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GEOGRAPHY

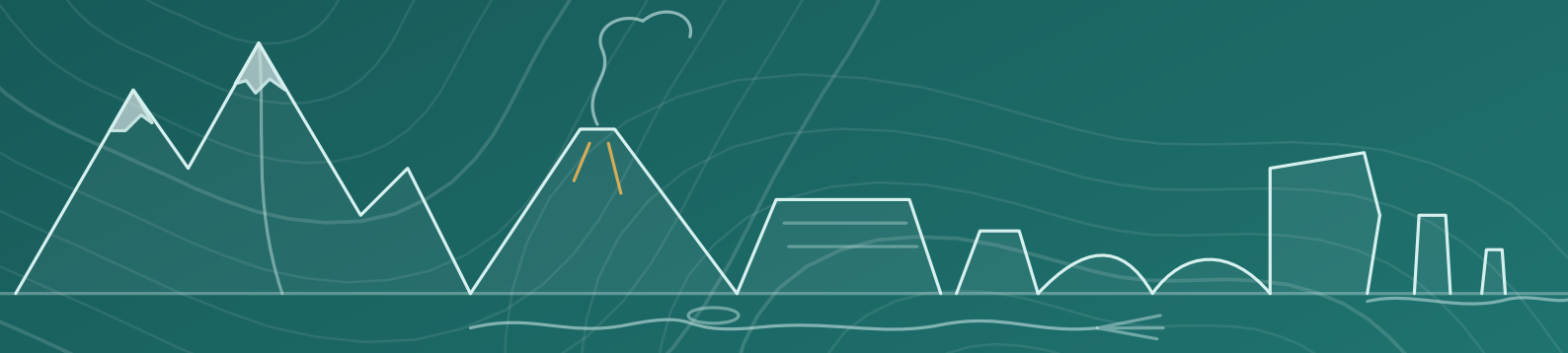
GS PAPER 1

Prelims Research 2013–2026

Every Geography question of UPSC Prelims from 2013 to 2026, year-wise with the latest paper first: the correct answer, an explanation of every option, and notes on the topic.

Compiled by Arvind KrS

179	14	87	2026
Questions explained	Years of papers	Maps and figures	Latest paper included



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02 Prelims 2017–2021

03 Prelims 2013–2016

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Geography Prelims Research 2013–2026

Year-wise UPSC Prelims Geography questions with answers and explanations

Prelims 2026 Edition · Compiled November 2026

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PRELIMS RESEARCH | GS PAPER 1 | GEOGRAPHY

UPSC Prelims Research: Geography 2026

All 11 Geography questions of UPSC Civil Services Preliminary Examination 2026, General Studies Paper 1, with the correct answer and an explanation of every option.

1. In what way(s) does the Vizhinjam International Seaport represent a structural shift in India's maritime trade and logistics policy?

1. By functioning exclusively as a domestic cargo hub to reduce reliance on coastal shipping and eliminate the need for foreign collaborations.

2. By focusing primarily on passenger cruise tourism and heritage shipping to increase Kerala's profile as a maritime heritage destination.

3. By leveraging its natural deep draft and strategic location to reduce dependence on foreign trans-shipment ports, enhance revenue retention, and reposition India in regional maritime trade.

Select the answer using the code given below:

(a) 1 only
(b) 1 and 2
(c) 2 and 3
(d) 3 only

> **Answer: (d) 3 only**

Vizhinjam International Seaport

- **Vizhinjam International Deepwater Multipurpose Seaport** near **Thiruvananthapuram (Kerala)** was **dedicated to the nation by the Prime Minister on 2 May 2025**. Built at a cost of about **₹8,800 crore**, it is **India's first dedicated container trans-shipment port** and its first semi-automated port.
- It is developed on a **Public-Private Partnership (PPP)** model: the **Government of Kerala** is the landlord and **Adani Vizhinjam Port Pvt. Ltd. (APSEZ)** is the concessionaire. It is also the first port project to receive **Viability Gap Funding (VGF)** from the Centre.

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- Why it is a structural shift:
  - **Natural deep draft of nearly 20 metres** with very little need for capital dredging, which allows the world's largest container ships (Ultra Large Container Vessels) to berth. The **MSC Irina**, among the largest container ships in the world, berthed here in June 2025.
  - **Strategic location**: only about **10 nautical miles from the international East-West shipping route** linking Europe, the Persian Gulf and the Far East.
  - About **75% of India's trans-shipment cargo was handled at foreign ports** such as **Colombo, Singapore and Port Klang**. Vizhinjam allows this cargo to be handled within India, so the **revenue, foreign exchange and jobs stay in the country**.
  - It **repositions India as a trans-shipment hub** in the Indian Ocean region, in line with the **Maritime India Vision 2030** and the **Sagarmala Programme**.



Vizhinjam and the international East–West shipping route

Why statements 1 and 2 are incorrect

- **Statement 1 is incorrect**: Vizhinjam is an **international trans-shipment hub**, not an exclusively domestic cargo hub. Its business model depends on **foreign shipping lines** (for example, MSC) bringing mother vessels, whose cargo is then moved to feeder vessels. It complements coastal shipping rather than reducing it, because feeder services carry the cargo to other Indian ports.
- **Statement 2 is incorrect**: the port is a **container trans-shipment and multipurpose cargo port**. Cruise tourism or heritage shipping is not its primary focus.

Feature	Vizhinjam International Seaport
Location	Thiruvananthapuram, Kerala (south-west tip of India)
Commissioned	2 May 2025
Model	PPP: Govt. of Kerala (landlord) + Adani Vizhinjam Port Pvt. Ltd.
Natural draft	Nearly 20 m (deep-water, minimal dredging)
Distance from East-West route	About 10 nautical miles

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Significance	India's first dedicated container trans-shipment port; cuts dependence on Colombo, Singapore and other foreign hubs

2. Identify the river of the Indian sub-continent on the basis of the following information:

1. It has an antecedent drainage system.

2. It flows through three countries.

3. It originates in the Tibetan Plateau and is an important river for irrigation.

4. It does not form distributaries.

Select the answer from the following:

(a) Brahmaputra
(b) Indus
(c) Sutlej
(d) Teesta

> **Answer: (c) Sutlej**

Antecedent Drainage

- An **antecedent river** is one that **existed before the uplift of a mountain range** and kept cutting its valley downward as the land rose. Such rivers flow **across** the mountain axis through **deep gorges**.
- The **Indus, Sutlej and Brahmaputra** are the classic antecedent rivers of the Himalaya. They are older than the Himalaya and cut gorges at **Nanga Parbat (Indus)**, **Shipki La (Sutlej)** and **Namcha Barwa (Brahmaputra/Dihang)**.

Sutlej

- The Sutlej **rises from Rakas Tal near Lake Mansarovar in Tibet**, where it is known as **Langchen Khambab**. It enters India through the **Shipki La pass in Himachal Pradesh**, cutting a deep gorge, which is why it is an **antecedent river**.
- **Three countries**: China (Tibet), India and Pakistan. It forms part of the India-Pakistan border in Punjab and then joins the **Chenab in Pakistan to form the Panjnad**, which joins the Indus near Mithankot.
- **Irrigation lifeline**: the **Bhakra-Nangal project (Gobind Sagar reservoir)** and the **Indira Gandhi Canal**, which starts from the **Harike Barrage** at the Sutlej-Beas confluence, irrigate Punjab, Haryana and Rajasthan.
- **No distributaries**: the Sutlej is a **tributary** that merges into the Chenab/Indus system. It **never reaches the sea**, so it does not form a delta or distributaries.

