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1. Shaksgam Valley and Pakistan-occupied Jammu & Kashmir under CPEC

- China recently defended infrastructure activity in Shaksgam Valley and Pakistan-occupied Jammu & Kashmir under CPEC, calling it construction on "its own territory."
- India strongly rejected the claim, reiterating that Shaksgam Valley is Indian territory and that it does not recognise the 1963 China–Pakistan boundary agreement or CPEC.

What is Shaksgam Valley?

- Also known as the Trans-Karakoram Tract, Shaksgam Valley lies north of the Siachen Glacier in the Hunza–Gilgit region.
- **Area:** Over 5,000 sq km.
- Terrain is harsh and sparsely populated.
- Claimed by India, but was under Pakistani control before being ceded to China in 1963.

The 1963 China–Pakistan Boundary Agreement

- Signed after the 1962 India–China war, when China–Pakistan ties were deepening.
- Pakistan ceded about 5,180 sq km of Shaksgam Valley to China.
- Article 6 stated the agreement was provisional, pending final settlement of the Kashmir dispute between India and Pakistan.
- Effectively involved Pakistan transferring territory claimed by India to China.

India's Core Objections

- India has never recognised the 1963 agreement, calling it illegal and invalid.
- Maintains that Pakistan had no legal authority to cede territory that belongs to India.
- Considers the agreement a violation of India's sovereignty and territorial integrity.
- India holds that entire Jammu & Kashmir and Ladakh are integral parts of India.

India's Response over the Decades

- **1963:** Prime Minister Jawaharlal Nehru accused China of interfering in Indo-Pak relations and exploiting the Kashmir dispute for expansionist aims.
- India formally lodged protests with China soon after the agreement.
- **2022: MEA reiterated that:**
  - China occupies ~38,000 sq km of Indian territory in Ladakh.
  - Pakistan illegally ceded 5,180 sq km of Indian territory in Shaksgam Valley to China.
  - India has repeatedly warned against altering ground realities in the region.

Aksai Chin Context

- China built a strategic highway through Aksai Chin in the 1950s, linking Tibet and Xinjiang.
- India considers Aksai Chin part of J&K; China claims it as part of Xinjiang.
- This historical precedent deepens India's concerns over Chinese infrastructure activity.

The CPEC Angle

- Shaksgam Valley's importance has grown due to proximity to the China–Pakistan Economic Corridor (CPEC).
- Launched in 2015, CPEC aims to link Gwadar Port (Pakistan) with Kashgar (China).
- China views it as an alternative trade and energy route bypassing the Malacca Strait.

- India objects to CPEC because it passes through Pakistan-occupied Kashmir, which India considers illegally occupied territory.

India's Current Position

- Rejects Chinese and Pakistani claims over Shaksgam Valley.
- Does not recognise CPEC or the 1963 agreement.
- Reserves the right to take necessary measures to safeguard its interests.
- Continues diplomatic protests against attempts to change the status quo.

QUESTIONS

1. Consider the following statements regarding Shaksgam Valley:

1. Shaksgam Valley is also known as the Trans-Karakoram Tract and lies north of the Siachen Glacier.
2. It was under Chinese control prior to 1963 and was subsequently transferred to Pakistan.
3. The valley is sparsely populated and covers an area of over 5,000 square kilometres.

Which of the statements given above are correct?

A. 1 and 2 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2 and 3

2. With reference to the **1963 China–Pakistan Boundary Agreement**, consider the following statements:

1. Pakistan ceded approximately 5,180 sq km of territory in Shaksgam Valley to China under this agreement.
2. The agreement declared the boundary settlement as final and irreversible regardless of the Kashmir dispute.
3. India considers the agreement illegal because Pakistan had no legal authority to transfer territory claimed by India.

Which of the statements given above are correct?

A. 1 and 2 only
C. 1 and 3 only
B. 2 and 3 only
D. 1, 2 and 3

3. Consider the following statements regarding India's objections to CPEC and Chinese activity in the region:

1. India objects to CPEC because parts of the corridor pass through Pakistan-occupied Kashmir, which India considers illegally occupied.
2. China views CPEC as an alternative trade route that reduces dependence on the Malacca Strait.
3. India officially recognises Chinese sovereignty over Shaksgam Valley but disputes only infrastructure construction activities.

Which of the statements given above are correct?

