

(36044)

(655)

GS SCORE

GEOGRAPHY TEST SERIES 2021

TEST - 02

149

GEOGRAPHY

Time Allowed: 3 hrs.

Max. Marks: 250

Instructions to Candidate

- V. good attempt
- keep it up.

- There are Eight questions divided in two Sections.
- 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 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 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 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.

Name Yasharth Shukla

Mobile No. _____

Date 7/11/2021

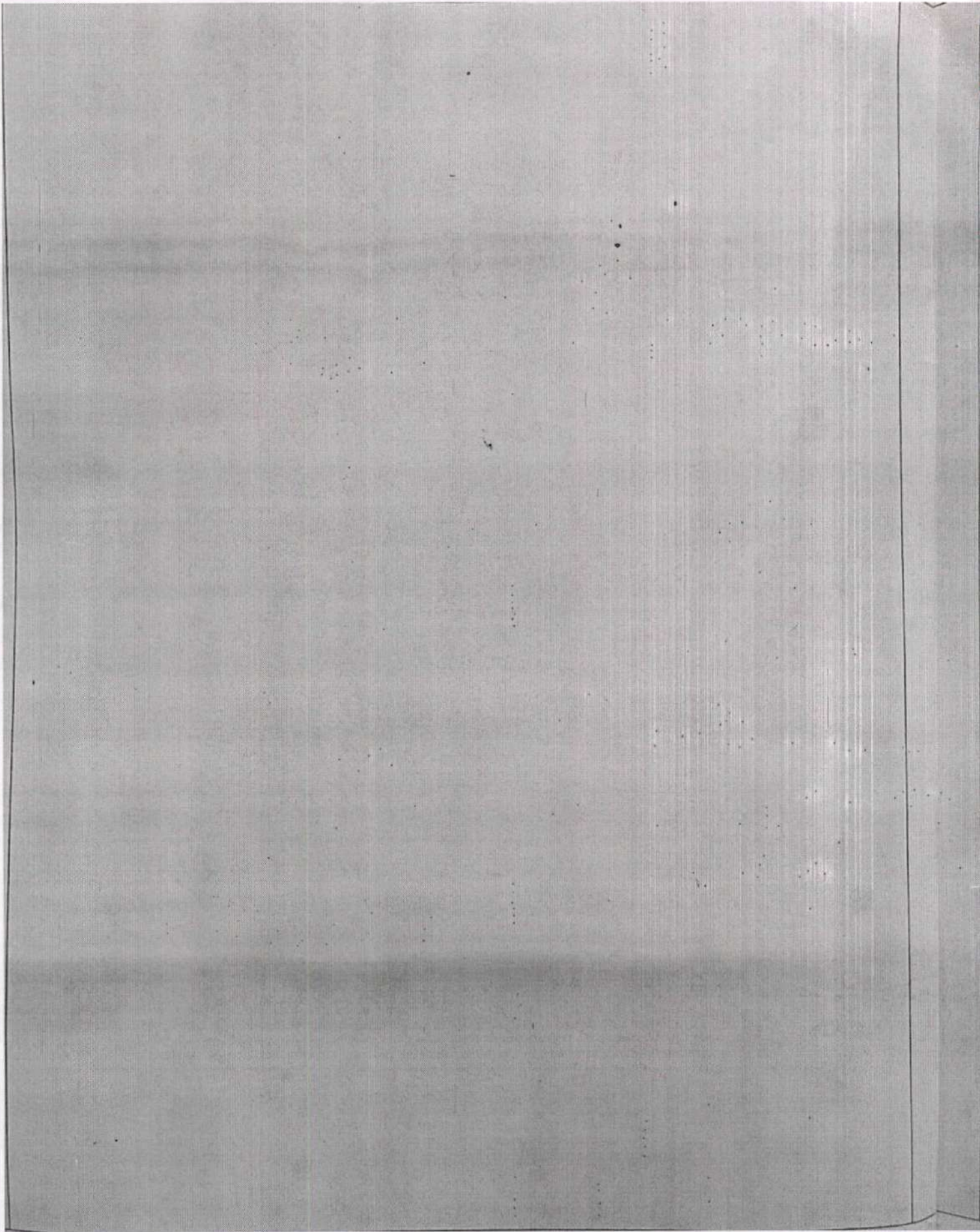
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1. Invigilator's Signature [Signature]

2. Invigilator's Signature _____

(12)

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SECTION-A

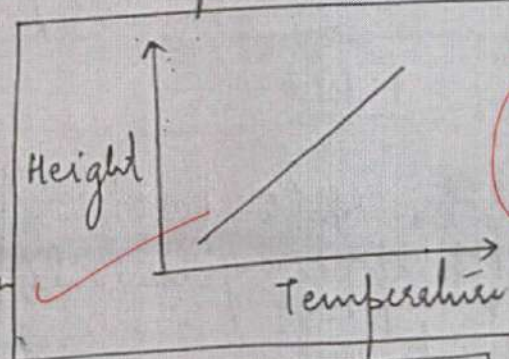
Attempt all questions:

1. Answer the following questions in about 150 words each: (10 × 5 = 50)

- (a) Write a short note on Temperature Inversion. Also discuss its role on local economic activities.
- (b) Write a short note on Urban climate
- (c) Chernozem Soil
- (d) Write a short note on temperate grassland biome
- (e) Conditional Instability

(a) Temperature inversion occurs when as height increase, temperature increases as well. i.e. Environmental lapse rate is negative.

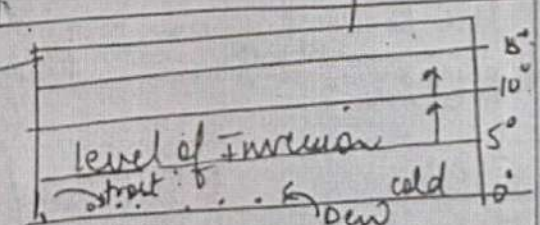
It is of many types:



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good

① Radiation inversion when

- ① long winter night
- ② High Relative Humidity
- ③ Calm winds
- ④ no clouds

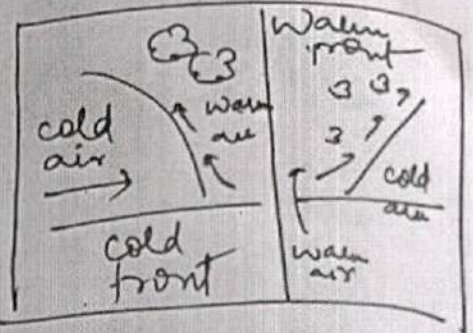


so that entire radiation is sent back to space e.g. in northern Delhi, during winter

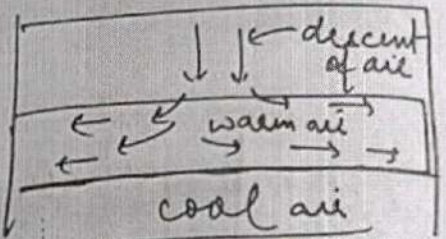
② Frontal Inversion when warm air lies over

Remarks

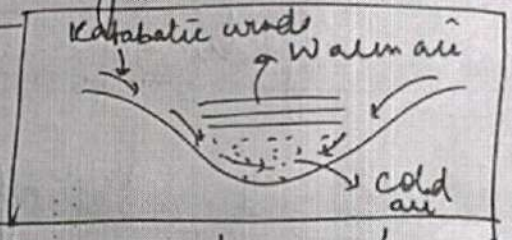
cold air eg. cold and warm front during temperate cyclone.



③ Subsidence inversion occurs when large mass of air descends so it is adiabatically heated.



④ Valley inversion when cold katabatic winds descend down slope during night causing freezing conditions eg. valleys of Himalayas.



Role

① It cause problem of trapping pollutants due to inversion eg Delhi

③ It cause fog when mix with sulphur to cause smog harming people's health eg. Great Smog of England

② It cause plantation/agriculture on slope and not bottom due to frost eg. Valleys of Uttarakhand.

④ It leads to reduction of rainfall causing desert formation eg. Sahara during nights. Thar etc.

However, the fog is useful for coffee plants grown in Yemen.