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Course of the Sutlej: from Rakas Tal through the Shipki La gorge to the Panjnad

Why the other options do not fit

- **Indus**: it is antecedent, rises in Tibet (near Mansarovar, as **Singi Khamban**), flows through Tibet, India and Pakistan and is vital for irrigation. But it **forms a large delta with many distributaries** before entering the **Arabian Sea near Karachi**. So it fails the fourth clue.
- **Brahmaputra**: it is antecedent and flows through three countries (Tibet as **Yarlung Tsangpo**, India, Bangladesh). But it is a **heavily braided river** and forms the **Ganga-Brahmaputra delta with many distributaries**. Its main use is navigation and hydropower rather than canal irrigation.
- **Teesta**: it **rises in Sikkim** (Tso Lhamo lake / Teesta Khangtse glacier), not on the Tibetan Plateau. It flows through **only two countries**, India and Bangladesh, and joins the Brahmaputra (Jamuna) in Bangladesh.

River	Origin	Antecedent?	Countries	Distributaries?
Sutlej	Rakas Tal, Tibet	Yes (Shipki La gorge)	3: China, India, Pakistan	No (tributary)
Indus	Near Mansarovar, Tibet	Yes (Nanga Parbat gorge)	3: China, India, Pakistan	Yes (delta near Karachi)
Brahmaputra	Chemayungdung glacier, Tibet	Yes (Namcha Barwa gorge)	3: China, India, Bangladesh	Yes (braided; delta)
Teesta	Sikkim (India)	No	2: India, Bangladesh	No (tributary)

3. Which of the following with reference to Indian States is/are not correct?

1. Uttar Pradesh shares its boundary with the highest number of other Indian States.

2. Rajasthan shares the longest international border among all Indian States.

3. Sikkim is the only State that shares its boundary with just one other Indian State.

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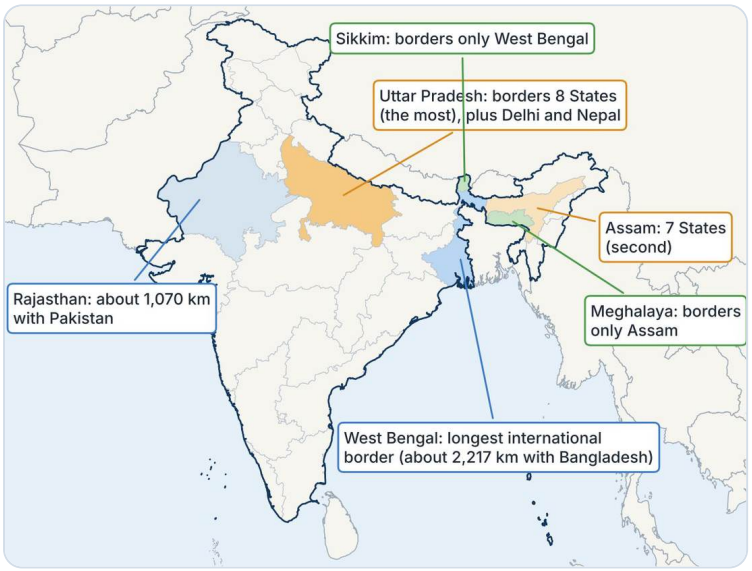
Select the answer using the code given below

(a) 1 only
(b) 1 and 2
(c) 2 and 3
(d) 3 only

Answer: (c) 2 and 3

- **Statement 1 is correct: Uttar Pradesh borders 8 States:** Uttarakhand, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand and Bihar. It also borders the NCT of Delhi and has an international border with Nepal. **Assam is second with 7 States** (Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and West Bengal).
- **Statement 2 is incorrect: West Bengal has the longest international border** of any Indian State: about **2,217 km with Bangladesh**, plus borders with **Nepal and Bhutan**. Rajasthan's border with Pakistan is about **1,070 km**.



Indian States in the question: borders with States and with other countries

- **Statement 3 is incorrect**: Sikkim borders only **West Bengal**, but it is not the only such State. **Meghalaya borders only Assam** among Indian States (its southern and western sides face Bangladesh).

India's Land Boundaries

- India's land border is about **15,200 km**, shared with **7 countries**: Bangladesh (4,096.7 km, the longest), China (3,488 km), Pakistan (3,323 km), Nepal (1,751 km), Myanmar (1,643 km), Bhutan (699 km) and Afghanistan (106 km).
- **Five States border Bangladesh**: West Bengal (2,217 km), Tripura (856 km), Meghalaya (443 km), Mizoram (318 km) and Assam (263 km).
- **Five States border Nepal**: Uttarakhand, Uttar Pradesh, Bihar, West Bengal and Sikkim.

Fact	State
Borders the most States	Uttar Pradesh (8), then Assam (7)
Longest international border	West Bengal
Longest border with Bangladesh	West Bengal
Borders only one other State	Sikkim (West Bengal) and Meghalaya (Assam)
Borders 3 countries	West Bengal (Bangladesh, Nepal, Bhutan) and Sikkim (China, Nepal, Bhutan)
Longest border with Pakistan (State)	Rajasthan (about 1,070 km)

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4. Which among the following is/are the objective(s) of the Rainfed Area Development (RAD) initiative under the National Mission for Sustainable Agriculture (NMSA)?

1. Encouraging monoculture in rainfed areas

2. Increasing rice cultivation in irrigated regions

3. Enhancing productivity and minimising climatic risks through Integrated Farming Systems (IFS)

Select the answer using the code given below:

(a) 1 only
(b) 1 and 2
(c) 2 and 3
(d) 3 only

> **Answer: (d) 3 only**

Rainfed Area Development (RAD)

- **RAD** is a component of the **National Mission for Sustainable Agriculture (NMSA)**, which is one of the **eight missions under the National Action Plan on Climate Change (NAPCC)**.
- It follows an **area-based (cluster) approach** and promotes **Integrated Farming Systems (IFS)**, combining crops with **horticulture, livestock, fisheries, apiculture, agro-forestry** and value addition.
- **Objective**: to **enhance productivity and minimise the risks of crop failure** due to climatic variability. Combining several enterprises means that if one crop fails, other activities still give income.
- It also supports **natural resource conservation**, soil and water conservation, and the **cropping-system approach** (multiple, inter-, mixed and rotational cropping).
- Rainfed areas cover roughly **half of India's net sown area** and produce a large share of pulses, oilseeds and coarse cereals, which is why risk reduction there is a priority.

Why statements 1 and 2 are incorrect

- **Statement 1 is incorrect:** RAD does the **opposite of monoculture**. It promotes **crop diversification**, because a single crop raises climatic and market risk in rainfed areas.
- **Statement 2 is incorrect**: RAD targets **rainfed areas**, not irrigated regions. Expanding water-intensive rice in irrigated areas is not its objective.

Components of NMSA

Component	Focus
Rainfed Area Development (RAD)	Integrated Farming Systems, area-based development of rainfed areas
On-Farm Water Management (OFWM)	Water-use efficiency; now merged with PMKSY - Per Drop More Crop
Soil Health Management (SHM)	Soil testing, Soil Health Cards, balanced use of fertilisers

