

NEXT IAS

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ADVANCED INTEGRATED MENTORSHIP

GEOGRAPHY ASSESSMENT TEST-10

(To be filled by candidate)

Test Code : TC__

Name of Candidate : RITKA CHITLANGIA

NEXT IAS Roll No. : AIM246CRA075 Date of Examination : 27/8/23

Exam Centre : Old Rajinder Nagar ☒ Bhopal ☐ Online ☐

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Question paper will be provided separately and can be taken by the candidates after conclusion of the exam.

SUBJECT/PAPER
GENERAL STUDIES

Invigilator's Sign. :

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Evaluator Code :

Q.No	Pg No.	Maximum Marks		Marks	Total
1	1				
2	3				
3	5				
4	7				
5	9				
6	11				
7	14				
8	17				
9	20				
10	23				
Grand Total					

Signature

MACRO COMMENTS

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2. Write your registration number and other particulars, in the space provided on the cover of QCA Booklet.
3. Write legibly and neatly. Do not write in bad/illegible handwritings.
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1. Discuss the causes of tsunamis and their impact on coastal areas. What measures can be taken to mitigate the impact of tsunamis? (Answer in 150 words) 10 marks

Tsunami refer to the vertical displacement of water, generating enormous sea waves (50m) high, due to shifting or displacement of ocean bed.

causes of tsunami

① Underwater Earthquake - 6.5 magnitude seismic waves generate tsunami waves.

② landslides - coastal debris causes momentum of ocean water.

③ Crater Impact - fall of huge meteor & meteorites into ocean waters.

Eg: scientists predict that if a 10km diameter crater falls into Pacific ocean, tsunami will engulf entire california & Mexico.

Impact on coastal areas

① Generation of tsunami waves $\Rightarrow$ waves 50m high can engulf entire coastal cities like mumbai & chennai.

- ② storm surges - due to horizontal displacement of ocean water.
 - ③ coastal erosion - mangroves & wetlands can be destroyed.
 - ④ Power outages & fires - due to incursion of water.
 - ⑤ Water borne diseases - stagnant water can become a breeding ground of mosquitoes & various vector diseases.
- Mitigation measures

- ① Early warning systems → for proper awareness & evacuation.
- ② Shelter homes on high ground - to ensure immediate relief.
- ③ Enrichment of mangroves & wetlands - act as shock absorbers in coastal areas.
- ④ Checks on seaward encroachment of infrastructure.
- ⑤ Frequent evacuation drills & safety kits should be prepared.

Therefore, tsunamis are natural disasters, but through various structural & non-structural measures, it can be mitigated.

2. India is endowed with large rivers emerging from the Great Himalayas yet the region faces water shortage. Discuss. Also, give solutions to deal with the problem of water shortage.

(Answer in 150 words) 10 marks

Great Himalayas are home to some of the largest rivers in the world like Indus, Ganga, Brahmaputra, yet nearly 66% of India is drought prone.

Reasons for water shortages

- ① Lackadaical management of hydrology & river flow $\Rightarrow$ extreme fluctuations in river levels $\Rightarrow$ drought & floods in recurrent years.
- ② Extensive Agriculture $\Rightarrow$ drawing of excessive surfacial & groundwater $\Rightarrow$ shortage of water.
Eg: Punjab & Haryana (semi arid regions) but cultivates water intensive crops.
- ③ Unsustainable manuf. activities and industrialisation $\Rightarrow$ over-use of river waters $\Rightarrow$ discharge of polluted waters $\Rightarrow$ unusable river water.

④ Population pressure - Northern Gangetic plain → highly densely populated ⇒ huge stress on rivers.

Solutions to address water shortage.

① Interlinking of rivers → comprehensive feasibility assessment to ensure scientific & sustainable linkages to address water gap.

② Small dams → 'run of river' projects.
Eg: Chenab - Rattle project; Indus-Kishanganga ⇒ sustainable management of water.

③ Agro-ecology should be coherent
Eg: semi arid areas should focus on dryland agriculture.