Remarks

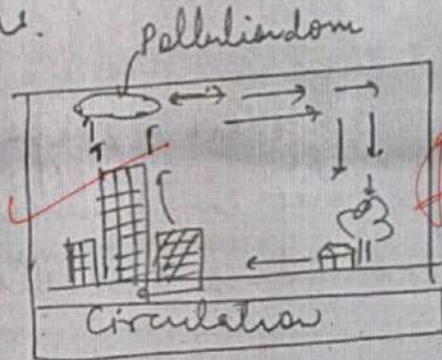
shaped by built up environment,
human population concentration &
economic activities

b) Urban Climate is a function of climatic impact of various meteorological factors working specifically in urban area.

① Pollution dome created to urban heat island effect where the temperature over urban area is more than avg temperature or more than rural area.

Briefly explain reasons.

This circulatory pattern occurs due to urban heat island impact as urban areas are hotter



good

than surrounding area forcing convection which together with pollutants form clouds called Pollution Dome

6

② Urban areas are concrete jungle which do not allow much evaporation leading to high temperature

Evapotranspiration.

- ③ All this leads to higher than normal rainfall causing ~~at~~ flash floods or urban flood
eg case study of Chennai
- ④ Heat waves as experienced in Lytton in 2024
- ⑤ Problem of water scarcity eg. Chennai as No infiltration happens.
- ⑥ All this has been enhanced by climate change.

These steps are needed for urban planning in institutional, political and socio-economic development.

(1) Chernozem soils are soil found under the temperate grasslands of the world. It is a zonal soil. Its nomenclature under USDA is under Mollisol.

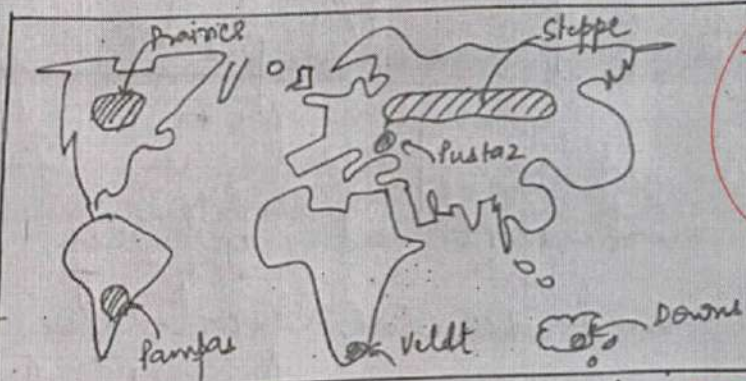
- ② It is also called Black Earths
- ③ due to a presence of a 1 metre thick ^{black} layer

base rich material

on top because of basal material.

③ ~~Below this~~ This soil is found in areas of incomplete leaching to moderate leaching so has a calcium base rich horizon below 1 metre thick black soil.

④ Ideal soil building material is loess



⑤ It is granary for wheat production in USA, cattle ranching in South America; Dairy farming in Australia.

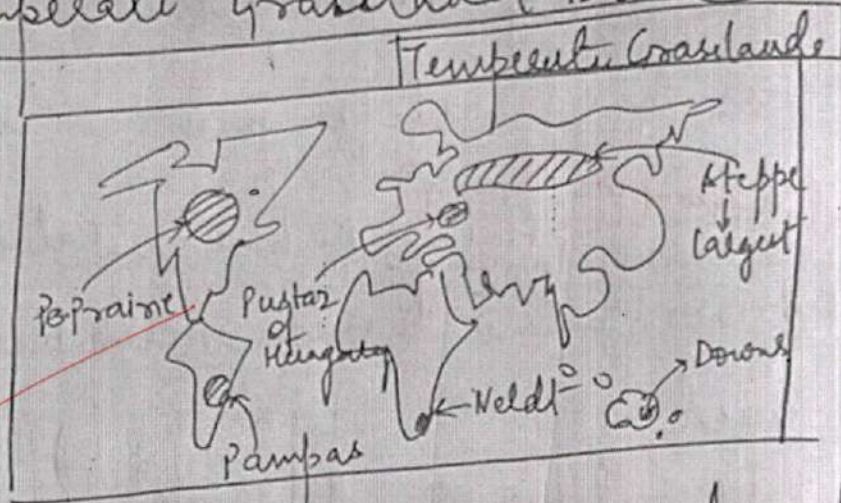
⑥ It has a crumb structure which enhance ease of cultivation.

⑦ on the wetter side it transform into prairie soil, on drier side it is chestnut.

⑧ Ex of cities → Kansas, USA, oblast Province of Russia, Victoria Province of Australia.

Thus it is important for food security of the world.

(d) Temperate Grassland Biome



① It is found in the continental interiors at between 40°N/S - 65°N/S and receive moderate rainfall from westerlies and temperate cyclone of about 40 - 60 cm/yr. [Mid-latitude Areas]

② eg. Pampas of Argentina, Prairies of USA, Steppes of Asia

③ Flora - includes nutritious grasses like Alfa-Alfa grass among others

④ ECONOMIC ACTIVITY → ① wheat cultivation in Prairie → lead to development of ② Cattle Ranching in Estancias of Argentina ③ Dairy Farming in Austria

Remarks

degraded biome - natural fauna & flora have been destroyed for industrial farming.

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5) Fauna includes not much variety.
eg. Kangaroo in Australia, Emu/Striches,
sheeps, Goats, Alpaca etc.

6) As per USDA, soil is rich in base →
Mollisol or Chernozems or Black Earth

7) Temperature - cool winters and warm

summers.
8) eg of a city include Kansas, Plata Basin etc.
These are very important of biome
for food security of the world.

① ② Conditional instability is a
situation where air is stable for
unsaturated air mass but unstable for
saturated air particle i.e. when

Wet Adiabatic lapse rate (WALR) < Environmental lapse rate (ELR) < Dry Adiabatic lapse rate (DALR)

② When the wind is forced to ascend the
slope, it will have to be forced till
it reaches level of condensation, beyond

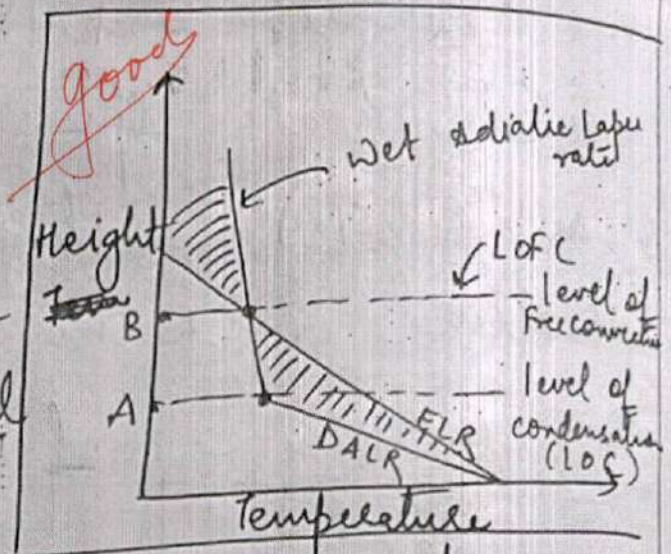
Remarks

good

which convection occur automatically

eg Beyond B, the convection happen without any force.

eg as happen in case of an orographic rainfall



It is usually experienced that when storm comes and go :

- ① No rainfall happen - rising air parcel did not reach LOC
- ② Rain happens but stop immediately as storm passes eg air parcel reached beyond LOC but removal of force pushes it down of LOC
- ③ Rain happens long after storm passed ie Air parcel above LOC

It's utility is felt in areas like South East USA, ^{storms like} Kalbasakhi storms etc

→ Explain in relation to ELR & latent heat of condensation.

