



An Institute for Civil Services

IAS TOPPER'S TEST COPY

SACHIN RAHAR

AIR 291

CSE 2023

GEOGRAPHY



8448496262



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GS SCORE

Geography Test Series 2023

TEST - 01

GEOGRAPHY

Time Allowed: 3 Hrs.

Max. Marks: 250

Instructions to Candidate

- There are FIVE questions. All Questions are compulsory.
- 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. No marks will be given for answers written in medium other than the authorized one.
- Word limit in questions, wherever specified, should be adhered to.
- Attempts of questions shall be counted in chronological order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the answer book must be clearly struck off.

68.5

Name SACHIN RAHAR

Mobile No. _____

Date _____

Signature Sachin

1. Invigilator's Signature _____

2. Invigilator's Signature _____

- Dear Sachin,
- * Some of your answers like Q → 1(d), 2(b), & 3(b) are fine in content and understanding. However you need to work for concept & content enrichment. Kindly refer basic books / discussion videos.
 - * Try to add case studies, Examples, Notes & diagrams to fetch more marks.
 - * Always try to provide a suitable conclusion at end.
- All the Best!
Keep it up!

GEOGRAPHY

Time Allowed: 3 Hrs.

Max. Marks: 250

1. Write short notes on the following in about 150 words:

- (a) Discuss the impact of the Coriolis effect on atmospheric circulation. Explain how it influences the direction and speed of winds in different latitudes. ✓ (10 Marks)
- (b) Discuss the impact of lapse rate on atmospheric stability. Explain the difference between environmental lapse rate and adiabatic lapse rate and their significance in determining stability. ✓ (10 Marks)
- (c) Discuss the role of local winds in shaping regional climates. Provide examples of regions where local winds have significant impacts on weather patterns and human activities. ✓ (10 Marks)
- (d) Explain the role of occluded fronts in the life cycle of mid-latitude cyclones. Discuss the characteristics and weather conditions associated with occluded fronts. ✓ (10 Marks)
- (e) Discuss the concept of water balance and its importance in the hydrological cycle. Explain how the water balance is influenced by inputs and outputs of water in a given area. (10 Marks)

2. Attempt all the questions:

- (a) Compare and contrast the concepts of sensible heat and latent heat in the context of the Earth's heat budget. How do these heat transfer mechanisms contribute to the energy balance of the Earth? (15 Marks)
- (b) Discuss the concept of atmospheric circulation and its importance in the global climate system. Explain the driving forces behind atmospheric circulation patterns. ✓ (15 Marks)
- (c) Explain the concept of heat storage in the Earth's system. Discuss the role of the oceans, landmasses, and the atmosphere in storing and redistributing heat. ✓ (20 Marks)

3. Attempt all the questions:

- (a) Analyse the impacts of global climatic change on various spheres of the Earth's system, including the atmosphere, hydrosphere, biosphere, and cryosphere. ✓ (15 Marks)
- (b) Compare and contrast the bottom topography of the Indian Ocean with that of the Pacific Ocean, highlighting their similarities and differences. ✓ (15 Marks)
- (c) Discuss the concept of applied climatology and its significance in various sectors such as agriculture, water resource management, and urban planning. (20 Marks)

4. Write short notes on the following in about 150 words:

- (a) Explain the concept of micro climatology and its applications in studying climate variations at a local scale. Discuss the factors that influence microclimates. (10 Marks)

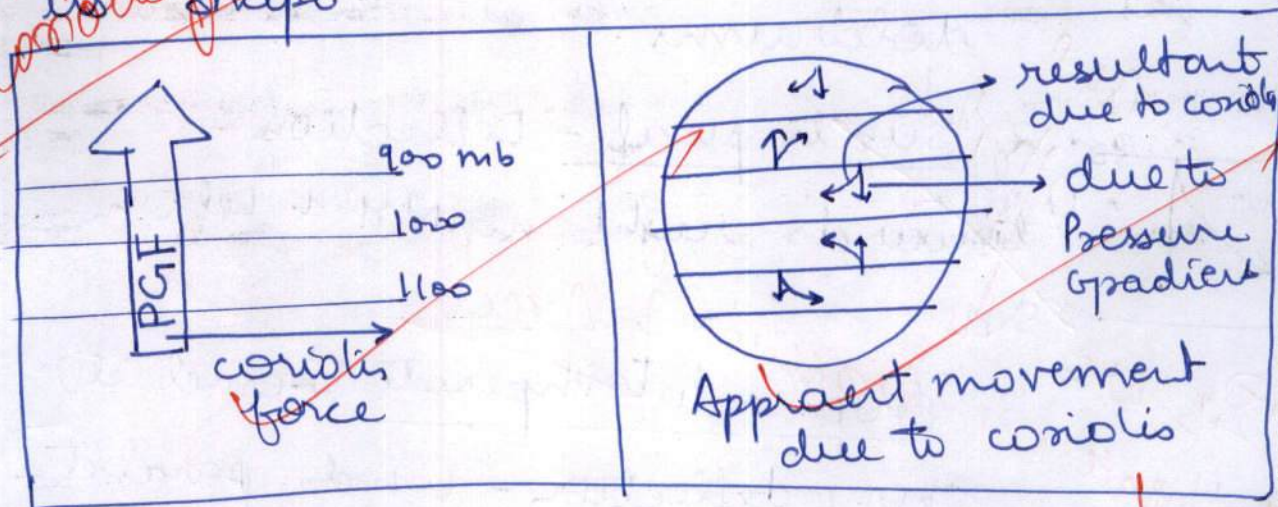
- (b) Discuss the significance of the polar jet stream and the subtropical jet stream in global atmospheric circulation. Explain their influence on weather patterns and air traffic. ✓ (10 Marks)
- (c) Describe the concept of oceanic stratification and its relationship with temperature and salinity variations. ✓ (10 Marks)
- (d) Explain the concept of salt budget in the ocean and discuss the processes involved in the transfer and distribution of salt within the oceanic system. (10 Marks)
- (e) Explain the concept of marine protected areas (MPAs) and discuss their role in conserving marine biodiversity and enhancing the sustainable use of marine resources. (10 Marks)
5. Attempt all the questions:
- (a) Analyse the different types of ocean deposits, including terrigenous, biogenous, hydrogenous, and cosmogenous sediments, and explain their characteristics and formation processes. ✓ (15 Marks)
- (b) Evaluate the effectiveness of marine protected areas (MPAs) and their role in mitigating and preventing marine pollution. (15 Marks)
- (c) Discuss the importance of studying waves, currents, and tides in understanding coastal dynamics, marine navigation, and sustainable coastal zone management. ✓ (20 Marks)



1. (a) Discuss the impact of the Coriolis effect on atmospheric circulation. Explain how it influences the direction and speed of winds in different latitudes.

(150 Words) (10)

Coriolis force is an ~~apparent~~ force applied on moving fluids due to rotation of earth and its shape.



Impact of Coriolis force

1. General Impact

1. Curved deflection of winds (right in N.H and left in S.H).

Always act perpendicular to the Pressure Gradient force.

3. The force increases with velocity

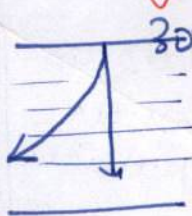
Remarks

1. The deflection increases with latitude.

2. Latitude Specific

1. Equator - No deflection as 0° latitude. Presence of doldrums.

Left all
and



2. Subtropical - Deflection - towards right in N.H & left in S.H.

* Discuss
influence on

3. Tropics to temperate / Ferrel cell
strong deflection - winds parallel to latitude

4. Upper Air - very fast velocity - winds westerlies everywhere.

Impact on Globe as a whole.



1. Changes Unicellular model to tricellular.

2. Cyclonic movement circular due to Coriolis

Tricellular model

* Fouad
Suitable
Conclusion

Remarks

* Refer Discussion

2.5

1. (b) Discuss the impact of lapse rate on atmospheric stability. Explain the difference between environmental lapse rate and adiabatic lapse rate and their significance in determining stability. (150 Words) (10)

Lapse Rate - It is ^{rate of} decrease of temperature with altitude.

Environmental Lapse Rate - It is rate of average decline in temperature. Mostly, it is noted as 6.5°C.

Adiabatic Lapse Rate - It is rate of decrease of an air parcel without changing its heat. It mainly occurs via change in volume - expansion or compression.

Significance in determining stability

Stability occurs with the relationship between environmental and dry and wet adiabatic

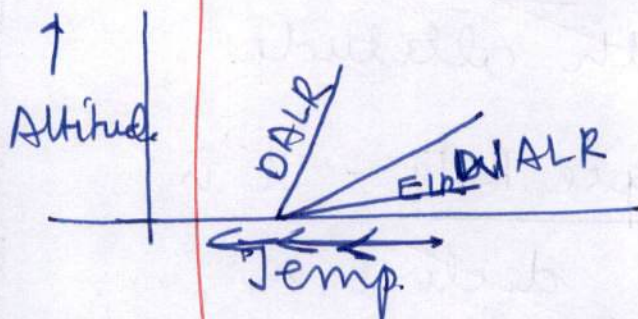
Remarks

fine

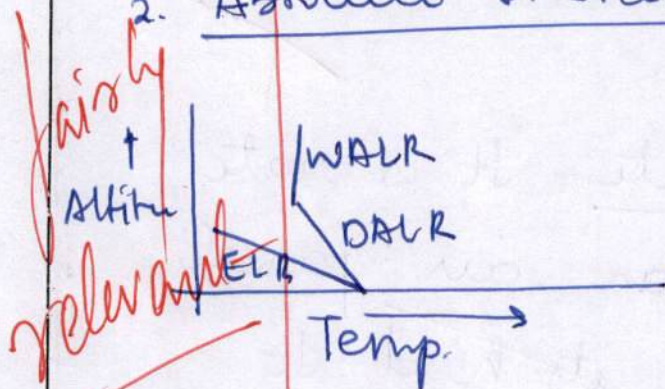
Could directly start with their salient features

lapse Rate

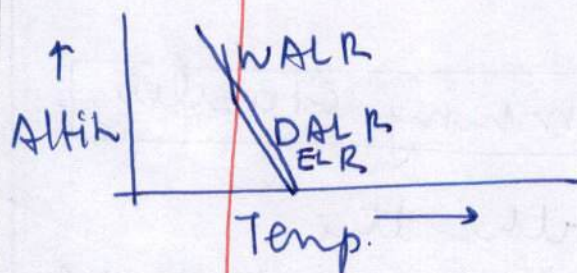
1. Absolute Stability - when environment lapse rate is greater ~~lesser~~ than wet and dry adiabatic lapse rate



2. Absolute Instability - when environment lapse rate is greater than both dry and wet adiabatic lapse rate



3. Conditional Stability - when environmental lapse rate lies in between. Thus, instability sets in when WALR is achieved.