④ Obligations on industries for cleaning the discharged water.

Therefore, the problem does not lie in less availability, rather it is rooted in effective management.

3. Discuss the different types of soils found in India and their significance for agriculture.

(Answer in 150 words) 10 marks

Soil refers to upper unconsolidated sediments, capable of plant growth.

Thus, soil refers to the organic layer, having bio-productive capacity.

Types of soil & Importance for Agriculture

① Alluvial soil $\Rightarrow$ azonal, shallow soil, extremely fertile, sustaining the large scale valley cultivation $\rightarrow$ important crops like rice, wheat, sugarcane, maize etc. are vital.

② Black soil $\rightarrow$ volcanic lava soils, rich in magnetite iron, but poor in nitrogen & organic matter. $\rightarrow$ known as 'regur', extremely important for cotton cultivation.

③ Red and yellow soils $\Rightarrow$ poor in phosphates & nitrogen, but can be cultivated with fertiliser treatments.
Eg: cashews, coconuts, dryland crops like millet etc.

④ Laterite soil → highly leached soils,
found in heavy rainfall areas.
→ used for coffee, tea, cashews,
spices and other plantation crops
in Western Ghats & N.E.

⑤ Peaty-Marshy soil → high organic content, composed of fossil deposits.
→ useful for mangrove forests,
sundari tree - useful for dyeing.

⑥ Desert / Arid soil → saline soil,
called as 'usara' because it
infertile. But with
irrigation ⇒ millet
can be cultivated.

Therefore, India has
a rich diversity
of soils, leading
to cultivation of
tropical and
temperate crops.



4. Differentiate the causes of landslides in the Himalayan region and Western Ghats.

(Answer in 150 words) 10 marks

Landslides refer to the de-stabilisation of slopes, causing the downslope movement of rocks, boulders, masses etc. under the influence of gravity.

Causes of landslides

① Himalayan region.

① Seismic Activity $\Rightarrow$ Himalayas are geologically active $\Rightarrow$ frequent earthquakes, causing the de-stabilisation of steep slopes, leading to movement of rock fragments.

② Shifting river courses $\Rightarrow$ due to erosion & deposition, extensive saturation of rock masses, enhancing disequilibrium of slopes.

Thus, Himalayan landslides are primarily caused by natural factors.

② Western units.

- ① Deforestation $\Rightarrow$ causes the loosening of soil $\Rightarrow$ easy movement of debris.
- ② Extremely heavy rainfall $\Rightarrow$ saturated rock masses become disbalanced $\Rightarrow$ slipping of rocks.
- ③ Mining $\Rightarrow$ stripping soil cover, creation of pits, blasting of roofs $\Rightarrow$ ground displacement $\Rightarrow$ landslides.

The Western units are geologically stable, thus most landslides are result of anthropogenic disturbances.

Therefore, landslides need to be effectively mitigated through slope stabilisation by afforestation, geo-textiles, boulders, frequent checks on overexploitation etc.

5. Major hot deserts in the northern hemisphere are located between 20-30 degrees north and on the western side of the continents. Why? (Answer in 150 words) 10 marks

Tropical Hot deserts are found between 20-30°N, located on western side of continents, exemplified by Thar Desert (India), Sahara Desert (Africa), Arabian desert, Chinshan? Sonoran Desert (USA-Mexico).

Location of hot deserts

(i) 20-30°N.

→ This zone is marked by the sub-tropical high pressure zone, reinforcing mechanical high pressure, due to subtropical westerly jet stream.

→ This causes atmospheric stability, leading to cloudless skies, high clouds (manning effect) and negligible precipitation.