2. Answer the following questions:

- (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)
- (b) How can ground fog is different from advection fog and steam fog? (200 Words) (15)
- (c) Discuss the factors affecting wind direction and speed. Also write the conditions necessary for the generation of katabatic winds. (200 Words) (15)

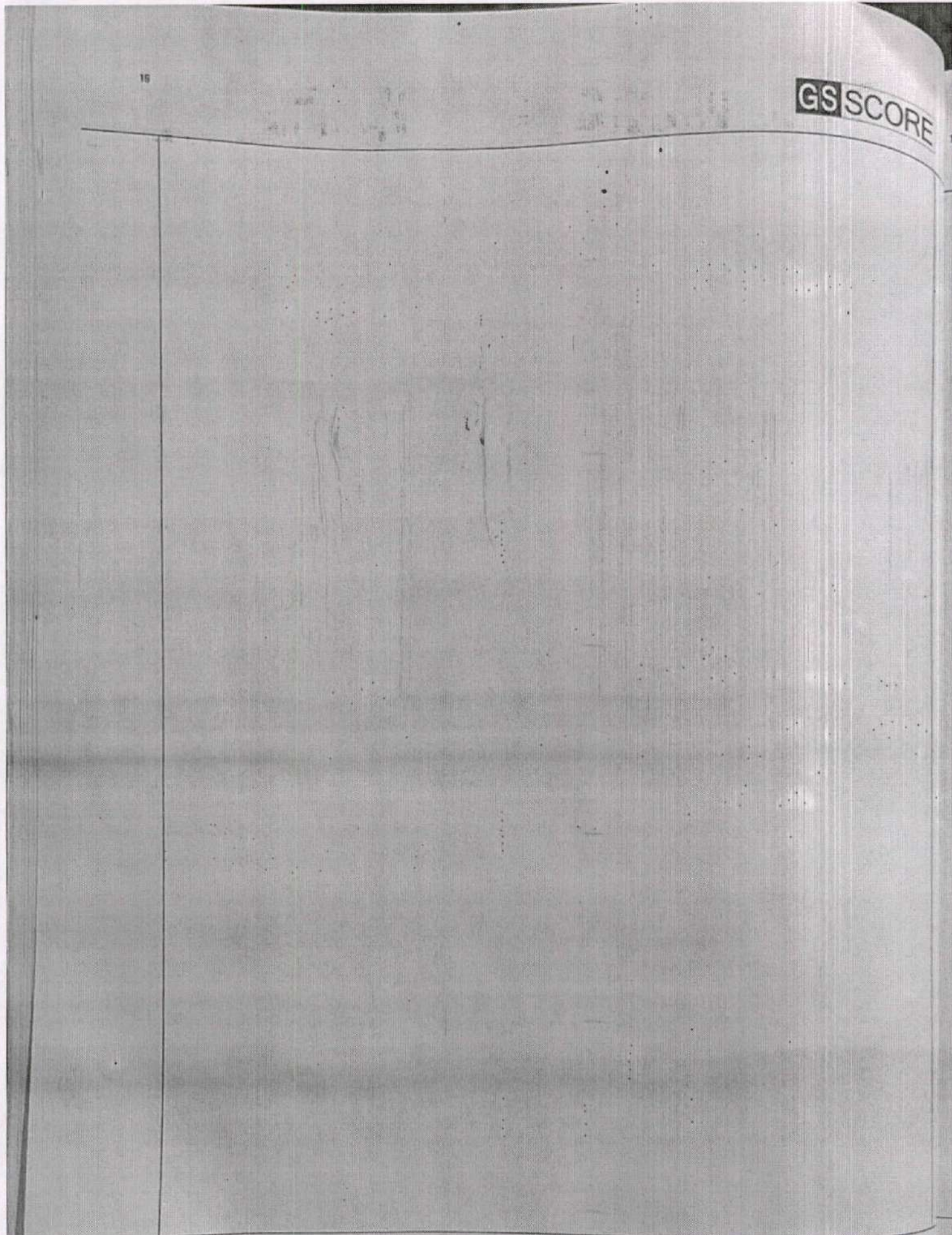
Remarks

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Remarks

3. Answer the following questions:

- (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)
- (b) Discuss the possible impacts of introducing Genetically Modified crops on biodiversity? (200 Words) (15)
- (c) Discuss the major processes and factors involved in the soil formation. (200 Words) (15)

Remarks

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Remarks

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Remarks

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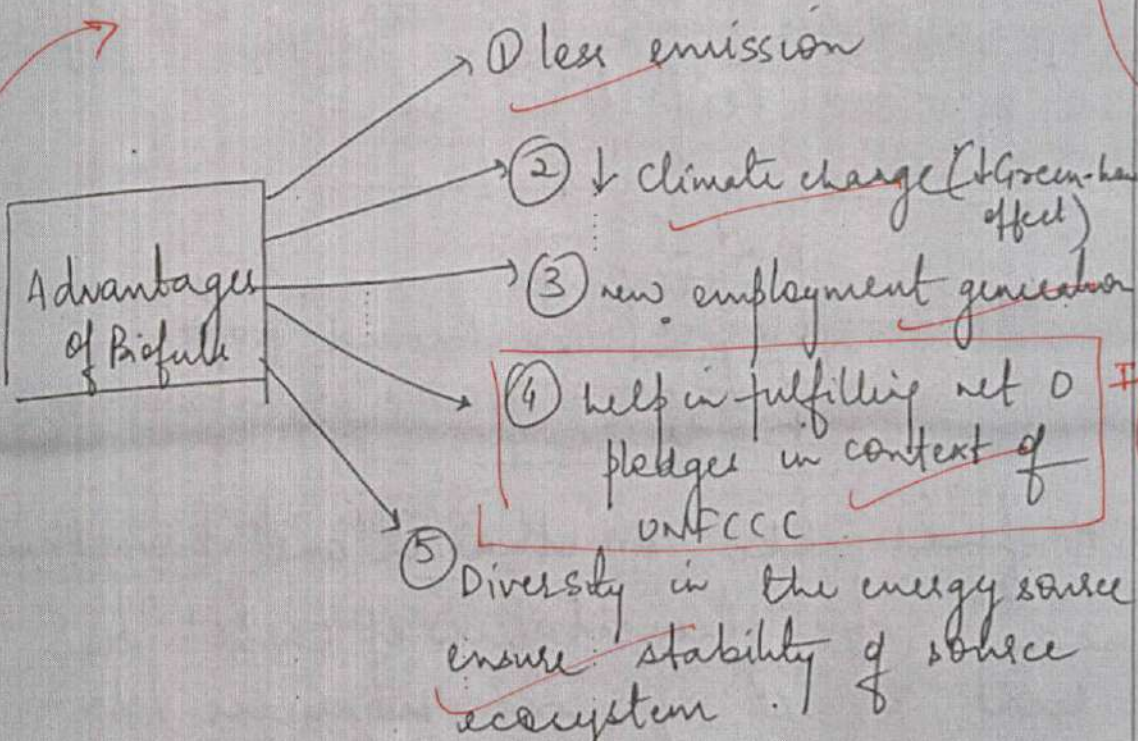
Remarks

Remarks

Answer the following questions:

- (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)
- (b) Write the favourable conditions for the formation of tropical cyclone. Also illustrate associated weather conditions. (200 Words) (15)
- (c) Discuss the Thornthwaite's scheme of climatic classification. (200 Words) (15)

(a) Biofuels are fuel that are derived from Biological sources like food, starch, algae etc and not from fossil fuels like coal etc.



India: No Net 0 pledge.
INDCs

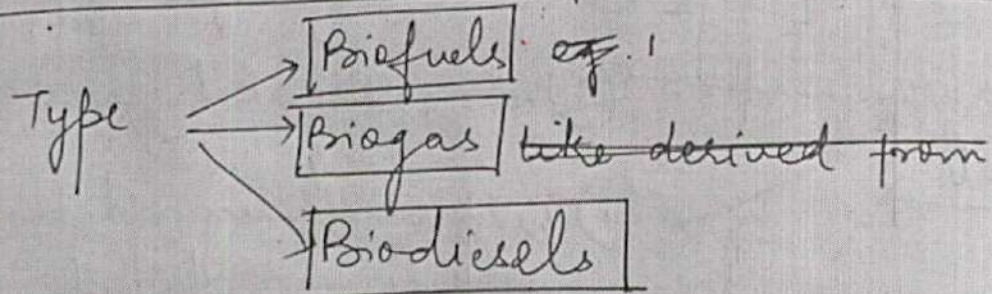
Different type of Biofuels :

① First Generation Biofuel — derived from food source eg. wheat, rice, potato

② 2nd Generation Biofuel — derived from Non food source in context of food vs fuel debate eg. Starch based

③ 3rd Generation Biofuel — derived from Algae eg. seaweeds found in oceans, kelp etc

④ 4th Generation Biofuel — derived from genetically engineered source eg. G.E. Algae etc



Biofuels like bioethanol and biomethanol made from fermentation of carbohydrate rich source eg. corn sugarcane, etc

Biogas — ~~is~~ decomposition of organic matter in absence of air/oxygen eg. Biogas rich in

Remarks

methane
Biodiesel - made from trans-esterification
of fat in the presence of hydrogen

Viability

Demand aspect

Supply aspect

DEMAND ASPECT

① Increasing demand

Challenges & Opportunities

(i) on account of net 0 pledges

(ii) IPCC report argued that world temp $> 1.1^\circ$ above pre industrial level and will touch 27°C by 2100
 → creating pressure for new sources.

