GSSCORE

An Institute for Civil Services

IAS TOPPER'S TEST COPY

RISHENDRA SINGH

AIR 113

CSE 2023

GEOGRAPHY

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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.

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Name RISHENDRA SINGH

Mobile No.

Date

Signature Rishendra.

1. *Invigilator's Signature* _____

2. *Invigilator's Signature* _____

Dear Rishendra,

* Your content is fine, however in some question need to work on presentation & articulation.
* Refer Discussion Videos for Better Understanding.
* Try to Avoid writing in Margin. (this could lead to penalization of Marks in Mains exams)
* All the best!

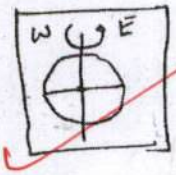
Keep it up!

Roll No. _____

GS SCORE

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)

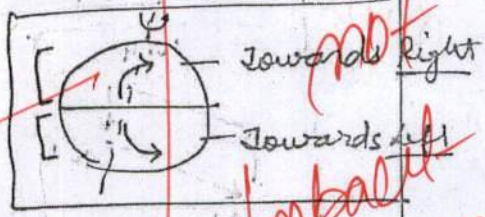
Coriollis effect is the turning effect on a non-hinged moving body due to the rotation of earth from west to east direction.



Impact of coriollis effect in different latitudes:

(a) Northern Hemisphere - Coriollis force tends to deflect the air mass in Right

(b) Southern Hemisphere - deflection in Left direction

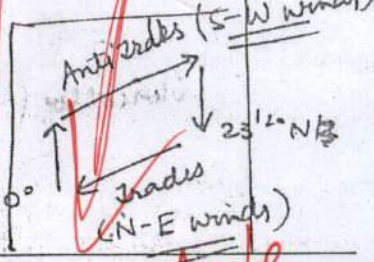


Impact on atmospheric circulation:

(i) Hadley cell:

The rising air parcel bends North & South at tropopause

Differs towards Right in N. Hemi and Left in S. Hemi



Remarks

Start directly addressing impact.

Give list first

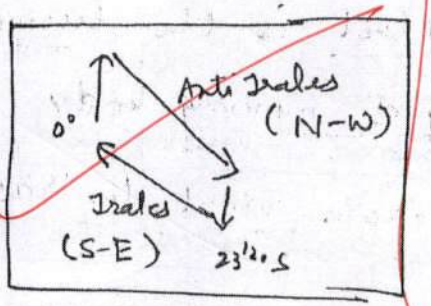
Formation of cyclones & Anticyclones etc

This is not impact

Include Also on upper air westerlies Impact on tropical cyclones

after sinking ⇒ deflects right again = (Trade winds)

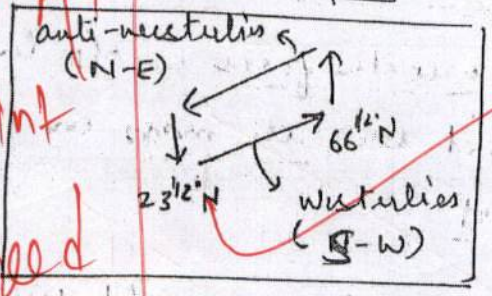
S. Hemisphere



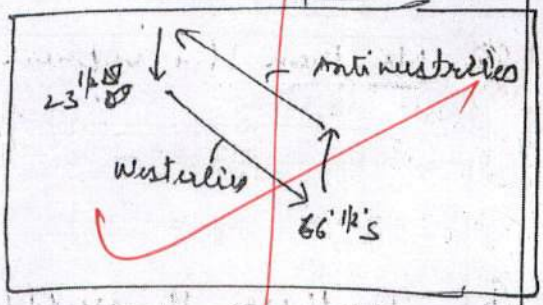
Silly ② Ferrel cell

not required

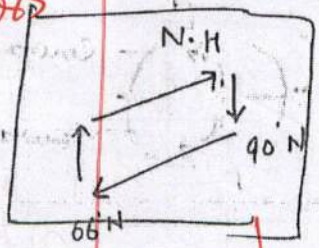
N. Hemisphere

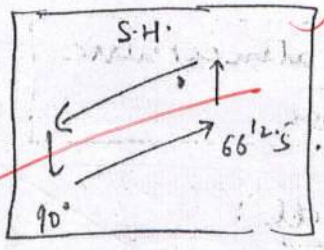


S. Hemisphere



Silly ③ Polar cell





2.5

Influencing direction & speed

i. C_f (coriolis force) ⇒
- velocity of body ($\propto v$)
- angle from earth's centre ($\propto \theta$)
- distance from equator

C_f @ equator = 0 (∵ 0° angle) & max (90°)

Remarks

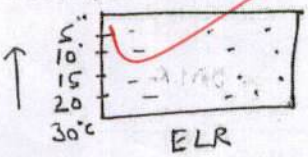
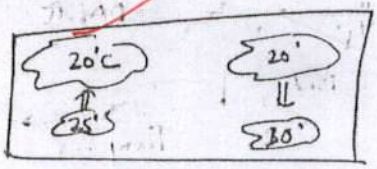
and as v ↑ses as C_f also increases.

Thus Coriolis force significantly impacts earthly phenomenons

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)

Decent Start

Lapse rate is defined as the rate of fall in temperature with height (also called Normal Lapse Rate) : LR = 6.5°C/Km - It is an average

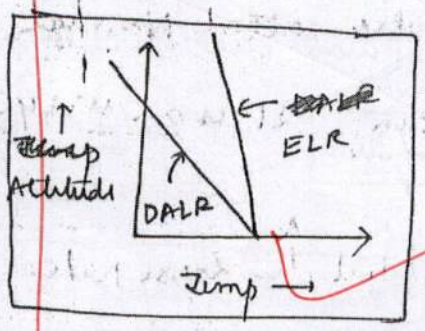
Environmental Lapse Rate	Adiabatic Lapse Rate
*) The rate of change of temperature at any place at a particular time	The rate of change of temperature of a rising or sinking parcel of air.
 ELR	
*) Environmental rate change i.e. fall in general environmental temperature	Divided further in 2 types
	Dry adiabatic Lapse Rate: Rate of change of temperature in rising/falling parcel upto Level of condensation. ⊕ DALR = 10°C/Km	Wet Adiabatic Lapse Rate: Rate of change of temperature in rising/falling parcel beyond level of condensation.
Remarks	⊕ Generally less than DALR. WALR = DALR - Latent heat of condensation

Fair

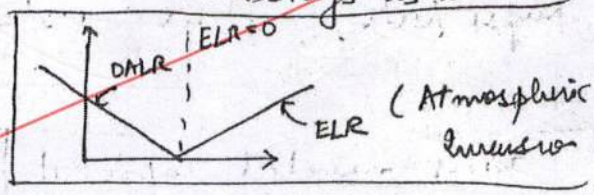
Avoid this

It is the ELR & DALR, WALR that determines environmental stability conditions

① Atmospheric stability : ELR < DALR

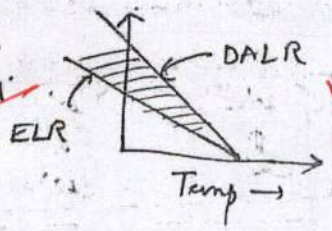


(No Buoyancy) & air stays as it is



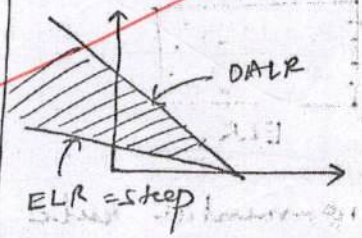
② Atmospheric Instability : when ELR > DALR

ⓐ Absoluti Instability

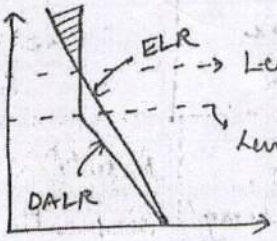


ⓑ Mechanical Instability

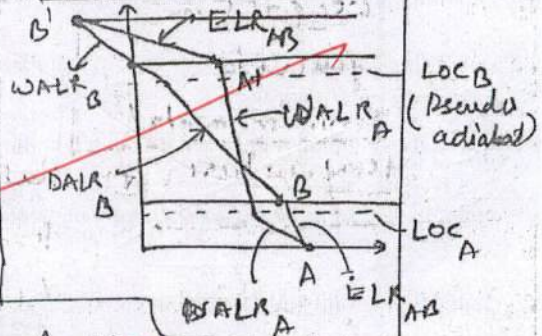
ELR >>> DALR



ⓒ Conditional Instability



ⓓ Potential Instability



Thus, it is the combination of these adiabatic & environmental lapse rate that determines the weather of any place.