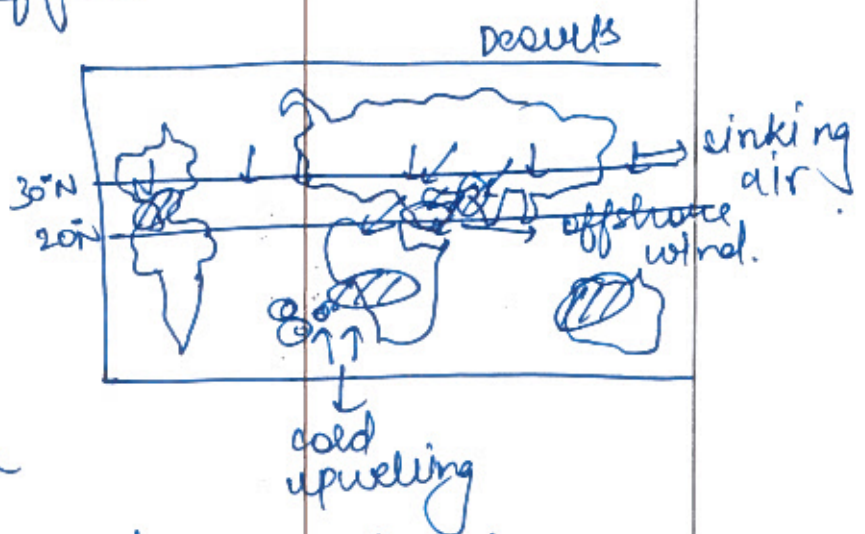
(ii) Western side of continents → This can be attributed to 2 reasons:

(a) offshore winds ⇒ The peripheral trade winds are offshore, that means wind blows from land to sea ∴ No moisture ⇒ No rainfall.

(b) cold upwelling zones ⇒ due to density currents ⇒ upwelling of cold bottom waters ⇒ strengthens high pressure, producing a desiccating effect on coastal deserts.

thus, most of tropical deserts are found in a

certain specified belt, due to various complementary ocean-atmospheric interactions.



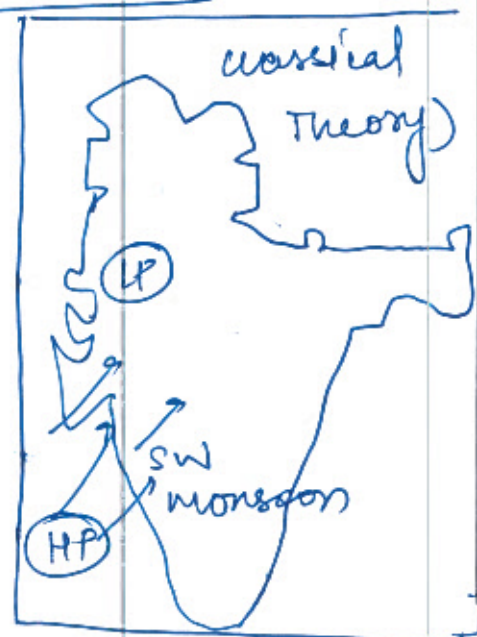
6. Explain the mechanism of the Indian monsoon. What role do El-Nino and La-Nina play in its development over the Indian subcontinent? (Answer in 250 words) 15 marks

Indian monsoon refers to the seasonal reversal of winds, oscillating pressure differentials between land and sea, rhythm of seasons and summer concentration of rainfall.

Mechanism of monsoon.

① Classical Theory - The North western region of India develops a low pressure, while ocean has a high pressure, leading to inflow of moisture-laden winds.

② Dynamic Theory - explains the role of movement of ITCZ over Northern India, due to sun's northward



migration. Develop a low pressure due to which, the moisture laden winds i.e. equatorial westerlies cross the equator and enter towards India.