Another is convective instability, that occurs within an air packet causing extreme instabilities

Remarks

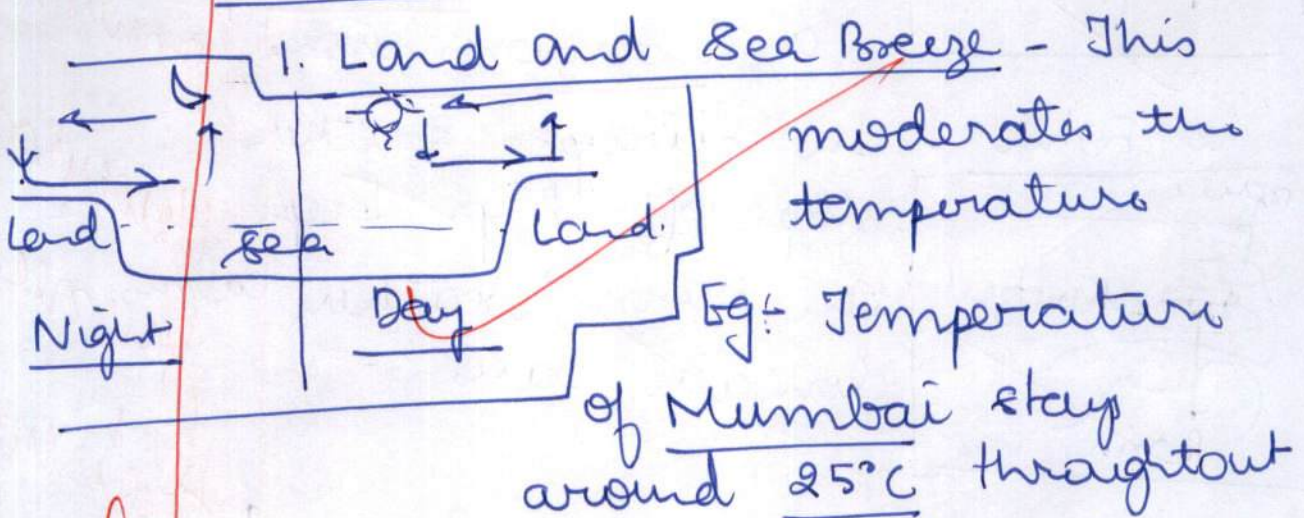
fair

3.5

1. (c) Discuss the role of local winds in shaping regional climates. Provide examples of regions where local winds have significant impacts on weather patterns and human activities. (150 Words) (10)

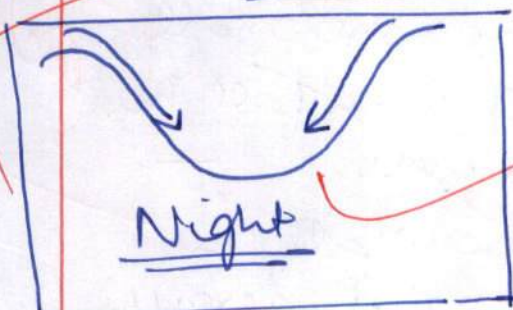
Local winds largely depend upon local phenomena - temp. and pressure.

1. Periodic (reversal after an interval)



Summers whereas temperature in Delhi reaches 40°C .

2. Mountain and Valley - katabatic



and Anabatic - Reason why houses in France around Alps are formed on

valley slopes to avoid snow & frost

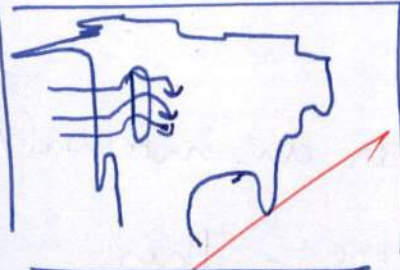
Remarks

* weather impact - good
discuss impact on human activities

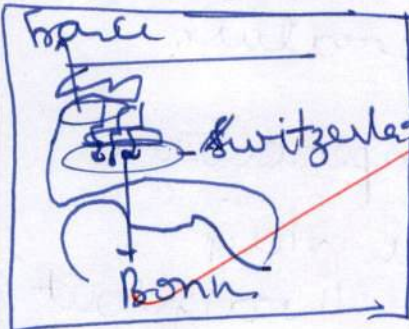
2. Non Periodic (Hot and Cold)

Hot Winds - Temp ↑; Pressure ↓, condition of stability.

1. Chinook - This is called snow eaters. Flows in N^o America E of Rockies. Raises temp. and removes snow.



2. Föhn - In Europe, southern slope of Alps. Keeps the Swiss weather calm, climatic oasis.



Cold winds - Temp ↓; Pressure ↑, condition of stability.

1. Northers - Flows from polar Canada to USA. Causes extreme snowfall. Eg. 2019 snowfall in Vancouver.



2. Bora - causes snowfall in Switzerland and destroys crops of grassland.

Remarks

* Conclusion can't be skipped.

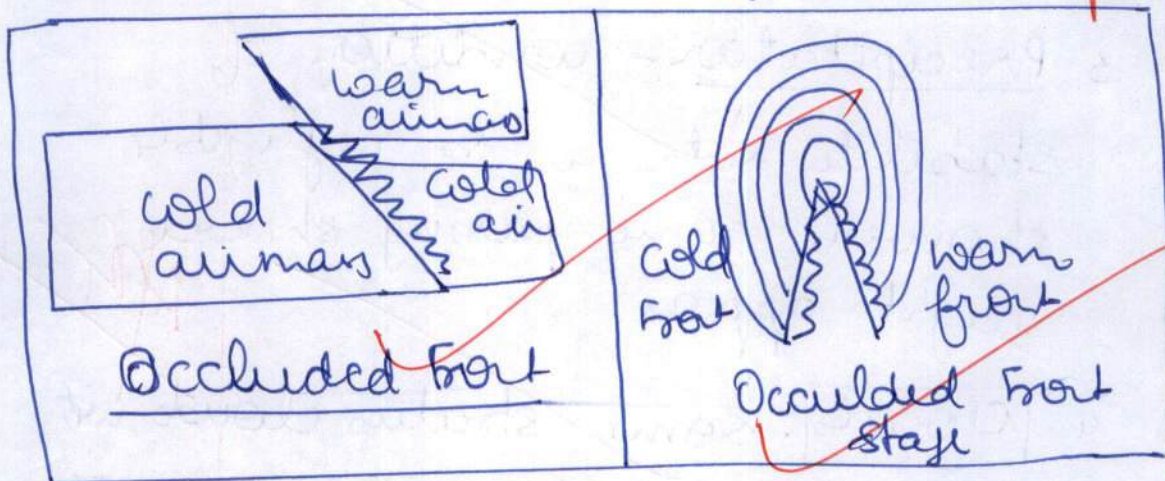
3

1. (d) Explain the role of occluded fronts in the life cycle of mid-latitude cyclones. Discuss the characteristics and weather conditions associated with occluded fronts.

(150 Words) (10)

Mid-latitude cyclones are tertiary weather phenomena caused due to collision of two contrasting air masses.

Occluded fronts occur when temperate cyclone life cycle (5-7 days) is in the last stage.



Role in the life cycle:-

1. Cold air mass overtakes warm air mass.
2. Temperature of the entire cyclone drops and pressure rises.

Remarks

⇒ Erratic weather
Complex phenomenon

3. Condition of stability sets in.

4. Dissipation of the airmass.

Weather Conditions Associated

1. Temperature - Temperature drops to very low, reaches the temp. of cold airmass (sub-zero)
2. Pressure - pressure rises (> 1000 mb)
3. Precipitation - condition of stability sets in & negligible shower. Some passing showers might appear.
4. Clouds - Some stratus clouds with precipitation. Later, replaced with cirrus clouds and fair weather.

Thus, Occluded front leads to the death of cyclone.

Remarks

4.5

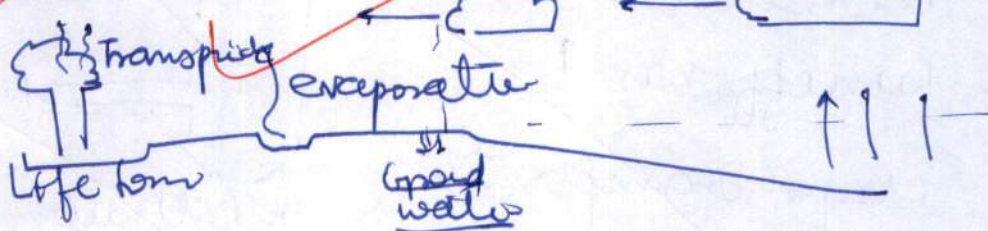
1. (e) Discuss the concept of water balance and its importance in the hydrological cycle. Explain how the water balance is influenced by inputs and outputs of water in a given area. (150 Words) (10)

Water Balance refers to the equilibrium of moisture that exists in various components of Hydrological cycle.

Importance in The hydrological cycle ÷

1. Equilibrium between the inflow, outflow and storage of water.

2. Land-Sea moisture exchange - After residence time water moves back.



3. Latitudinal heat and moisture exchange cycle.

Note Hydrological cycle is the path through which water passes through various subsystems of earth changing its form.

Remarks

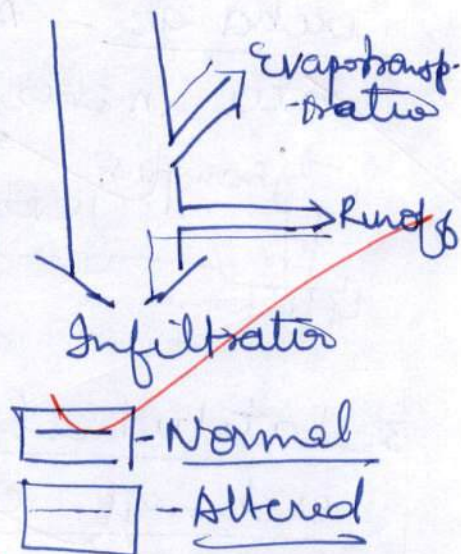
Influenced by inputs and outputs in a given area →

Inputs - 1. Precipitation - primary source of input of water.
2. Infiltration - soil moisture and ground water.

Outputs - 1. Runoff - influenced by soil type, slope & land use
2. Evaporation - process by which water is converted from a liquid to water
3. Transpiration by plants.
4. Human Activity usage

Human Influence

1. Infiltration has decreased ↓
2. Runoff has ↑
3. Evapo Transpiration has increased
4. Residence time altered



Remarks

* Provide suitable conclusion

8.5

2. (a) Compare and contrast the concepts of sensible heat and latent heat in the context of the Earth's heat budget. How do these heat transfer mechanisms contribute to the energy balance of the Earth? (200 Words) (15)

Start with relevance of sensible heat & latent heat with heat budget.

Heat Budget - Earth stays in equilibrium with respect to its inflow of solar radiations and outflow of heat.