Remarks

Jaisky relevant

However elaborate

4

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)

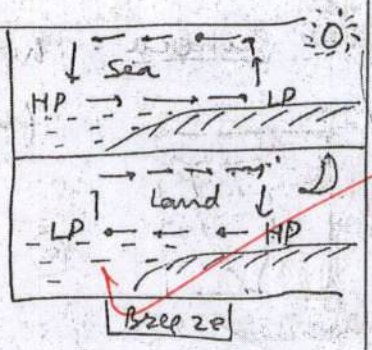
local winds also called micro-level winds formed after thermodynamic modifications of prevailing physical characteristics

- Temperature
- Insolation
- Humidity
- Weather patterns

Good start

Local winds shaping regional climate & weather patterns & human activities

① (Day) Land & Sea Breeze (Night)



Map

Weather impact

- Being relief during day
- Frequent showers along coast if moisture present is huge
- Recurring weather phenomenons

② Katabatic & Anabatic winds

Katabatic (Night)

Anabatic (Day)

→ help in defreezing of mountain slopes

→ creates foggy weather conditions

Include impacts on human activities

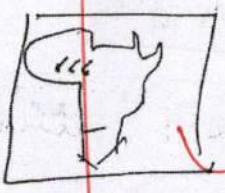
Remarks

Other winds & their impacts:

③ Chinook :- Melting of snow (direct sublimation) in central America

* Cold winds

④ Harmattan : Doctor winds



relief in Guinea coast by causing evaporation from sticky & humid atmosphere

⑤ Sirocco : hot & dry winds along Northern Africa from Sahara

⑥ Mistral, Bora, Buran, Karbiran, Siberia

Form as other local winds

Economic impact
- Agriculture on slopes (as Mistral)
- Pasture creation - Livestock rearing
- Relief from incessant (Chinook) temperature
- Fishing & marine economy (Land & Sea Breeze)

Thus local winds significantly impact the weather condition of the surrounding region.

Remarks

3.5

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)

Why Occlusion?

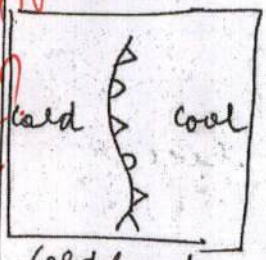
Occlusion is the last stage of the process of cyclogenesis where cold front tends to completely lift the warm sector (or) the warm air mass gets completely lifted along warm front

Start with Defining Mid latitude Cyclone?

→ Role of occluded

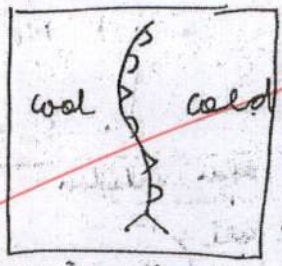
Body Part

Types of Occlusion



← Cold sector (behind cold front) overtakes the warm front-

Cold front occlusion



Cold sector ahead of warm front overtakes the cold front

Warm front occlusion

a transition zone reappear

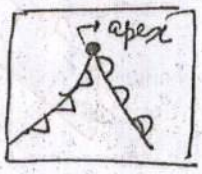
occlusion process starts from apex

Characteristics

Inversion prevails

depends upon speed of cold front (shift in ground position)

warm air gets completely lifted



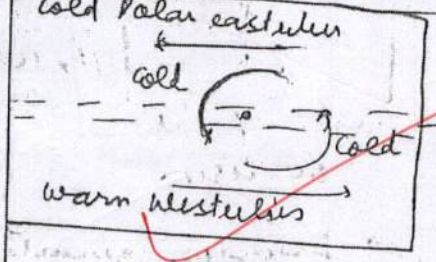
Remarks

Weather associated :

① As cold front passes

- Actostratus clouds visible
- Later Cirrus clouds appear
- Level of Inversion is created
- Absolute stability prevails
- Clear, dry and sunny weather
- No Rainfall takes place
- Exchange of heat takes place

include
- Cumulonimbus clouds
- Thunderstorms
- Occlusion b/w Cold & warm fronts
- Erratic weather.



Thus an occlusion stage marks the end of a temperate cyclone and last stage in the process of FRONTOLYSIS..

Fair

3.5

Remarks

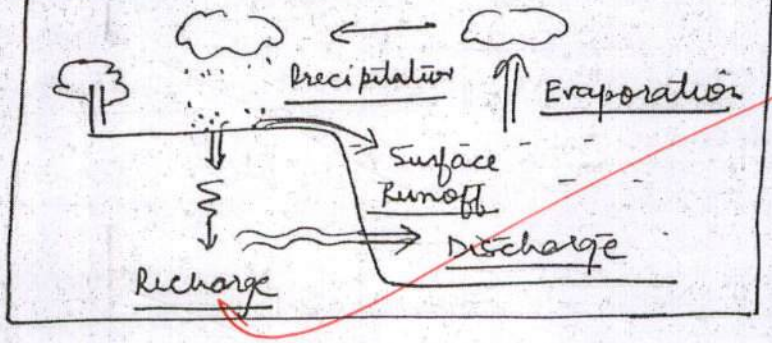
1. (e) Discuss the concept of water balance and its importance in the hydrological cycle. Explain how the water balance is influenced by inputs and outputs of water in a given area. (150 Words) (10)

Wrong Start.

Hydrological cycle can be defined as the state of balance maintained between different water reservoirs such as atmosphere, land and ocean bodies. This balance is dynamic in nature.

Start with Water Balance

Process of Maintenance of water Balance



Thus water Balance is maintained by a 5-step process:

1. Evaporation
2. Precipitation
3. Surface Runoff
4. Recharge
5. Discharge

Elaborate

This balance continuously changes but the composition of water in each step remains the same (Dynamic Balance Maintained)

Join

Remarks

Micro - regional impact of on Hydrological cycle

① Concretisation (Urbanisation) → Increases surface runoff and reduces recharge capacity.

② Agriculture → excess groundwater extraction and increased runoff.

③ Pollution → Increased intensity of insolation leading to greater evaporation & extremes of precipitation

④ Discharging effluents → concentration of acid in water increases impacting ocean-water ecology.

⑤ excessive livestock rearing ⇒ Increase in GHGs (methane) ↓ Increased Insolation impact → Greater evaporation & precipitation

Thus a shift in reservoir capacities and quantities is seen recently due to anthropogenic causes. This state of dynamic balance is constantly altered creating environment hazards where protection via fulfilment of SDG is & adherence to NDC's is must.

Remarks

Discuss inputs outputs of water

Agri

Jair

3

* Refer Discussion Video

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)

Earth's heat content remains dynamically stable as it acts as a perfect black body where the heat absorbed via Insolation is equal to heat released via terrestrial radiation.

Decent Start

Sensible heat : * The amount of heat that enters the earth's atmosphere and contributes in heating the atmosphere and surface of earth is called Sensible heat.

* The amount of heat entering the atmosphere is not all absorbed, a portion gets reflected back playing a role in heat balance.

Fairly relevant.

Latent heat : Various processes occur on earth – ultimate energy - Sun

Better to compare & contrast in table form on basis of parameters

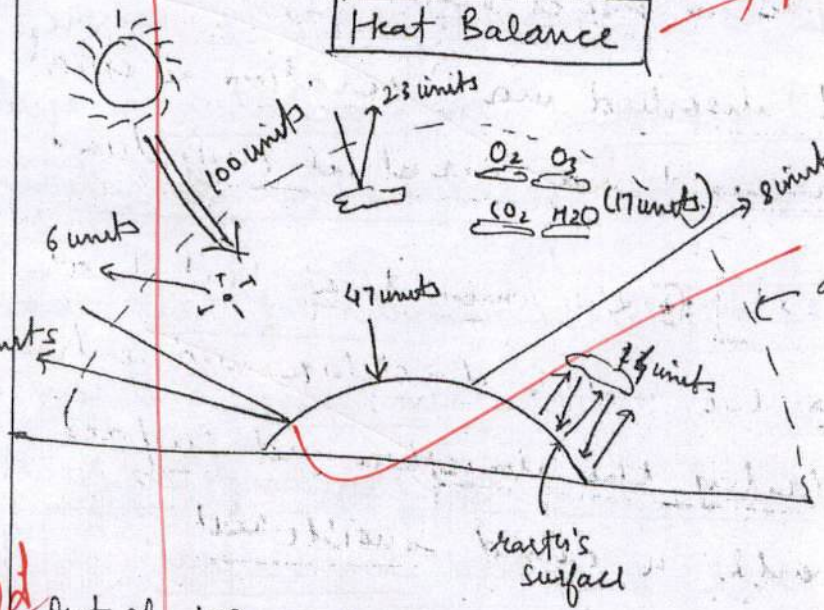
Latent heat of Vaporisation	Latent heat of condensation
The heat which is released when liquid converts into vapour.	Heat which is released when liquid condenses from vapour state.