(iii) dowling finances for coal exploration as was done in recent G20 meeting and by ADB.

(iv) depleting coal reserves

(v) Increasing awareness on part of people. to demand new source

(vi) Increasing technology to meet demand

(vii) Falling cost of production per unit

Bio-fuels are not necessarily low carbon footprint fuels
 ↓
 Agricultural emissions

- All these factors have created a market for biofuel.

② Now let's take a look at supply side

- (i) New technology
- (ii) Tech transfer from developed world to meet the needs
- (iii) Excess production of food grain to enhance production
- (iv) Pandemic has led to shortage of energy resource and thus new efforts for exploration in RE like Biofuels.

It is in context GOI recently enhanced the target of RE generation to 500 GW ^{in COP 26} → a large part of which will come from biofuel. (National Biofuel Policy 2018)

(b) Tropical Cyclone is a ~~low~~ dynamic low surrounded by isobars of high pressure. It is formed under following favourable conditions:

1) High temperature of above 27°C above ocean/sea

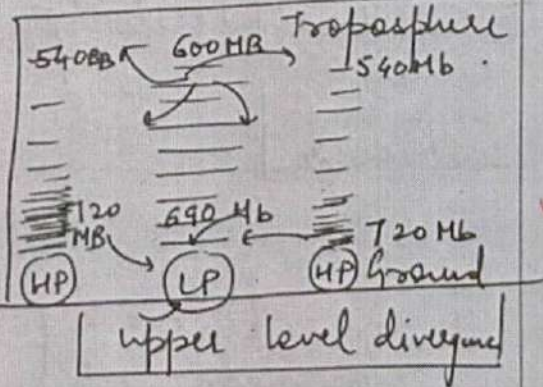
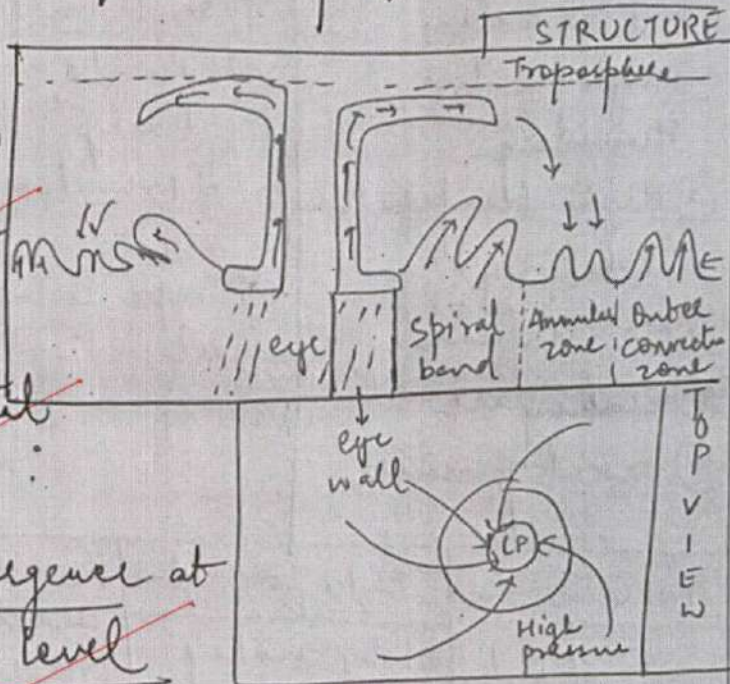
2) absence of vertical wind shear

3) upper level divergence at upper tropospheric level

4) presence of pre-existing weak depression over the region

5) Coriolis force hence it is formed a little away from equator.

Thus Tropical Cyclone is like a heat engine energized by latent heat of vaporisation.



Remarks

needs constant moist supply.

9

Weather conditions

As we move from eye to outer convective zone → weather

Eye	Eye Wall	Spiral band
<ul style="list-style-type: none"> ① it is calm ② High Relative Humidity ③ High temperature (Relatively) ④ No rainfall ⑤ Sinking air ⑥ lowest pressure 	<ul style="list-style-type: none"> ① High rainfall with thunder and lightning ② High cumulonimbus clouds ③ upper rising air ④ 	<ul style="list-style-type: none"> ① Cumulonimbus clouds ② High Relative Humidity ③ Moderate to intense rainfall ④ upward rising air ⑤ low temperatures

V. good

Annular zone	Outer Convective zone	Pre-cyclone weather	Harmful impact
<ul style="list-style-type: none"> ① <u>Zone of sinking dry air</u> ② High relative temperature due to adiabatic heating ③ low relative Humidity due to high temp + low moisture 	<ul style="list-style-type: none"> ① dry sinking air force incoming wind as dry winds are denser causing r-fall → High Relative Humidity ② 	<ul style="list-style-type: none"> ① <u>Temperature increase</u> ② <u>Pressure ↓</u> ③ <u>Wind velocity ↓</u> ④ <u>Visibility ↓</u> ⑤ <u>Cirrus clouds appear with halo around sun and moon</u> 	<ul style="list-style-type: none"> ① <u>Sea surge</u> ② High winds destroying infra ③ Flooding <p>as done by Hurricane Katrina of 2005.</p>

Thus, the study of Tropical cyclone is essential to fully understand impact of climate change on them.

Remarks

(1) Thornthwaite Climate scheme came in 2 year - 1931, 1948.

1931 Scheme

(1) acc. to him, ~~Temperature~~ ^{OR} ~~of (totality of vegetation)~~
 vegetation = f(totality of climate)

(2) He gave two indices

(1) Precipitation effectiveness - amount of water actually available for growth of vegetation

$$P/E \text{ ratio} = \frac{\text{Total Monthly Precipitation}}{\text{Total Monthly Evaporation}}$$

$$= 11.5 \left(\frac{r}{E} - 10 \right)^{10/9}$$

r - avg monthly temp in °F r - avg monthly precip in inches

$$P/E \text{ ratio} = 11.5 \sum_{i=1}^{12} \left(\frac{r}{E} - 10 \right)^{10/9}$$

On the basis of P/E, he divided vegetation into Wet (A), Humid (B)

Sub Humid (C), Semi Arid (D) and Arid (E) depending upon the value of P/E ratio

(2) Thermal efficiency is the mean monthly positive departure of temperature from freezing point

$$\Rightarrow \left(\frac{T - 32}{4} \right)$$

$$TE \text{ index} = \sum_{i=1}^{12} \frac{T - 32}{4}$$

On this basis, he divided world into

(1) Mesothermal (A')
Mesothermal (B') Microthermal (C')
Taiga (D') Tundra (E') and Frost (F')

(2) On the basis of seasonal distribution of precipitation

he gave 4 pointer as "h", "a", "s", and "w" → explain

eg. AA'r → Tropical Wet Climate with rainfall throughout the year

8

Remarks

Table form with values

In 1948, he said
 Vegetation = f(Potential
 Evapotranspiration)
 which is the total theoretical
 amount of evaporation
 that occurs under
condition of infinite
water supply.