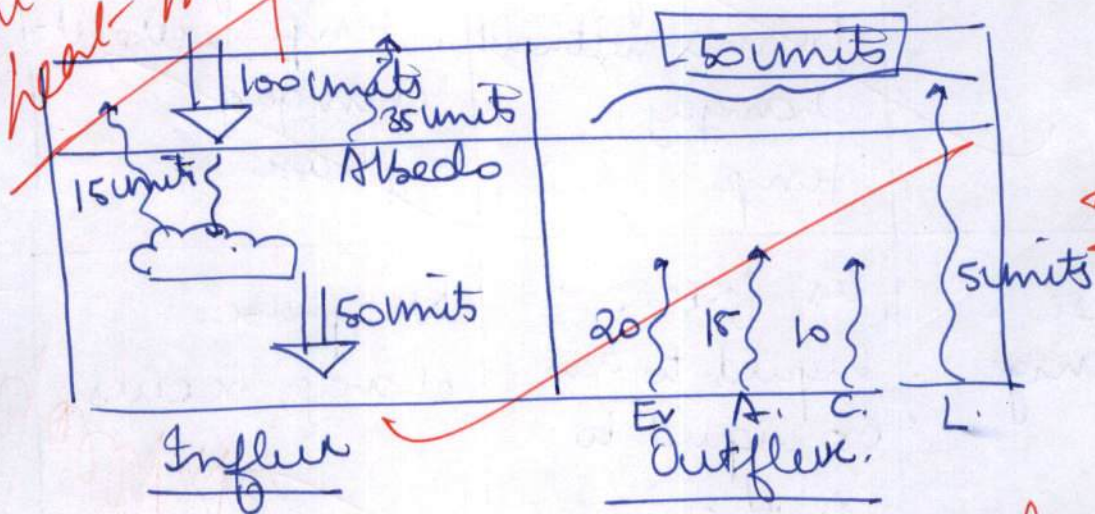


Fig. Heat Budget of Earth

Thus, owing to its Albedo, earth receives 50 units of inflow, out of which 20 units is lost to evaporation, 15 units directly to Atmosphere, 10 units in conduction & convection and 5 units is lost directly to space in

Remarks

Relate with both

the form of long wave radiations

Latent heat v/s Sensible heat

<u>Criteria</u>	<u>Latent heat</u>	<u>Sensible heat</u>
<u>Definition</u>	Heat required to change form without changing temp	Heat required to change temp without changing phase
<u>Phase change</u>	Yes, from liquid to gas or liquid to solid.	No, phase change occurs
<u>Temperature change</u>	No, it stays the same	Yes, the phase remains same but kinetic energy of particles rise
<u>Earth's system</u>	<u>Evaporation:</u> powers cycles via latent heat of condensation	Temperature rise and movement of wind & ocean currents

appropriate analysis

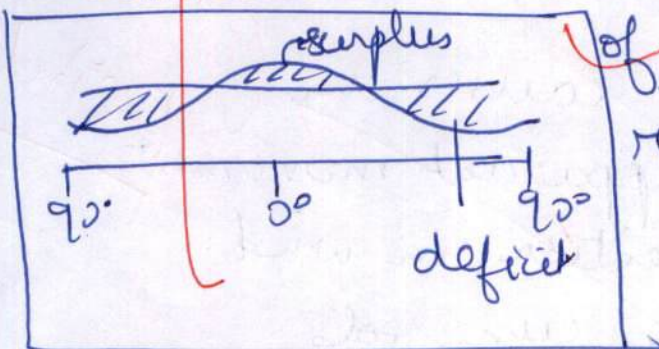
Remarks

Contribution to Earth's heat Budget

Latent heat - The component of outflux in the form of evaporation of water utilises latent heat. It takes around 20 units of heat from earth system.

Further, heat redistribution when winds carry vapour and precipitates causes transfer of latent heat.

Sensible heat - The component of outflux in the form of conduction and convection leads to sensible heat loss. It helps in atmospheric circulation leading to redistribution of heat from surplus regions to deficit.



* Conclusion is missing

Remarks

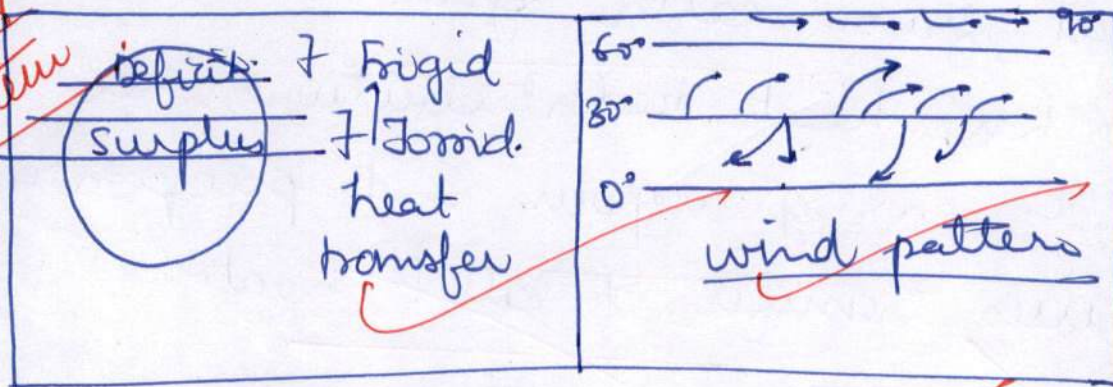
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* 1st part need more analysis.

2. (b) Discuss the concept of atmospheric circulation and its importance in the global climate system. Explain the driving forces behind atmospheric circulation patterns. (200 Words) (15)

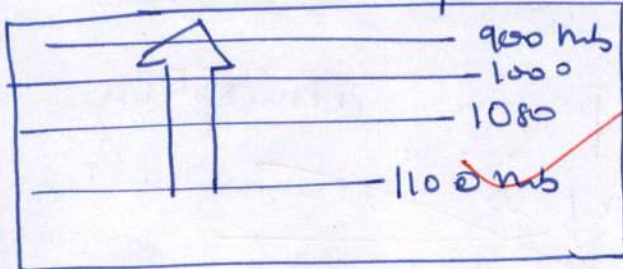
Atmospheric Circulation - is a global wind circulation leading to transfer of heat and moisture.

• Add World Wide Wind System



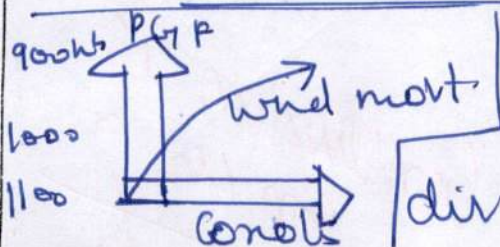
Driving Forces →

1. Pressure Gradient Force - Main



driving force is due to difference in pressure.

2. Coriolis Force - causes an



apparent movement deflection in wind direction curved.

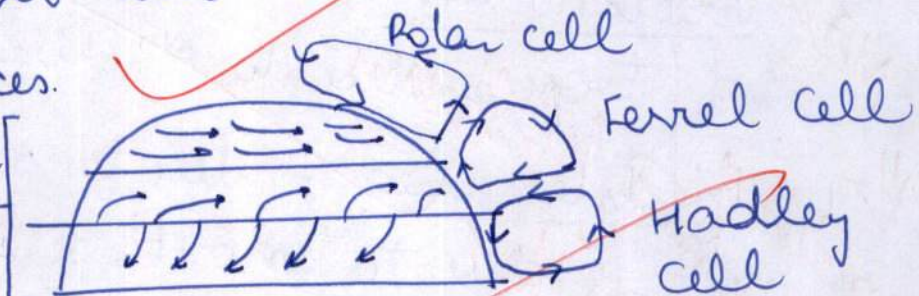
aim point

Remarks

3. Frictional Force - leads to a drag in the velocity and direction of wind circulation
4. Centrifugal Force - acts when pressure gradient is circular in nature. largely in polar regions during anti-cyclones

Concept - Atmospheric Circulation

1. Surface Winds - These vary as per the combination of above forces.



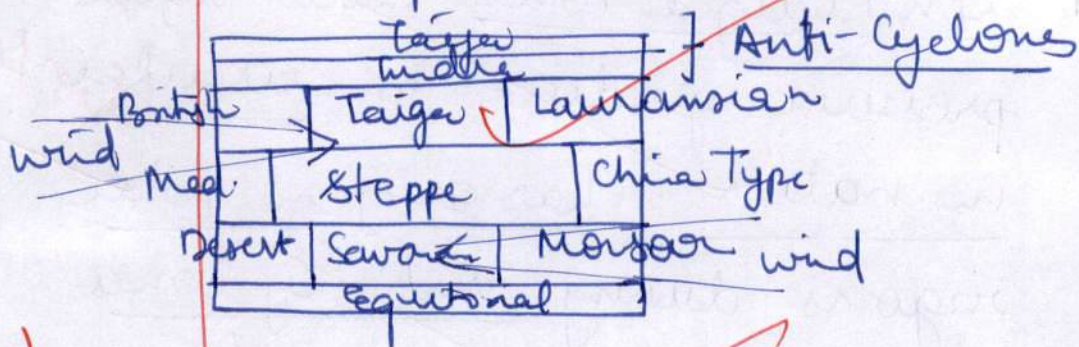
2. Upper Air winds - Pressure gradient is very high which leads to very high velocity. This leads to very Coriolis force. Thus, upper air winds are westerlies.



Remarks

Importance in Global Climate System

1. Global Climate belts because of Atmospheric circulation



2. Equatorial Region - low pressure, thus, high instability and precipitation.

3. Tropical Desert on western side of tropics due to offshore easterlies

4. Mediterranean - due to shifting of winds due to movt. of ITCZ.

5. Taiga and Tundra - Anti-cyclones

6. Mid-latitude - cyclones because Ferrel cell not efficient.

7. Precipitation pattern

90°	Minima	Maxima
60°	Secondary	Secondary
30°	Secondary	Minima
0°	Maxima	

Remarks

6.5

Conclusion?

fine

2. (c) Explain the concept of heat storage in the Earth's system. Discuss the role of the oceans, landmasses, and the atmosphere in storing and redistributing heat. (250 Words) (20)

Earth's heat storage stays in equilibrium which is known as its heat budget.

Could Quote IPCC 6th A.R.

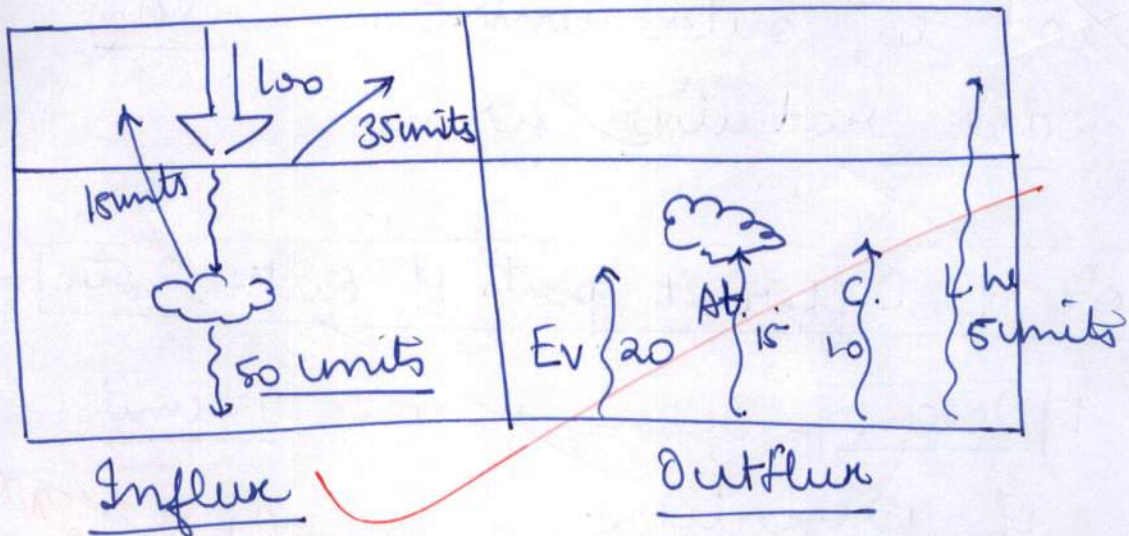


Fig. Heat Budget of Earth

Influx - Earth receives 100 unit of insolation from sun, out of which 35 units are reflected (Albedo of Earth) and 15 units are reflected by clouds. Thus it receives 50 units.

Remarks

Outflux - Out of 50 units, 20 units are lost in evaporation; 15 units are lost to atmosphere and 10 units are utilised in convection and conduction. 5 units are lost to outer universe in long wave radiation form.