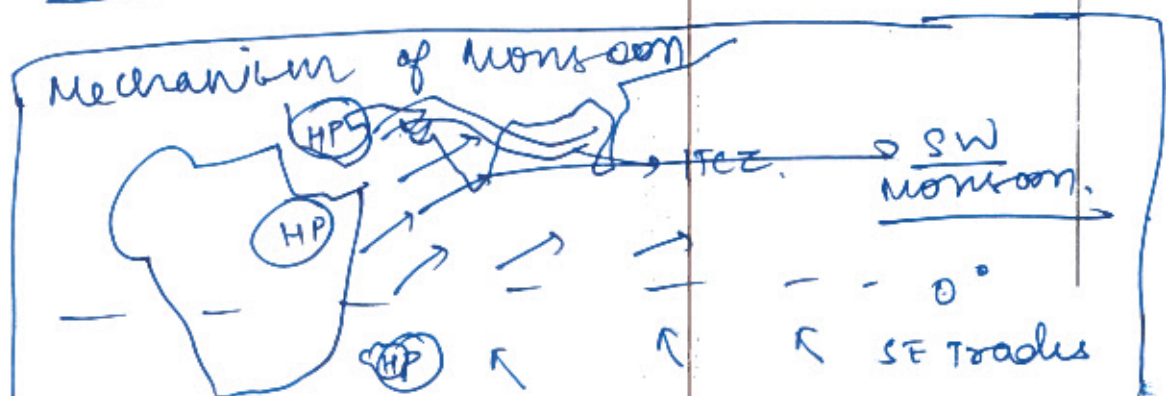
⑧ Modern theory

(i) Jet stream

→ emergence of Tropical Easterly jet over peninsular India, due to heating of Himalayan peninsula. strengthens Indian monsoon.

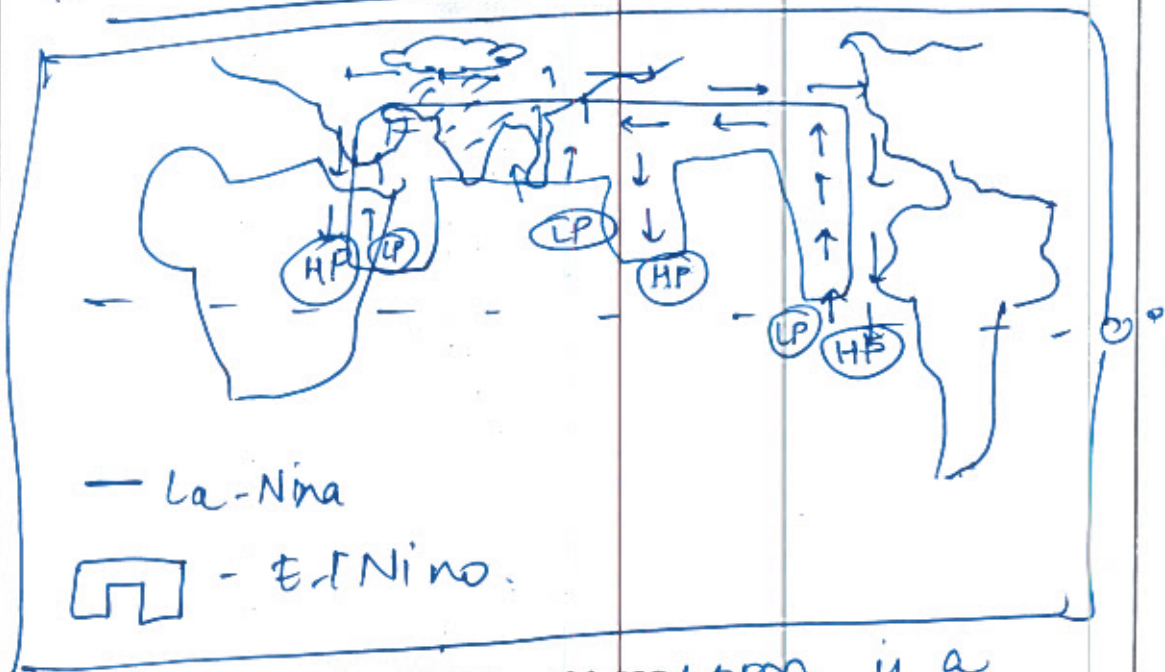
→ Disappearance of Subtropical westerly jet ⇒ over Kunlunshan helps to develop a low pressure over N.W. Rajasthan.

(ii) Development of Somalian, Arabian & Mascarene high.