Remarks

⇒ Helps in raising cloud upwards (pushes)

Thus, Latent heat forms a crucible part of sensible heat received by sun.

Heat Balance



Out of 100 units from Sun

Planetary albedo
- Scattering = 6 unit
- Ice (Albedo) = 8 unit
- Clouds = 23 units

} 37 units (No part in Heating)

Rest 63 units enters the atmosphere

Of which ⇒ (17 units) - absorbed by atmosphere

(Upper atm) O_2 & O_3 + $(CO_2 + H_2O)$ = Lower atmosphere

Remaining 47 units strike the surface and gets absorbed by it.

Remarks

Terrestrial radiation emitted at night

(47 units) ⇒
- 8 units directly to space
- 23 units ⇒ conduction & convection process (atmosphere)
- 14 units ⇒ Latent heat of conduction & Condensation
- 2 units released via convection

∴ atmospheric absorption ⇒ released

∴ Terrestrial radiation ⇒ (goes out)

Hence heat balance maintained

Sun's insolation forms primary source of all energy on earth

Significance:
- Maintain the global liveable temperature (≈ 16°C)
- Used for renewable energy
- Self balancing phenomenon (keeps temp constant)

Thus, increasing amount of green house gas in atmosphere is causing shift in heat balance leading the global warming which needs adequate prevention

Remarks

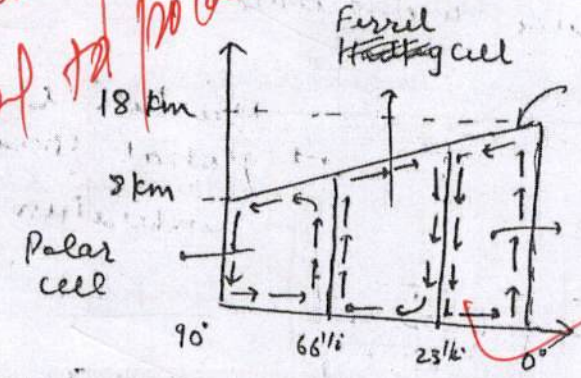
* Answer required more content.

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)

After constant lines from Halley, Hadley, it was Ferrel who proposed his Trimeridional atmospheric circulation concept explaining the surface, upper air and sinking/rising winds functioning on earth.

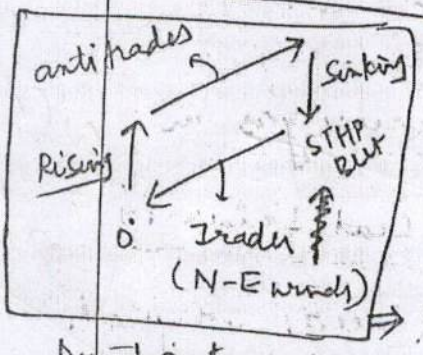
Decent start include ↓ World wide ↓ Transportation

Atmospheric circulation



Wind directions & phenomenon

① Hadley cell – Thermal origin – intense solar insolation → L.P at surface → air parcel 's rise (∵ ELR > DALR) → diverge due to cooling & reaching tropopause



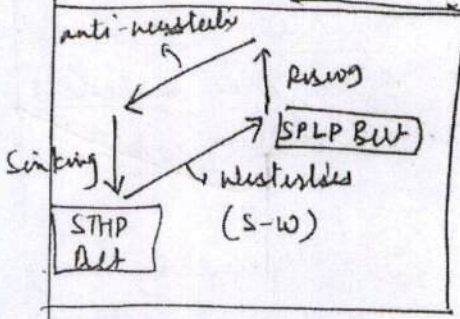
⇒ At tropopause (23½°N), it cools & subsides due to → Coriollis blocking effect
→ Thermal radiational cooling

Direction & wind	Remarks

Avoid out of Margin

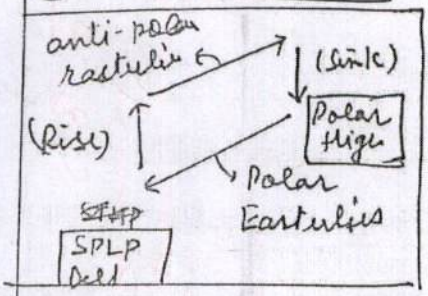
and diverges at Sub Tropical HP Belt. One Branch moves as N-E winds towards the equator creating the cellular structure

② Ferrel Cell:



The thermodynamically STHP Belt causes wind to diverge in Northward direction as westerlies which rises at SP-LP Belt and returns to STHP Belt in upper atmosphere along tropopause creating Ferrel cell

③ Polar cell:



A thermodynamic zone which narrow space causes polar easterlies to spread out and coriolis force helps rising of these winds along SP LP Belt from where one branch returns towards polar high creating polar cell.

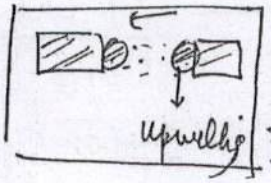
fairly relevant points

Remarks

Explain & Discuss

Importance

- global heat distribution
- Various anomalies in form of Jetstream, Cyclone & Air Masses depend on these planetary winds
- Weather patterns are decided by surface winds
  - Mediterranean Rains
  - West European Rainfall
  - Tropical Monsoon Type
- Vegetation, economy of an area depends on these winds
  - (eg) ⇒ Upwelling along eastern equatorial oceans due to Trades ⇒ Fishing zone



Driving forces :

1) Ultimate energy = Sun (Insolation)
2) Pressure differences → Pressure gradient force
3) Coriolis force → deflection & direction
4) Local occurence - Orographic fall (Leeward side)
   (eg) Chinook, Mistral

this need to elaborate (can part of question)

Add frictional forces centripetal forces etc

Thus Planetary winds system impact global atmospheric circulation which determines the economy, geography, polity & society of any region

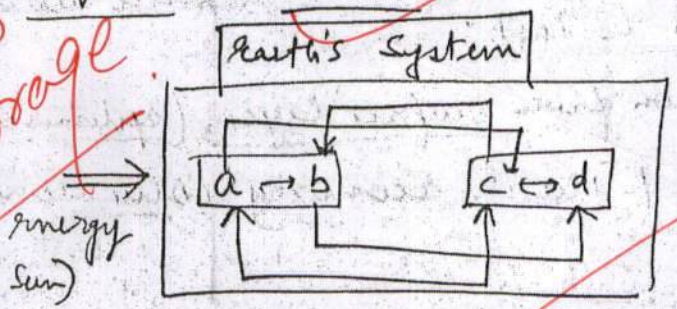
Join

Remarks

6

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 Geographic system is an ~~closed~~ open system where the net heat received from sun tends to move from one energy acquirer to another



a, b = various ecosystems on land

c, d = various ecosystems on sea

arrows = constant exchange from one to other

Heat storage occurs in various constituents:

(a) Living organisms (flora & fauna)

(b) Ocean & water surfaces

(c) Land heats quickly (low specific heat capacity)

(d) Stored in clouds.

(e) Various natural phenomenons — cyclones, oceanic currents, Air masses, Jet Streams

Start with concept of heat storage

Apt

Valid

Remarks

Role of oceans in storing & redistributing heat

(Murray's oceanic heat storage constituents)

1. Currents
2. Pelagic and Neritic deposits
3. Ocean borne phenomenons
   - Cyclones
   - Storms
   - Water currents

Ans

Thus heat stored is lost:

1. Evaporation from surface layers (epilimnion)
2. Fishing & marine economy (Blue economy)

Role of landmasses in storing heat

Storage:

1. Land's low specific heat capacity
   (quickly looses & gains heat)
   - Insolation (Day)
   - Terrestrial Radiation (Night) (longwave) traps

Release:

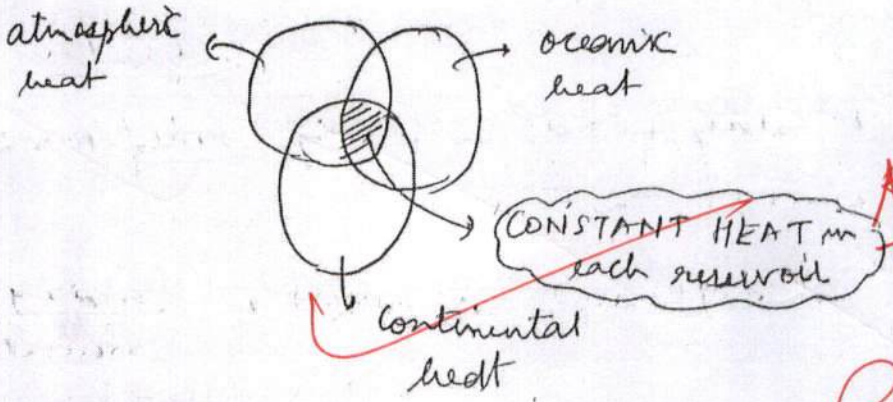
2. Flora & Fauna ⇒ changing energy forms
   Plants ⇒ (food) ⇒ Fauna
   (autotrophs) (consumers)
   In these processes heat is released as well.