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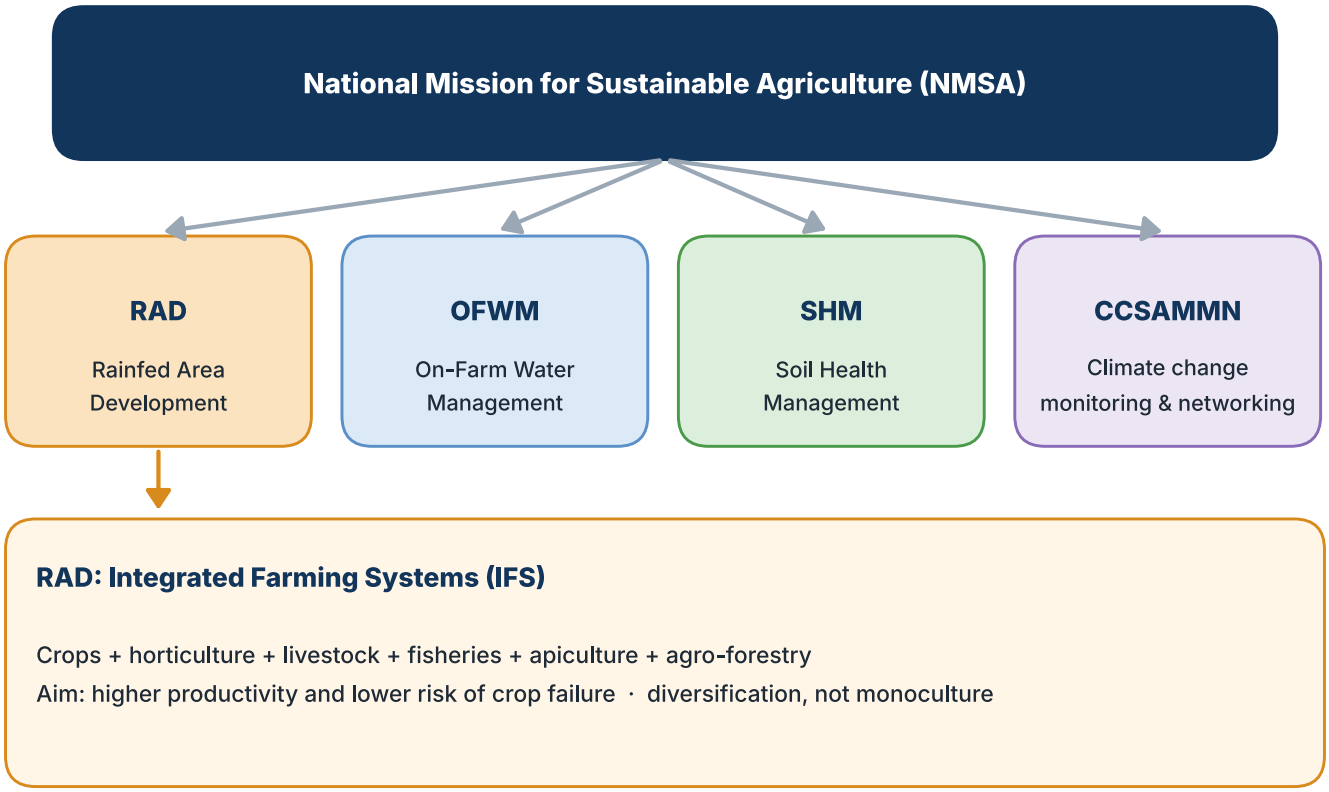
Climate Change and Sustainable Agriculture: Monitoring, Modelling and Networking (CCSAMMN)	Information on climate change and adaptation



Components of NMSA and the Integrated Farming Systems approach of RAD

5. Ships from which of the following countries have to cross the Strait of Hormuz to reach out to the Indian Ocean?

1. Bahrain

2. Syria

3. Qatar

4. Egypt

Select the answer using the code given below:

(a) 1 and 2
(b) 1 and 3
(c) 2 and 3
(d) 3 and 4

Answer: (b) 1 and 3

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Strait of Hormuz

- The **Strait of Hormuz** lies between **Iran** (north) and the **Musandam peninsula of Oman** (south). It connects the **Persian Gulf** with the **Gulf of Oman**, which opens into the **Arabian Sea and the Indian Ocean**.
- It is about **33 km wide** at its narrowest point and is the **world's most important oil chokepoint**: roughly **one-fifth of global oil consumption** and a large share of LNG trade (mainly from Qatar) passes through it.
- Any country whose **entire coastline lies inside the Persian Gulf** must cross Hormuz to reach the open ocean: **Bahrain, Qatar, Kuwait and Iraq**.
  - **Bahrain**: an island country in the Gulf of Bahrain inside the Persian Gulf, so **it must cross Hormuz**.
  - **Qatar**: a peninsula jutting into the Persian Gulf, so **it must cross Hormuz**. It is among the world's largest LNG exporters, and India imports a large share of its LNG from Qatar.

Why Syria and Egypt are incorrect

- **Syria** has its coastline on the **Mediterranean Sea**. Its ships reach the Indian Ocean through the **Suez Canal, the Red Sea and the Bab-el-Mandeb**, never through Hormuz.
- **Egypt** has coasts on the **Mediterranean and the Red Sea**. Ships from its Red Sea ports reach the Indian Ocean through the **Bab-el-Mandeb strait**.
- **Saudi Arabia, the UAE and Iran** are partial cases: Saudi Arabia also has a Red Sea coast, the UAE has the port of **Fujairah outside Hormuz** on the Gulf of Oman, and Iran has **Chabahar and Jask** on the Gulf of Oman.

Chokepoint	Connects	Bordering countries
Strait of Hormuz	Persian Gulf - Gulf of Oman	Iran, Oman
Bab-el-Mandeb	Red Sea - Gulf of Aden	Yemen, Djibouti, Eritrea
Suez Canal	Mediterranean Sea - Red Sea	Egypt
Strait of Malacca	Andaman Sea - South China Sea	Malaysia, Indonesia, Singapore

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Strait of Hormuz and the Gulf countries that must cross it

6. Tungurahua Volcano, which was declared a Global Geopark by UNESCO in 2025, is situated in which one among the following countries?

(a) Ecuador
(b) Peru
(c) Bolivia
(d) Colombia

Answer: (a) Ecuador

Tungurahua Volcano UNESCO Global Geopark

- **Tungurahua** is an **active stratovolcano in the Eastern Cordillera of the Andes in central Ecuador** (Tungurahua province, near the town of **Baños**). It rises to about **5,000 m**. Its name in Kichwa is often translated as **"Throat of Fire"**, and locals call it the **"Black Giant"**.
- It had a long eruptive phase **from 1999 to 2016**, with ash falls and pyroclastic flows that forced the evacuation of Baños.
- The **Tungurahua Volcano Geopark** was designated a **UNESCO Global Geopark on 10 April 2025** by the UNESCO Executive Board, together with the **Napo Sumaco Geopark**, also in Ecuador.
- Ecuador now has **three UNESCO Global Geoparks**: **Imbabura** (2019), **Napo Sumaco** (2025) and **Tungurahua Volcano** (2025).

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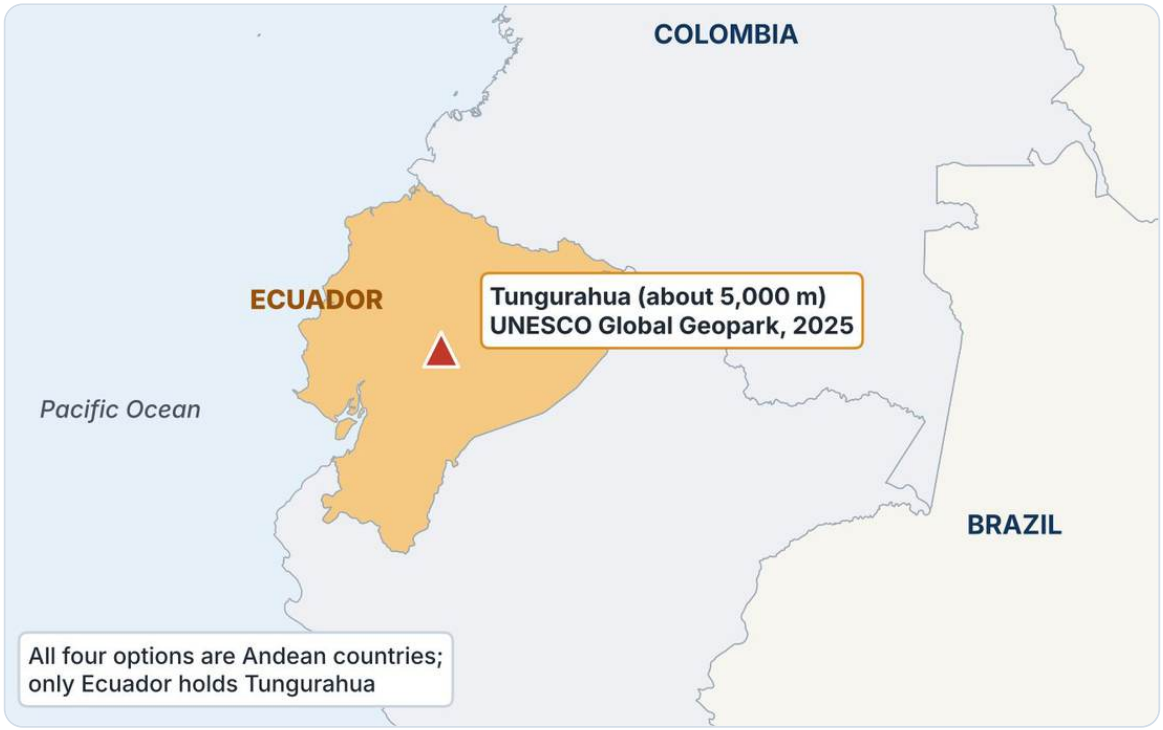