Using PE as base

$$= 1.6 \left(\frac{10E}{I} \right)^a$$

$$= a = f(I), I = \sum_{i=1}^{12} \left(\frac{E}{5} \right)^{0.14}$$

Using this PE, he
 gave 4 indexes of

- ① Moisture Index
- ② Thermal Efficiency or
PE index

Analysis

+ves

- ① included concepts of
Soil Moisture Balance
- ② use important concept
 of Potential Evapotranspiration

-ves

- ① ignored causal factors of
climate
- ② very complex
- ③ Calculations difficult
- ④ data not easily available for PE
- ⑤ ignored the role of air masses
condenses, etc

Remarks

③ Aridity and Humidity
Index

④ Concentration of PE
index.

Thus his three letter
 classification became
 a 4 letter one — very
complex.

eg A'Aa'r_r

SECTION-B

Attempt all questions:

5. Comment on the following into 150 words:

(10 × 5 = 50)

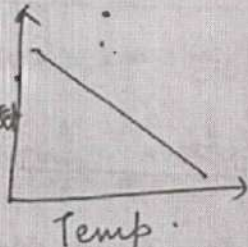
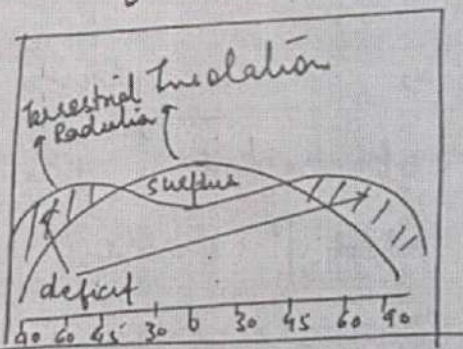
- (a) Write the factors affecting distribution and variation of temperature
- (b) Write a short note on Collision-coalescence process of precipitation
- (c) Polar front theory
- (d) Discuss the major causes of soil salinity and alkalinity. Also, suggest few measures to treat soil salinity and alkalinity.
- (e) "Topographical factors plays an important role in determining spatial and temporal variation of monsoon rainfall". Comment.

(a) Temperature is a function of presence and distribution of amount of heat.

Factor affecting distribution:

① Latitude - High the latitude, lesser insolation, lesser avg temp. eg. temp of Copenhagen < Kisangani of Congo.

② Altitude as Height

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eg Temp. of Mussoorie < Temp. of Delhi.

③ Distribution of land and sea - as oceans have a moderating impact eg. temp of New York more moderate than Kansas city

Remarks

④ Factor like ocean currents, airmass, Hornes like Tropical, and Temperate also influence temperature
 eg. Temperature of NW Norway warmer due to North Atlantic Drift

Albedo

Factor Affecting variation

① Pressure of waterbody affects variation as places on same latitude will have different temperature creating

- Temperature anomaly
- ② Planetary winds
 - ③ Coriolis force
 - ④ Other factor like Climate change, presence/absence of aerosol
 - ⑤ Solar cycle

It is important parameter of life on earth.

(b) Bergeron - Findeisen theory could not explain rainfall mechanism in tropical areas where cumulus clouds of height 2000 metre had a max. min. temp. of 5°C on top.

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As per this theory, atmospheric turbulence cause cloud droplets to collide and thus their size so much that

Remarks

↓ & coalesce.

they overcome the updraft resistance and fall onto ground. ✓

Two criticism ① collision may lead to splitting, not necessary coalescence

② Turbulent clouds often do not cause rainfall

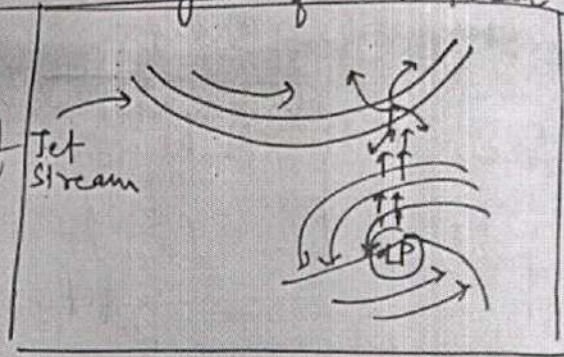
to Langmuir gave another version. According to him, the terminal velocity of falling air cloud droplet \propto diameter so a falling large air drop will absorb other droplet to grow in size, till it becomes heavy enough to overcome the resistance of updraft and fall on ground as Rainfall ✓

~~However~~, This theory could explain mechanism in Tropical areas ✓

explain briefly

(c) Polar front theory was given Bjerknes brother (also called Berger theory). Their theory explained the formation of temperate cyclones at Polar front location. London experience rainfall.

I Role of Jet Stream in creating unstable wave or wave shaped discontinuity on polar front. They argued the upper air trough of Jet stream created zone of low pressure on polar front surface \Rightarrow initiation of temperate cyclone.



7
V. good

Stationary front	Incipient stage	Early Mature
Late Mature	Occlusion Begin	Occlusion ends



① Stationary front is created when cold polar easterlies and warm westerlies meet side by side creating polar front.

② Incipient stage \rightarrow wave shaped discontinuity forces cold polar easterlies and warm easterlies.

Remarks

to move to zone of low pressure created.

③ Mature stage - distinct zone of cold/warm front and warm/cold areas, leading to formation of full temperate cyclone. later, central pressure increases, velocity increases and in late mature stage, warm air zone ↓

④ Occlusion begins with no contact of warm air with the ground and ends with entire warm air zone so uplifted causing frontolysis

Importance → causes rainfall in Mid-latitude region
 ② Bring winter rainfall to India, beneficial for Rabi crops

(d) Soil salinity/alkalinity occurs with increase in soil salt amount to such an extent that it begins to hurt fertility of the soil.

Causes

① In dry area, where evaporation > precipitation capillary action brings salts to surface eg. through capillary action.
~~the~~ deserts like Thar, Sonoran, etc.

② In areas of rising ground water level eg. areas irrigated

Remarks

6

Excessive irrigation + poor drainage

by canals eg. Indira Gandhi Canal Command areas, or in areas of extreme rainfall

(3) Area which lost its source of sines ^{seas} due to tectonic upliftment and water evaporated leaving salts eg. Kutch Salt Marshes, Makgadikadi Salt Pans etc.

(4) Application of excessive amount of fertiliser eg in China per capita consumption is too high.

(5) Nature of rocks forming soil eg if they are rich in salt, soil will be so.

Measures

(1) Reducing monocropping and rational fertiliser usage

kind of fertiliser to use or not eg soil health card.

(2) Artificial treatment through technology

(4) Rational utilisation of Irrigation water

(3) Studying soil and its continent and advising people what

(5) Growing crops that req high amount of salt rich soil to drain the soil of such salts.

- washing the soils
- gypsum + rearmat?

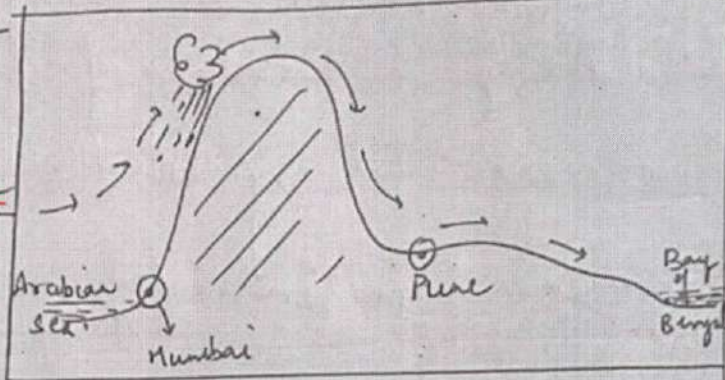
It is very essential to maintain fertility of soil for ensuring global food security

Remarks

(i) Monsoonal Rainfall is mainly orographic in nature so topographical factors play an important role.

