GSSCORE

An Institute for Civil Services

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TEST COPY

RUPAL SRIVASTAVA

AIR - 113

(CSE 2022)

GEOGRAPHY OPTIONAL

8448496262 www iasscore.in

34377 (1195)

GS SCORE

Geography Test Series 2022

TEST - 03

135

GEOGRAPHY

Time Allowed: 3 Hrs. *Max. Marks: 250*

Instructions to Candidate

- Please read each of the following instructions carefully before attempting questions.
- There are EIGHT questions divided into TWO SECTIONS and printed in ENGLISH.
- The candidate has to attempt FIVE questions in all.
- Question Nos. 1 and 5 are compulsory and out of the remaining, THREE are to be attempted by choosing at least ONE question from each Section.
- The number of marks carried by a question/part is indicated against it.
- 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 a medium other than the authorized one.
- Word limit in questions, wherever specified, should be adhered to.
- Illustrate your answers with suitable sketches/maps and diagrams, wherever considered necessary. These shall be drawn in the space provided for answering the question itself.
- Attempts of questions shall be counted in sequential order. Unless struck off, the attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

Name RUPAL SRIVASTAVA

Mobile No. _____

Date _____

Signature Rupal

1. *Invigilator's Signature* _____

2. *Invigilator's Signature* _____

REMARKS

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Roll No. 34377

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Section - A

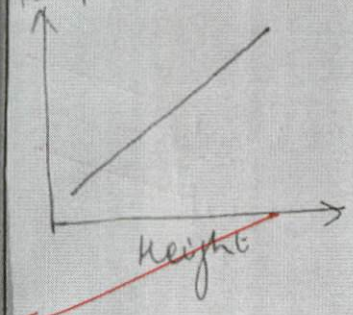
1. (a) Write a short note on Temperature Inversion. Also discuss its role on local economic activities. (150 Words) (10)

use words like negative lapse rate.

Temperature inversion refers to the opposite of the normal lapse rate. In this, with the increase in ~~temperature~~ altitude, the temperature also increases.

Condition for formation of inversion

→ Surface inversion = heating during day
= clear cloudless sky at night for heat to escape
⇒ calm horizontal winds.



→ Aloft inversion/ mechanical inversion ⇒ due to sinking of air at aloft high pressure

at the tropopause
- temperature increases due to ↑ in ozone

Temperature inversion can happen

- Land (Radiation)
- seas (Advection of air mass)
- valley slope
- upper atmosphere

Remarks

represent these phenomenons using diagrams.

Impact on local economic activities

(1) Dense fog formation affects
- crop yield due to frost bite
- Transportation issues due to fog
  Ex: Yamuna expressway fog in winter → good example

(2) Reduces cloud formation as air does not rise and thus affects local rainfall.
Ex: Low rainfall in Rabi season can affect crop maturity.

(3) But helps in fishery development
Ex: Grand Bank → mix of cold labrador & warm gulf current

Inversion is a natural phenomenon and thus care must be taken to minimize harmful effect.

* Also mention benefit of these for Yemen coffee cultivation.
* Also mention these are reason for worsening of weather in Delhi etc..

Remarks

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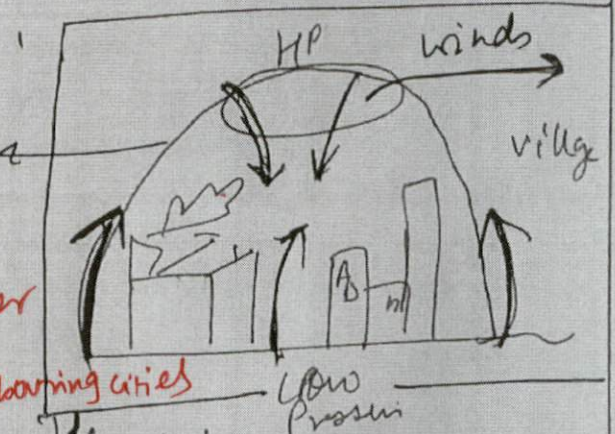
1. (b) Write a short note on Urban climate (150 Words) (10)

Urban climate refers to climatic changes in areas of dense urbanized regions. They are characterized by high temperature and humidity.

→ rather mention extreme weather phenomenon as these also face severe cold & precipitation

Urban climate can be understood as the formation of urban heat domes.

Urban heat dome



① city temperature Vs. rural temperature = 3-7°C contrast (Ex Delhi warmer by 3-4°C than neighbouring cities)

② Higher Bowen ratio > sensible heat / latent heat upto (58-65) = showing warming of cities.

Important aspects of urban climate

① Urban heat waves due to sharp temperature contrast

Ex: Delhi heat wave = temperature as high as 50°C → please cross check this it might be around 47°C

Remarks

GS SCORE

(2) Urban cloud burst to sudden increase in the humidity

Ex: ~~Shimla floods~~ 2017 = due to higher ~~tourist~~ footfalls also mention popular one like Banglore floods of 2019 or mumbais

(3) Urban cold waves due to weakening of heat dome in winters as rapid cooling of concrete structures.

Ex: cold wave in Canada → Weaker vortex → low temperature = -3°C

4.5

Urban climate's understandig will help in hazard planning and mitigation. Use of super-computers can help in climate prediction.

* Don't make mistakes like around 50°C observed etc..

Remarks

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1. (c) Chernozem Soil (150 Words) (10)

Chernozems refer to the Pedocal soils, rich in calcium found in cooler temperate zones of the world.

Process ~~of~~ acting in Chernozem
→ capillary action in the soil as lesser humidity
- gleyification and humification due to cooler climate - forming peat and potassium glauconite

① Chernozems are a type of zonal soils affected by climate patterns

② They are found in the Prairies of North America and steppes in Eurasia

③ Towards the tropics they are also called Chestnut soils.

④ These are black in colour but unlike black cotton soils which are formed due to weathering of basaltic rock

* Show there distribution in world map.

Remarks

(5) Chernozems Nutrients –
↳ calcium deposits
↳ organic matter = humus

(6) suitable for cultivation after addition of some fertilizers. Hence form the granaries of the world. (Eg: wheat farms in Prairies)

Chernozems are thus representative of cooler temperate climates. They can also be found in cooler himalayan regions upto 1000mtr height.

4.5

Remarks

(d) Write a short note on temperate grassland biome (150 Words) (10)

The temperate grassland biome is one of the few largest biomes of the world.

It is distributed in the latitudes of 30°- 45° N and South

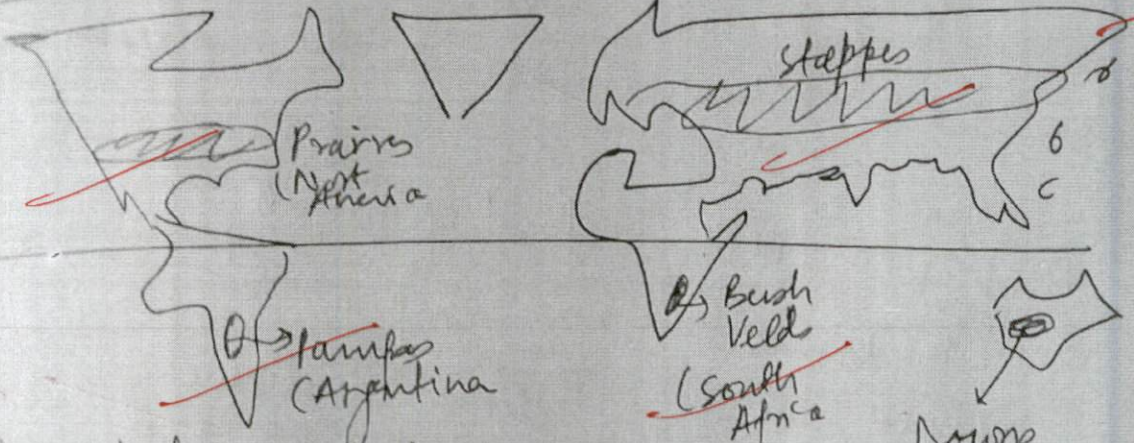

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Fig: global Distribution

Climatic features of the biome-

① Rainfall 75-100 cm/annum

② Temperature: Summer = 20-22°C
Winter = 2-15°C

③ Frontal rainfall areas. (subtropical Westerly Jetstream)

Nutrient found in the biome soil
- rich in peaty deposits due to cooler climate
- can be used for extensive cultivation with use of fertilizers

Remarks

III Grass type -

- short grasses like Alfafa and Lucerne can be found in these grasslands.