Tungurahua volcano in the Andes of central Ecuador

UNESCO Global Geoparks

- UNESCO Global Geoparks are **single, unified geographical areas** where sites and landscapes of **international geological significance** are managed with a holistic concept of **protection, education and sustainable development** with local communities.
- They come under the **International Geoscience and Geoparks Programme (IGGP)**, set up in **2015**. Status is given for **four years** and is then revalidated.
- **India has no UNESCO Global Geopark** so far.

Other options

- **Peru, Bolivia and Colombia** are Andean countries too, which is the trap. Peru's **Colca and Volcanoes of Andagua** became a Global Geopark in 2019, while the Tungurahua designation belongs to Ecuador.
- Other famous volcanoes of Ecuador: **Cotopaxi** (one of the highest active volcanoes) and **Chimborazo**, whose summit is the farthest point from the Earth's centre because of the equatorial bulge.

---

7. With reference to the climate of Andaman and Nicobar Islands, which of the following statements is/are correct?

1. The climate can be defined as a humid, tropical coastal climate.

2. It receives rainfall from both South-west monsoon and North-east monsoon.

3. Maximum precipitation is between December and May.

Select the answer using the code given below:

(a) 1 only
(b) 1 and 2

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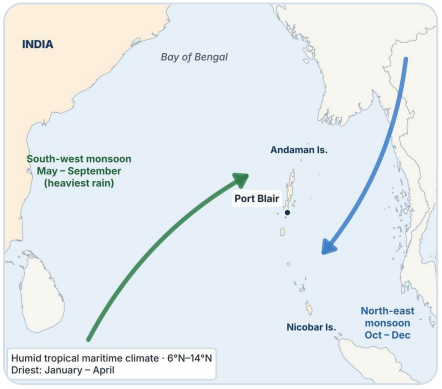
(c) 2 and 3
(d) 3 only

Answer: (b) 1 and 2

- **Statement 1 is correct**: the islands lie between about **6°N and 14°N** in the Bay of Bengal. Being close to the equator and surrounded by sea, they have a **warm, humid, tropical coastal (maritime) climate**. Temperatures stay between about **23°C and 31°C**, the annual range is small and humidity is high (about 70-90%).
- **Statement 2 is correct**: the islands get rain from the **South-west monsoon (May to September)** and also from the **North-east monsoon (October to December)**. Annual rainfall is about **3,000 mm** at Port Blair.
- **Statement 3 is incorrect**: **December to April is the driest part of the year**. The heaviest rain falls from **May to September/October**, with the **onset of the SW monsoon over the Andaman Sea in the third week of May**, which is the first landfall of the monsoon in Indian territory before Kerala.



Two monsoon spells over the Andaman and Nicobar Islands

Climate of the Islands

- The islands are prone to **tropical cyclones** forming in the Bay of Bengal (especially April-May and October-December).
- The **Nicobar Islands**, being closer to the equator, get rain almost **throughout the year** and show near-**equatorial** conditions.
- Vegetation reflects the climate: **tropical wet evergreen forests**, semi-evergreen and moist deciduous forests, and extensive **mangroves** along the coasts.

Season	Months	Weather at Port Blair
South-west monsoon	May - September	Heaviest rainfall; onset in third week of May
North-east monsoon	October - December	Second spell of rain; cyclone season
Dry season	January - April	Least rainfall; clear skies; peak tourist season

---

8. Which of the following geographical features or phenomena is/are associated with the Peninsular Block of India?

1. Submergence of parts of the western coast due to tectonic activity

2. Presence of residual mountain ranges such as the Veliconda hills and Mahendragiri hills

3. Deep, V-shaped river valleys formed by fast-flowing rivers

Select the answer using the code given below

(a) 1 only
(b) 1 and 2

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(c) 2 and 3
(d) 3 only

Answer: (b) 1 and 2

The Peninsular Block

- The Peninsular Block is made of **old crystalline, igneous and metamorphic rocks (gneisses and granites)** and is part of the ancient **Gondwana landmass**. Its northern boundary is roughly the line from **Kachchh along the western flank of the Aravalli, near Delhi, along the Yamuna and Ganga up to the Rajmahal Hills and the Ganga delta**; Karbi Anglong and the Meghalaya plateau in the north-east are also its extensions.
- **Statement 1 is correct**: as NCERT puts it, since the Cambrian period the Peninsula has stood like a **rigid block**, **except for some of its western coast, which is submerged beneath the sea**, and some other parts changed by tectonic activity without affecting the original basement. The narrow, straight western coast is an example of a **submerged coast**.
- **Statement 2 is correct**: the Peninsula is dominated by **relict and residual mountains**, such as the **Aravali hills, the Nallamala hills, the Javadi hills, the Veliconda hills, the Palkonda range and the Mahendragiri hills**. They are the remains of old mountains worn down by long erosion.
- **Statement 3 is incorrect: deep V-shaped valleys and gorges** are typical of the **young, fold mountain Himalaya**, where swift rivers cut down rapidly. Peninsular rivers are old and mostly have **broad, shallow, graded valleys** with low gradients.

Other features of the Peninsular Block

- It has undergone **vertical movements and block faulting**. The **rift valleys of the Narmada and the Tapi** and the **Mahanadi rift valley** are examples.
- Most peninsular rivers flow **east into the Bay of Bengal** and form **deltas**, except the Narmada and Tapi, which flow west through rift valleys and form **estuaries**.

Feature	Himalayan region	Peninsular Block
Age	Young fold mountains (Tertiary)	One of the oldest landmasses (Gondwana)
Rocks	Sedimentary, folded and faulted	Crystalline igneous and metamorphic
Stability	Unstable; earthquake-prone	Relatively stable rigid block
River valleys	Deep V-shaped valleys, gorges	Broad, shallow, graded valleys
Mountains	Lofty young ranges	Residual/relict hills (Aravali, Nallamala, Veliconda, Mahendragiri)

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	Himalayan region	Peninsular Block
Age	Young fold mountains (Tertiary)	One of the oldest landmasses (Gondwana)
Rocks	Sedimentary, folded, faulted	Crystalline igneous & metamorphic
Stability	Unstable, earthquake-prone	Rigid, stable block; parts of west coast submerged (Statement 1)
Mountains	Lofty young ranges	Residual hills: Veliconda, Mahendragiri, Nallamala, Aravali (Statement 2)
Valleys	Deep V-shaped valleys, gorges (Statement 3 belongs here)	Broad, shallow, graded valleys

Peninsular Block versus the Himalayan region

9. Consider the following statements with reference to the Sagarmala Programme of the Government of India:

I. The Sagarmala Programme seeks to achieve port-led economic growth through cost-effective and sustainable coastal infrastructure.

II. The success of the Sagarmala Programme is reflected in significant growth in coastal and inland waterway shipping, along with improved global port rankings.

III. Sagarmala 2.0 aims to position India as a global maritime innovation hub aligned with Atmanirbhar Bharat and Viksit Bharat 2047 visions.

Which of the following relationships among the above statements is/are correct?