Role of El-Nino Southern Oscillation

- ① El-Nino - Anomalous warming of Eastern Pacific $\Rightarrow$ reversal of walker cell $\Rightarrow$ weakening of Indian monsoon.
- ② La Nina $\rightarrow$ strengthening of trade winds $\Rightarrow$ Anomalous cooling of Eastern Pacific, strengthening of walker cell $\Rightarrow$ stronger Indian monsoon.



Therefore, Indian monsoon is a result of complex atmospheric-ocean interactions, that determine its arrival, frequency & strength.

7. Discuss the ways in which earthquakes can trigger secondary hazards such as landslides, tsunamis, and liquefaction. Assess the relative risks associated with these hazards and the measures that can be taken to mitigate their impact. (Answer in 250 words) 15 marks

Earthquake refers to the sudden release of energy due to pulverisation of rocks, which generates seismic waves.

Secondary impacts of earthquakes

① landslides

→ especially in hilly & mountainous areas, causes slope de-stabilisation and leads to displacement of rock debris.

② Tsunami

→ caused due to 6.5 magnitude earthquakes, under water, causing vertical displacement of sea water, generating magnanimous waves, as high as 50 m.

③ soil liquefaction → subsidence of rocks due to seismic waves.

water saturated soil goes into
dis equilibrium.

- ④ Ground displacement - movement
of surface waves, shakes the
foundation of buildings &
roads due to ground movement.
- ⑤ Fixes - collapse of grid systems.
- ⑥ Avalanches - movement of
ice debris downslope.

Relative Risks

Earthquakes refers to generation
of seismic waves (P & S waves),
it is through these secondary
hazards that major destruction
is caused.

- ① landslides $\Rightarrow$ destruction of
forest cover, blockage of streams $\Rightarrow$
floods, destruction of infrastructure
& loss of life.

- ② Similarly, collapse of buildings etc. leads to death due to debris and suffocation.
- ③ Fires can wipe out inhabited areas, forests, agricultural fields.
- ④ Land subsidence can lead to infrastructural collapse.
eg: Jashimath subsidence 2022.

Mitigations

- ① Resilient Infrastructure $\Rightarrow$ using light construction material, sand-box technology etc)
eg: CDRI $\Rightarrow$ initiative to develop disaster resilient infrastructure.
- ② Geological assessments of earthquake risks before laying down foundations of buildings.
- ③ Frequent drills & shelter comes in Earthquake prone areas.
- ④ Fire proofing, early warning systems etc. in high rise building for efficient evacuation.

Therefore, Earthquake risks cannot be completely eliminated, but they can be significantly reduced.

8. How do the melting of the Arctic ice and glaciers of the Antarctic differently affect the weather patterns and human activities on the Earth? Explain.

(Answer in 250 words) 15 marks

Sea ice of Arctic and glaciers of Antarctica comprise a significant element of cryosphere, which stores nearly 80% of world's fresh water resources.

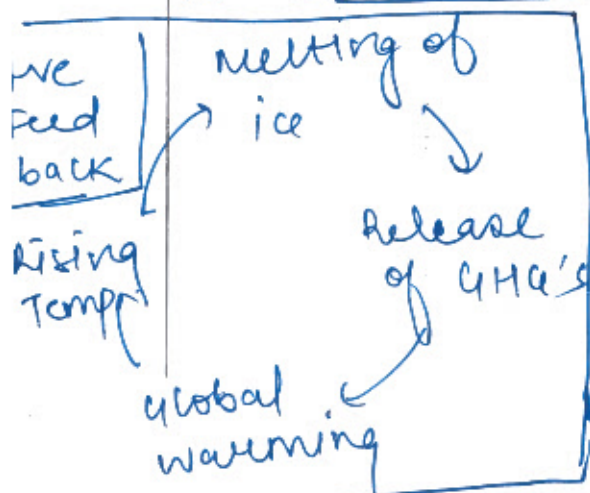
Melting of Arctic ice

(i) Influence on Weather Patterns

① Weakening of polar vortex $\Rightarrow$ decreasing temperature contrasts
 $\Rightarrow$ Arctic Amplification $\Rightarrow$ warmer Arctic & colder mid-latitudes.