IV Due to large scale continentality, can often lead to extreme climate in the interiors.

V) Comparison with Tropical Grasslands

Temperate	Tropical
- Annual range of temperature = high	lower range due to tropics
- Rainfall = 25 - 100 cm	Rainfall = 110 - 150 cm
- short grasses	tall grasses.

Good comparison. (5)

Thus temperate grasslands offer a transitional zone between the tundra biome and Tropical deserts.

* Briefly mention the biome aspect with fauna characteristics of velds, also mention there economic significance like Increased ranching practices etc..

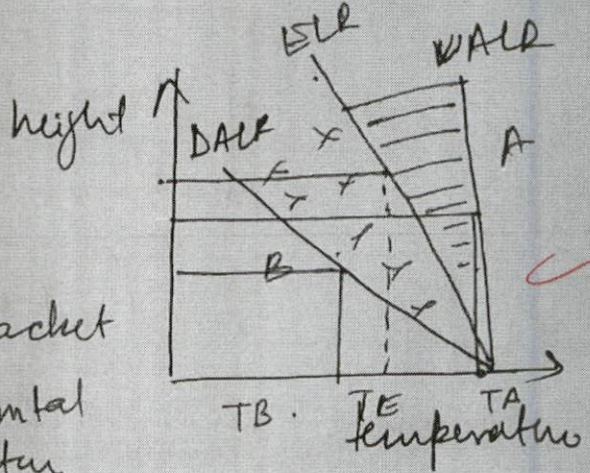
Remarks

1. (e) Conditional Instability

(150 Words) (10)

Conditional instability is an atmospheric condition in which a parcel of air is stable upto a certain height but once it is pushed beyond the height, it becomes unstable.

Graphical Relation



Zone A

- Temperature of air packet
  - $T_A > T_E$ (environmental temperature)
- Hence packet continues to rise and thus leads to instability

Zone B

- Temperature of air packet = $T_B < T_E$ (environment)
- Hence air packet does not rise
- stability in the atmosphere.

* try to explain using Numbers like ELR - 6.4°C/km etc.. It will help in easy understanding

Remarks

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How stability converts to instability?

① When the packet is lifted due to any mechanical barrier, it begins to lose latent heat of condensation

② temperature of packed thus increases and it continues to rise.

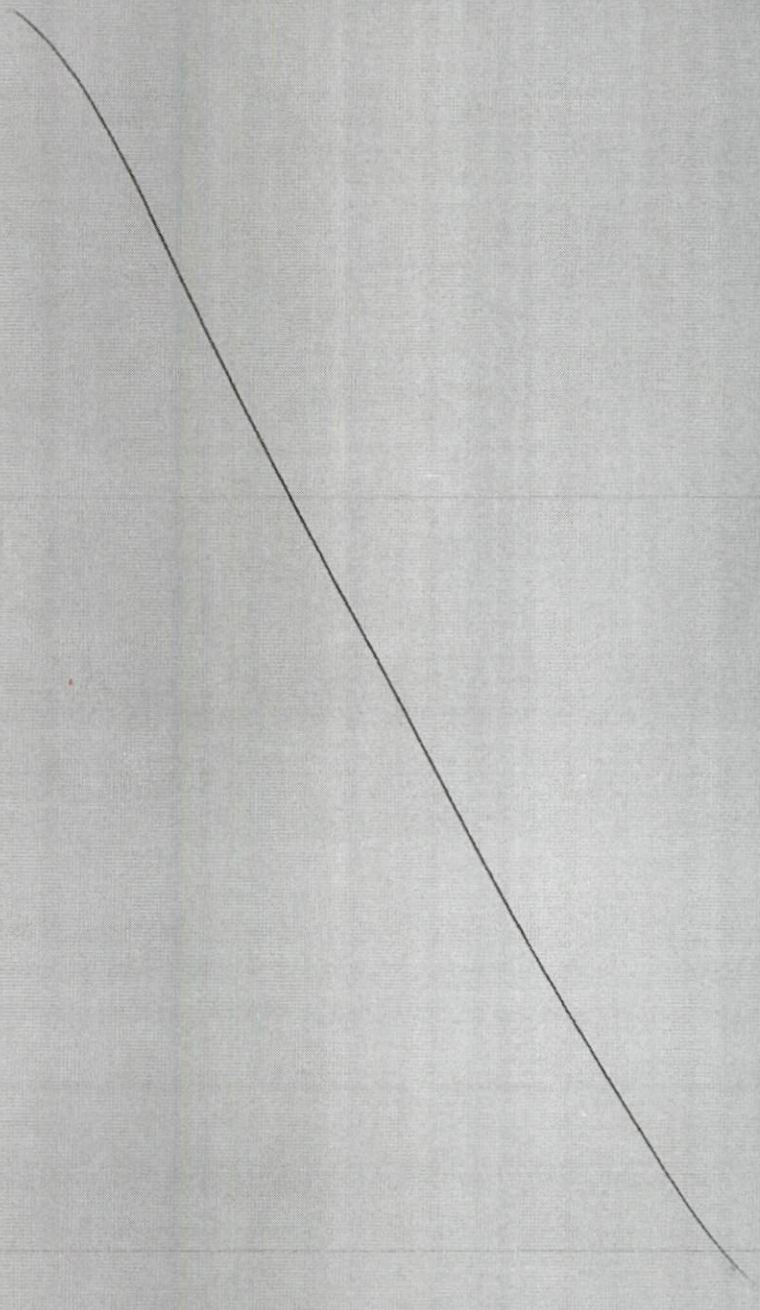
Atmospheric conditional stability can be used to understand the fog formation in area of orographic barrier. It also affects the temperature inversion in the stable zone.

5.5

→ Good answer
→ You have structured your answer in a fair order

Remarks

2. (a) The twenty first century has witnessed various outbreaks of new diseases including Covid-19 which threatened human and animal health. How far these diseases can be associated with the rapid habitat loss and deforestation. (250 Words) (20)



emarks

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2. (b) How can ground fog is different from advection fog and steam fog? (200 Words) (15)

Remarks

2. (c) Discuss the factors affecting wind direction and speed. Also write the conditions necessary for the generation of katabatic winds. (200 Words) (15)

Remarks

3. (a) Extreme climatic events are on rise both in terms of their number and severity in our country. Discuss the major causes and vulnerable areas in the backdrop of National climate vulnerability assessment report. (250 Words) (20)

According to the National Climate Vulnerability Assessment, India is now among the top 10 most vulnerable countries due to climatic events.

This can be seen in the rise in intensity and frequency of extreme events as follows-

① Urban floods.

causes → ① change in landuse pattern due to concretization of ground

② formation of urban heat chimneys due to industry and high rise buildings

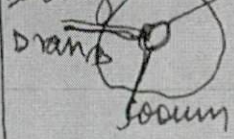
③ Clogging of storm and sewage drains.

Areas-

- Heavy density areas like Mumbai, Chennai, Shimla due to change in urban morphology.

Chennai Floods 2018

- Rainfall 160 cm in 24hrs



⇒ rapid urbanisation

↓

built up of urban heat island

Fig

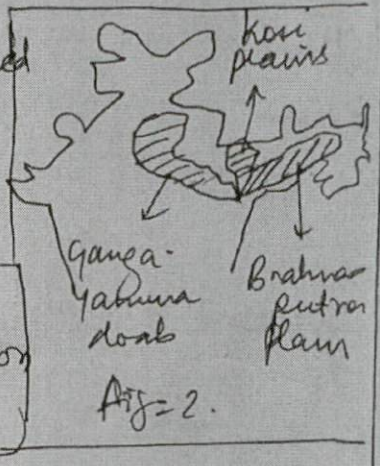
Remarks

II Floods in floodplains.

① Causes → floodplain modification affecting the soaking capacity.

↳ Intense rainfall due to climate change convectional cells.

Areas → floodplains of large silted rivers like Ganga, Yamuna, Kosi and Brahmaputra.



Adj = 2.