Topographical factors ↔ Spatial variation of rainfall

(i) Spatially, areas on the windward side receive more rainfall upto level of inversion



6

beyond which rainfall reduces reflecting spatial variation

(ii) In case of closed mountained topography or funnel shaped topography excess rainfall get collapsed into 1 region. e.g. Mawsynram

(iii) In case of wind blowing parallel to mountain then no rainfall is



→ Windy → Monsoon winds cause rainfall in the shelter

Remarks

Anwarahis

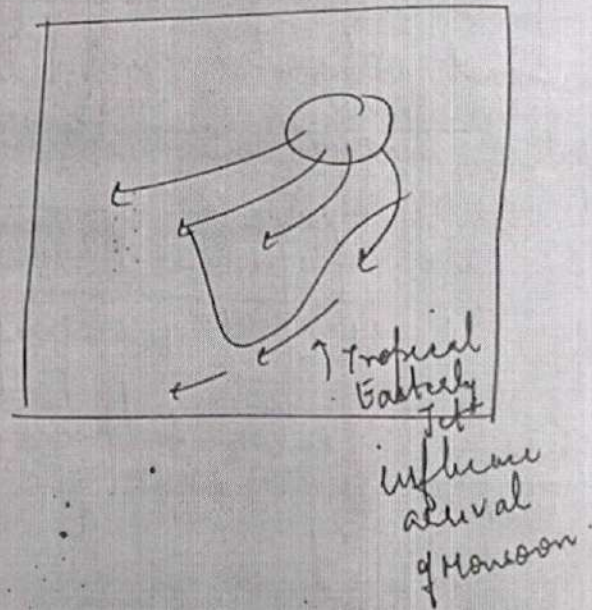
Topographical barrier \longleftrightarrow Temporal variation

(i) As topography stops the flow down the wind movement, it change temporarily distribution of precipitation. eg. Pune receives monsoon later than Mumbai.

(ii) Delay in heating of Tibetan Plateau causes delay in the arrival of Monsoon in India (for eg.)

- Himalayas
- E. G. gets 11 to 1500 mm
but N. TN gets rain from the NE monsoon.

Thus, Monsoonal winds are affected by Topographical factor in these manner.



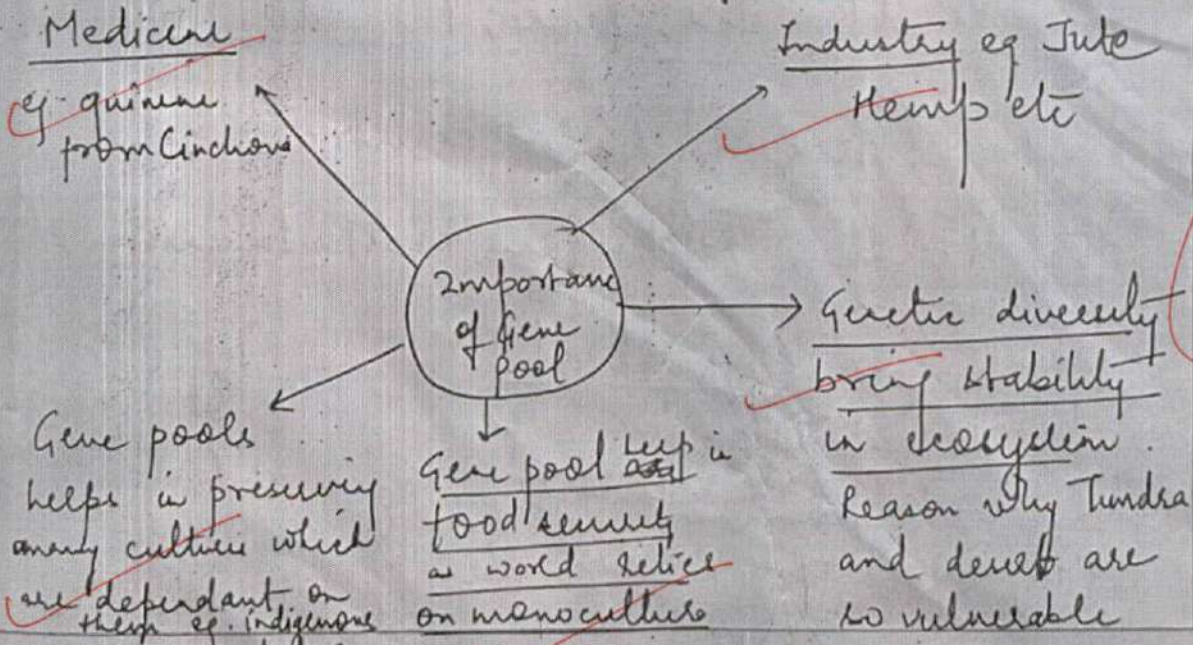
9. Answer the following questions:

- (a) Explain the concept of gene pool. Also describe the Vavilov's concept of gene pool centres of the world. (250 Words) (20)
- (b) Discuss the concept of Jet Stream and also explain Index Cycles of Jet Stream. (200 Words) (15)
- (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)

(a) Gene pool are the genetic variants of the same species eg. Rice has varieties like Juli Bengal, Basmali, Kalanamak - all these are part of gene pool of Rice.

gene pool
↓
Total assemblage of genetic diversity of any given species of crops.
↓
ensures a robust population.

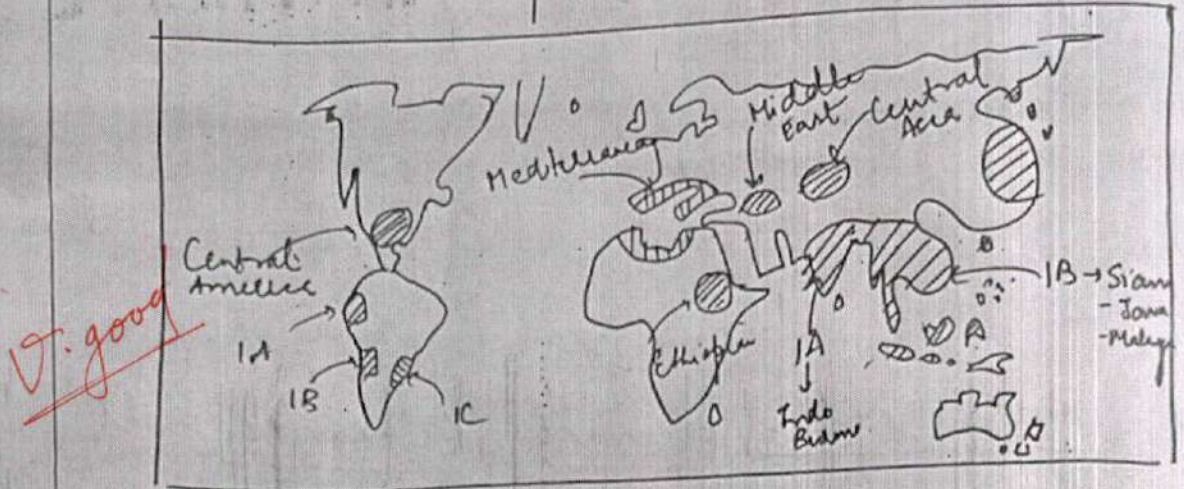
Those regions of world which are rich in gene pool are called Gene pool centres - given by Vavilov.



12

Remarks

Vavilov's concept of Gene pools.



① South Asian Tropical Region - includes
South Asia (Indo-~~Malaya~~ ^{Burma}) and Java-
 Malaya - Siam Region.

Species like Tea, Rice, Palm oil, etc

② Central Asia include countries like
 Uzbekistan, Tajikistan, ~~Azer~~ Turkmenistan etc
Species - Figs, wheat, etc

③ Middle East include regions like
 Iraq, Turkey, Jordan etc

Remarks

Species - Date Palm, etc

- (4) Ethiopian Region - around Ethiopia and some parts of Sudan and Eritrea.