1. Statement II validates the effectiveness of the strategies envisioned in statement I.

2. Statement III extends the objectives of statement I by embedding them into a future-oriented innovation framework.

3. Statement I contradicts statement III by focusing only on traditional infrastructure instead of modern innovation.

Select the answer using the code given below:

(a) 1 only
(b) 1 and 2

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(c) 2 and 3
(d) 3 only

Answer: (b) 1 and 2

Sagarmala Programme

- The **Sagarmala Programme** was approved in **March 2015** by the **Ministry of Ports, Shipping and Waterways** to promote **port-led development** and reduce logistics costs for EXIM and domestic trade with minimal infrastructure investment. So **Statement I describes its basic objective**.
- Its **five pillars**:
  - **Port modernisation and new port development**
  - **Port connectivity enhancement**
  - **Port-led industrialisation** (Coastal Economic Zones)
  - **Coastal community development**
  - **Coastal shipping and inland waterways transport**
- **Relationship 1 is correct (II validates I):** the outcomes show the strategy has worked. According to PIB (2026):
  - **315 projects worth ₹1.57 lakh crore** have been completed.
  - **Inland waterway cargo rose from 18.1 MTPA (2013-14) to 145.5 MTPA (2024-25)**, a growth of about **700%**, and coastal cargo has more than doubled since 2014-15.
  - **9 Indian ports are now in the world's top 100**, with **Visakhapatnam among the top 20** for container traffic.
- **Relationship 2 is correct (III extends I)**: **Sagarmala 2.0** carries forward the port-led growth objective into a future-oriented framework. It includes **research and development, innovation, maritime services, shipbuilding and institutional strengthening**, aligned with **Maritime India Vision 2030, Maritime Amrit Kaal Vision 2047 and Viksit Bharat 2047**. PIB puts its **budgetary support at ₹85,482 crore** with a total investment of about **₹3.6 lakh crore**.
- **Relationship 3 is incorrect**: Statement I does not contradict Statement III. Statement I says "cost-effective and **sustainable** coastal infrastructure". Sagarmala 2.0 builds on that same objective and adds innovation, rather than replacing it.

How to solve such relationship questions

- UPSC introduced Statement I / Statement II questions in 2023, and in 2026 it added questions on the relationships among statements. First check whether each statement is true, then check whether one is **evidence** for, an **extension** of, or a **contradiction** of another. Words like **"only"** in an option (here "focusing only on traditional infrastructure") usually signal a wrong relationship.

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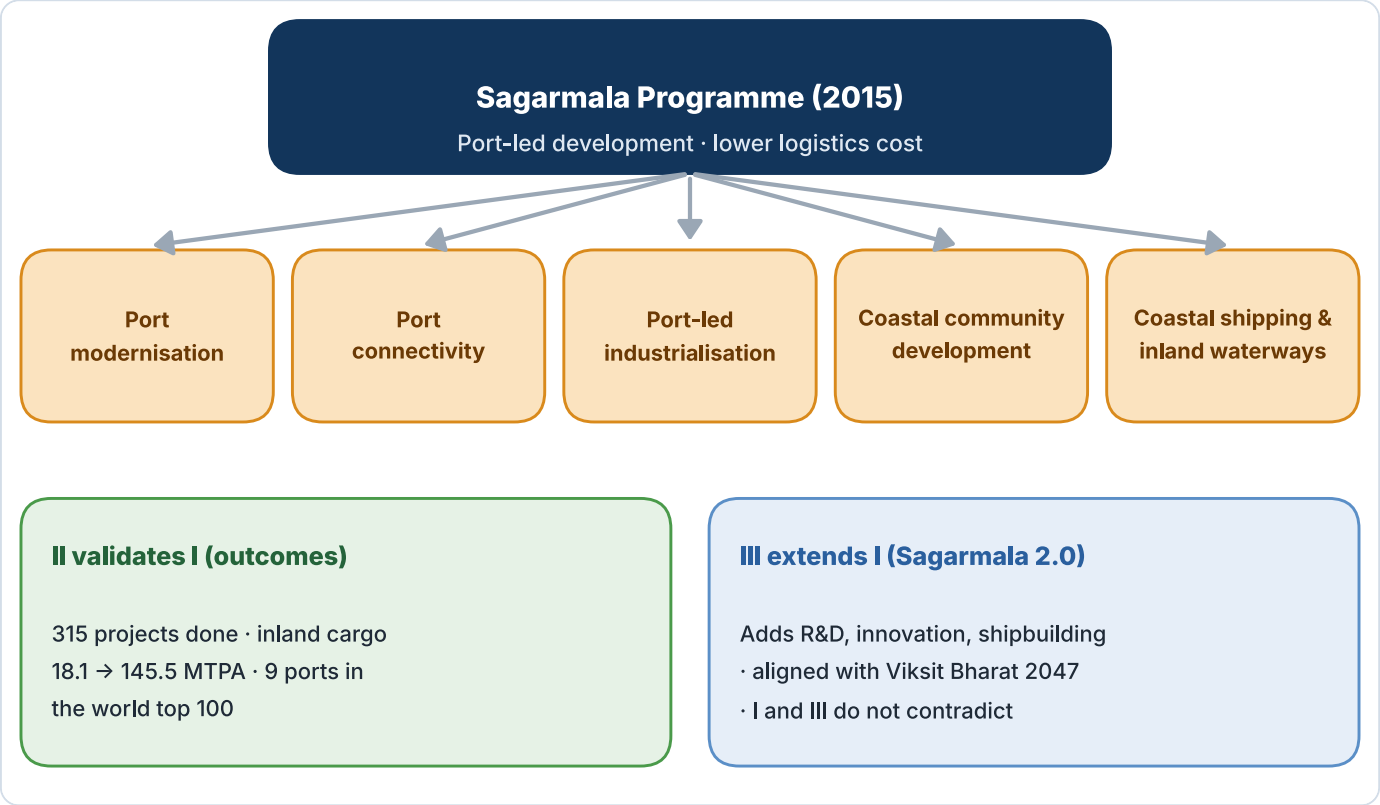

Sagarmala: five pillars and how the three statements relate

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10. Which of the following statements with reference to Lake Turkana is/are correct?

1. It is the largest desert lake in the world.

2. The lake is situated in South Sudan along the eastern fringe of the Sahara desert.

3. The lake is listed as a UNESCO World Heritage Site and is also referred to as the 'Jade Sea'.

Select the answer using the code given below:

(a) 1 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: (b) 1 and 3 only

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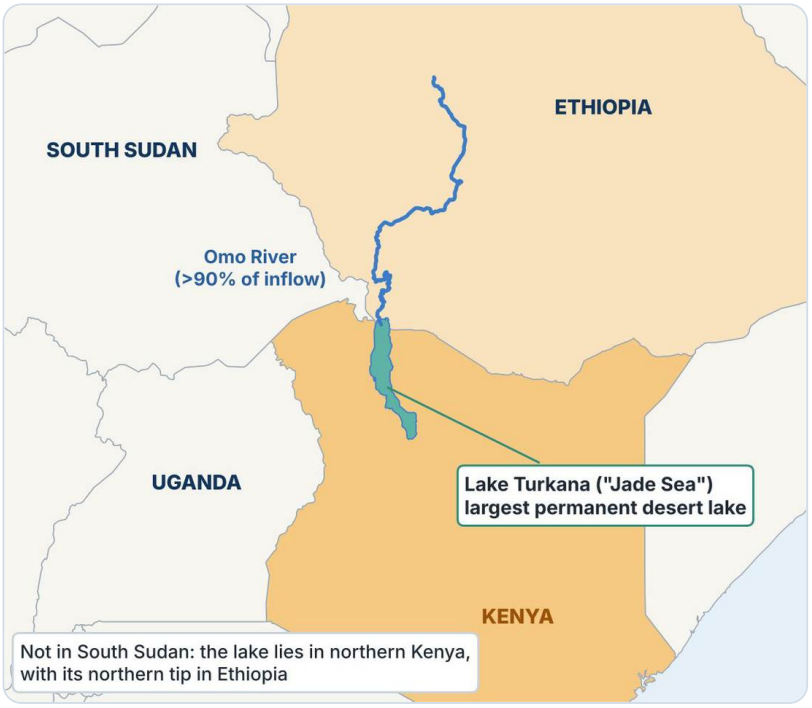
Lake Turkana

- **Statement 1 is correct**: Lake Turkana is the **world's largest permanent desert lake** and also the **world's largest alkaline lake**. It lies in an arid region of the **Eastern (Gregory) Rift Valley**.
- **Statement 2 is incorrect**: the lake lies in **northern Kenya**, with its **northern tip extending into Ethiopia**. It is in East Africa, not in South Sudan, and not on the fringe of the Sahara (the Sahara lies far to the north-west).
- **Statement 3 is correct**: the **Lake Turkana National Parks** (Sibiloi National Park, Central Island and South Island) were inscribed as a **UNESCO World Heritage Site in 1997**. The lake is called the **"Jade Sea"** because of the striking blue-green colour of its water, caused by algae.