Good examples

Case: Assam floods | 2020&2021

- heavy rainfall due to deep depression + sediment load

III Tropical Cyclones

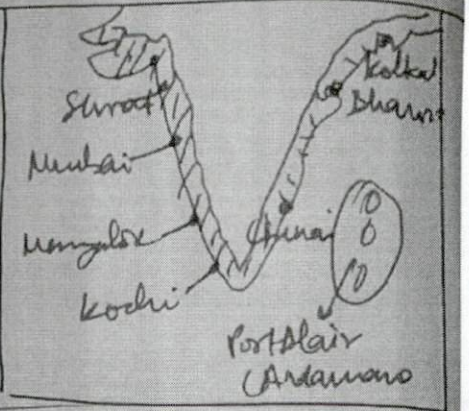
① Cause → ① Warming of Arabian Sea and Bay of Bengal at 1.7°C/decade (higher than global average of 0.7°C → IPCC 5th AR)

② formation of very severe cyclones and rapid intensification in 24 hrs.

Hence often 2-3 cyclones in a year in coastal areas. Eg: 2021 - Tauktae, Amphan etc.

Remarks

Areas. - Earlier only BoB coastline but now due to warmer Arabian sea, west coast also



IV Heat Waves and cold Waves

Heat Waves

Causes →

① Urban Heat Island effect → increases the Bowen's ratio

Areas

- All densely populated urban centres and rural fringes

Eg: Alwar Rajasthan > maximum temp > 53°C

Cold Waves

(i) Intense cold winds due to subtropical westerly jetstream in the northern plain areas

Areas

- Entire northern plains and Himalayan areas like that of Uttarakhand, Sikkim, Himachal etc

V Landslides in Western Ghats

Cause →
- Torrential rainfall (>200cm/day)
- Slope modifications of Western Ghats
- Dam Mismanagement

Proper Hazard Vulnerability Assessment of areas is needed. Also climate prediction systems like Pratyush at IMD Pune can help in mitigation measures.

Remarks * very well written & good presentation along with case studies.

3. (b) Discuss the possible impacts of introducing Genetically Modified crops on biodiversity? (200 Words) (15)

Genetically modified crops are those whose natural genes have been altered by biotechnology and gene editing to produce some special traits.

Ex: Bt cotton

→ Good presentation

Positive effects on biodiversity

① Higher yields of crops.
Ex: Bt cotton has yield rate as high as 80-85% as compared to regular cotton (55-60%)

② Root Resistance to pests, herbicides, Arsenic and salinity increase survival rate of the crop.
Ex: GM mustard - Herbicide tolerant.

③ Increase the crop production to help in melting food security. Ex: tests on GM soyabean

Remarks

④ Add aspects like Food Security ⑤ cultivation of GM soyabean helps in oil security for India

⑤ Economic benefits for countries like India which Imports soyabean oil etc.

However researchers like that MS Swaminathan have also pointed out to the risks of introduction of GM crops -

Risks

(1) Affect the ecological niches of native crops by taking over their functions and zones

(2) Affect the regular succession crops
Es: Regular cotton → matures in about 6 month
BT cotton → mature = 3 months

(3) Affect the nutrient cycling of the native ecosystem.
Eg: can lead to terminator seeds which have no further use in nutrient formation

(4) Competition and exclusion of native species of crops. Es: GM chana is being debated as it can lead to extinction of native 'chana' species

→ Genetic diversity resilience would be Impacted

Remarks

* monopoly of these technologies only by western / few 1st world countries.

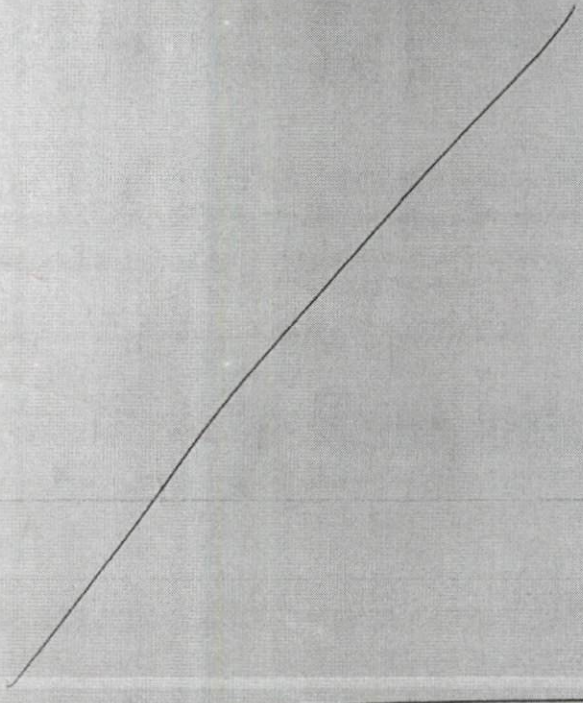
(5) Also the effects on human health have not been ascertained to well → fear of disease outbreak in humans

(6) can also lead to formation of superbug and resistant traits.

Eg: Bt cotton - resistance to pink Ballworm in Yavatmal (Maharashtra)

Any introduction of any GM crop must be done only after proper Environmental Assessment of the crop.

7.5



Remarks

3. (c) Discuss the major processes and factors involved in the soil formation. (200 Words) (15)

Soil formation is a slow process which is an outcome of various processes and factors. Some of these are active and some passive.

Soil forming

Factors

① Parent Material } passive
② Topography
③ Climate } active ⇒
④ Biological Agents
⑤ Time - passive

Processes

① Weathering
② Leaching
③ Podzolization
④ Gleyification
⑤ Mineralization

Good presentation

Role of factors

① Parent Material ⇒ decides the soil texture
Eg: Granite rock = coarse
Basaltic = fine

Soil colour
due to nutrient in parent rock
eg: Red soil due to Fe oxide.

Soil minerals
Eg: Basaltic black soil rich in Fe, Mg

Remarks

③ Topography - affects the soil profile

Steep → thin profile

gentle → thick profile

④ Biological Agents - determine the humus content of soil and thus soil organic matter.

⑤ time - a passive factor affecting soil profile

Ex Alluvial : young soil ⇒ less mature profile

Role of Climate and Process

① Weathering → Physical weathering (cold) Eg: Frost action, Onion Peeling (Hot)

→ Chemical Weathering in high temperature & humidity

↳ Eg: Oxidation, carbonation

② leaching

Al and Fe oxide (sesquioxide) ⇒ pans

(water) (illuviated) B

(illuviated) C

SiO_2 dissolves and leaches

- in warm and humid climate eg: laterite soil

③ capillary action

→ Alkaline deposits due to evaporation

A

B

→ found in warm and dry areas

Eg: Soils in Punjab

Just mention where these are found on global level.

Remarks

(4) Podzolization → A type of leaching
cool and moist areas (Hilly areas)
Acidic in nature due to 'chelating' agent
Eg: Himalayan soil → due to fir and pine

(5) Gleyification and Mineralization

Dead matter → Gleyification → Partial decay
→ Potassium glauconite
→ Green pellets
Eg: Karri soil in Kerala

Dead matter → Mineralization → Inorganic matter
→ Release of C, N, and minerals in soil
→ completely decomposed

8

Soil though appear to be a static entity is highly dynamic in nature due to the process and factors involved in formation.