Role of Different parts of earth system -

1. Ocean - Ocean receives 48 units of insolation.

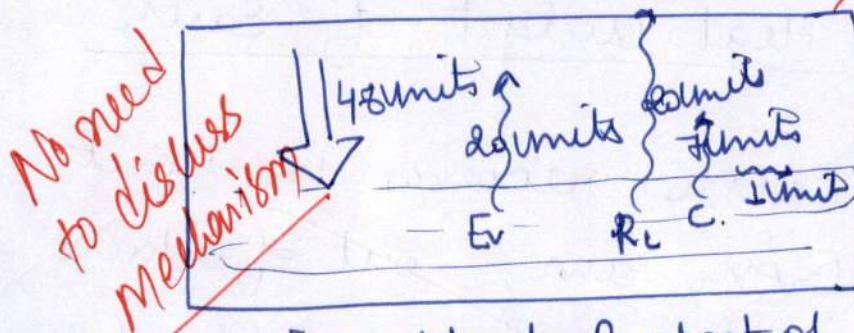


Fig: Heat Budget of Ocean.

Oceans lose 20 units to evaporation; 20 units in Radiation loss, 1 unit is utilised by Bio to

Role of Ocean

↓
Salinity & Temp. gradient
- regulator of Earth's Temp.

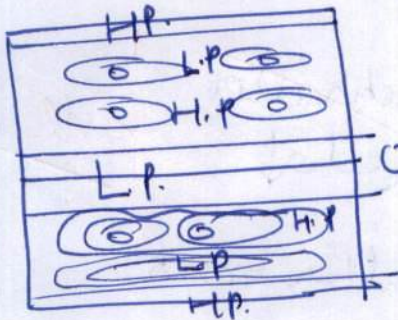
- CO₂ dissolve etc

Remarks

and rest of units is utilised in convection, conduction and ocean currents.

Ocean currents play the role of redistribution of heat energy from surplus to deficit regions. Thermohaline circulation.

Landmass - Landmass can absorb the heat energy greater than other systems. Albedo is very low. It helps in creation of global pressure pattern which leads to redistribution of heat. Since it does not have any mobile component of its alone, it has limited role in redistribution.



Humans have increased concretisation leading to increased role of Landmass.

Remarks

Atmosphere - It stores the heat in the form of latent heat but is always in equilibrium.

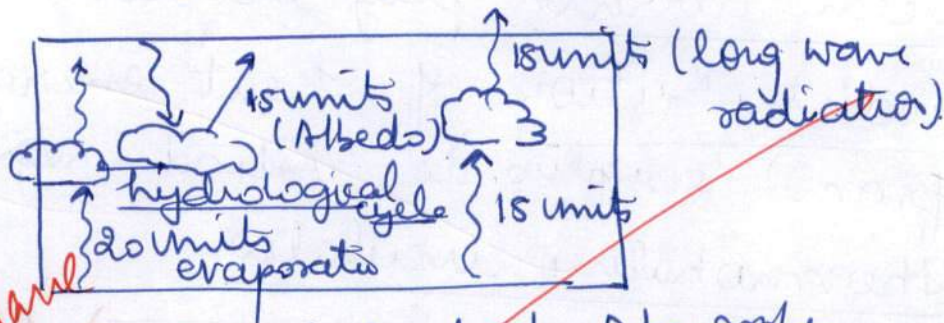
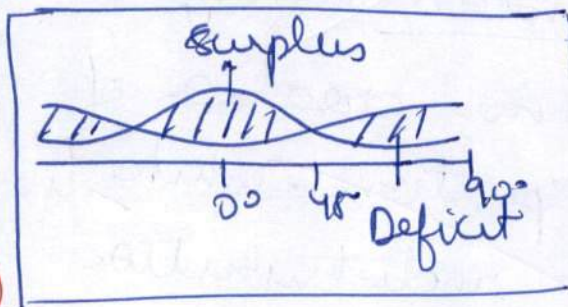


Fig: Heat Budget - Atmosphere

Redistribution is managed by atmospheric circulations (Global)



Secondary distribution is managed by cyclones, Thunderstorms etc.

Human Influence

1. Impacts Land mass \rightarrow Albedo \downarrow
2. Atmosphere \rightarrow extreme weather events by H₂O
3. Thus, residence time of heat has increased leading to extreme weather events.

Conclusion?

Remarks



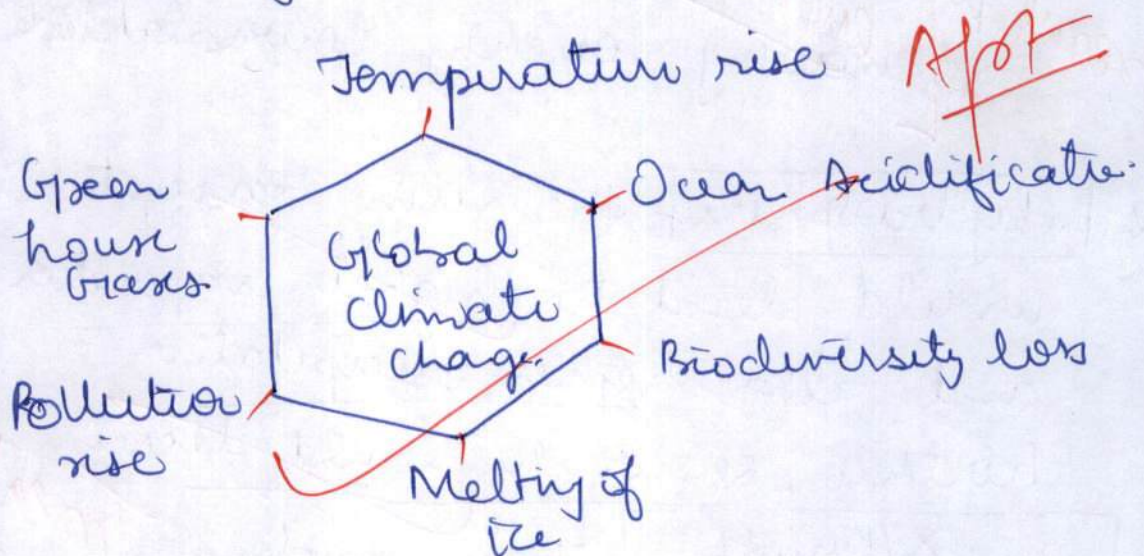
3. (a) Analyse the impacts of global climatic change on various spheres of the Earth's system, including the atmosphere, hydrosphere, biosphere, and cryosphere.

(200 Words) (15)

IPCC Assessment report V

reveals that even if all countries adhere to their INDCs, their target of 1.5°C will be breached.

Decent start The same report highlight the impact on various sphere of Earth's system.



Impact

1. Atmosphere - The temperature rise in the atmosphere leading to

Remarks

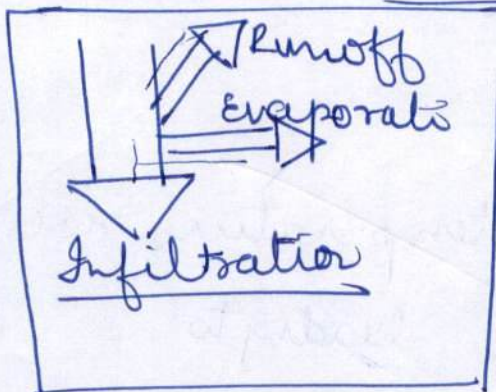
extreme weather events.

↳ Hadley Cell - Poleward shift of the cell. High evaporation and precipitation.

Why? ↳ Ferrell Cell - Poleward shift. Rise in secondary & tertiary circulation in the form of Bomb cyclones.

→ GHGs ↑
Global warming
extreme weather events
↳ Polar Cell - Squeezing of polar cell leading to higher melting of polar ice stream and phenomena of snowing reaching lower latitude.

2. Hydrosphere The rising temperature would lead to higher evaporation and also higher precipitation.
Further, snowfall would decrease.



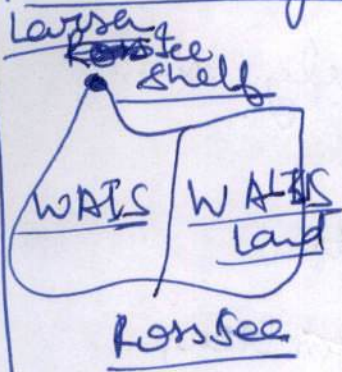
Thus, residence time would increase.

Melting of ice leading to unprecedented sea level rise.

Threats to coastal flooding
- water scarcity

Remarks

Case Study - Antarctica



↳ WAZS - most prone

↳ every decade 2400 tonnes of ice is lost

↳ 2^{1st} CG - 300 bn tonnes / yr lost as per AR V

3. Cryosphere - The frozen part of Earth.

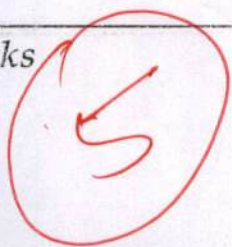
The melting - Arctic Amplification

most prone. Leading to exposure of old virus, bacteria.
 → Release of stored carbon.

4. Biosphere - The combined impact of above all factors. Habitat loss. Species Extinction with the highest rate - Anthropogenic extinction.
 300 species lost/yr. → effect of CO₂.
 Plant physiology

The world needs a common framework to ensure sustainable development as per Giamis

Remarks



Challenges & way forward reference.

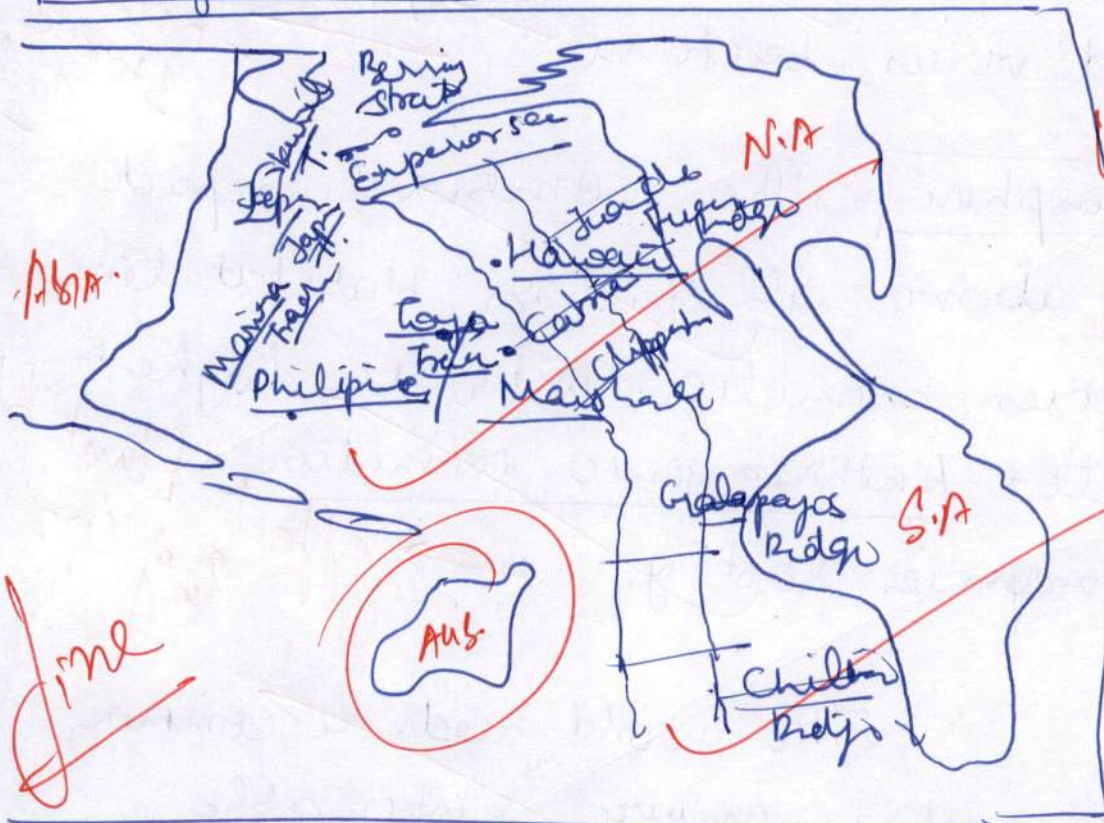
* Needs further contextual / descriptive analysis

3. (b) Compare and contrast the bottom topography of the Indian Ocean with that of the Pacific Ocean, highlighting their similarities and differences. (200 Words) (15)

Indian Ocean largely extends in Southern Hemisphere.

