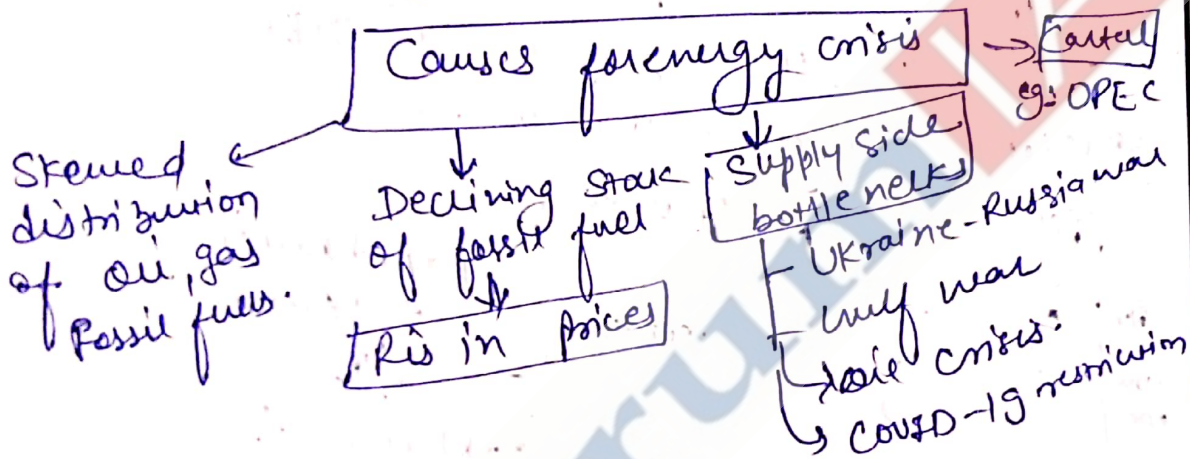
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b) Analyze how marine resources can bridge the ongoing energy crisis that has crippled sovereign nations across the globe? (20 Marks)

Energy crisis is a situation where a nation unable to meet the long and short-term energy demand of its citizens and economy. The dependence on other nations can cause sovereignty to be undermined.

eg → energy crisis ongoing in Sri Lanka.



Role of marine resources in bridging the ongoing energy crisis

① Tidal energy: Tides are global phenomena and a coastal nation can easily harness tidal energy in economic and greener way.

eg → India have 10,000 MW Tidal energy potential.

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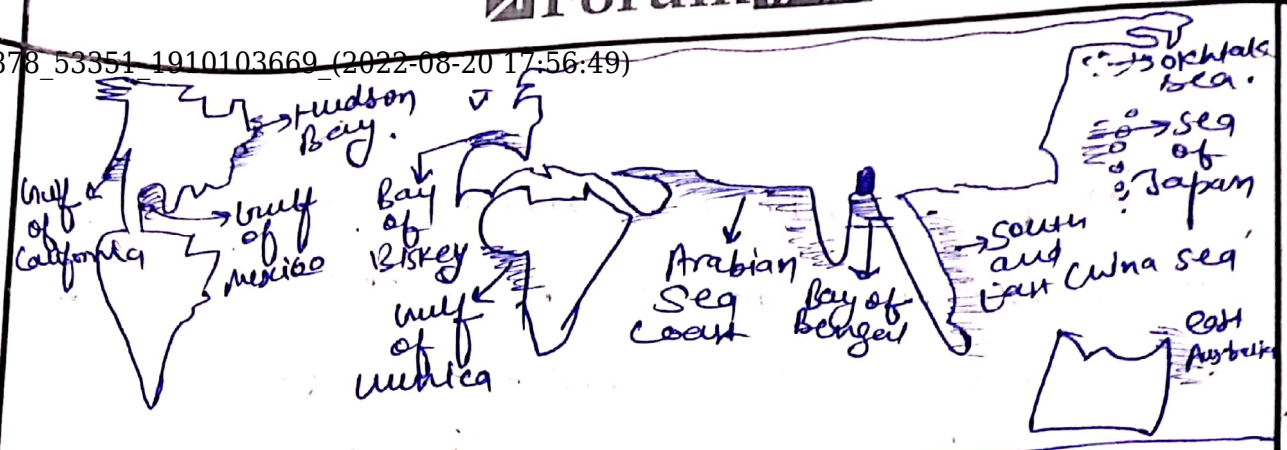
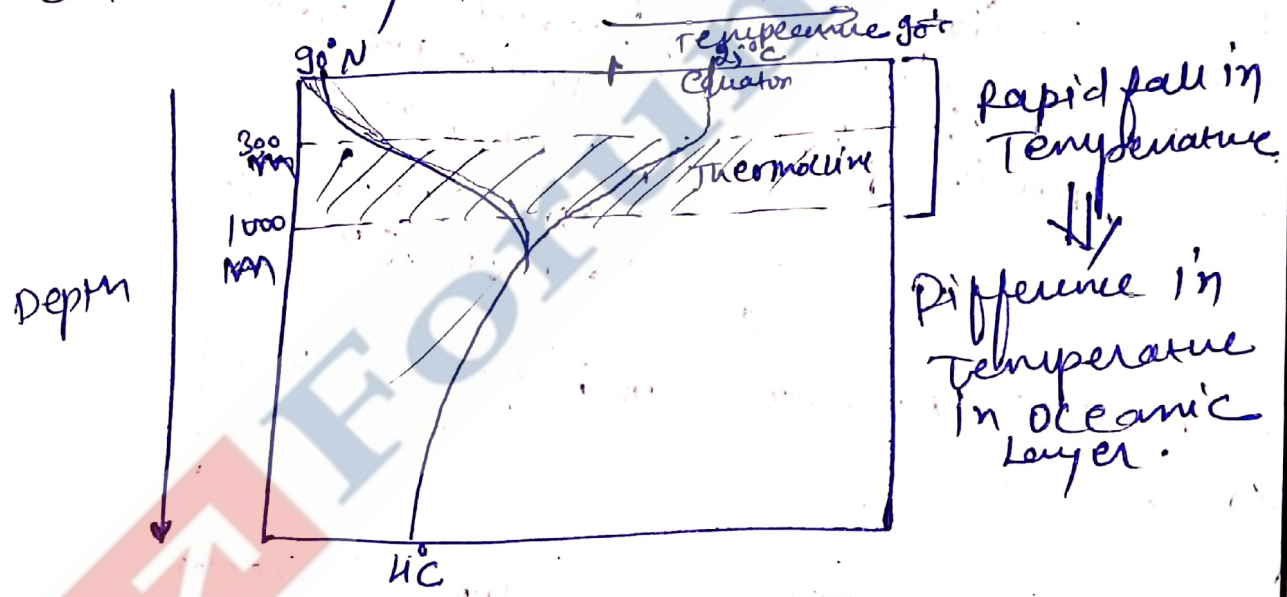