Species - mainly Coffee*

- (5) Mediterranean Region - covers parts of Spain, Italy, Libya, Tunisia, Morocco, etc

Species - Olives, Grapes, Oranges etc

- (6) Central American region include countries like Mexico, Honduras, Guatemala etc

Species → Cocoa

- (7) South American include countries like

(1A) → Peru-Ecuador

(1B) → Chile

(1C) → Argentina - Paraguay

Species - Strawberry, Coffee, Tobacco, Potato etc

(8) East Asian Region include China, South Korea
and Japan
Spices - Tea, etc

However the Gene pole today are
 threatened by climate change and growing
population

geo-strophin
 circumpolar
 upper air instabilities

(b) Jet Streams are fast moving winds
 of high velocity in the upper troposphere
 level. They are of many type:

(1) Polar front Jet Stream

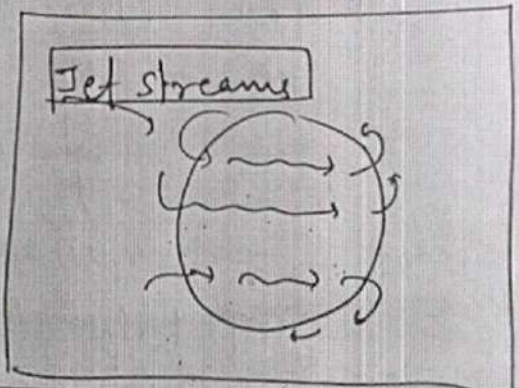
(2) Sub tropical Westerly Jet Stream

(3) Polar Night Jet Stream

(4) Tropical Easterly Jet

Causes

(1) Thermal winds
 generated due to
Tropospheric low
at polar area and
Tropospheric High at



Remarks

Thermal contrast b/w polar &
 temperate region determines the strength

9

Equator

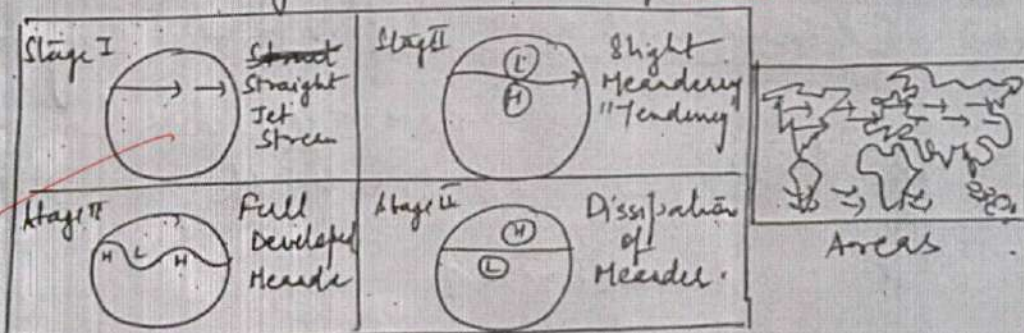
- ② Rotation of earth and Coriolis force
- ③ Conservation of Angular Momentum in context of Sub-Tropical Westerly Jet Stream
- ④ Pressure differential and temperature differential of Polar Front Jet Stream
- ⑤ Heating of Tibetan Plateau - Tropical Easterly Jet

Importance

- | | |
|--|--|
| <ul style="list-style-type: none"> ① <u>Role in monsoon</u> - e.g. Tropical easterly jet steers Tropical cyclone to India and intensifies Mascarene High ② <u>Heat distribution from equator</u> | <ul style="list-style-type: none"> to Poles ③ <u>Role in Western Disturbances</u> ④ <u>Role in formation of Temperate cyclone</u> ⑤ <u>Role in intensifying Polar Vortex</u> |
|--|--|

Index Cycle

The process of development of meander (called Rossby waves) in the Jet Stream is called Index Cycle. 4 stage process



Remarks

weakening tendency
9-16 km

Stage I → NO meander
 - full fast Tct stream moving from west to East

Stage II → presence of N-S topographic barrier causes the "tendency" to meander to develop
 - slight meander
 - pressure differential: North to South

Stage III - ~~Full~~ curvature and size of meander increases
 - Pressure differential from E to West direction $H \rightarrow L \rightarrow H \rightarrow L \rightarrow H$

Stage IV dissipation of Tct with cut off of warm air moving into cold air and cold air moving into warm air
 (1) warm air cut off
 (2) cold air cut off

Importance

- ① It is meandering tendency that leads to formation of temperature cycle
- ② Spatial distribution and balancing of heat

(c) Climate change refers to the long term change in the average climatic condition of earth. It can be both natural and anthropogenic

8

Remarks

It is true that these means are adopted & taken in sustainable development as argued by SDG

is brief sustainable development on deforestation, Methane control essential international calls eg. COP 26 decision

4 Environmental litigation - change like reduce demand of energy at home level solar plants on community level & recharge at societal level + installation of eg. Rainwater harvesting and Acquires invest in climate friendly means is

3 Social litigation -> social as a whole should

- self-awareness and demand for less climate sensitive products
- switching to public transport (eg)
- Reducing wastage (eg)
- Reducing use of Plastics (eg)

number climate change cost of mitigation

As per IPCC AR4, temperature has already risen about 1.09°C since industrial times, and it will reach 2.7 by 2100. Ocean sea level rise has doubled from 21mmpa b/w 1993-2002 to 4.4 mm/year between 2013-2021 (WMO report)

All this require change in life style - climate change has become part and parcel of climate debates and the ideas of common but differentiated responsibility has to be part of that Ex. ^{led to Britain} declaring Climate Emergency and Net Net 0 by 2050.

Personal lifestyle - per capita consumption of 400 in US in 2000 but of India is just 20. Per Equities of the value has to end.

Consumption
Consumption

Answer the following questions:

- (a) Discuss the concept of Airmass and also elaborate its role in macroclimatic changes. (250 Words) (20)
- (b) Critically analyse the impact of Climate change on biological diversity. (200 Words) (15)
- (c) Histosols play a critical role in regulating global nutrient cycle. How has anthropogenic activities disrupted this balance? Elaborate. (200 Words) (15)

Remarks

Remarks

GS SCORE

Remarks

GS SCORE

Remarks

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Remarks

GS SCORE

Remarks

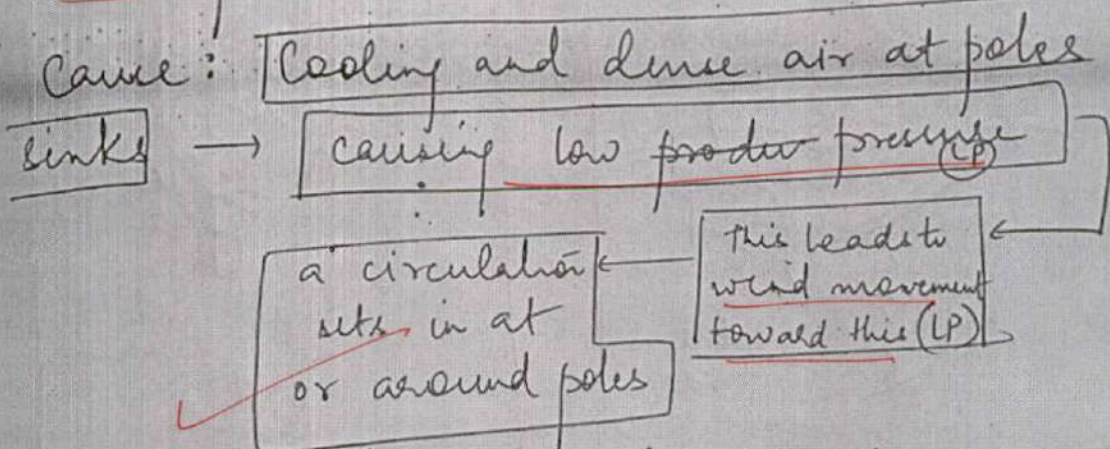
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Remarks

Answer the following questions:

- (a) What is Polar Vortex? How far climate change is responsible for erratic behaviour of the polar vortex? (250 Words) (20)
- (b) Analyse the impact of deforestation on climate change. Also discuss its effects on humans and animals. (200 Words) (15)
- (c) Discuss the basis of Koppen's climatic classification. Bring out the salient characteristic of 'Cs' type of climate. (200 Words) (15)

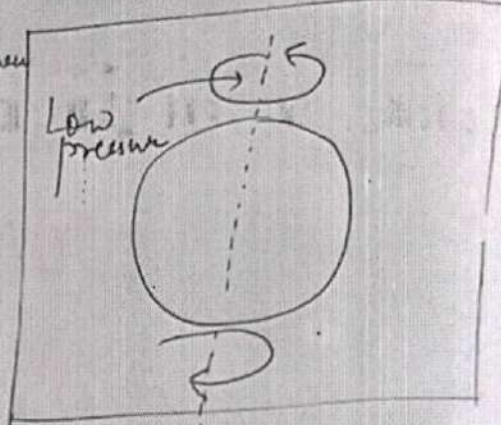
(a) Polar Vortex is the zone of fast moving westerly winds close to upper Troposphere and lower part of Stratosphere.