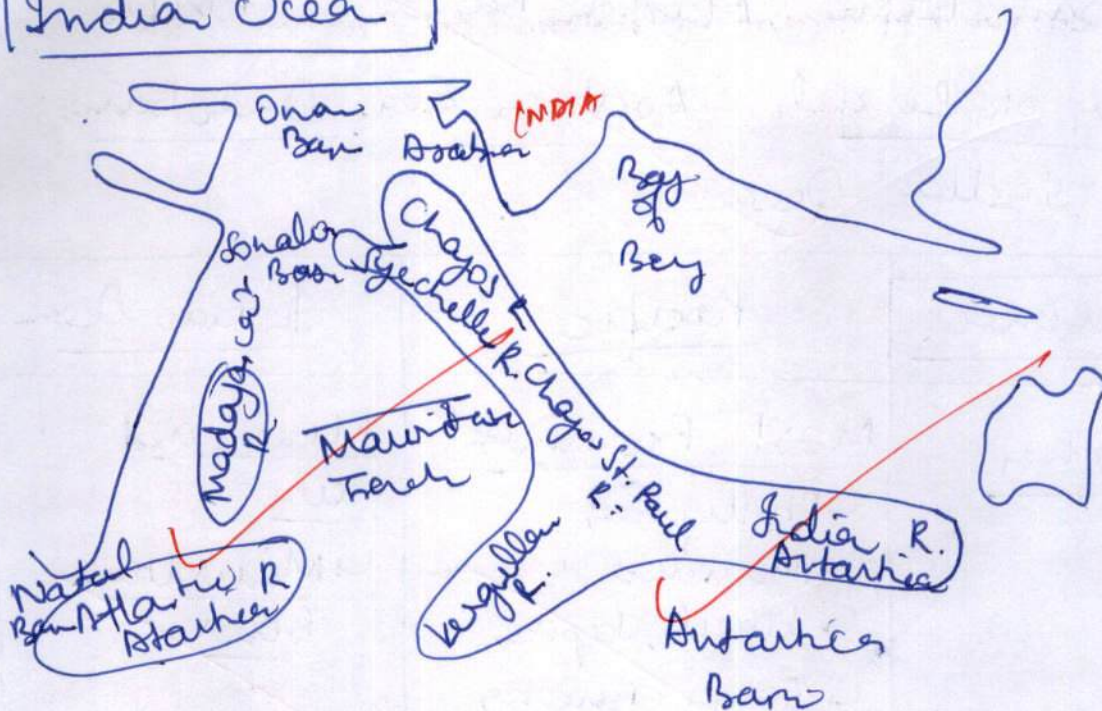
Pacific Ocean has the largest component in tropics thus has the highest temperature (17.1°C) of all oceans.

Pacific Ocean



Remarks

India Ocean



Similarities -

1. Continental Shelf - in both ocean it is narrower than Atlantic Ocean Pacific Ocean ~ 5.71 whereas in Indian Ocean ~ 4.571 .
2. Continental Slope - Pacific Ocean - 71° India Ocean - 6.51° .
3. Presence of Non-Central Ridge as against Atlantic Ocean.
4. Basins - Philippines Basin, South China Basin

Valid point

Remarks

Japan Basin, Alaskan Basin in Pacific
 Bay of Bengal, Andaman Sea, Omar Basin
 in Indian Ocean.

Differences	Pacific	India Ocean
Trenches	Most Prominent ↳ Philippines ↳ Mariana ↳ Kuril, Japan, ↳ Tonga Trenches due to vast size, subduction increases	Minor and rare. ↳ Mauritania Trench
Islands	Prominent - due to higher Plate tectonic activity Eg: Emperor Sea, Japan, Indonesia, Marshall Island, Phillipines. (Continental)	Minor & because of deep sea volcanism Eg: Reunion, Seychelles (volcanic)
Disjoints in Ridge	Cambrian, Clipperton	New eastat
Ocean Deep	80% full of guyots, submarine canyons	80% -

Remarks

* Provide a suitable
 Conclusion

6

3. (c) Discuss the concept of applied climatology and its significance in various sectors such as agriculture, water resource management, and urban planning.

(250 Words) (20)

Applied climatology refers to scientific analysis of scientific data in light of useful applications for operational purposes. It studies climatic conditions and countless weather sensitive activities. Helps in understanding the relationship between humans and climate.

3 Type of Activities

1. Data collection - field survey meteorological instruments
2. Interpretation of data using regress statistical methods or computer analysis.
3. Decision Making - regarding urban morphology or crop analysis.

Could Add more Applications
- Agriculture
- Urban Planning
etc.

Remarks

Evolution + 2 stages

1. Pre 1970s - Thomas Jefferson, when they planned framing laws around local climate.

↳ Koppen, Thornthwaite - associating climate with land use.

↳ Horton made discoveries with regards to discharge and hydrological cycle of great lakes.

↳ During WW II, need for climate data expanded bringing newer dimensions.

2. Post 1970s - Golden phase due to

globalisation, climate change, extreme weather events and environmentalism.

↳ Geography as a whole took functional turn.

Remarks

Significance of Applied Climatology -

1. Agriculture -

1. Crop Combination can be best answered by climatology.

Eg: long growing season sugarcane can grow. → led to shifting of sugarcane industry to South of India.

2. Soil moisture - helps in development of irrigation facilities.

3. Livestock -

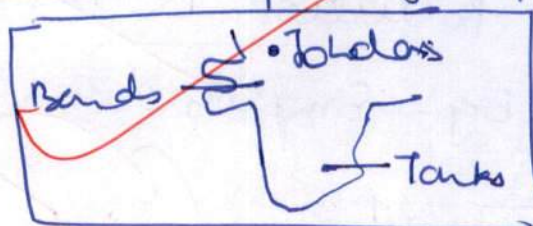
Sheep Milk & Dairy Goat

4. Dry Land farming

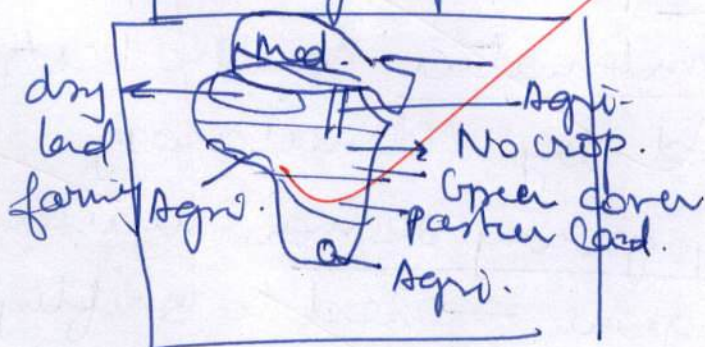
precipitation ↑

2. Water Resource Management -

Improved Water Harvesting infrastructure - depending upon region



2. Planning for management
depending upon climatic conditions

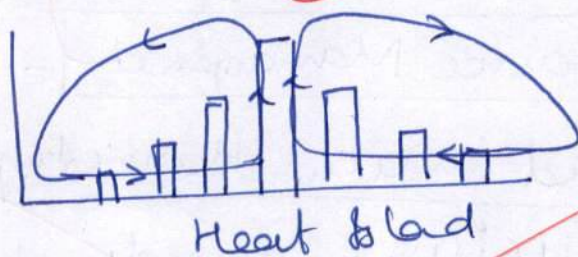


Urban Planning

1. Infrastructural decision - Improved

Albedo. Solar tiles. to reduce pollution

2. Morphology such that that heat trap is reduced.



3. Pollution Reduction

Green Egt Employed in London post 1970s

Green	Employed
in	London
post	1970s
Employed	in London

7.5

* Need to provide conclusion

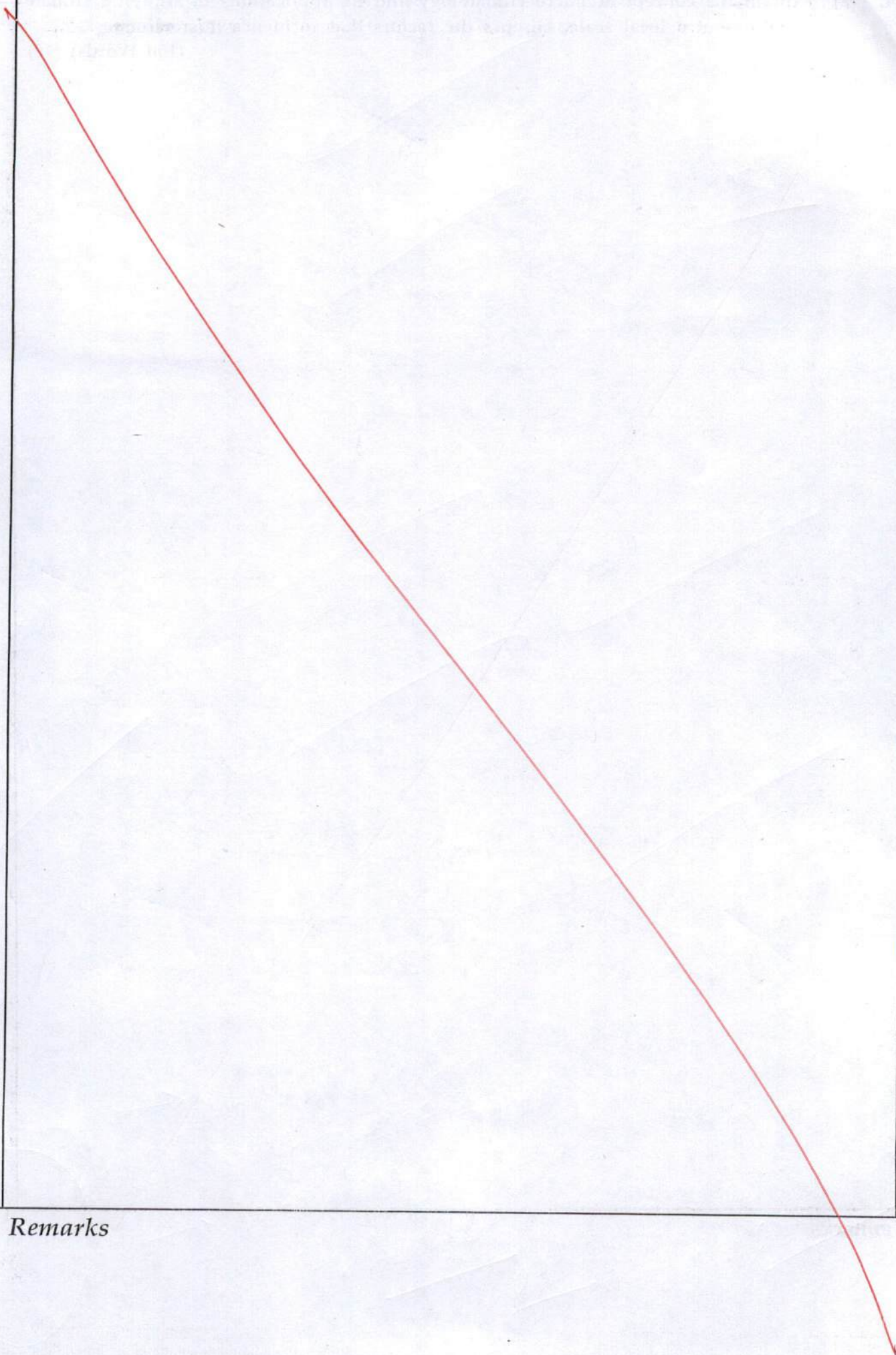
* Importance

Remarks

4. (a) Explain the concept of micro climatology and its applications in studying climate variations at a local scale. Discuss the factors that influence microclimates.