② Lowering of albedo $\Rightarrow$ disturbances in heat balance of Earth.

③ Positive Feedback Mechanism



(ii) Influence on Human Activities

① Submergence of coastal society & economy due to rising sea levels.

② Increase in frequency of epidemics & diseases due to release of frozen viruses.

Eg: Zombie virus in Siberia.

③ Erratic levels of precipitation & increased natural disasters due to warming oceans & slowing down of density currents.

Eg: Increased frequency & intensity of tropical cyclones in Arabian sea.

Melting of glaciers in Antarctica

(i) influence on weather pattern.

① slowing down of West Wind drift $\Rightarrow$ warming of Benguela current $\Rightarrow$ warmer western Africa.

② melting of Antarctica $\Rightarrow$ increased precipitation & less snowfall $\Rightarrow$ release of CO₂, methane etc. $\Rightarrow$

global warming.

- ③ Influence on global wind circulation
 → disturbances in redistribution
 of heat.

(ii) Influence on human activities

① Excessive precipitation

② Frequent El-Nino → destruction
 of fisheries belt along Peru coast.

③ Loss of habitat & biodiversity ⇒
loss of important resources
 for polar settlements.

Therefore, Arctic & Antarctica
 are warming much faster than
 other areas. There is a need of
strict research & development,
coherent policy making, decarbonisation,
climate finance etc. to check the
rising global temperatures.

9.

Explain the origin of Indian islands in the Bay of Bengal and the Arabian Sea.

(Answer in 250 words) 15 marks

Island refers to a piece of land
surrounded by water on all
four sides. Indian territory
comprises of 612 islands,
located in Arabian sea and
Bay of Bengal.

Origin of Indian Islands

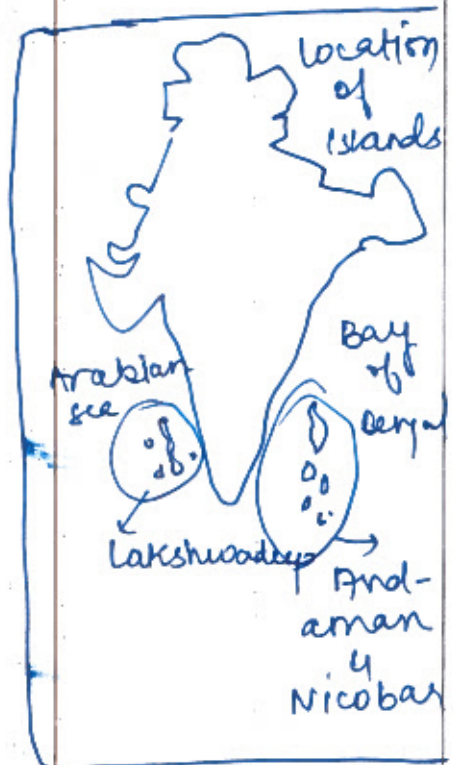
(i) Bay of Bengal

→ Andaman and
Nicobar islands

are found off the
east of Eastern
India.

→ These islands are volcanic in
origin, formed due to tectonic
movement of plates.

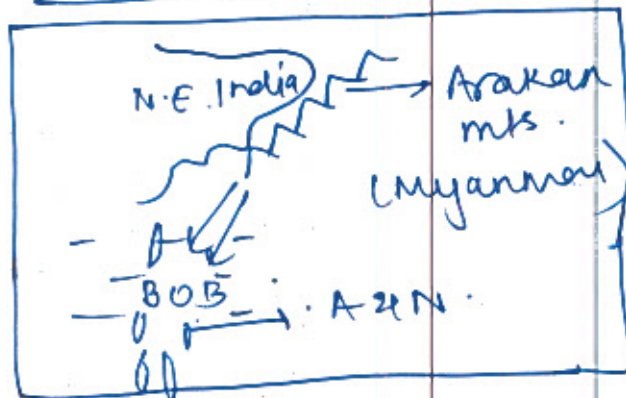
→ As the Indian plate collided



with Eurasian plate, syntaxial
band developed near Narmada
Barwa, led to N-S orientation,
of Purvanchals.