Valid

Remarks

Inference: This balance is visible in the global average temperature of earth which remains constant during this dynamic heat balance

Global average temperature = 16°C



Thus, human indulgence in this fine balance is leading to a change in this balance which has recently increased global average temperature to 17.1°C on July 3 and 4 which is highest ever recorded. Thus pollution of GHG's and influence with ecosystem balance should be avoided at all cost maintaining sustainability in actions.

Remarks

* Try to include role of cryosphere also

Adequate

Role of atmosphere in heat storage:

Storage:

① Clouds, rain pellets, ice pellets, frost & fog
⇓
heat storage in form of latent heat of
↙ Condensation ↘ vaporisation

② Planetary winds exchange heat from one place to another.

③ Atmospheric phenomenons → Secondary & tertiary circulation
to gain heat in various forms

Release $

① via same processes as above

Heat exchange

land/continents → oceans → atmosphere → land/continents

a circular loop

Thus, net heat in the atmospheric & Biodiverse realm remains constant

Remarks

Conclude with impact of heat storage and distribution over earth.

8.5

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's recently released "Synthesis Report" has highlighted that Earth is on course breach the 1.5°C mark and even 2°C mark breach is possible enclaving significant impact on global systems.

Decent start

Impact on Atmosphere:

(1) Rising pollutant emits in environment

(2) Increased green house effect due to increase CO_2 in air. → ↑ use of GHGs.

(3) Frequency of solar insolation increasing

(4) Change in global heat Budget & Balance

(5) Increased instability in varied region

(6) Extreme climatic events

- Highest global temperature: July 3 ⇒ 17.1°C (average)
- warmest: February & March
- Rainfall: (eg Wettest July-2023)

Fairly relevant

Remarks

Impact on Hydrosphere :

① - Ocean acidification (Largest CO_2 intake occurs here)

② - Coral Bleaching - Mass scale.

(1st Coral Bleaching mass event due to La Nina - 2022

③ Increased frequency of Tropical cyclones

(eg) Andaman Sea cyclone increased

④ Regular occurrence of Super cyclones.

(eg) Amphan

⑤ Marine Biodiversity threat & migration

(eg) Beluga whales → moved North from east USA coast

⑥ Oceanic pollution - risks of eutrophication (algal Bloom)

(eg) Industrial wastes & Fertilizers

Impact on Biosphere :

① Threat to plants - getting extinct &, animals getting extinct

$ endangered

Remarks

Good

Scanned with OKEN Scanner

② Carbon sink - deteriorating

Amazon forest in 2021 ⇒ Carbon Sink → Carbon Source

③ Impact on humans

↓ migration & Adaptation lack

perpetuate cycle of Global Climate Change

Release of CO_2 → Climate change → Adaptation (illogical) → Increased use of AC's/Refrigerator → Global Cooling Cycle

Impact on Cryosphere :

1) Melting of Polar Ice Caps beyond Triggering effect

2) Rise of sea level

3) Increased habitable zones in such region

4) Polar caps ⇒ perpetuating climate change by reduced Albedo

Thus, Global Climate Change has collectively threatened the human existence & leading towards 6th Mass extinction.

Remarks

Good 20/24

Include more points

Fair

Avoid

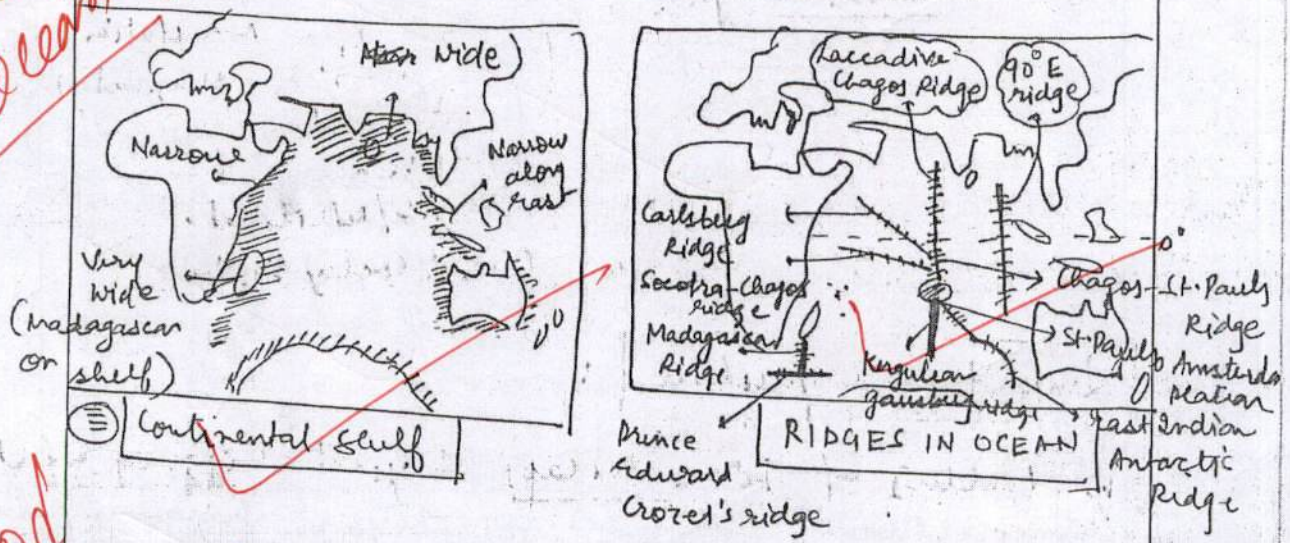
F.

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)

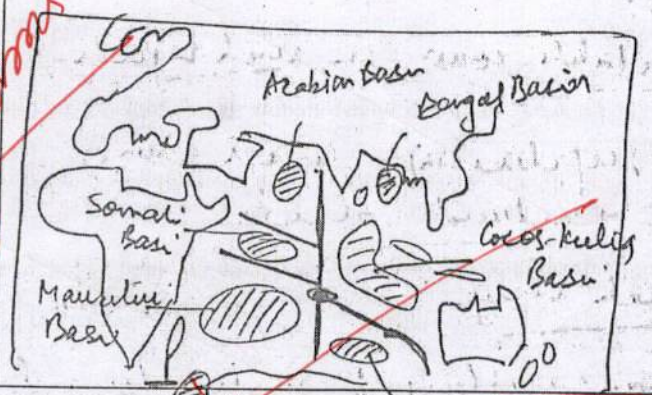
Bottom Topography of any ocean depends upon the internal plate structure which vary from place to place over oceans creating contrasts over the deep basins.