Lake Turkana in northern Kenya, fed by the Omo River

Key facts

- It is a **closed (endorheic) basin**: water enters mainly from the **Omo River (Ethiopia)**, which supplies over 90% of its inflow, and leaves only by evaporation. That is why it is **brackish and alkaline**.
- The World Heritage Site was put on the **List of World Heritage in Danger in 2018**, mainly because the **Gibe III dam** and irrigation projects on the Omo River reduce inflow.
- **Koobi Fora** on its eastern shore is one of the richest sites of **hominin fossils** in the world. **Central Island** has active volcanic craters and is a breeding ground for the **Nile crocodile**.
- Its former name was **Lake Rudolf**.

Lake	Country	Notable fact
Turkana	Kenya (northern tip in Ethiopia)	Largest permanent desert lake; largest alkaline lake
Victoria	Uganda, Kenya, Tanzania	Largest lake in Africa; source of the White Nile
Tanganyika	Tanzania, DRC, Burundi, Zambia	Longest freshwater lake; second deepest
Chad	Chad, Cameroon, Niger, Nigeria	Shrinking Sahelian lake on the Sahara's southern edge

---

11. Which of the following statements about Rare Earth Elements (REEs) and Critical Minerals is/ are correct?

1. Modern technological innovations including Artificial Intelligence, robotics and space exploration extensively utilise Rare Earth Elements (REEs).

2. China has the highest share in mining of REEs followed by India.

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3. The Government of India launched the National Critical Mineral Mission (NCMM) in 2025 to establish a robust framework for self-reliance in the critical mineral sector.

4. Rare Earth Elements are a set of 13 metallic elements.

Select the answer using the code given below :

(a) 1 and 3 only
(b) 1, 2 and 3
(c) 1, 3 and 4
(d) 1, 2 and 4

> **Answer: (a) 1 and 3 only**

Rare Earth Elements (REEs)

- **Statement 1 is correct**: REEs are used in **permanent magnets (neodymium-iron-boron)** for EV motors, wind turbines, **robots, drones, hard disks and data-centre hardware for AI**, in **satellites and space systems**, missile guidance, lasers, phosphors and catalysts.
- **Statement 2 is incorrect**: **China** is the largest miner, producing about **270,000 tonnes out of world output of about 390,000 tonnes (about 69%) in 2025** (USGS Mineral Commodity Summaries 2026). It is followed by the **United States, Australia and Myanmar (Burma)**. **India's mine production is only about 2,900 tonnes (under 1%)**, although India has large reserves in its coastal **monazite** sands. China also controls about **90% of REE processing**.
- **Statement 3 is correct**: the **National Critical Mineral Mission (NCMM)** was approved by the Union Cabinet in **January 2025** with an outlay of **₹16,300 crore** plus about **₹18,000 crore expected from PSUs**, for **2024-25 to 2030-31**. It covers the whole value chain: exploration, mining, processing, recycling and acquisition of mineral assets abroad.
- **Statement 4 is incorrect**: REEs are a group of **17 elements**: the **15 lanthanides** (atomic numbers 57 to 71) plus **scandium and yttrium**.

Classification of REEs

Group	Elements	Uses
Light REEs (LREE)	Lanthanum, Cerium, Praseodymium, Neodymium, Promethium, Samarium, Europium	Magnets (Nd, Pr), catalysts, glass polishing, batteries
Heavy REEs (HREE)	Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium	High-temperature magnets (Dy, Tb), lasers, fibre optics
Associated	Scandium, Yttrium	Aerospace alloys (Sc), phosphors and superconductors (Y)

REEs and Critical Minerals in India

- In India, REEs occur mainly in **monazite-bearing beach sands of Kerala, Tamil Nadu, Odisha and Andhra Pradesh**. Monazite also contains **thorium**, so it is a **prescribed substance under the Atomic Energy Act**; mining and processing are handled by **IREL (India) Ltd.** under the **Department of Atomic Energy**.
- In **2023** the Ministry of Mines identified **30 critical minerals**, including REEs, lithium, cobalt, nickel and graphite. The **MMDR Amendment Act, 2023** allowed the Centre to auction blocks of critical minerals.

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- India also joined the **Minerals Security Partnership (MSP)** in 2023 and set up **KABIL (Khanij Bidesh India Ltd.)** to acquire mineral assets abroad, for example lithium blocks in Argentina.

Rare Earth Elements = 17 elements (not 13)

Light REEs	Heavy REEs	Associated
La · Ce · Pr · Nd Pm · Sm · Eu	Gd · Tb · Dy · Ho Er · Tm · Yb · Lu	Scandium (Sc) Yttrium (Y)
Magnets (Nd, Pr), catalysts, batteries	High-temperature magnets (Dy, Tb), lasers	Aerospace alloys, phosphors

15 lanthanides (atomic numbers 57–71) + scandium + yttrium

Largest miner: China (about 69% in 2025), then the USA, Australia, Myanmar — India is not second

Classification of Rare Earth Elements

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Q. The vegetation of savannah consists of grassland with scattered small trees. The forest development in such areas is generally kept in check by one or more or a combination of some conditions.

Which of the following are such conditions?
1. Burrowing animals and termites.
2. Fire
3. Grazing herbivores
4. Seasonal rainfall
5. Soil properties

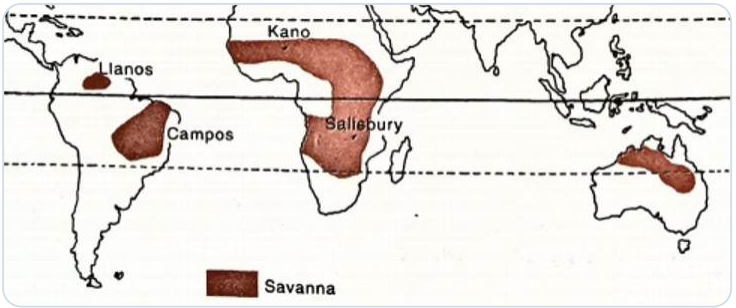
Select the correct answer using the code given below.

(a) 1 and2
(b) 4 and 5
(c) 2, 3 and 4
(d) 1, 3 and 5

Answer: (c) 2, 3 and 4

Savannah

- **Tropical Wet and Dry Climate** or Sudan Climate.
- This type of climate has **alternate wet and dry season**s similar to monsoon climate but has considerably **less annual rainfall.**
- Also, there is no distinct rainy season like in the monsoon climate.