Remarks

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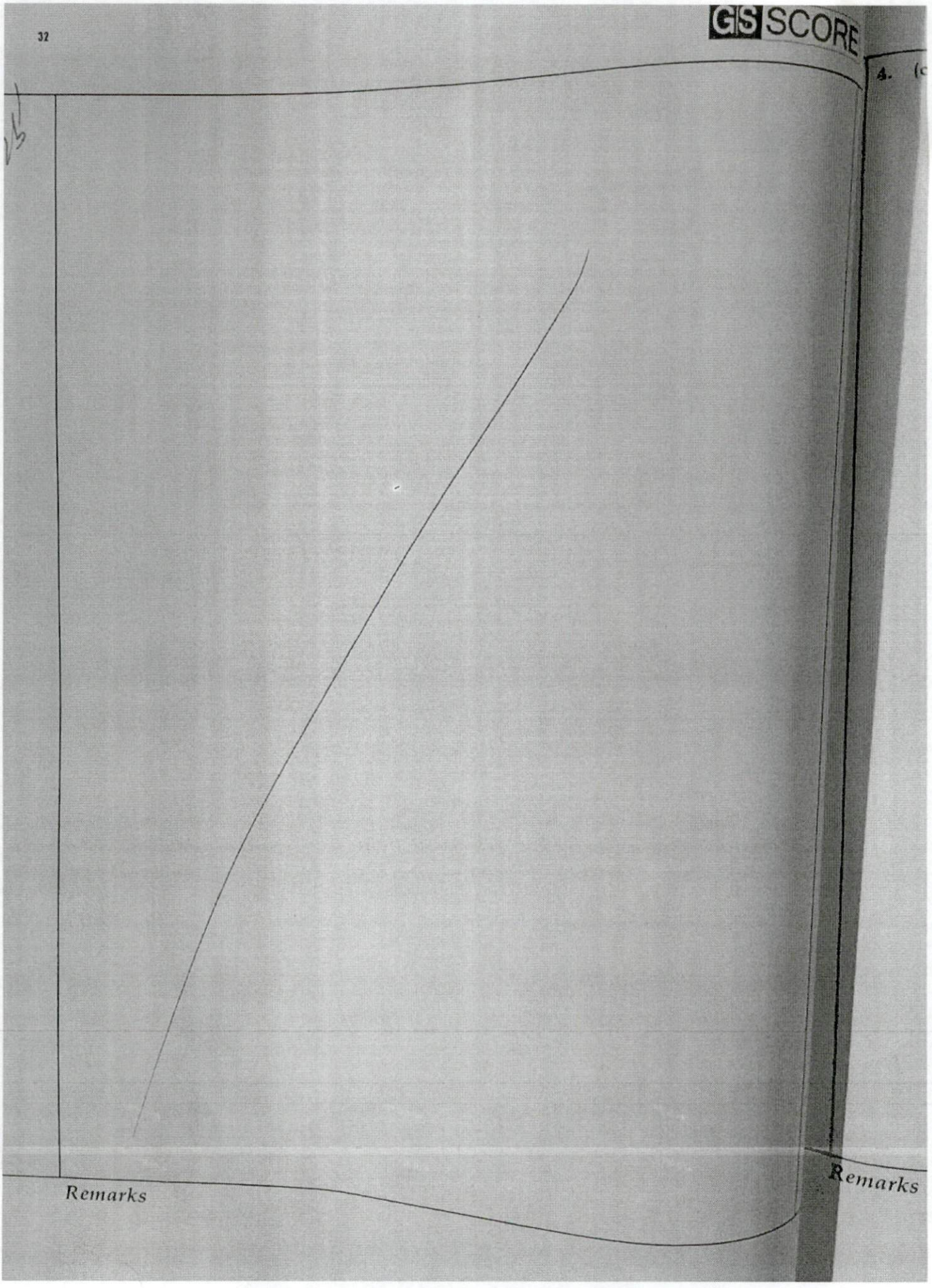
4. (a) Bio-fuels have the potential to fulfil our future energy demands. In this context identify the different biofuel and also analyse its viability in fulfilling our future energy demands.

(250 Words) (20)

Remarks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4.
Remarks
Remarks

4. (c) Discuss the Thornthwaite's scheme of climatic classification. (200 Words) (15)

Remarks

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Section - B

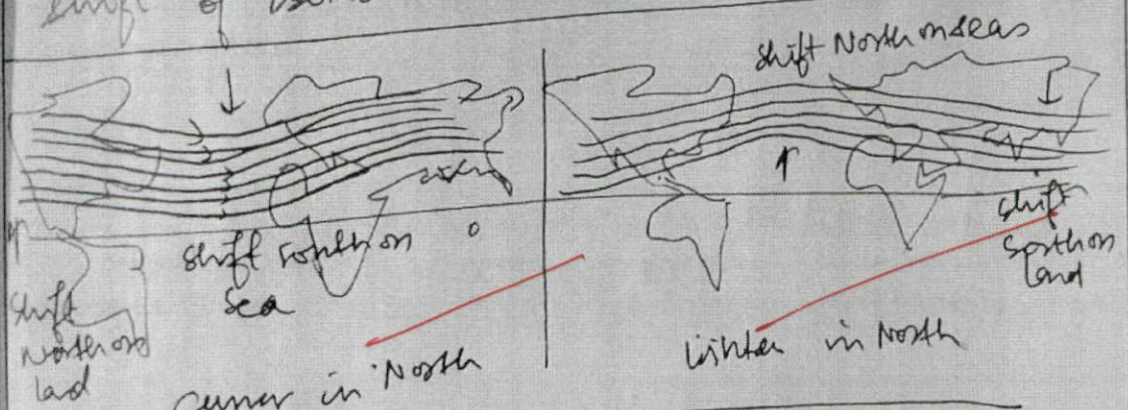
5. (a) Write the factors affecting distribution and variation of temperature

(150 Words) (10)

The general pattern of temperature variation is affected by insolation - hence as a broad pattern, temperature decreases from equator to poles.

However, according to Oliver and Hidore, various other localized factors affect temperature creating anomalies.

① Affect of latitude → shifting of ITCZ determines shift of isotherms on the latitude



② Altitude - due to Environmental lapse rate, Temperature decrease with altitude. As an average theoritical value = 6.4°C / km rise in height

give examples like hilly regions are colder than valley etc..

Remarks

→ give some examples

good representation

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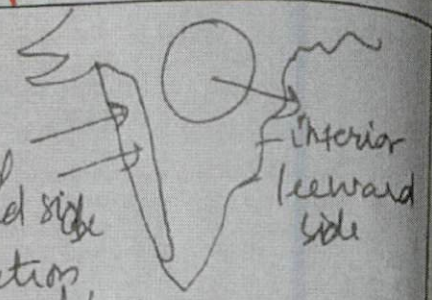
(3) Continentality

↳ extremities of temperature.

↳ give examples of deserts like gobi due to continentality



- moderation due to sea/land breeze

(4) Land-water differential

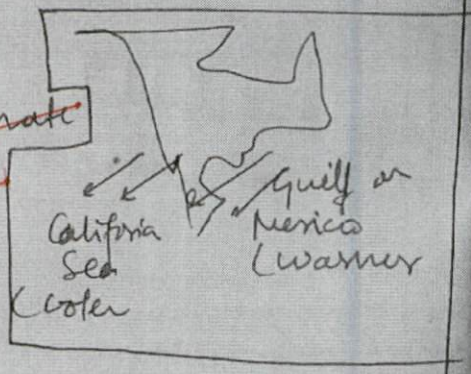
- Nature of land: high heat capacity and lesser redistribution

Hence: Russia, Ukraine, Black Sea, Georgia (Landlocked = higher temperature)

(5) Winds and current - affect the local climate pattern.

(i) Eg → off shore winds = cooler climate

- on shore " = warmer



(ii) Currents - modify the ocean and coastal climate.

Eg: Warm Gulf Stream moderate Murmansk Port of Russia

Also land use patterns changes affect the temperature of a place.

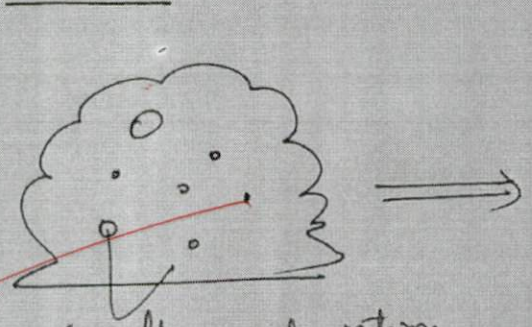
5.5

Remarks

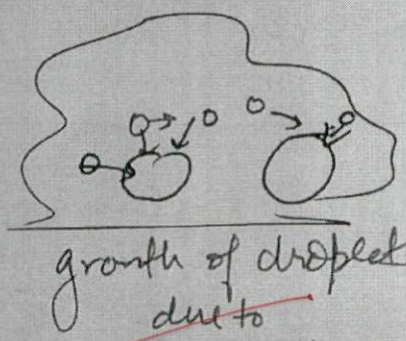
5. (b) Write a short note on Collision-coalescence process of precipitation (150 Words) (10)

Collisson- coalescence procen by Wake helps to describe how condensation and precipitation are interlinked to each other

Procen

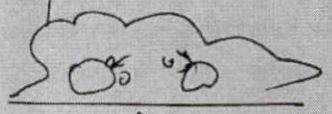


Smaller condensation droplets in clouds
- Not big enough to fall as precipitation

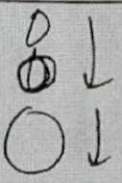


growth of droplets due to collision (wind action)

Heavy enough to fall as precipitation



due to terminal Velocity and



Bernoullis effect
- grow in size by coalescing with atmospheric moisture.