(150 Words) (10)

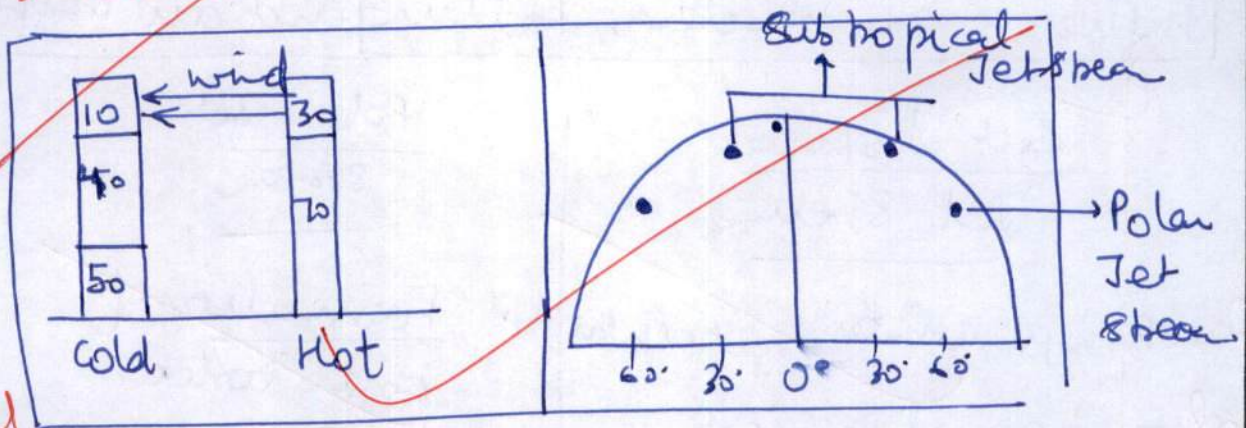
Remarks



Remarks

4. (b) Discuss the significance of the polar jet stream and the subtropical jet stream in global atmospheric circulation. Explain their influence on weather patterns and air traffic.
(150 Words) (10)

Jet Streams are narrow band of fast moving wind produced due to thermal gradient.



Significance of Subtropical Jet Stream.

1. Maintenance of Heat Budget
2. Doesnot let cold air mix with tropical wind.
3. Leads to formation of cyclones in tropical regions

Significance of Polar Jet Stream.

1. Heat Budget.

Remarks

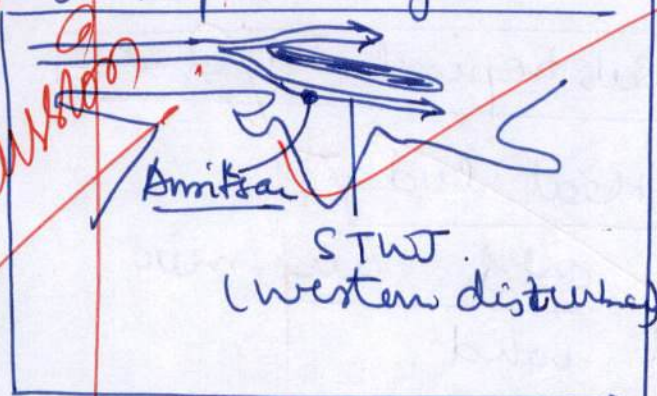
2. keeps polar cold winds trapped and doesnot let them reach lower latitudes

3. Maintenance of ^{high} ~~low~~ pressure in Polar region.

Influence on weather patterns and air traffic

Sub-Tropical Jet Stream

Brings winter precipitates to tropical region.



Helps in air traffic of aeroplanes

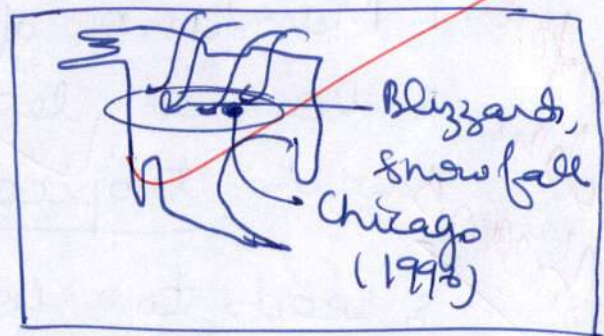
→ Aeroplanes benefited (west to east travel)

→ Windshear & turbulence etc

Polar Jet Stream

Formation of polar vortex.

Blizzards and Northerns in the US



Air traffic and non mixing to Polar and Stratospheric air

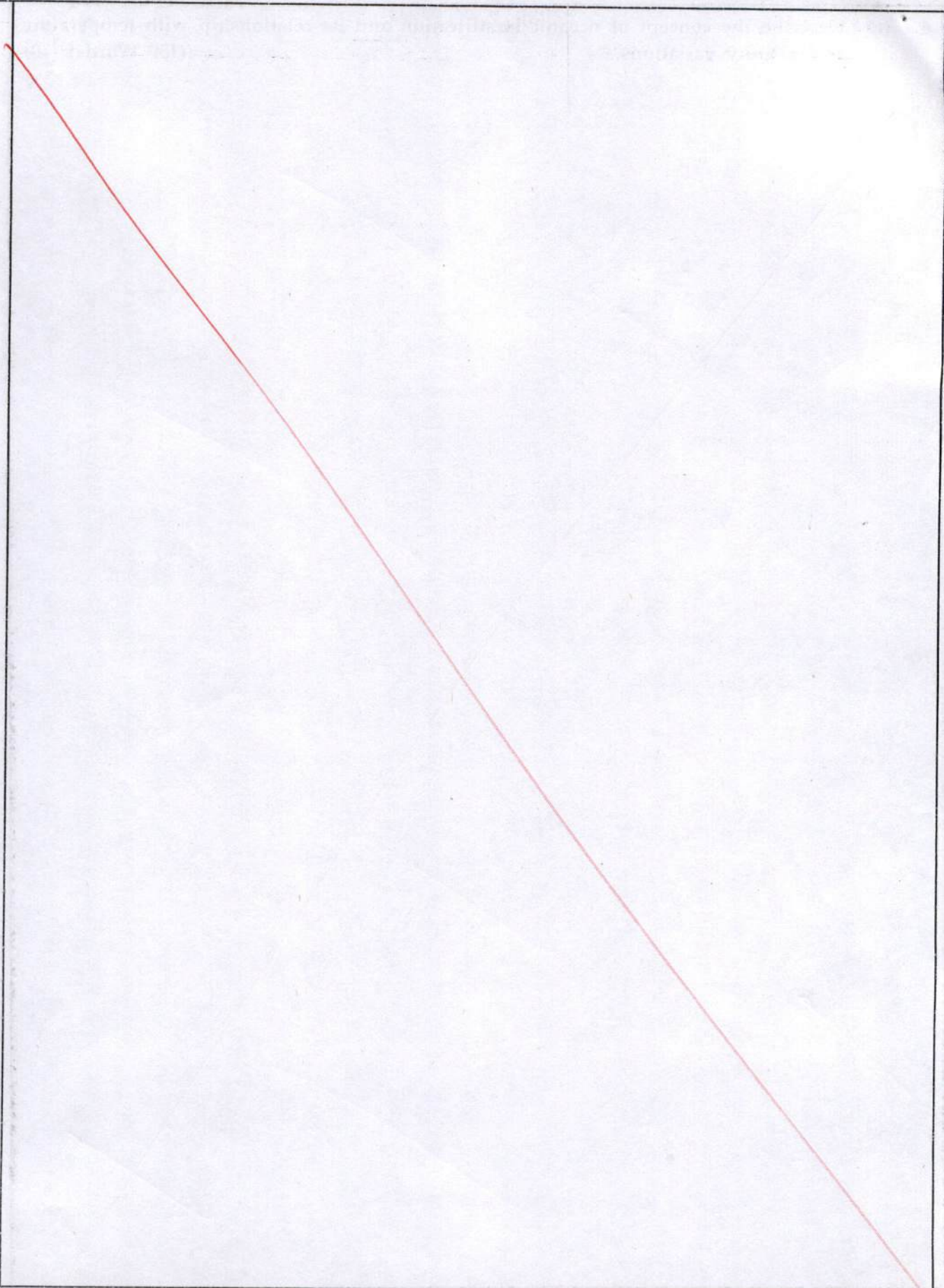
Conclusion?

Remarks

4

4. (c) Describe the concept of oceanic stratification and its relationship with temperature and salinity variations. (150 Words) (10)