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- There are **Only two seasons** – winter and summer. **Rains occur in summer.**
- Floods and droughts are common.
- The savanna landscape is typified by **tall grass and short trees**.
- Here is depends on grazing intensity and not the burrowing animals or termites.
- Bush fires are common in Savannah because of the alternate wet and dry seasons which can modify the forest.
- **Grazing intensity is a major reason for the type of Savannah**, so Grazing herbivores do contribute to keeping a check on forests.
- It has **seasonal rainfall** based on which it is divided into wet, dry or thornbush.
- Soil properties influence the type of Savannah and its vegetation but don't contribute to checking it once formed.
- **Tropical savanna climates are most commonly found in Africa, Asia, and South America**. The climate is also prevalent in sections of Central America, northern Australia, the Pacific Islands, in sections of North America, and some islands in the Caribbean. Most places that have this climate are found at the outer margins of the tropical zone, but occasionally an inner-tropical location (e.g., San Marcos, Antioquia, Colombia) also qualifies.

Q. With reference to the water on the planet Earth, consider the following statements:

1. The amount of water in the rivers and lakes is **more than** the amount of groundwater.
2. The amount of water In polar ice caps and glaciers is more than the amount of groundwater.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

> **Answer: (b) 2 only**

Distribution of water on the surface of the earth:

RESERVOIR	PERCENTAGE OF THE TOTAL
Oceans	97.25
Ice caps and glaciers	2.05
Groundwater	0.68
Lakes	0.01
Soil moisture	0.005
Atmosphere	0.001
Streams and Rivers	0.0001

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RESERVOIR	PERCENTAGE OF THE TOTAL
Biosphere	0.00004

- **Water in groundwater is 0.62%** while in **lakes and rivers it is 0.008 (Salt lakes) + 0.009(freshwater lakes) + 0.0001(rivers)=0.0171.**
- Water in **polar ice caps and glaciers is 2%** while in **groundwater it is 0.62%**.
- **Earth's surface is covered with 29% of land and 71% of water**. Out of 71% of water, **97% of water is saltwater which is present in oceans, seas, and saltwater lakes.**
- Remaining **3% of water present on the land is freshwater which is present in the form of glaciers, ice caps, groundwater, lakes, rivers, and in the atmosphere as water vapor**.
- Out of 3% of freshwater, 2.5% of the earth's freshwater cannot be used because it is locked up in glaciers, polar ice caps, atmosphere, and soil; highly polluted, or lies too far under the earth's surface to be extracted at an affordable cost.
    - Of the **total freshwater,** 69% resides in glaciers**, 30% underground**, **and less than 1% is located in lakes, rivers, and swamps. Thus, t**he amount of water in rivers and lakes is **less** than amount of groundwater.

Q. Consider the following statements:

1. Moringa (drumstick tree) is a **leguminous evergreen** tree.
2. Tamarind tree is **endemic** to south Asia.
3. In India, most of the tamarind is collected as minor forest produce.
4. India exports tamarind and seeds of moringa.
5. Seeds of moringa and tamarind **can be** used in the production of biofuels.

Which of the statements given above are correct?

(a) 1, 2, 4 and 5
(b) 3, 4 and 5
(c) 1, 3 and 4
(d) 1,2, 3 and 5

> **Answer: (b) 3, 4 and 5**

Moringa (drumstick tree):

- Moringa oleifera is a plant that is often called the drumstick tree, the miracle tree, the ben oil tree, or the horseradish tree.
- Moringa has been used for centuries due to its **medicinal properties** and health benefits. It also has antifungal, antiviral, antidepressant, and anti-inflammatory properties.
- It can be **evergreen or semi-deciduous**. Because of which is extensively being grown in semiarid regions in India.

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Tamarind Tree:

- Tamarind (Tamarindus indica) is a leguminous tree bearing edible fruit that is **indigenous to tropical Africa.**
- It is **native to Africa** or Indian-sub continent and grown in Southeast Asia and Africa as well.
- Most of the tamarind is collected as minor forest produce.
- India is one of the largest exporters of both Tamarind and Seed of Moringa.

Q. The black cotton soil of India has been formed due to the weathering of

(a) Brown forest soil
(b) Fissure volcanic rock
(c) Granite and schist
(d) Shale and limestone

> **Answer: (b) Fissure volcanic rock**

Black Soil:

- The parent material for most of the black soil is the **volcanic rocks that were formed in the Deccan Plateau (Deccan and the Rajmahal trap).**
- A typical black soil is highly argillaceous [Geology (of rocks or sediment) consisting of or containing clay] with a large clay factor, 62 per cent or more.
- In general, **black soils** of uplands are of low fertility while those in the valleys are very fertile.
- The black colour is due to the presence of a small proportion of titaniferous magnetite or iron and black constituents of the parent rock.
- The **black soil is highly retentive of moisture**. It swells greatly on accumulating moisture. Strenuous effort is required to work on such soil in the rainy season as it gets very sticky.
- Black soils are spread mostly across interior **Gujarat, Maharashtra, Karnataka, and Madhya Pradesh on the Deccan lava plateau and the Malwa Plateau,** where there is both moderate rainfall and underlying **basaltic rock**.

Q. How is permaculture farming different from conventional chemical farming?

1. Permaculture farming discourages monocultural practices but in conventional chemical farming, monoculture practices are predominant.
2. Conventional chemical farming can cause increase in soil salinity but the occurrence of such phenomenon is not observed in permaculture farming.
3. Conventional **chemical farming** is **easily possible** in such regions.
4. Practice of mulching is very important in permaculture farming but not necessarily so in conventional chemical farming.

Select the correct answer using the code given below.

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(a) 1 and 3
(b) 1, 2 and 4
(c) 4 only
(d) 2 and 3

Answer: (b) 1, 2 and 4

Permaculture

- The **philosophy behind permaculture was developed in 1970s in Australia by Bill Mollison and David Holmgren**. The land is called Tamera, the name given to these 330 acres in southern Portugal by a community of 30 people who moved here from Germany in 1995. Through simple practices of digging swales (ditches) and creating water retention spaces, Tamera's ecology experts have transformed an area on the brink of desertification.
- Permaculture tries to look at a piece of land in a holistic manner, **integrating every animal and plant living on it, and combining that with social structures** designed to foster long-lasting agriculture as well. Each element of a food cycle is broken down into what it requires and what it contributes, and then **each element is pieced together to form a dynamically self-supporting whole.**
- **Permaculture** is a totally integrated design system that's modelled on nature. **Permaculture farming promotes multicropping and integrated farming systems**. Agroforestry is its example.
- High-density crops and the use of single crops over large expanses of land strips away necessary nutrients as generations pass, eventually leaving the land barren. So **Permaculture discourages monoculture.**
- At the same time, **artificial fertilizers can build up salts over time, making the soil inhospitable to plants**.
- **Mulching is an important practice** in permaculture.
- **Chemical farming**
  - Chemical farming is more suitable for monoculture cropping due to use of crop specific inputs like irrigation, chemical fertiliser and harvesting methods.
  - **Chemical farming** is based on intense use of inputs like Chemical fertilizers and irrigation that make the soil less fertile over time, thus restricting its practise in semi-arid region. Thus, conventional farming is not suitable for semi-arid regions.

Q. With reference to 'palm oil', consider the following statements:

(a) The palm oil tree is **native to** Southeast Asia.
(b) The palm oil is a raw material for some industries producing lipstick and perfumes.
(c) The palm oil can be used to produce biodiesel.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only

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(c) 1 and 3 only
(d) 1, 2 and 3

Answer: (b) 2 and 3 only

Palm Oil tree:



- **Palm oil is derived from the oil palm tree**, **which is native to West Africa** and grows best in tropical climates with abundant water. It was imported into SE Asia in the mid 19th century.
- Oil palm flourishes in the humid tropics and produces a high yield when grown 10 degrees north and south of the equator.
- Palm Sludge Oil (PSO) is the floating residual oil that separated during the initial stage of POME discharge to the pond. The PSO is currently being categorised under sludge oil as it exhibits high Free Fatty Acids (FFA) and very low Deterioration of Bleachability Index (DOBI) values.
- Due to the inferior quality of PSO, this residual oil cannot be used directly as a food source but normally being used for low-grade laundry soap formulation to substitute palm fatty acids distillate.
- Conventionally, Volatile short-chain fatty Acid (VSCFA) has been widely used as raw material in the fragrant industry for the production of perfume via the esterification process.
- If refined, the PSO can be applied directly as boiler fuel, raw material for biodiesel production.
- The **Palm oil** can be used to produce **biodiesel**. It can be used in compression ignition engines, i.e., diesel engines without any modifications. It refers to methyl esters derived from palm oil through a process known as **'transesterification'.**

Q. With reference to the Indus River system, of the following four rivers, three of them pour into one of the which joins the Indus direct. Among the following, which one is such river that joins the Indus direct?