Remarks

This helps us to understand that -

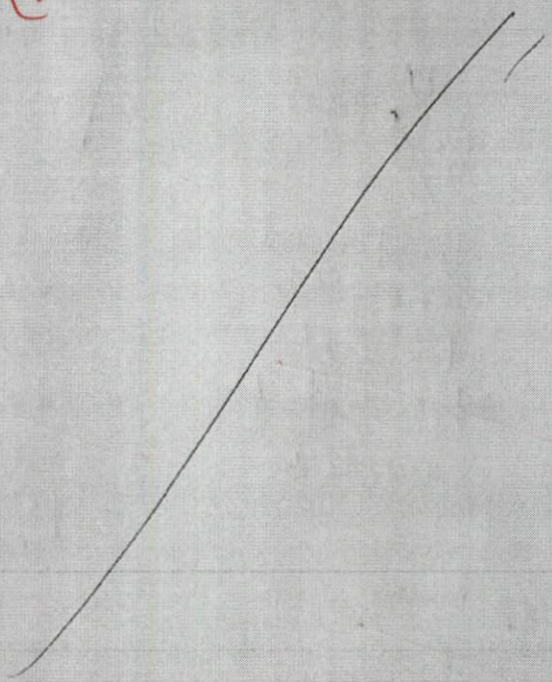
① Not every clouds leads to precipitation unless the water droplets grow sufficiently large

② All precipitation has its origin in clouds.

Another theory by Bergeron explains the precipitation of ice crystals which this theory does address adequately.

5.5

→ Good & well structured answer

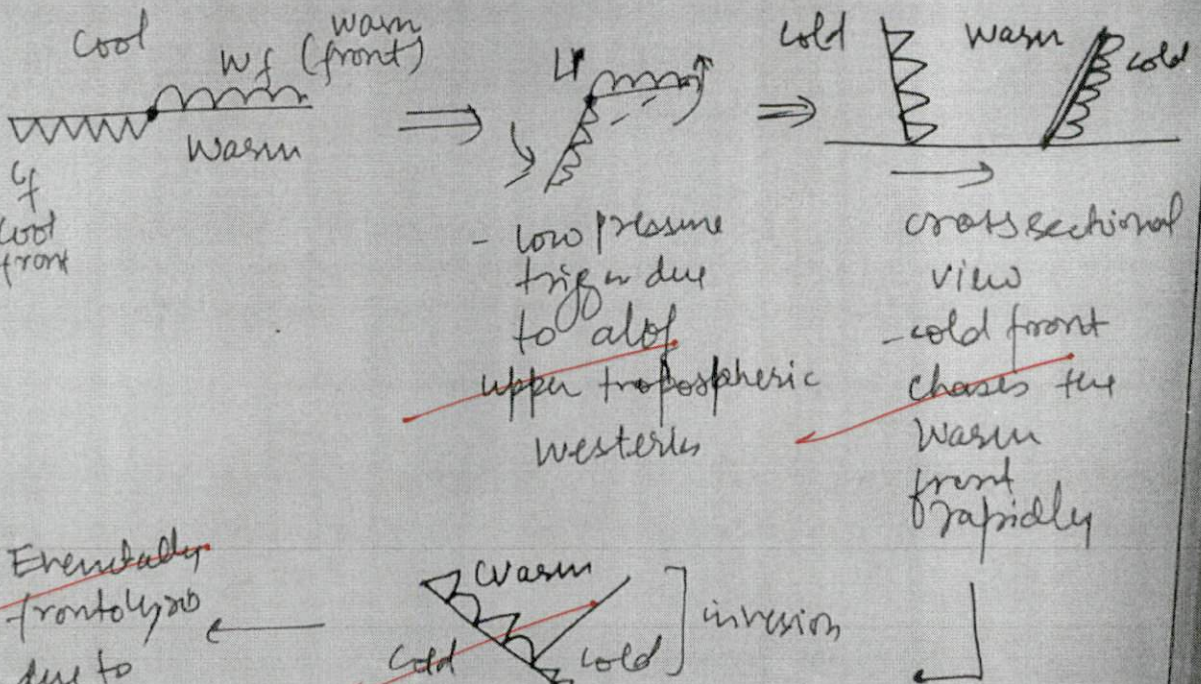


Remarks

5. (c) Polar front theory (150 Words) (10)

Polar fronts refers to the fronts formed in the higher latitudes due to meeting of contrasting air mass ⟹ cool polar and arctic air mass with warm continental air mass from tropics.

This leads to the frontal / cyclonic rainfall in these regions as per V. Jerkens formation of fronts and frontal Rainfall



Remarks

The polar fronts are formed due to two types of air mass

↳ cold = Arctic, Siberian, Canadian

↳ Warm = West Asian, Central Asian, Californian air mass.

Polar fronts also have their impact on India due to the meandering nature of Rossby waves and Jetstreams formed at the boundary of these fronts. They thus bring winter mediterranean rainfall to India

(3) Goodenough

* briefly mention some of weather patterns associated with polar fronts & there impacts in places like American continent.

Remarks

5. (d) Discuss the major causes of soil salinity and alkalinity. Also, suggest few measures to treat soil salinity and alkalinity. (150 Words) (10)

Soil salinity and alkalinity refers to increase in the salt content, particularly Sodium salts, in the soil. They form white efflorescent salt pans at the surface.

The proces responsible for formation is capillary action which leaves back the salt on soil upper horizon-A.

Causes

① Over irrigation and flooding bring up salts to the surface and the water evaporates

② Brackish water aquaculture in the coastal regions lead to salinity due to ingression of marine waters

③ Increase in ~~climate~~ ~~due~~ heat waves and temperature which lead to loss of moisture

Thus these soils are also known as 'Reh', 'kallar', 'Usar', 'Chopan' in

Remarks

* use Increased aridity Instead

* mention some places where these are found in India, especially Green revolution Belt of India.

India.

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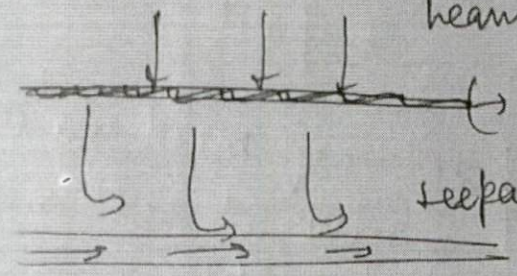
Remedial Measures

Structural:

① Addition of gypsum to reduced the alkalinity and make it suitable for agriculture

② heavy addition of freshwater



Ca salts left back = nutrient

seepage of Na salts via underground drainage

5.5

Agro-economic Measures

① Micro irrigation technique like Drip and sprinkler to minimise flooding → good aspect

② Cultivation of resitant plants like Cattail Reed for reclamation of soils

③ Climate smart crop choices to suit the local edaphic nature

→ hence "per drop more crop" is good initiative mention govt Scheme which India has launched

soil salinity leads to land degradation which if prolonged can become desertified.

Remarks

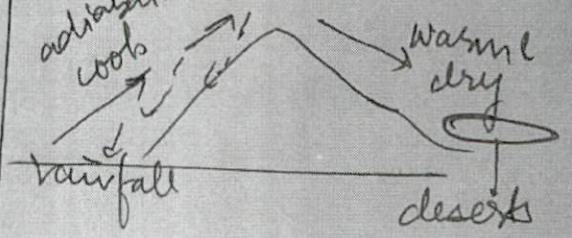
* You should have mentioned some points like Ingress of Saline water in coastal locations as cause of salinity, you have written more in terms of alkalinity.

5. (e) "Topographical factors plays an important role in determining spatial and temporal variation of monsoon rainfall". Comment. (150 Words) (10)

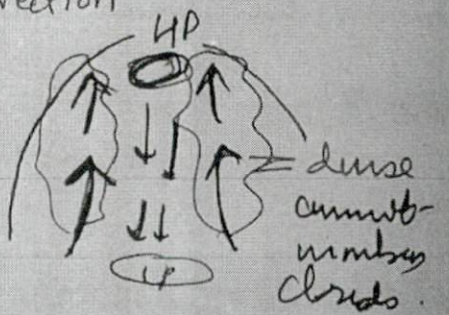
Topographical factor act as barrier to the moisture laden monsoon winds. They thus help in spatial and temporal variation.