Start with briefly discussion of Indian and Pacific ocean

Bottom Topography of Indian Ocean



Good diagram



Imp Islands on them

Volcanic	Continental	Coral
• Barren	• Sri Lanka	• Lakshadweep
• St. Azuri	• Madagascar	• Maldives
• Mauritius		• Reunion

Remarks

BASINS

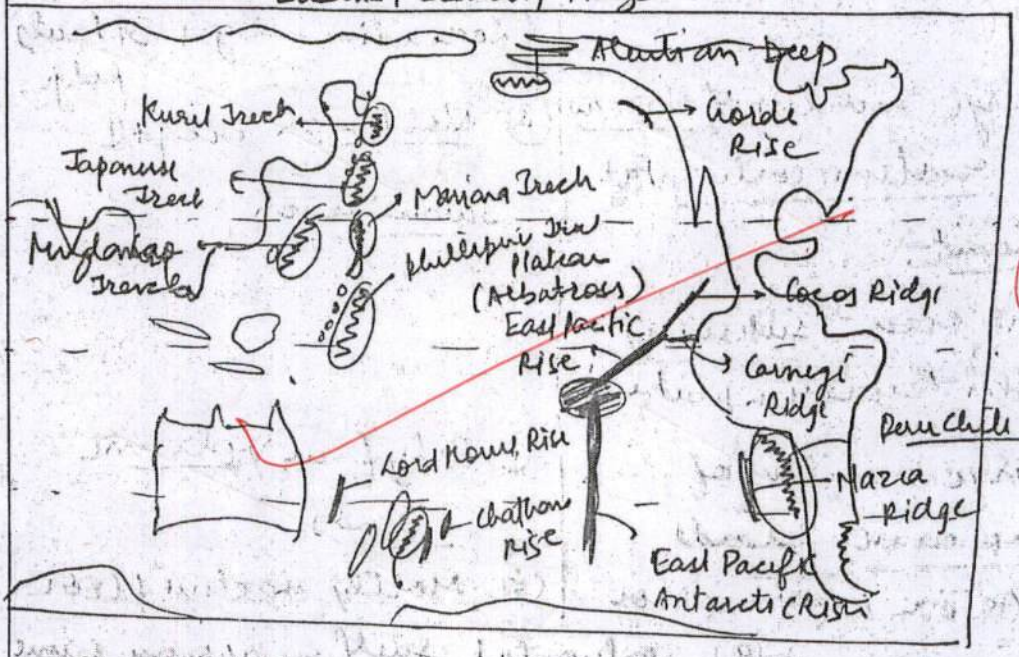
Marginal Seas on Indian Ocean :

① Red Sea ② Persian Gulf ③ Andaman Sea

④ Bay of Bengal ⑤ Mozambique Channel ⑥ Arabian Sea

Pacific ocean - Bottom Topography

Basins / Trench / Ridges



Good

Deeps in ocean

Aleutian Trench

Kuril Trench (Vityz deep)

Japanese Trench - (Ramapo deep)

Mariana Trench - (Challenger deep or Mariyn deep)

Philippines Trench (Cape Johnson deep)

Imp Islands

① Coral - Indonesian Islands
- Nauru Is. (Coral △)

② Continental Islands
- Islandic - Java & Sumatra

③ Volcanic Islands
- Japan - Philippines

Remarks

Peru Chili Trench - Bartholomew deep

elaborate in 1-2 lines

Differences in Pacific & Indian ocean.

Pacific ocean	Indian Ocean
① Largest ocean body and deepest	① 3rd Largest and 2nd deepest
② Contains no mid oceanic ridges	② Contains a single Mid Oceanic Ridge (Laccadives - Chagos - St Paul's Ridge)
③ Large number of Trenchs on Eastern continental Limit. (Pacific ocean subsiding under Eurasian plate	③ No Trench except ① Java Trench
④ Large number of volcanic Islands	④ Only few volcanic Islands
⑤ Active ocean floor	⑤ Mostly inactive floor

Similarities: ① Continental shelf → approx same area

② Coral Islands dominate

Thus, Both Pacific ocean & Indian ocean form an important part of ocean bottom study Adequate understanding & study is needed to figure changes occuring in groynes, coral beaches.

Remarks

Appropriate points

Fair Conclusion

Good Attempt

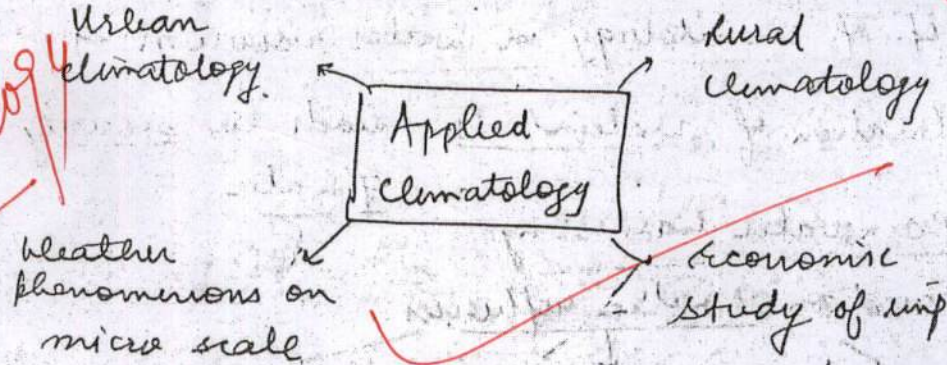
7.

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)

Climatology can be defined as the study of ~~climate~~ and its phenomenons and its impact on various human activities.

Start with Applied Climatology

Add - (H. Smith)



Agriculture :-

① Deforestration and entering of industrial phenomenons

② Use of fertilizers to a great extent

- Eutrophication
- Algal Bloom
  - ③ Red algal Bloom (NY coast)
- Salinization
  - due to capillary action

Valid

Remarks

③ Use of High Yielding Varities and its climatic impact

HYV's → Pollen spread → climatically active hygroscopic nuclei

④ Excess rainfall → clogging & flooding ⇒ less yield.

Could Add - Spatial distribution of Crops

Role of of climatology in water resource management

① Creation of watersheds - leads the security of water

② Rainwater harvesting based on climatic influences

- Deccan → Tanks / stores
- Manipur (North East) → Bamboo irrigation
- Northern plains → Bore wells & Tubewells

③ Creation of embankments the prevent river run off towards flood plains

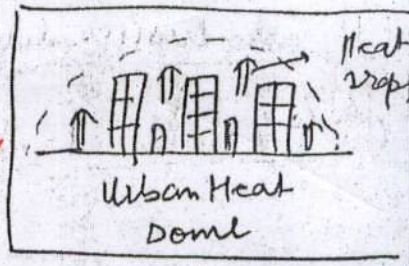
④ Role of Irrigation techniques depends on climate of the region.

Remarks	
Poldars / Marshes	(Eg) Restoring Italian Coastal marshes
	(Eg) Polders of Netherlands

Appropriate Analysis

Role of climatology in urban planning

1. Understanding impact of Urban Heat Islands
2. Recreation of concrete structure into seep zones
3. Soaking footpaths (green) ⇓ (eg) Amsterdam
4. Role of micro level precipitation & forest cover
5. Urban dense forest cover (eg) Miyawaki forests and its impact in arranging urban Biodiversity



Fair could include Green Buildings etc

Thus Urban, Agri and water resource mangemt intensly depends on study of ~~urban~~ applied climatology.

Significance in learning ~~UCO~~ Applied Climatology

1. Urban planned infrastructure development
2. Agricultural protection from climatic vagaries (eg Monsoon - gamble for agriculture)

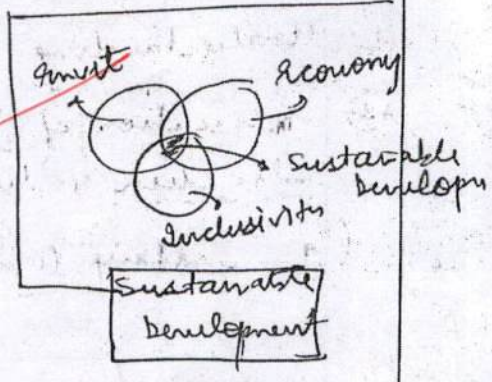
Agri

Remarks

(3) Sustainable development - maintaing future of next generation

(4) Inclusive development

(5) Peoplenet technology



Thus, urban, rural climatologic impacts must be focused on and ideas of Indian meteorological Dept (IMD) to enhance of study and research of holistic nature must be incorporated

Fair Conclusion

8.5

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)

Micro climatology can be defined as the study of climatic phenomenons and their occurences in a sub-regional scale impacting the area individually. (focus on Atmospheric layer near ground).

Application:

① Urban Heat Islands study
- weather pattern
- pollution level
- rainfall pattern

② Local winds and its impact

(a) Chinook ⇒ keeping ice away from plains


pasture available

(b) Harmattan ⇒ Doctor winds.
* Relief at Guinea coast & West African humidity

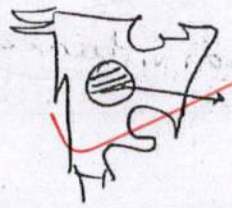
(c) Mistral ⇒ Switzerland - Cold winds impacting Terrace farming

Remarks

③ Study of local weather phenomenon
(Eg)

ⓐ. Thunderstorms – its origin & its impact on local weather

ⓑ Tornadoes & Twisters
(Eg)



④ Its impact on local water bodies & zonal distinguishing criterias

2nd Part of question need to elaborate & discuss in detail

Factors influencing Microclimate:
- Local physiography (Orographic Barriers)
- Anthropogenic activities → Deforestation, Concretisation, Infra
- Local level green space → Research → Miyawaki forests attract precipitation
- Presence of protective or destructive layer of pollutants → Global cooling, Global warming

Large scale regional climatic impact has demanded a thorough study of Microclimate.