Many time polar stratospheric clouds are found in Polar Vortex as temperature is very low at around -50°C to -85°C .
 - Thus Polar Vortex play a role in Ozone Depletion.

13

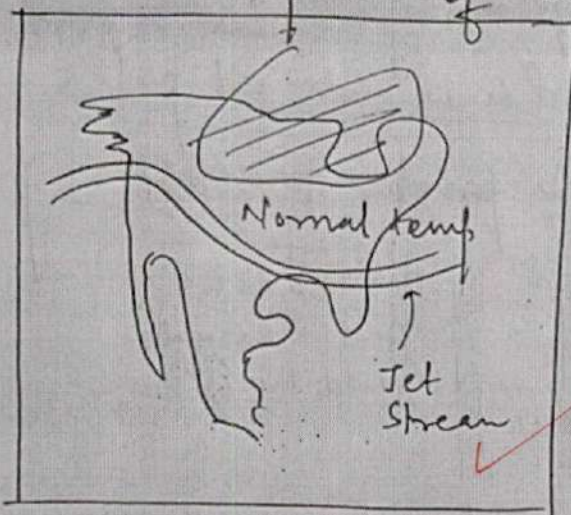
Polar Vortex is an upper troposphere level westerly wind movement surrounded by low pressure.



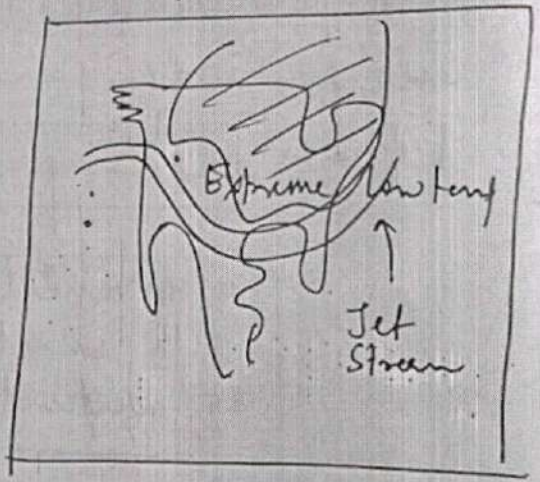
Its southern boundary is bounded by Jet Stream (Polar Front Jet) both in Northern and Southern Hemisphere

Polar Night Jet

Impact of Climate Change on Polar Vortex



=>



Climate change affects Jet Stream which begins to meander more leading to invasion of Polar Vortex deep South causing extreme low temperature eg. US Midwest Vortex impact

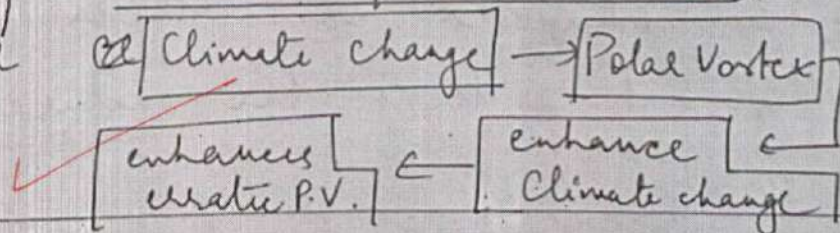
Remarks

② Climate change increases the strength of Polar Vortex in its origin place by reducing temperature at tropospheric level of poles, causing subsequent sinking and Polar vortex strengthening.

③ Climate change → induces erratic behaviours in Polar Vortex leading to exaggerated Ozone depletion. *if halides are present in PSC.*

④ Climate Change has led to increased frequency of Sudden Stratospheric warming which further induces variability in Polar Vortex. *good*

⑤ Climate change and Polar Vortex are caught up in positive feedback mechanism loop which



The Winters of 2019 were disastrous in the Mid West due to invasion of air-space by Polar Vortex.

It is essential to reduce Climate change to reduce erratic behaviour.

(b) Climate change is the long term change in the average climatic condition of the earth over long. It can be natural (solar cycle, continental drift, Milankovitch Cycle) or anthropogenic aerosol forcing.

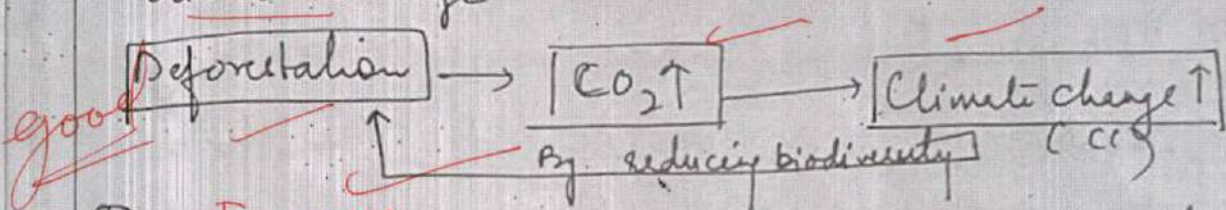
Impact of Deforestation on Climate Change

(1) It enhances the increase in temperature as it reduces the natural sink of CO_2 .

Remarks

② It ~~reduces~~ ^{makes} ~~rain~~ pattern erratic causing flood in places and drought in many place eg. Amazon Forest Flood, Dixie Fire of California

③ It set in a positive feedback mechanism with Climate change



Less Evapotranspiration
↓
less cloud cover

④ ^{Increases} Reduces runoff, aquifer dry, less evaporation
less rainfall → CC ↑

⑤ Deforestation disturbs the hydrological cycle
→ causing climate change. *good*

It is in this context that Born challenge is significant and the recent agreement of COP26 in Glasgow on combating Deforestation.

(*) Impact on Human and Animals*

① Loss of habitat for animal and increased man-animal conflict eg. Tiger roaming into human areas

② less of food sources/biodiversity and thus the entire ecosystem becomes unstable.

③ Extinction of species will hurt food chain and food web

④ Deforestation enhance Climate change which enhance erratic disaster like Tropical Cyclones, flood, drought harming animals and human alike of increased frequency of cyclone in Arabian Sea.

⑤ Deforestation will hurt industries as well by see and affect employment level.

⑥ Deforestation created a serious issue of water scarcity of case study of Chennai.

Thus it is essential that deforestation be controlled.

(1) Köppen's Climatic Classification was given in 1900 on the basis of critical values of temperature and rainfall.

→ vegetation was considered as a primary indicator

ie. Highest monthly rainfall and highest

1900 - Highest / lowest month yearly rainfall
Highest / lowest yearly precipitation

change in 1918 → Basis:

- ① Mean monthly and yearly temperature
- ② Mean monthly and yearly precipitation

9

-He then again worked with Geigge for Köppen-Geigge Classification when the lead to Geigge-Köppen-Pohi classification.

Basic idea = vegetation = is the function of totality of climate. Idea from de-candolle

at Mega level, he identified 5 types of vegetation
(A) Megathermal (B) Xerophytic (C) Mesothermal (D) Microthermal

Remarks

show in a neat table form.

and E - Frost. At Meso level, it was on the basis of precipitation eg

- f - all year precipitation
- w - winter dry
- s - summer dry
- d - deficient in all season

on the basis of temperature, he identified "a", "b", "c", "d" to indicate different temperature level. eg. ^{Type of} ~~vegetation~~ ^{Temperature} ~~paradigm~~ ^{paradigm}

"Cs" type of climate

① found in Mediterranean areas ② Location $22^{\circ}N/S - 45^{\circ}N/S$

③ Western side of continents (Warm Temperate zone)



④ Temp: coldest month between -3 and 18 and warmest month above $7^{\circ}C$

⑤ Rainfall: Dry Summers and Wet Winters due to shifting pressure belt of westerlies

⑥ Flora - Olives, Grapes, Vineyard etc (Sclerophyllous vegetation)

⑦ Example of a city - ① Rabat ② Adelaide ③ Cape Town ④ Marseille etc

Remarks

Good