Topographical feature and Impact

① Mountain barriers → rising of moist air on windward side = instability in atmosphere



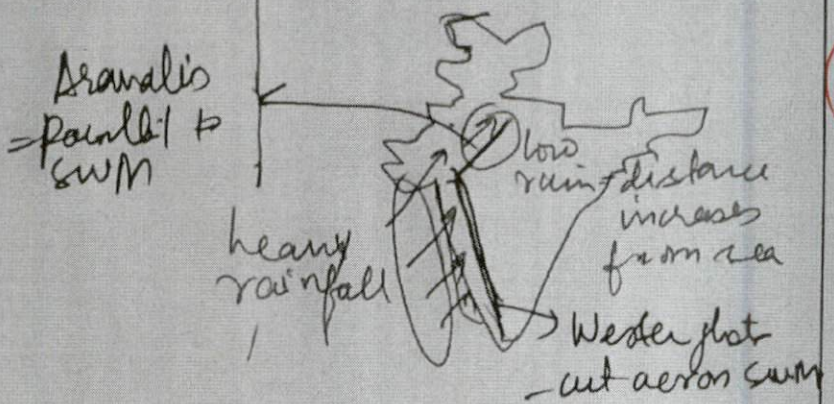
② Temporal variation due to land use topography → formation of heat domes with intense convection



Remarks

(3) Distance from barrier & orientation

- continentality affects amount of rainfall with time



4.5

thus topographical factors also play a role in variation of rainfall. their orientation (either East west) or North-South) also determines pripitation.

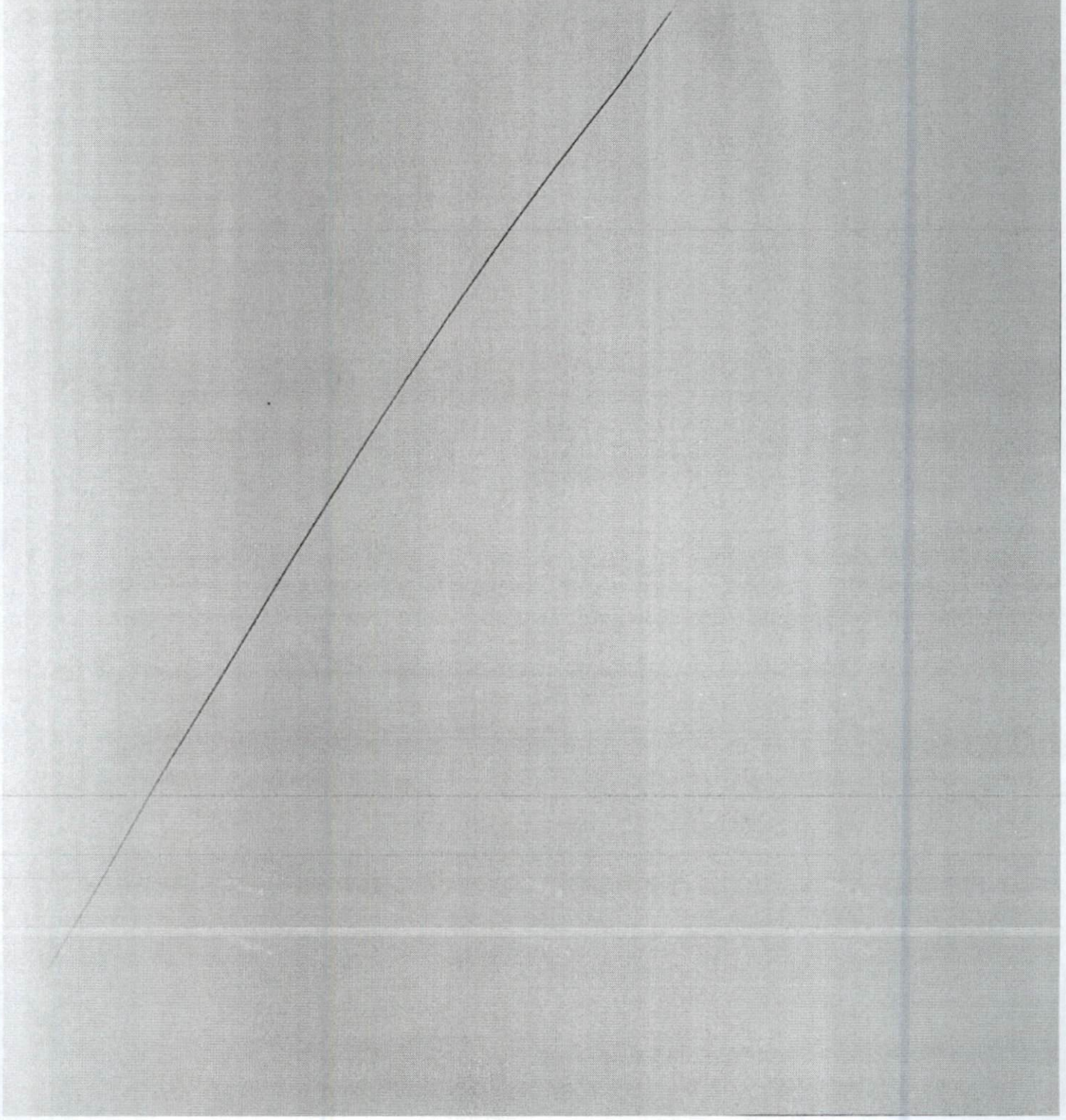
* you have mentioned spatial aspect of answer, mention temporal aspect & depict how increasing sea surface temperature has increased unseasonal rainfall in the form of cyclones in coastal regions as well.

Remarks

6. (a) Explain the concept of gene pool. Also describe the Vavilov's concept of gene pool centres of the world. (250 Words) (20)

Remarks

6. (b) Discuss the concept of Jet Stream and also explain Index Cycles of Jet Stream. (200 Words) (15)



6. (c) Do you agree that to fight climate change in 21st century Sustainable changes in life style is necessary. Justify your answer with suitable examples. (200 Words) (15)

Remarks

7. (a) Discuss the concept of Airmass and also elaborate its role in macroclimatic changes. (250 Words) (20)

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The concept of Airmass was given by B. Jerkens and J. Jerkens. Airmass refers to a vast body of air with a weak horizontal gradient of temperature and pressure. They covers large areas of around 1000 km^2.

Conditions for airmass formation

1. Vast planar surface with uniform surface profile
2. Minimum wind shearing
3. Strong anticyclonic conditions → sinking of air.

Thus according to the above criteria following type of air masses can be found

cP	polar continental	beyond 66 1/2° N and S = Eg. Siberia
cA	Arctic continental	→ Greenland and Arctic
mP	Marine polar	→ cooler seas → Norwegian, Labrador
mT	marine tropical	→ between 23 1/2° N → Eg: Gulf of Mexico, Caribbean
cT	Continental tropical	→ cooler season in Tibet etc.

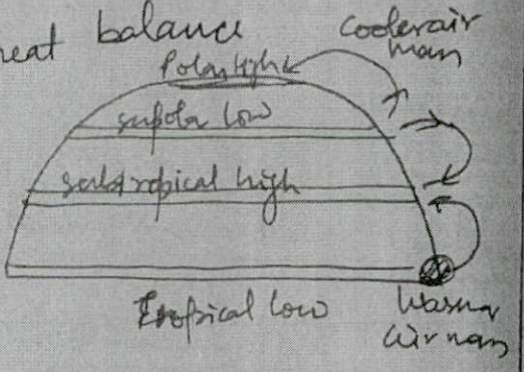
Good representation along with future locational extent

Remarks

Air masses affect the macro climatic changes as they help in heat distribution, rainfall & fog and vortex formation. These have been discussed here.

1. Air mass role in global heat balance

- transfer of heat from surplus warmer tropics to heat deficit polar areas by planetary wind formation



(2) Air mass and rainfall patterns

- warm air masses move over oceans and pick up moisture leading to rainfall and monsoons

Eg. South West Monsoon over Indian subcontinent

These are patterns of temperate lower latitudes. Instead rainfall in temperate regions of USA as an example.