→ Andaman & Nicobar are considered
to be the extension of Himalayan
orogenesis, geologically matching
the Arakan mountains of Myanmar.

→ Barren Island → only live volcano
of India, part of under sea
volcanic mountain chain, the
upraised part of which forms
the Andaman & Nicobar islands.



(ii) Arabian sea islands.

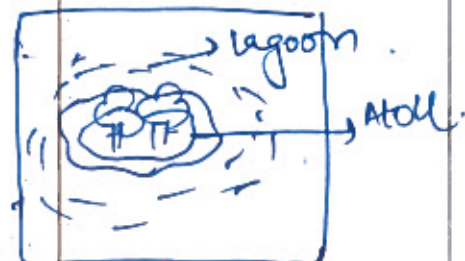
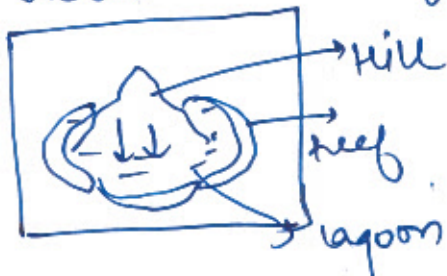
→ Lakshadweep Islands, located

480 km off the Malabar coast,
comprises of 43 islands, only 11 are
inhabited.

② These are coral islands, composed
of dead coral deposits, rich in
calcium carbonate, known as
atolls.

③ Hells surround a shallow lagoon,
formed due to subsidence of
hills, composed of granitic
rocks.

④ Gradually, the attached fringing of
barrier reef are raised above
sea level, and they cover the
hollow to form coral islands.



Therefore, the islands of India
have unique geomorphology and
are enriched with abundant
natural resources, heritage of humans.

10. How has global warming impacted the frequency and intensity of extreme weather events such as cyclones, floods, and droughts, and what are the implications of these changes for vulnerable communities?
(Answer in 250 words) 15 marks

Global warming, as per IPCC, refers to the increase in average global temperatures, as a result of rising concentration of green house gases. (1.2°C higher than pre-industrial levels (IPCC)).

Global warming - impact on weather
Due to rising temperatures, the balance of hydrological cycle has been disturbed, which leads to extremities of climate events.

① increased frequency & intensity of tropical cyclones → as the sea surface temperature rises, greater evaporation takes place ⇒ ideal conditions for formation

of cyclones. Moreover, slowing down of temperature & salinity currents, causes marine heatwaves.

② Floods & Droughts $\Rightarrow$ erratic precipitation levels.

Eg: Impact on Indian monsoon - untimely arrival of western disturbances $\Rightarrow$ floods in Himachal & Uttarakhand in 2023. Meanwhile, parts of China are drought stricken.

③ Melting of glaciers $\Rightarrow$ floods downstream, submergence of mountain villages.

④ Glacial lake outbursts $\Rightarrow$ slope destabilisation and melting of frozen ice.

⑤ Frequent sea storms $\Rightarrow$ coastal submergence & thunderstorms.

⑥ Weakening of polar vortex $\Rightarrow$ Blast of chilly weather in USA and Canadian cities.
heat waves over
Eg: Bomb cyclone (2022)

Implications on Vulnerable Communities

① Destruction of local economy -

Eg: Kashmir villagers are dependent on Karewa soil for saffron cultivation → floods & soil erosion.

② In coastal cities & islands, cases of rising sea level is worrisome.

Eg: shift of Indonesian capital, tsunami in Tuvalu, rising sea level in Maldives.

③ Frequent natural disasters →

Eg: wildfires in Greece, Italy, Hawaii → death of 60 people.

④ Agricultural drought & hydrological floods → Eg: Northern Chinese plains.

Therefore, there is a need for coherent policy making, based on Paris Agreement & SDG, climate finance, mitigation, adaptation etc. for curbing the catastrophe of global warming.

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Space for Rough Work

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