Include scope.

Remarks

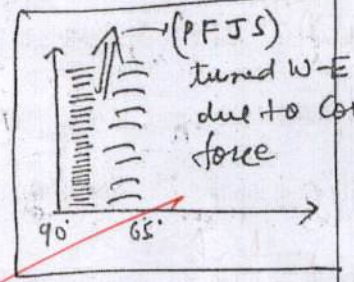
(3)

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 the section of upper air westerlies which get extremely intensive velocity in a concentrated core.

Characteristics:
- Move from west → east
- Circumpolar in nature
- Extreme velocity in upper air
- In both Hemisphere
- Move with apparent movement of sun

Polar Front Jet stream: are created due to the convergence of polar easterlies and warm westerlies over polar low pressure zone in upper air troposphere due to difference in pressure and coriolis force impact.



Significance:

(1) Impact the weather of temperate region - (eg) Temperate cyclone only source of rain

(2) Helps in clearing out pollution in temperate region (invasion prevails) ⇒ steers pollution in upper air & beyond

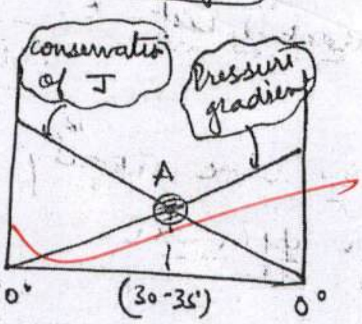
Remarks

(3) Global Heat Balance & Heat exchange via Meandering & its life cycle index.

Sub Tropical Jet Stream :

result due to maintanence of conservation of angular momentum and max pressure gradient need at 30–35°.

∴ at point A ⇒ The Net effect of J and Pg is max resulting in westerly jet stream of immense speed



Significance :

ⓐ Steers western disturbances (4 depression/week) in S-E Asia

ⓑ Intensifies the S-E Monsoon

ⓒ Date of Indian monsoon is decided by its northward shift from Tibetan plateau

ⓓ ~~Calm, and~~ Create Tropical Cyclones in Indian Ocean (eg) Biparjoy

Jet streams thus help in maintainig global heat balance and creation of various weather phenomenon.

Remarks

Valid — Fair — Weather pattern influence — Apt — Influence of Air traffic missed — Avoid out of margin writing — fine conclusion — 4.0

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

Ocean stratification can be defined as the layering of layers of ocean water at different depths according to their temperature and salinity variations.

Good Start

Insolation received by Sun

Reasons

Ocean Stratification

Ocean currents operating

Temperature intake and evaporation

Density differences in various layers

A/22

* Include Concept of Density

Ocean stratification & Temperature

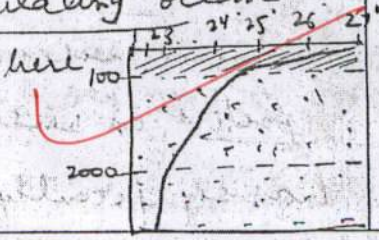
(in Km)

0 — EPILIMNEON → Warm/Cold circulating ocean currents here.

100 — THERMOCLINE → Rapid rate of decrease in temperature occurs here

2000 — HYPOLIMNEON → Cold uncirculating ocean water lies here

Max depth



Valid

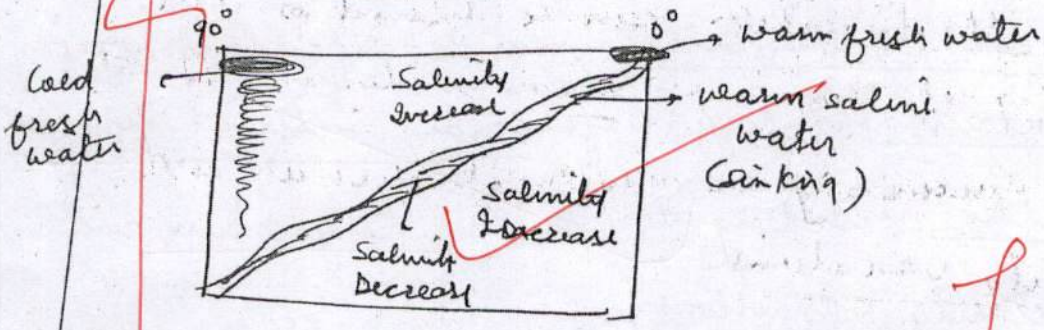
Remarks

Depth (Mts)

(Temp change w/i oceans)

Ocean stratification & salinity

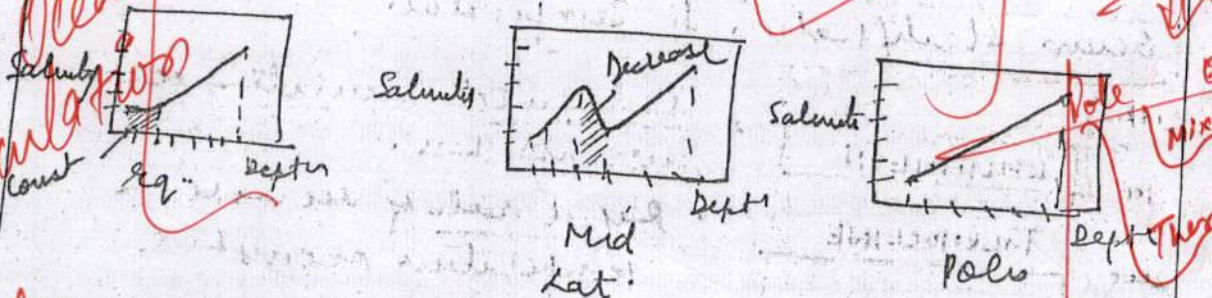
(Vertical distribution)



(a) At equator ⇒ at surface - less saline freshwater exists.
beyond that - Salinity rapidly decreases

(b) At Middle latitudes ⇒ first salinity increases, then decreases and then increases

(c) At poles ⇒ Salinity increases as one moves down.



Thus, ocean stratification occurs due to varied reasons and combination of most factors as well. Recent temperature rise of 1.1°C has significantly affected ocean acidity & shift in stratification which needs caring

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)

Salt budget is the amount of salt present in oceans which remains constant always.

Various methods of salt Balance :

$$Q_a + Q_b - Q_c - Q_d = 0$$

Q_a = Salt added via atmosphere & natural process (Volcanic)

Q_b = Salt added via marine & human ecosystems.

Q_c = Salt extracted via human processes

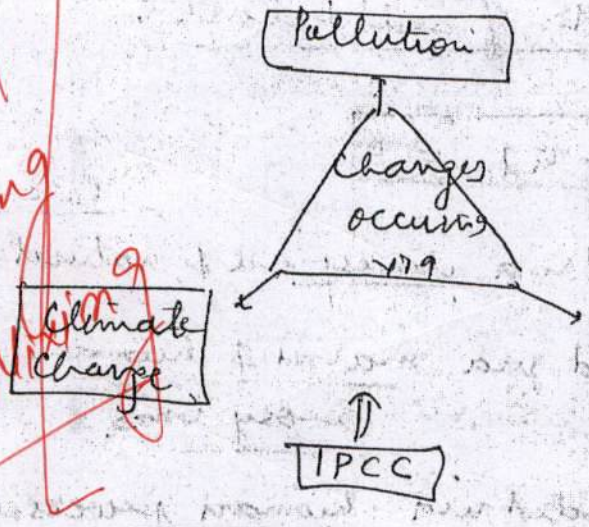
Q_d = Salt extracted via natural process

Thus this state of Balance always remains constant.

Any change in the balance creates natural calamities by impacting natural oceanic flow via.

Remarks

- Ocean Currents
- Tidal conditions
- Marine ecology - Migration of fauna
- Eurythaline & Stenohaline changes.