(a) Chenab
(b) Jhelum
(c) Ravi
(d) Sutlej

Answer: (d) Sutlej

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Indus River System



- The **Indus system** comprises the main **Indus, Jhelum, Chenab, Ravi, Beas and Sutlej.** The basin is mainly shared by India and Pakistan with a small share for China and Afghanistan.
- **Jhelum and Ravi join Chenab**, **Beas joins Sutlej**, and **then Sutlej and Chenab join to form Panjnad**, 10 miles north of Uch Sharif in Muzaffar Garh district.
- **The combined stream runs southwest for approximately 44 miles and joins the Indus River at Mithankot.**
- **Sutlej River:**
  - The ancient name of the Sutlej River is Zaradros (Ancient Greek) Shutudri or Shatadru (Sanskrit).
  - It is the **longest of the five tributaries of the Indus River** that give Punjab (meaning "Five Rivers") its name.
  - It rises on the north slope of the Himalayas in Lake La'nga in southwestern Tibet.

Q. With references to India, Didwana, Kuchaman, Sargol, and khatu are the names of

(a) Glaciers
(b) Mangrove areas
(c) Ramsar sites
(d) Saline lakes

> **Answer: (d) Saline lakes**

Notes:

- **Playas are small lakes** with flat floors and undrained basins in which water collects after rains and evaporates quickly are called **playas.**
- **Didwana** is a playa. Other such playas are the **Kuchaman, the Sargol and the Khatu lakes.**
- **Didwana** is a town in the Nagaur district of Rajasthan. It also has a **famous Didwana saltwater lake** of Rajasthan. The lake is about 4 km in length and with 3 km breadth, The depression is surrounded on all sides by sandhills, except to the west. The depression bed shows the presence of black clay and in appearance is similar to that of the Sambhar lake.
- **Kuchaman lake** is a continental saline lake located around Kuchaman city, Nagaur District, Rajasthan

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Q. Consider the following Rivers:

1. Brahmani
2. Nagavali

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3. Subarnarekha
4. Vamsadhara

Which of the above rise from the Eastern Ghats?

(a) 1 and 2
(b) 2 and 4
(c) 3 and 4
(d) 1 and 3

> **Answer: (b) 2 and 4**

Brahmani:

- The Brahmani is a major seasonal river in the Odisha state of eastern India.
- The Brahmani is formed by the confluence of the **Sankh and South Koel rivers near Rourkela.**
- Together with the river Baitarani, it forms a large delta before emptying into the Bay of Bengal at Dhamra.

Nagavali:

- The River Nagavali is also known as Langulya is one of the main rivers of Southern Odisha and Northern Andhra Pradesh States in India, between Rushikulya and Godavari basins.
- **Nagavali River originates in Kalahandi District, in eastern Ghats.**

Subarnarekha:

- The Subarnarekha **originates from the Ranchi Plateau in Jharkhand** forming the boundary between West Bengal and Odisha in its lower course.
- It joins the Bay of Bengal forming an estuary between the Ganga and Mahanadi deltas. Its total length is 395 km.

Vamsadhara:

- It is an east-flowing river that **originates in the Kalahandi district of Odisha, Eastern Ghat, flows in Odisha**, along its boundary with Andhra Pradesh and finally joins the Bay of Bengal at Kalingapatnam, Andhra Pradesh.
- It is the main river of the north-eastern Andhra region and the Boddepalli Rajagopala Rao Project was constructed on it to meet the irrigation needs of the region.

Q. Among the following, which one is the least water-efficient crop?

(a) Sugarcane
(b) Sunflower

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(c) Pearl millet
(d) Red gram

> **Answer: (a) Sugarcane**

Sugarcane

- **Sugarcane** is the **least water efficient crop**. Among the given options, its water requirement is 1800-2200 mm/season.
  - **Sunflower's** water requirement was estimated at 672.4 mm/season.
  - Pearl millet is a **drought tolerant crop.** Water requirement: 350 mm/season.
  - **Red gram** uses about 250-400 mm/season of water.
- In terms of production, **Sugarcane is the world's largest crop**.
- Sugarcane belongs to Poaceae family of **true grasses.**
- In India, **Sugarcane is grown as a Kharif Crop.**
- It needs **hot and humid climate with an average temperature of 21°C to 27°C.**
- **75-150 cm rainfall is favorable** for sugar cane cultivation.
- Irrigation needed for areas with lesser rainfall.
- Sugarcane can grow in any soil which can **retain moisture.**
- Ideal soil for sugarcane is deep **rich loamy soil.**
- The soil needs to be rich in **nitrogen, calcium and phosphorus** but neither it should be neither too acidic nor too alkaline.
- **Crop water needed: 1500-2500 (mm/total growing period) and draught sensitivity is very High. Hence, sugarcane is the correct answer.**

Q. Consider the following statements:

1. In the tropical zone, the western sections of the oceans are warmer than the eastern sections owing to the influence of trade winds.
2. In the temperate Zone, westerlies make the eastern sections of oceans warmer than the western sections

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 and 2

> **Answer: (c) Both 1 and 2**

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Notes:

- **Warmer water is transported westward** in the ocean by the Northeast trade winds in the Northern hemisphere of the tropical zone (as the figure given below shows). So, in tropical zones, the western section of ocean is warmer than eastern sections due to trade winds.
- Similarly, the **Westerlies** play an important role in carrying the warm, equatorial waters and winds to the western coasts of continents (that is eastern section of the Oceans in temperate zone). Thus, in temperate zones, **westerlies** make the eastern section of the ocean warmer than the western sections.

Q. "Leaf litter decomposes faster than in any other biome and as a result, the soil surface is often almost bare. Apart from trees, the vegetation is largely composed of plant forms that reach up into the canopy vicariously, by climbing the trees or growing as epiphytes, rooted on the upper branches of trees." This is the most likely description of

(a) Coniferous forest
(b) Dry deciduous forest
(c) Mangrove forest
(d) Tropical rain forest

Answer: (d) Tropical rain forest

Tropical rain forest:

- The **tropical rain forest is a forest with tall trees in a region of year-round high temperatures where an average of 50 to 260 inches of rain falls yearly.**
- Rain forests belong to the **tropical wet climate group**. The temperature in a rain forest rarely gets higher than 34°C or drops below 20°C, average humidity is between 77 and 88%. Rainfall is often more than 100 inches a year. There is usually a brief season of less rain. Almost all rainforests lie near the equator.
- Many of the **trees have straight trunks that don't branch out.**
- The majority of the trees have a **smooth, thin bark** because there is no need to protect them from water loss and freezing temperatures.
- It also makes it difficult for plant parasites to get a hold on the trunks.
- The bark of different species is so similar that it is difficult to identify a tree by its bark.
- Many trees can only be identified by their flowers.
- The **fertility of topsoil in rainforest regions is very poor**. **Torrential downpours wash out most of the topsoil nutrients.**
- The **soil deteriorates rapidly with subsequent soil erosion and soil impoverishment.**
- The equatorial vegetation comprises a multitude of evergreen trees that yield tropical hardwood, e.g. **mahogany, ebony, dyewoods** etc.
- In **tropical rainforest biome**, hot, moist atmosphere and all the **dead plant material create the perfect conditions in which bacteria and other microorganisms can thrive**. This leads to rapid decomposition of leaf litter material. The tropical rainforest is known for its **dense canopies of vegetation** that form three different layers.

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