Remarks

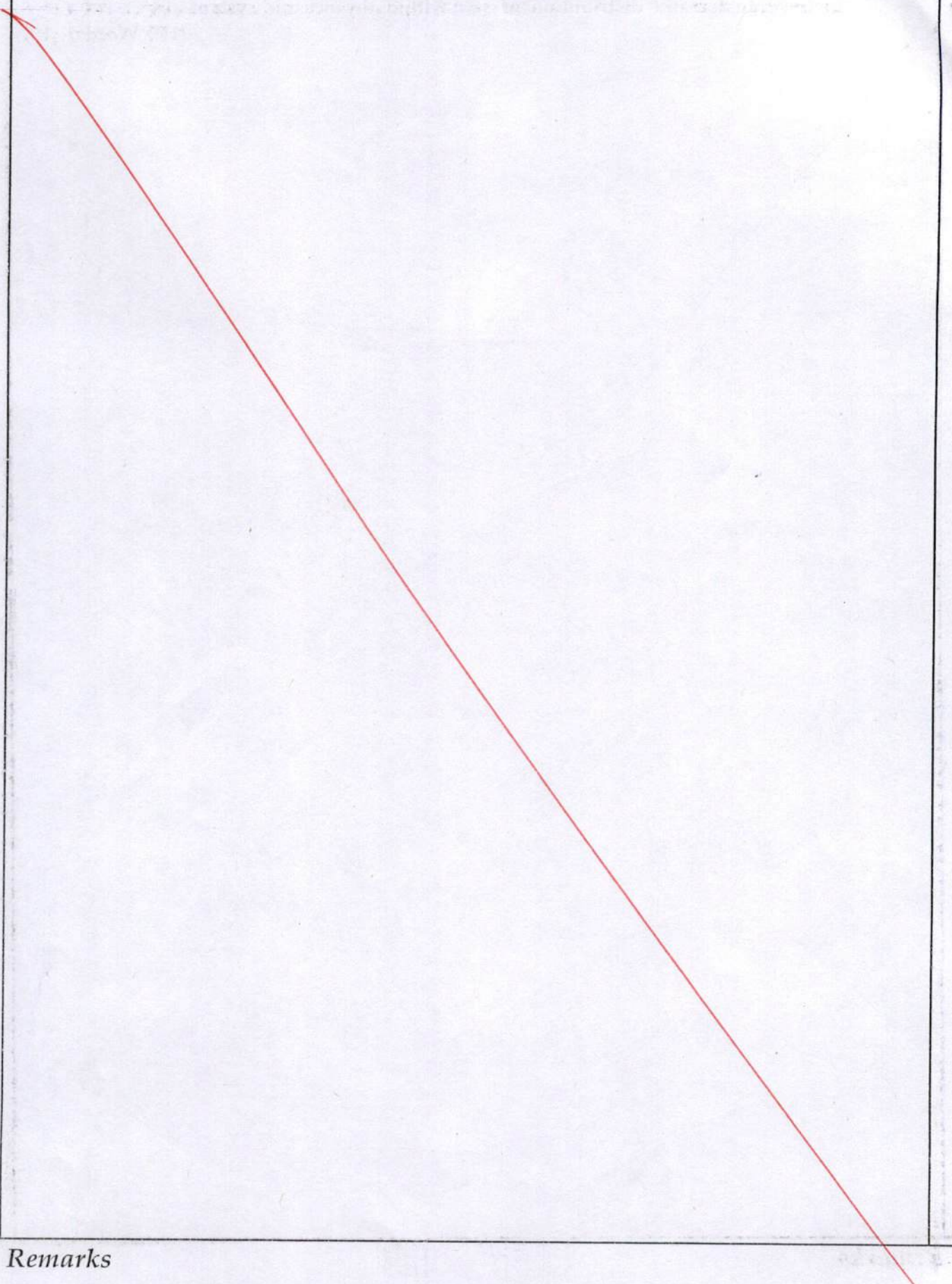


Remarks

4. (d) Explain the concept of salt budget in the ocean and discuss the processes involved in the transfer and distribution of salt within the oceanic system.

(150 Words) (10)

Remarks



Remarks

4. (e) Explain the concept of marine protected areas (MPAs) and discuss their role in conserving marine biodiversity and enhancing the sustainable use of marine resources. (150 Words) (10)

Remarks

Remarks

5. (a) Analyse the different types of ocean deposits, including terrigenous, biogenous, hydrogenous, and cosmogenous sediments, and explain their characteristics and formation processes. (200 Words) (15)

Jenkins divided ocean deposits on various forms

1. Terrigenous - generally neritic in nature reaches ocean surface.
 Sand ($\frac{1}{2}$ mm), Gravel ($\frac{1}{8}$ mm),
 Clay ($\frac{1}{256}$ mm)



1. Red Mud - It is oxide of Iron. Found near the Brazilian plateau, China & Japan.

2. Green Mud - It is oxide and compounds of potassium. Found around Atlantic coast.

3. Blue Mud - consists of Gluconites and is scattered on the ocean floor.

4. Black Mud is Organic in nature.
 Eg: Coast

Remarks

Biogenous - These are formed by biota. Two types siliceous and carbonates.

1. Siliceous - 2 life forms release these - Radiolara and Diatoms. Diatoms are more common.

↳ These are found in regions of upwelling and hydrothermal vent.

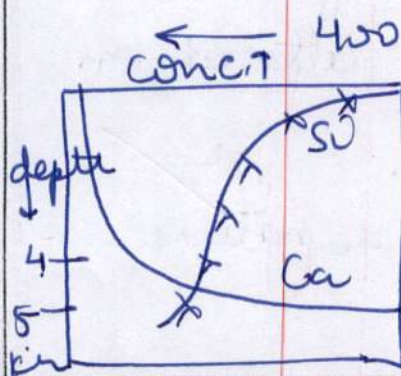
Appropriate analysis

2. Calcareous - 3 life forms

↳ Globigerina which are most common

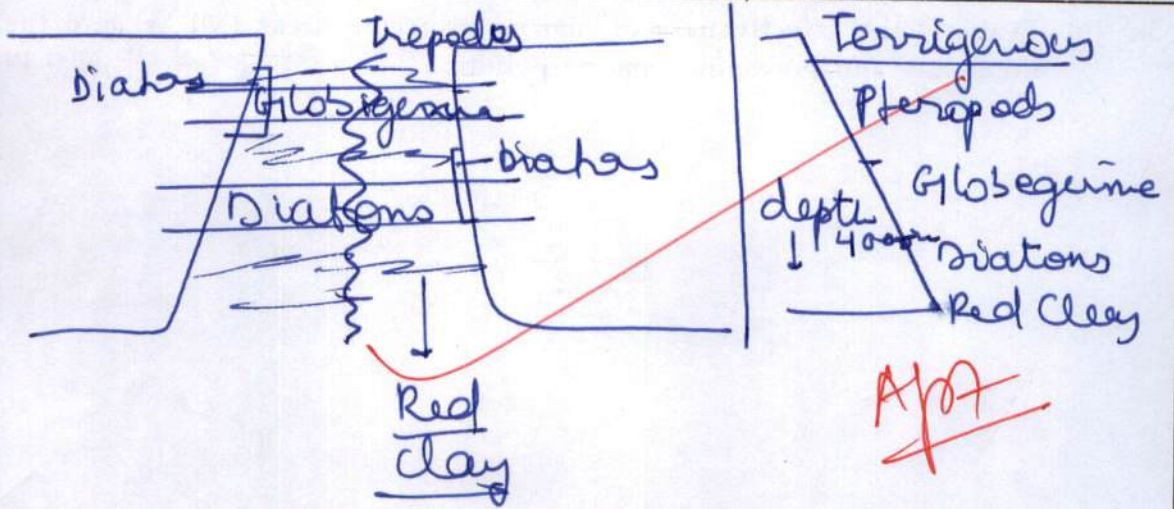
↳ Pteropods contain the highest CaCO_3

↳ These are not found beyond



↳ Carbonates dissolve beyond 4000m as it is carbonate compensation depth.

Remarks



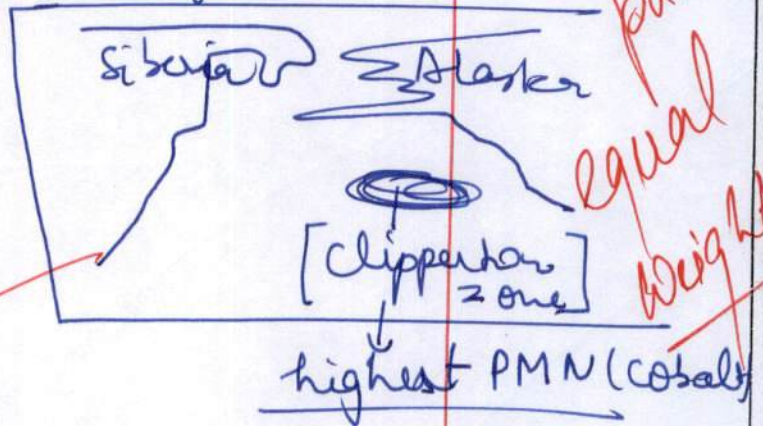
Hydrogenous - These are precipitates and poly metallic nodules.

These are found in Hydrothermal vents and Ridge region.

Cosmogenous -

These are meteorite dust and remains.

This are widely found but in very low concentrations.



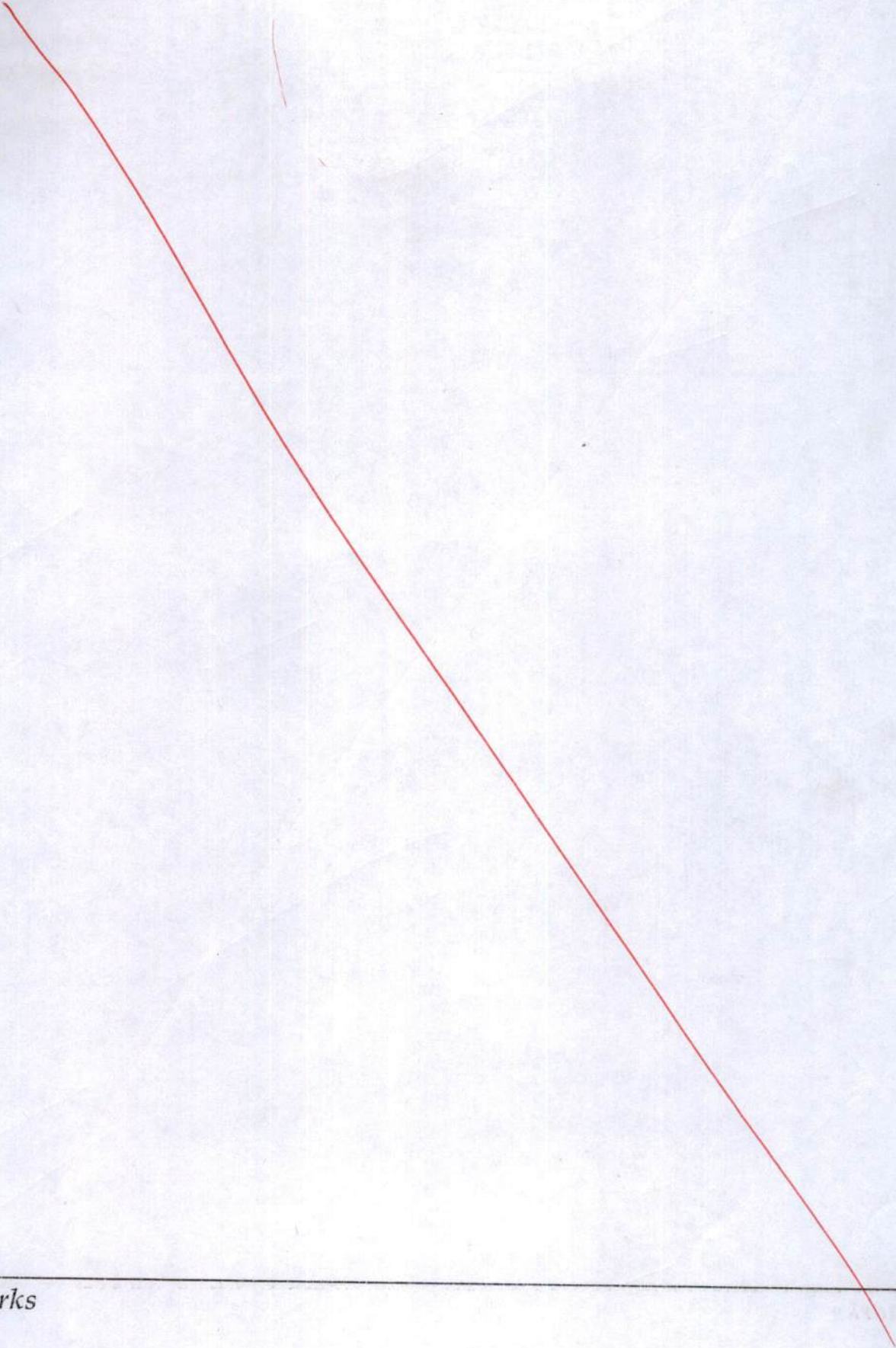
Nickel
iron Alloy
etc.

5.5

Conclusion?