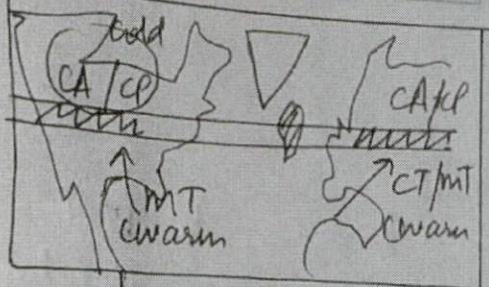
(3) Air mass affecting fronts formation in mid latitude

① In the midlatitudes, formation of fronts due to contrasting air masses leads to frontal rainfall and temperate cyclones

Remarks

GS SCORE

- these are often transported to the lower latitudes via jet streams.

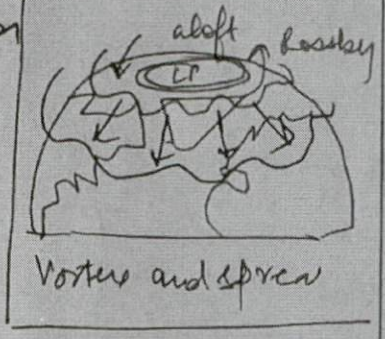


V Air mass and Vortex formation

- the cold arctic airmass CA forms cyclonic vortex due to aloft low pressure

Weaking of air mass due to warming of arctic and oceans leads to spread of vortex

case/ canada cold waves temperate as low as $-35°C$ in 2019



Vortex and spread

Air masses also help in fog formation especially over oceans like Newfoundland fog at the Grand Banks. these create fishing zone also.

However recent modifications to air masses has led to severe climatic changes like rise in cold waves, cyclones etc.

12

* Quote examples of these Airmasses Impacting N. American climate, like snowlake effect

Remarks

7. (b) Critically analyse the impact of Climate change on biological diversity. (200 Words) (15)

According to WWF, the current biological extinction due to climate change is referred to as the 6th mass extinction. Thus climate change has profound impact on biodiversity.

Negatives impact on biodiversity

(1) Increase in global temperatures have led to shifting of biodiversity from their ecological niches.

Eg: Migration of corals towards poles due to warmer ocean
+
Migration of cooler kelps towards equator

Good examples

(2) Impact on productivity patterns of biodiversity can be seen in declining productivity of species due to climatic changes.
Especially the stenotype species with low survival rate.
Eg: Decline in coral productivity due to bleaching - almost 80% corals under

Remarks
* Climate change can Increase Homogenization effect as shown by Thomas Lovejoy in Amazon Studies

GS SCORE

(3) Affecting the succession patterns of species leading to dysfunctional climax communities

Ex: Amazon rainforest fires -2020 | loss of 12-5% of rainforest species

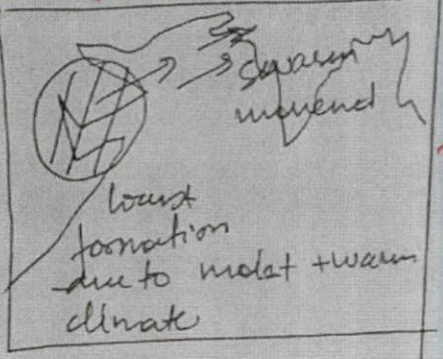
(4) Introduction of invasive species by climatic events such as tropical cyclones etc to the habitats of native species.

→ rather this try to connect with climate change Induced - Permafrost melting leading to Introduction of unknown Invasive species ie microbes into earth.

→ good examples

(5) Increase in incidents of pest attack

Ex: Locust attack of 2020 affecting ~60% of Kharif crops in Gujarat & Rajasthan



Some positive effects on species

(1) Increase in global CO_2 levels can increase CO_2 fertilization and enhance photosynthesis

(2) this can lead to growth of algae in the oceans.

→ good examples

+ Also add climate lead & now melting might

Remarks

3 Increase or create habitable region for some species.

However, the positive effect is only transitionary and short lived.

Extended climate change can impact the human-animal interactions which has been recently seen in wake of pandemics like COVID-19.

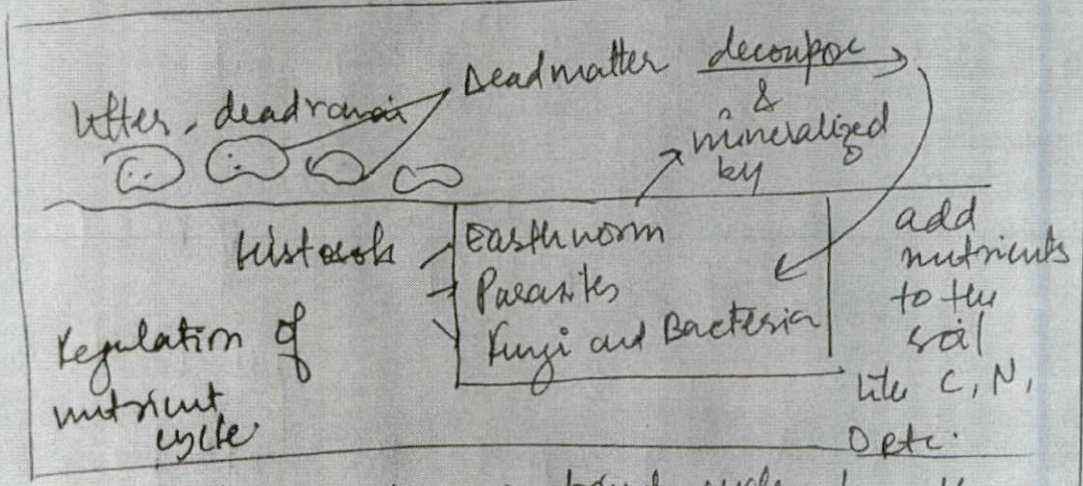
8

* you have given multiple good examples in this answer keep it up.

Remarks

7. (c) Histosols play a critical role in regulating global nutrient cycle. How has anthropogenic activities disrupted this balance? Elaborate. (200 Words) (15)

Histosols refers to the soils found in peaty areas and mangrove regions. These soils are crucial in regulating global nutrient cycle.



① Histosols regulate the nutrient cycle by the process of gleyification and mineralisation.

② they add to the soil organic carbon stock which is the largest CO_2 sink on terrestrial ecosystem

③ Histosols contain organism like earthworms, bacteria - Nitrosomonas, nitrobacter and fungi which help in nutrient recycling

Remarks

However, the anthropogenic activities has disrupted the homeostatis of histosols in following ways -

Impact on balance

① Rapid urban extension in the wetland and peaty areas leading to loss of soils.

Eg: Sundarban delta - being reclaimed as extension of 24 North Parganas of Bengal

② Discharge of effluents and landfill waste onto the histosols affects the ~~saprotroph~~ saprotrophs and nutrient recycling.

③ Human activities leading to global temperature changes (as per IPCC Report) of around 2°C has led to decline in productivity of histosols

④ Increase in anthropogenic climatic disasters affects the histosol leading to large scale erosion of these soil

Remarks

* mention soil as carbon seavenger, and hence any disruption to it will impact global carbon cycle & have increase in global climate temperatures.

Eg: More than 15% of tropical cyclones in the Indian ocean region.

Ecosystems thus need to be conserved by declaring them critical ecosystem zones and limiting human activities in those areas.

7.5

8. (a) What is Polar Vortex? How far climate change is responsible for erratic behaviour of the polar vortex? (250 Words) (20)

Polar Vortex refers to the spiralling movement of cold air above the poles formed due to low pressure conditions in the upper troposphere.

Formation of polar vortex is a natural phenomenon due to air mass formation.

Formation of Vortex

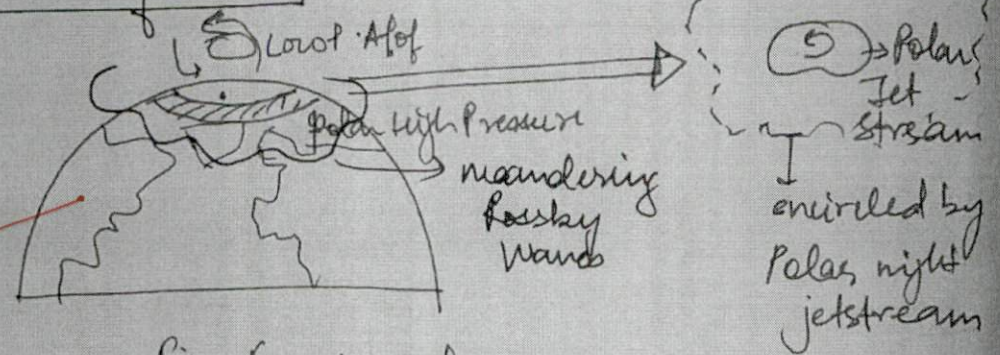


fig: formation of vortex.