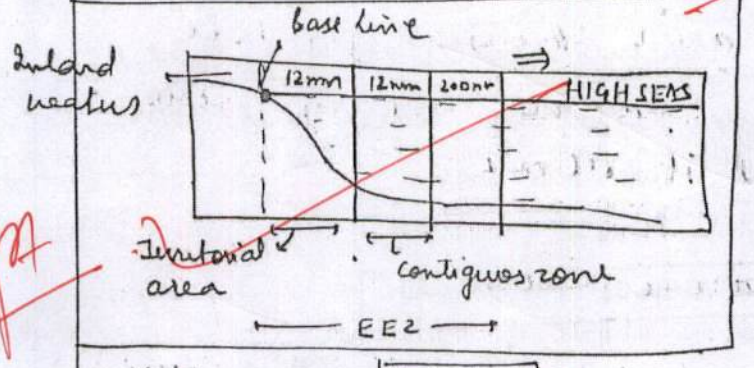


Thus, adequate prevention to the oceanic ecosystem must be looked into with adherence to UNCLOS and other oceanic treaties along with UNFCCC mandates.

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)

Recently announced / accepted High Seas Treaty also called Marine Biodiversity Beyond National Jurisdiction (BBNJ) has firmly put in place the concept of Marine Protected Areas giving it a legal status.



UNCLOS

It is in these high seas that marine protected areas will occur

Constituents of MPA's:

1. Islands - uninhabited rich in Biodiversity
2. Coral Islands - beyond National rule
3. Pollution free high seas - end illegal dumping
4. Cleaning polluted stretch
5. Catering Biodiversity
6. Access to resources & benefit sharing
7. Improving Habitat

Remarks

Role in conserving Marine Biodiversity

1) Regulate fishing
2) Ban unregulated, bottom trawling.
3) Creating conservation status of marine biodiversity
4) Creating enclosed protected areas free from human touch

Almost 70% of Marine species are yet to be discovered. Thus what we have right now must be protected at all cost

Could Add: Marine Mapping, Species Conservation, etc

Role in use of Marine resources

1. Safe extraction of Polymetallic Nodules (PMN)
2. Regulation & remission requirement from International Sea Bed Authority
3. Adequate Environment Impact Assessment before any extraction.
4. Reaching the SDG target 14 > Safe use of life under water

Add: Opportunity for Scientific research

Thus MPA constitute an important step in prevention of Ocean acidification & preventing Marine heat waves

Fine conclusion

Remarks

4

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)

Oceans are richly endowed with both deposits and resources which are significantly used by humans for varied purposes.

fair

Classification of Ocean Deposits

- Terrigenous deposits
  - (a) Boulders, Gravel, etc
  - (b) Sand, Silt
  - (c) Mud
- Volcanic Deposits
  - (a) Red Clay
- Cosmogenous deposits
  - asteroids & meteorites deposit
- Biogenous
  - Remains of plants & animals of oceans

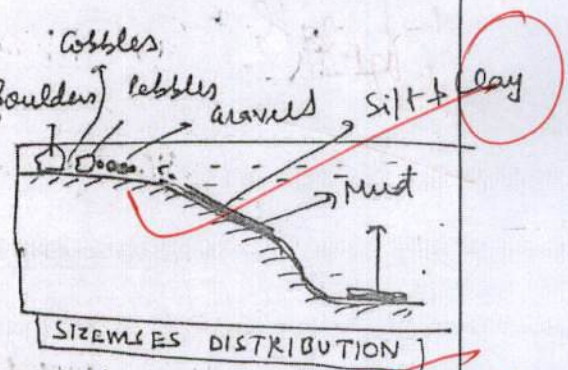
App

① Terrigenous deposits

(a) Boulders, Pebbles, Cobbles and Gravels from rivers & continental erosion process over continental shelf

(b) Silt & Clay

(c) Mud – lowest depth – (ultimately all deposits convert into it)



Global distribution occurs along continents

fair point

Murray's classification

Remarks

- Blue Mud → contains ⇒ FeS
- Red Mud → (FeO)
- Green Mud → Transformed from Blue Mud

offshore they are fine red clay.

Biological deposits

1) Neretic deposits → present on shallow depth
- dead & decaying remains of plants & animals (main)
- $CaCO_3$ is present in them
- Main found at Caribbean Sea
- Due to presence of coral's reef and its 90% erosion is Maya's Reef

High biological production

2) Pelagic deposits - based on algae.

(a) Calcarious deposits - found at relatively lower depths

(a.1) Pteropods → on mid oceanic ridges

(a.2) Globegerina → depth more than Pteropods
- Hard & in existed
- Not easily dissolved

Biogenous deposits

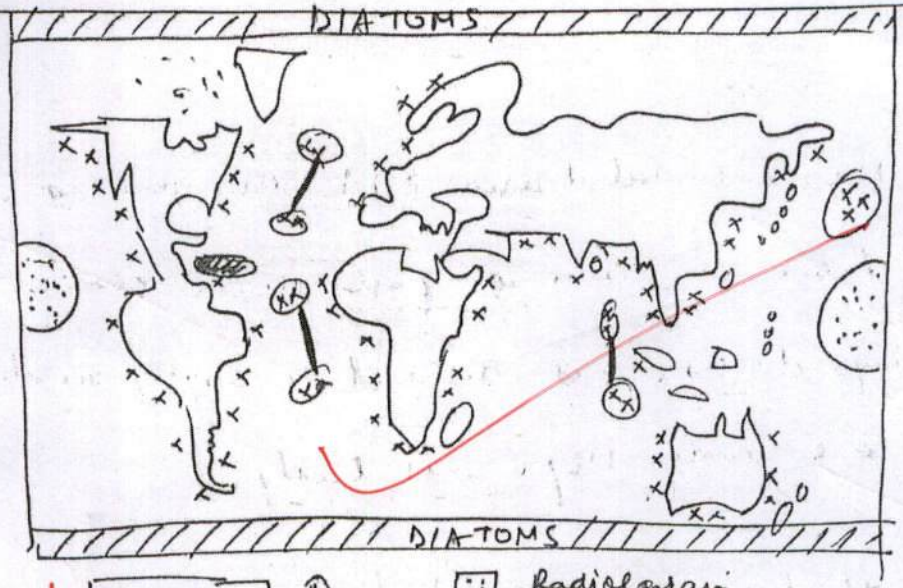
(b) Siliceous deposits - found at greater depth and contains Silica

(b.1) Radiolarain - Central Pacific & Central Indian Ocean

(b.2) Diatoms - Polar areas

(c) Red clay - from volcanic ash. The algae's growing & dying on ocean floor (most widely distributed)

Remarks



Good

Ocean Deposits

- Radiolarian
- Terrigenous deposits
- DIATOMS
- Pteropods
- Globogerina
- = Neritic

App

* You missed to include & discuss Hydrogenous & Cosmogenous deposits

Ocean deposits form an important resources for humans :

Uses	
Diatoms	⇒ fishes → Nutrition
Red Clay	⇒ Medicinal properties
Radiolarian	⇒ Anti-cancerous propeles
Terrigenous	⇒ Construction purpose, etc

Fair

Thus, its sustainable use and according to SDG-14, its prevention should be the motto

Remarks

5.5

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

Marine protected areas (MPA) are unhinged areas from the common parlance in oceanic realm beyond High Seas declared as legally binding zone under High Seas treaty.

Decent Start

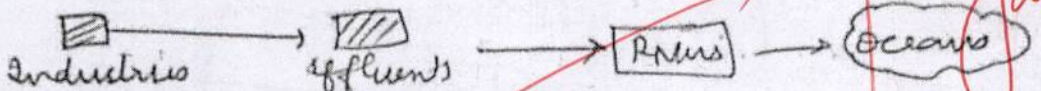
Effectiveness of MPA's

(1) Prevention of marine pollution

(a) Oceanic plastic

(2) Regulating oceanic discharge

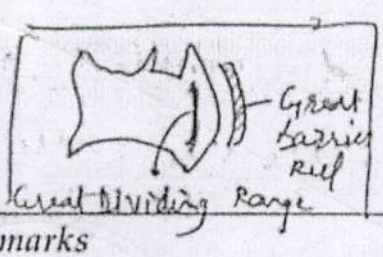
(a) Sewage Treatment plants



fairly relevant

(3) Creation of protected habitat for marine life

(a) Recently - UNESCO's designation the Great Barrier Reef (Australia) as endangered



Remarks

Role in **mitigation**:

① Environment Impact Assessment before any resource exploration.
→ {The process of reducing the impact of changing settled phenomenons}

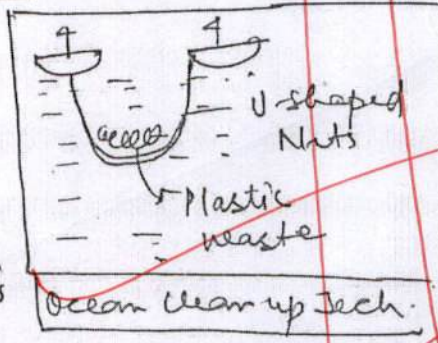
② Rejuvenating ocean biodiversity by creation of artificial habitats within MPA's

(Eg) - Accretion Technology (Biorock Tech) - for coral restoration along MPA in Red Sea

③ Ocean Cleanup Alliance getting a financial boost from MPA designating authorities, to purify waste.