5. (b) Evaluate the effectiveness of marine protected areas (MPAs) and their role in mitigating and preventing marine pollution. (200 Words) (15)

Remarks

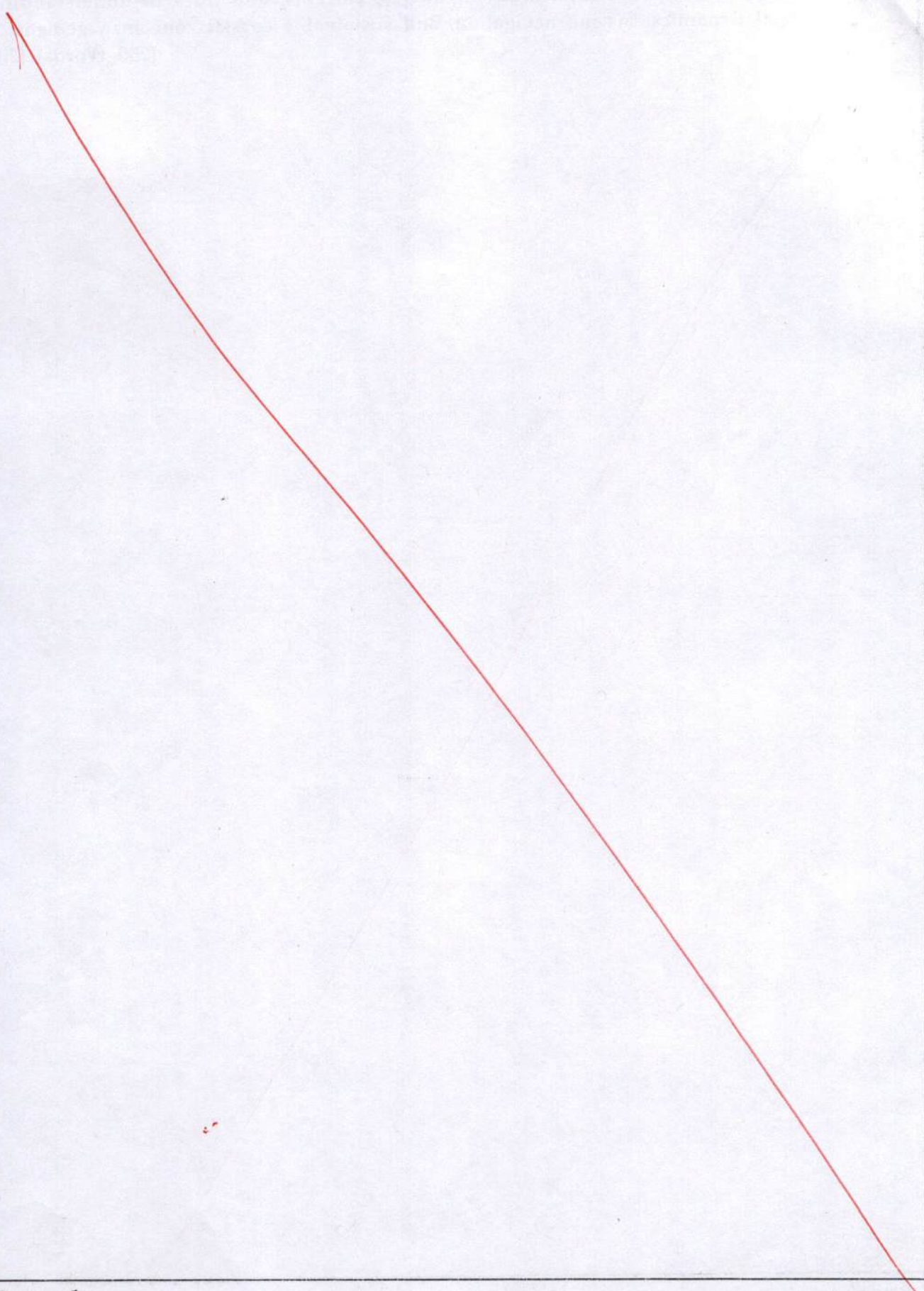


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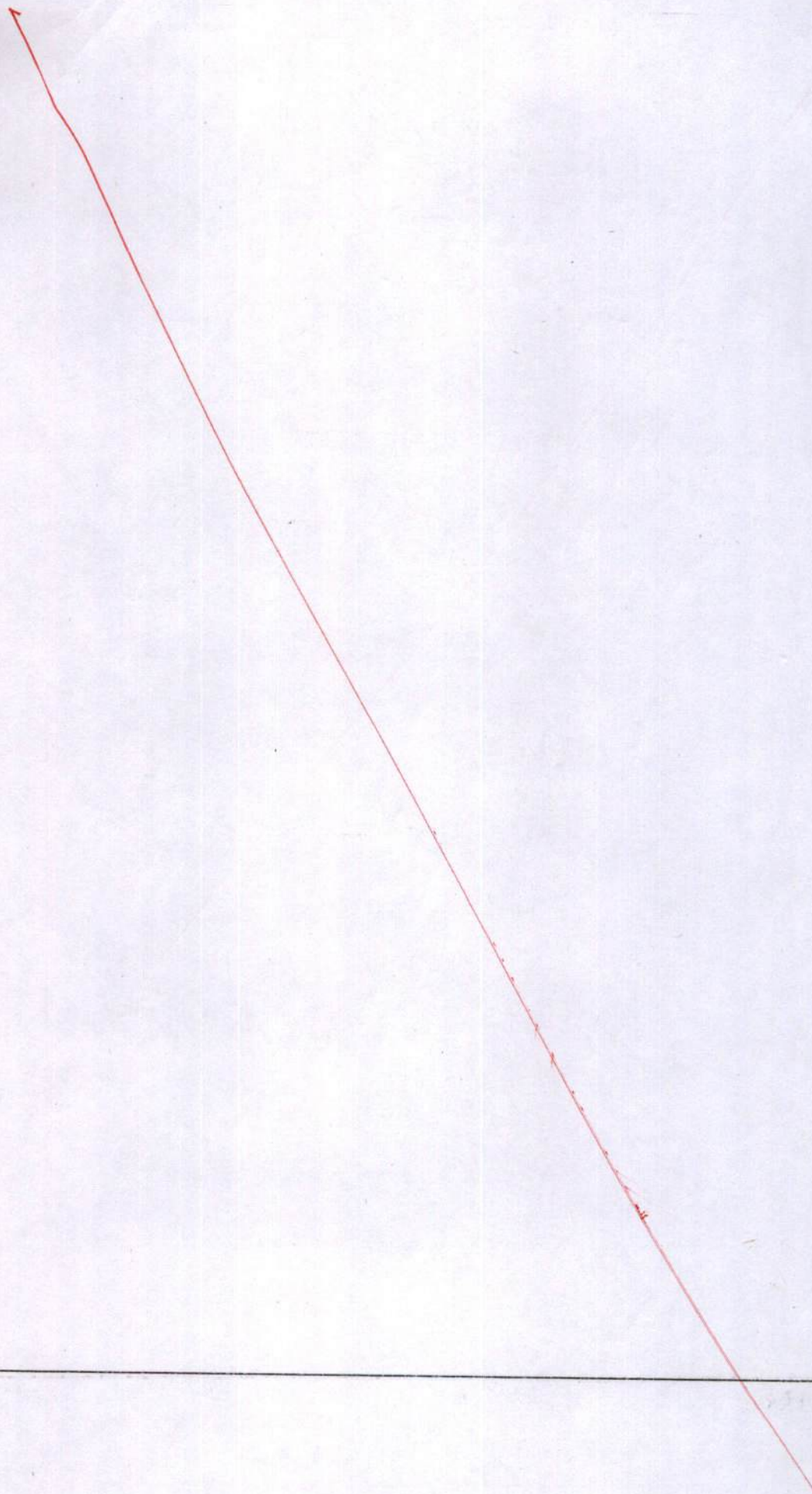
Remarks

5. (c) Discuss the importance of studying waves, currents, and tides in understanding coastal dynamics, marine navigation, and sustainable coastal zone management. (250 Words) (20)

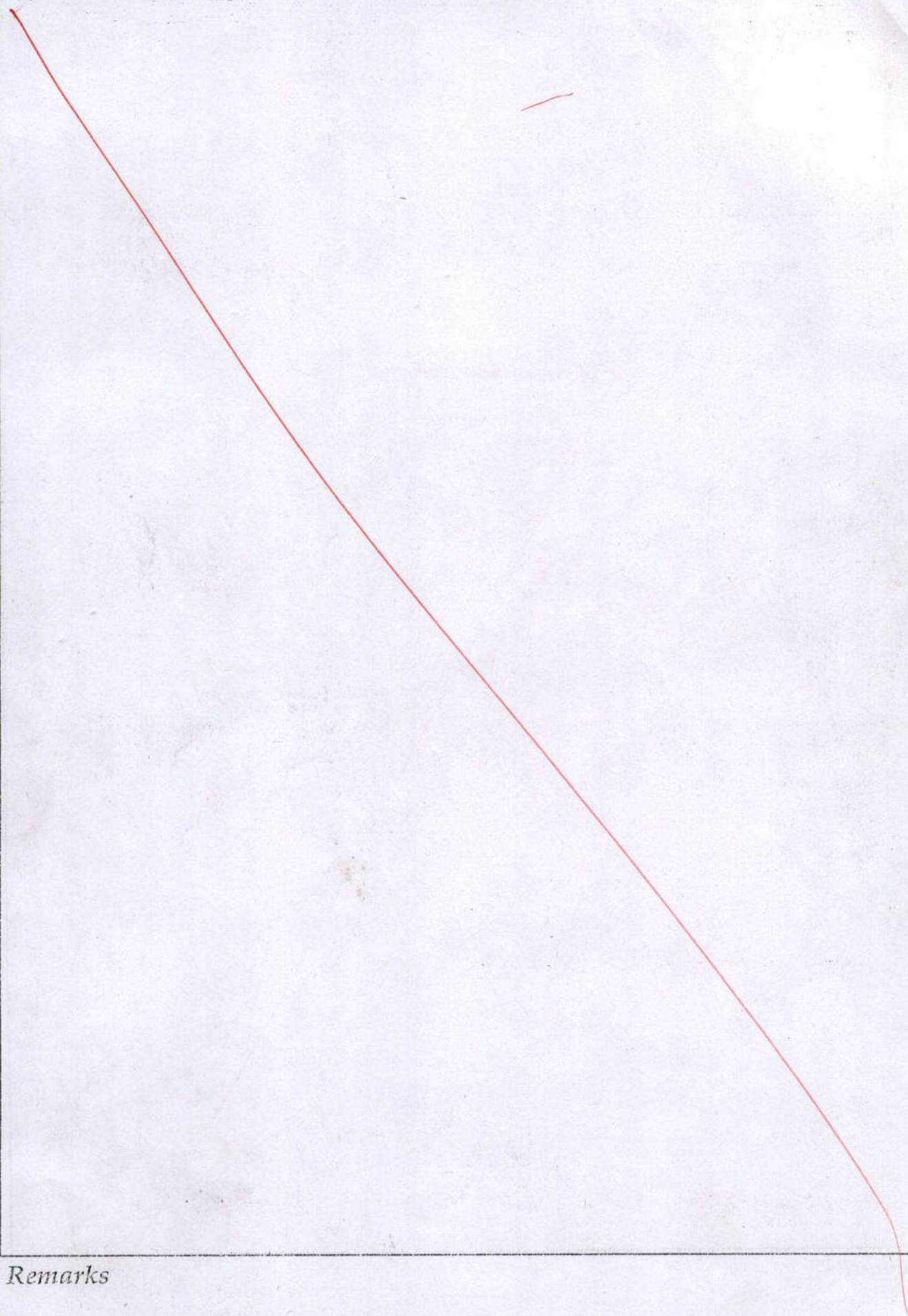
Remarks



Remarks



Remarks



Remarks