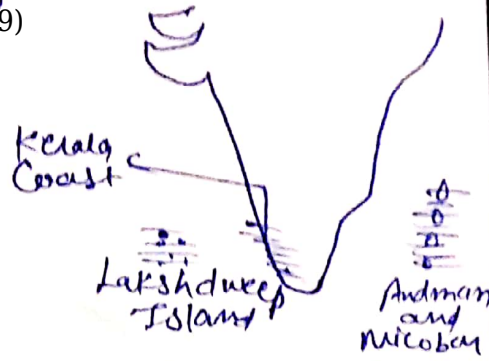
Fig: Tidal energy potential areas of world

② Ocean Thermal energy Conversion: Energy from the difference in temperature in layers of ocean. Except polar region the OTEC can be developed all over the world.



③ wave energy wave generates due to transfer of energy from winds to waves. The progressive approaching the coast can be converted in electronic energy.

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 India have Wave energy potential



④ Methane hydrates

These are found on the abyssal plains in forms of lumps. These are potential non-conventional source energy source.

➤ Deep ocean mission of India will harness methane hydrates.

⑤ Conventional energy sources like oil and gas are skewed distributed but harnessing these at national level may help in maintaining continuous supply during crisis.

➤ COVID-19, Ukraine Russia war etc.

Beside marine energy resources, the development of cleaner energy from solar, wind etc. are imperative to make the world self-reliant in energy and climate ready for future climate change crisis.

c) Discuss the landforms associated with the second cycle of erosion.

(15 Marks)

Davis himself acknowledged possibility of rejuvenation of landforms and negative changes in base level (fall in sea level or subsidence of land) and resultant lengthening of original cycle of erosion or starting a secondary cycle of erosion.

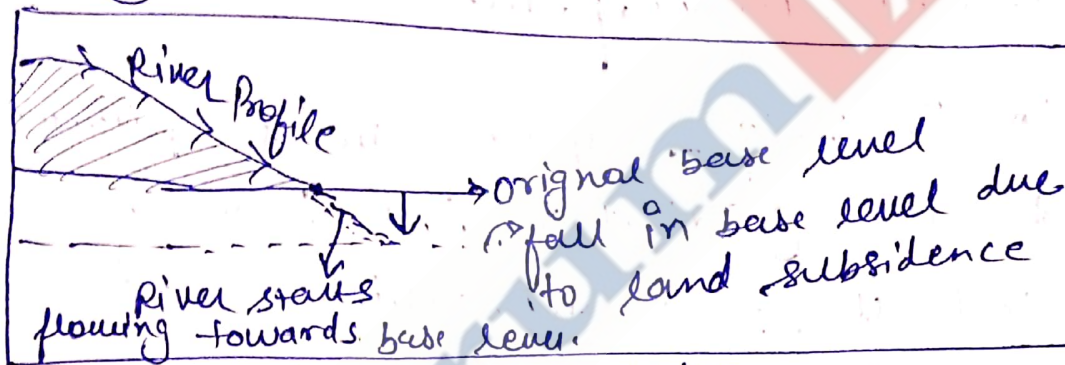


Fig: Second cycle of erosion

The second cycle of erosion creates topography of discordance i.e. youth feature superimposed on old topography.