Conditions for formation of polar vortex.

① According to Jerkens, polar vortex can be formed in extreme cold polar areas of Arctic and Antarctic → Arctic nights or extended winters

② Aloft low pressure to create spiral movement

③ Minimum wind shearing leading to stronger vortex.

Remarks

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Erratic behaviour of vortex due to climate change

① Naturally, polar vortex is contained within its limits by the encircling polar night jet streams

② However, climate change has led to the warming of pole (over continent and also oceans) → Good example

> Data | Arctic amplification → Warming of Arctic at a higher rate which is further increased due to exposure of land.

③ This warming affects the temperature contrast in the higher latitude and led to the weakening of vortex

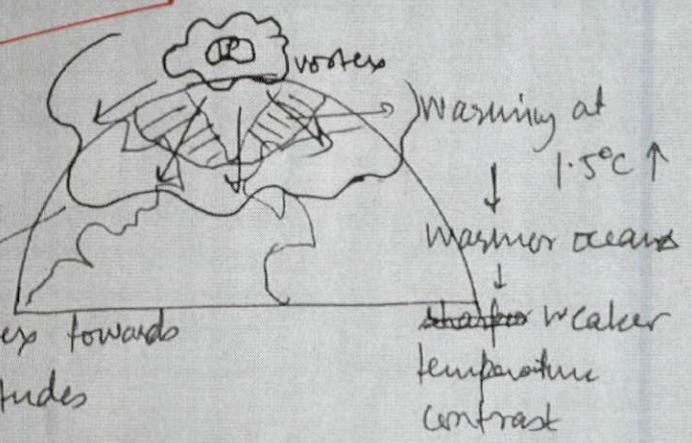


Figure: Weakening of vortex

Impact of this erratic behaviour of vortex -

Remarks → You have explained the formation of polar vortex & its mechanism in a fair manner keep it up.

(1) Incidence of extreme cold waves not in higher latitudes but also upto mid latitudes.

Es: Cold Waves extension till West Asia in 2020 Dec → temperature dropping to 2-3°C

(2) Intensity and frequency of temperate cyclones increases

Es: In January 2022 → Impact on the Mediterranean rainfall in India
- extreme cold temperatures (as low as 2.5 -5°C)
- rainfall over Punjab, Western UP → due to mediccanes

3.5

(3) Also affect marine environment and ocean thermal balance

Es: Warming of Norwegian Sea and interaction with cold vortex leading to dense fogs

Change in polar vortex has to be monitored. India's Himadri station at Arctic and Maitri-Bharati at Antarctic can help in mapping changes.

fair conclusion.

* your answer is good & you have structured it very good manner keep it up.

Remarks

* you have given fair examples to prove your argument keep it up.

GS SCORE

8. (b) Analyse the impact of deforestation on climate change. Also discuss its effects on humans and animals. (200 Words) (15)

According to IPCC 6th AR, rapid deforestation has been one of the causes of temperature increase upto 2°C. This inturn has impact on human and animals survival.

Affect of deforestation on climate change

① Affecting the hydrological cycle acrossthe world leading to extreme events like droughts and floods due to changes in potential evapotranspiration

② Release of CO_2 into the atmosphere as forests hold around 70-80% of global CO_2 sink. Thus strengthening the greenhouse effect.

③ Increase of land degradation and desertification leading to droughts because of increase in Bowen's ratio

Eg: Marathwada [deforestation due to sugarcane plantation
frequent droughts as rainfall ↓

cross check this once again.

Remarks

(iv) Affects the global heat budget by disrupting heat transfer from surplus equatorial areas to cooler polar areas.

Eg: Warmer tropical waters → leading to increase in tropical cyclones (35% in tropical seas) as per IPCC 5th AR

Impact of deforestation and thus climate change on

1) Humans -

↳ ① Survival issues due to extreme climatic events like urban floods

Eg: Mumbai flood, Recent floods in Germany

② Spread of zoonotics due to loss of habitat of animals

Eg: Coronavirus, Nipah virus + Zika

2) On Animals

① Affects their ecological niche and thus rapid increase in extinction of species

Good example { Eg: Bramble Melomy of Australia extinct due to climate chg

Remarks

Re

* mention on Impact of migration pattern of Animals.

GS SCORE

① Affect the ecological succession of species leading to secondary succession and plagioclimax

E: Forest fires in Amazon rainforest - loss of 18% of forest species

Thus deforestation has profound impact on the ecological homeostatis and human and animal health.

7

* Also mention cases of Increased Animal-human conflict.
  Assam, Karnataka - Elephant
  Crop destruction by Nilgai, deer - in MP etc.

* Also mention Standardization effect
  Increased due to destruction of forest & hence fear of loss of genetic diversity in Animals & extinction

Remarks

8. (c) Discuss the basis of Koppen's climatic classification. Bring out the salient characteristic of 'Cs' type of climate. (200 Words) (15)

Koppen's climatic classification was given in 1900's based on 'vegetation - as the best reflection of climate'. He was inspired from De Candole's scheme of climatic classification

Basis of Koppen

① The primary basis of classification of climate was vegetation patterns

② The vegetation patterns were explained interms of temperature & precipitation.

Thus this scheme was empirical in nature.

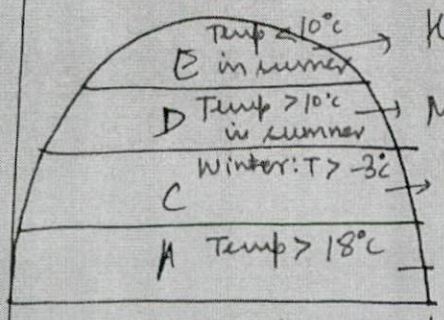


Fig: Relation between vegetation and temperature

Remarks

(3) towards a later stage, he also included the characteristics of precipitation for regions

Eg: R = rainfall throughout
S = summer dry
W = winter dry climate

(4) Koppen also later included the impact of extent of landmass in climatic classification

(5) He also gave an idea of (P-E) = effective precipitation which affects rainfall but could not establish mathematical basis like Thornthwaite.

Limitations -

① Could not include highland as a regular basis in the initial stages

② faulty description of monsoon as areas having atleast 1 month of dry climate.

→ how thornthwaite was an improvement

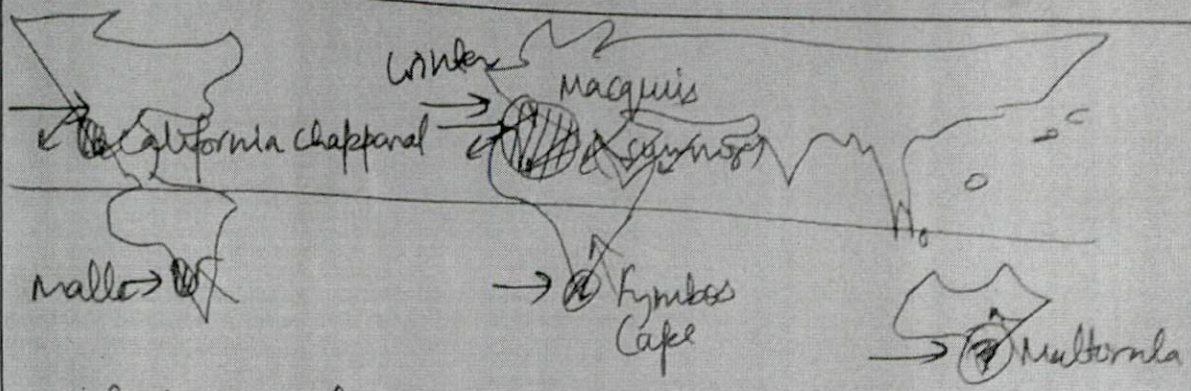
Feature of Cs type

C = Mesothem zone and S = summer dry
(Temperature > -3°C)

hence this reflects the mediterranean climate.

Remarks

GS SCORE



feature = ~~Off shore~~ trade winds in summer
= on shore westerlies in winter

Vegetation = ~~sclerophyllous~~, citrus fruits and viticulture.

(a type of climate thus explains impact of shift of winds on Climate and Vegetation

8

* mention Agricultural pattern in brief like growing citrus fruits, vineyard of world.

Remarks

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