④ Restoring Biodiversity -

(Eg) Introduction of Sea grasses along shallow coastal MPA's



Ocean clean up Tech.

⑤ Well functioning regulation regime

(Eg) - UNCLOS - its tribunal & exploration authority (ISA).

Appropriate Analysis could Act!

Promote Awareness & education

Self Purifying robust Eco Sys. etc

Remarks

* include some limitations & way forward

Thus Ocean clean up forms a quintessential and paramount want of 21st century to reduce the impact of climate change. Entrepreneurial initiatives such as Adidas making plastic threaded clothes & apparels to the need of the hour to overcome the risk that Oceans possess.

6

fair conclusion

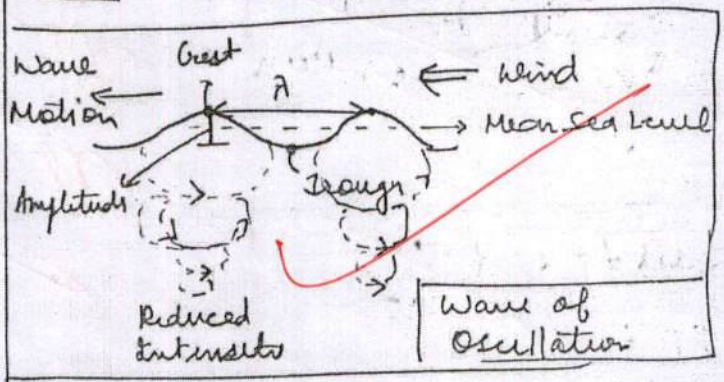
Remarks

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)

Various ocean phenomenons such waves, currents & tides are very important for understanding the coastal processes and their impact on humans

Fine Intro

Waves ⇒ are movement of energy due the varying carrying process our ocean mainly wind creates this oceanic phenomenon



Significance → Creates ocean phenomenon

Destruction along coast → removal surfaces (cliffs, Arches, Steep hills)

Renewable energy source (Wave energy) → Piezoelectric Cubes

Tsunami, Volcanic Burst, Landslides

Depositional surfaces → Tombolos, Sand spit, Coast – Beaches, Barriers, Reefs

Remarks

Relevant points

However presentation could be improved

Coastal dynamics
- Wave
- current
- Tide –

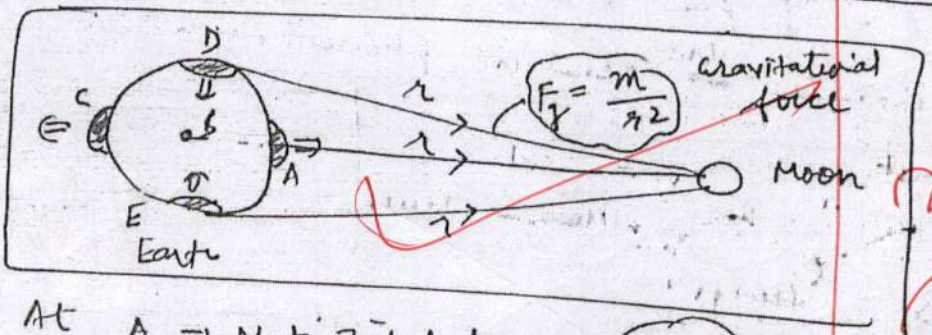
Navigation
- wave –
- Current –
- Tide –

Tides and its study

A Tide can be defined as the net impact of gravitational forces of Sun & Moon, Tidal forces of them & Centrifugal forces acting on the rotating earth

Acc. to Newton:

Tidal waves = Tidal force − Centrifugal force



not required

At A ⇒ Net Tidal force = $\frac{2m}{r^3}$

B = Net TF = 0

C = Net TF = $\frac{-2m}{r^3}$ result of Centrifugal forces

Thus tides get created due to gravitational pull of moon (& g of sun - some extent) and Centrifugal force acting on the rotating body.

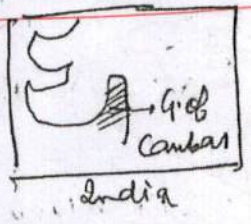
2 High Tides at A & C & 2 resulting Low Tides at E & D occur to compensate

Remarks

Coastal dynamics

Significance of Tides

1. ⇒ Creation of Renewable energy ⇒ Tidal energy
   - (eg) Gulf of Cambay (7000MW potential)



2. ⇒ Navigation purposes.
   Inlet gets filled with water during High Tide and results in passage of vessels.

3. ⇒ Biodiversity gets enhances ⇒ polluted stretch gets cornered (eg) Indian Ocean garbage pact due to Tides

4. ⇒ Helps in geostrategic purposes
   - (eg) movement of large vessels
   - (eg) Largest Tides of Norway

Valid point

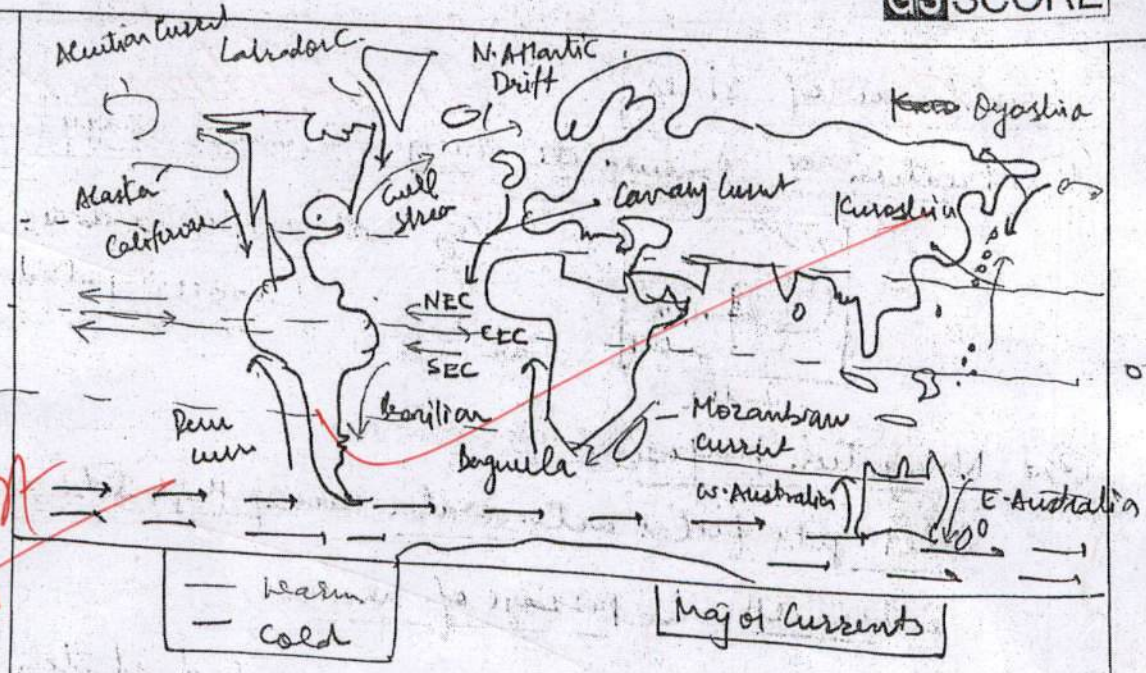
Currents :

Movement of water over ocean surface from hot zone to cold zone, helping in distribution of heat.

Causing factors:
- Insolation
- Density differences
- varying Salinity
- Coriollis force
- Nature of coasts & Bottom topography
- Latitudinal pressure

relevant

Remarks



Significance :

① Global Heat Balance & Heat exchange

② Maintain. weather — ④ West European weather (Gulf stream)

③ Defreezing ports & coasts ⑤ Norwegian coast (N. Atlantic Drift)

④ Influences weather patterns

Cold current → Dry & upwelling

Warm current → moist & No fishing coast

Fishing zone

⑥ economy decided ⇒ ⑦ Mixing zone of warm & cold currents

Ships, Warm, Tides & Currents are significant for human survival influencing large climatic patterns

Remarks

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