eg) Incised meander.

Landforms associated with second cycle of erosion

- 1) knick / nick point due to upliftment of

land represents break in cycle of erosion and form waterfall.

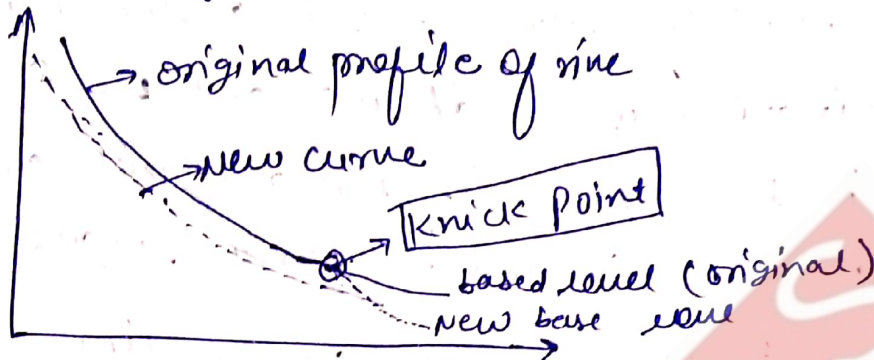
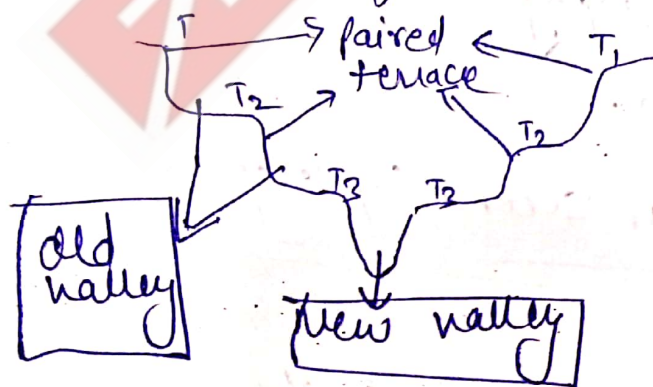


Fig:- Knick point

eg) Dhuadhar waterfall on Narmda near Jabalpur (Madhya Pradesh)

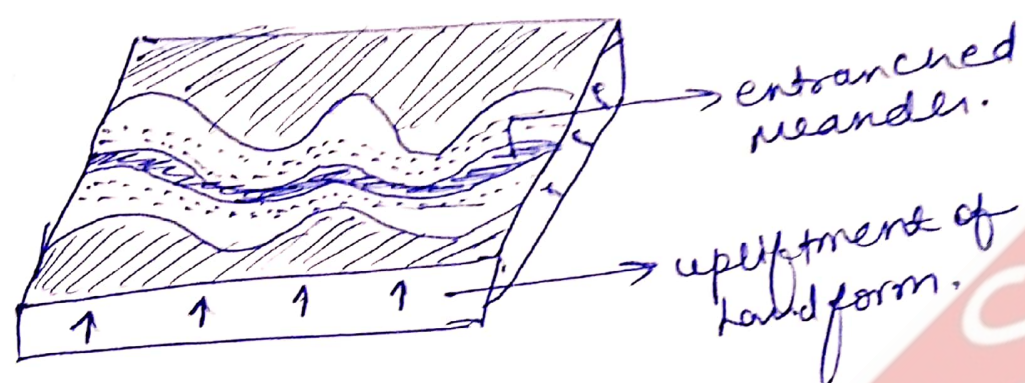
2) Valley in valley landform: due to upliftment of land the gradient of river becomes sharp and it starts downcutting and valley deepening. The old valley terrace above and new valley forms below, such topography referred as topographic discordance



eg) River Damodar near Hazaribagh in ~~Bihar~~ Jharkhand

Fig: valley in valley

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Entrenched meanders and upliftment of plain
 Cause river to meander in deep valley.



Second cycle of erosion and poly cycle
erosion creates erosional surface over
geological time period and led to development
 of palimpsest topography i.e. landform having
imprints of past

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