A. 1 and 2 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2 and 3

4. Consider the following:

1. Himachal Pradesh
2. Uttarakhand
3. Sikkim
4. Arunachal Pradesh
5. Jammu and Kashmir

How many of the above states/union territory share border with China?

A. Only two
B. Only three
C. Only four
D. All five

5. Consider the following statements with reference to the McMahon Line, Durand Line, and Radcliffe Line:

1. The McMahon Line was established in 1914 during the Simla Convention and functions as the de facto boundary between India and China in the eastern sector.
2. The Durand Line currently separates Afghanistan and Pakistan and is officially accepted as an international border by both countries.
3. The Radcliffe Line was drawn in 1947 to demarcate the boundary between India and Pakistan, primarily based on religious composition of regions.
4. The Radcliffe Line was finalized and published before India attained independence in August 1947.

Which of the statements given above are correct?

A. 1 and 3 only
B. 1, 2 and 3 only
C. 2 and 4 only
D. 1, 3 and 4 only

2. EU, Latin America bloc Mercosur set to sign historic trade deal, despite French-led opposition

- The long-awaited European Union–Mercosur Free Trade Agreement (FTA) is poised to be formally signed on January 17 in Asunción, Paraguay, marking the culmination of negotiations that began in 1999.
- While the agreement represents a major strategic and economic milestone for both blocs, it has also sparked significant political, agricultural, and environmental debate within Europe.

1. What Is Mercosur?

Mercosur (Southern Common Market) is a South American trade bloc.

- **Current members:**
  - Brazil (largest by economy, population, and territory)
  - Argentina
  - Paraguay
  - Uruguay
  - Bolivia (newest member)
- Venezuela is suspended indefinitely due to political concerns.
- Mercosur represents a major agricultural and natural resource powerhouse.

2. Status of the Agreement

- Negotiations began in 1999, stalled repeatedly, and were formally concluded in December 2024.
- Final political momentum came when EU ambassadors voted 21–5 in favor on January 9, 2026.
- France, Poland, Austria, Hungary, and Ireland voted against; Belgium abstained.
- The agreement will now move to formal signing and ratification processes.

3. Core Features of the Trade Deal

- Largest EU FTA ever in terms of tariff reductions.
- Eliminates over €4 billion ($4.7 billion) annually in duties on EU exports.
- **Current Mercosur tariffs:**
  - 35% on car parts
  - 28% on dairy products
  - 27% on wines
- These barriers will be progressively dismantled.

4. Market Access and Tariff Reductions

Mercosur commitments:

- Remove duties on 91% of EU exports over 15 years (from 35% currently).

EU commitments:

- Remove duties on 92% of Mercosur exports within 10 years.
- Total goods trade between blocs currently valued at €111 billion annually.

5. Trade Composition between the Blocs

EU exports to Mercosur:

- Machinery
- Chemicals
- Transport equipment

EU imports from Mercosur:

- Agricultural products
- Paper
- Minerals and raw materials

6. Agricultural Quotas and Sensitive Products

- To protect domestic farmers, both sides retain quotas on sensitive goods:
- EU quotas: poultry, pork, sugar, ethanol, rice, honey, maize, sweet corn
- Mercosur quotas: milk powder, infant formula

Key concessions:

- EU increases beef quota by 99,000 metric tons
- Mercosur grants 30,000 tons duty-free quota for EU cheese

Impact remains limited:

- Beef imports equal 1.6% of EU consumption
- Poultry imports equal 1.4% of EU consumption

7. Protections and Safeguards

Geographic Indications (GI):

- Around 350 EU food and drink products (*e.g.*, cheeses, wines) protected from imitation.

Safeguard clauses allow the EU to:

- Suspend imports if markets are disrupted
- Revoke preferential access if conditions are breached

Additional EU measures:

- Crisis fund for farmers
- Accelerated €45 billion in agricultural support
- Reduced fertilizer import duties
- Stronger controls on pesticide residues and food safety

8. Why Is There Opposition Within the EU?

Agricultural competition:

- Fear of cheaper South American meat and crops undercutting EU farmers.
- Strong resistance from France and Ireland, especially beef producers.

Environmental concerns:

- Critics argue Mercosur products may not meet EU climate and biodiversity standards.
- Concerns over deforestation, particularly in the Amazon.
- Deal lacks strong, enforceable penalties tied to environmental violations.

Public protests:

- Farmer demonstrations in Paris and Poland highlight political sensitivity.

9. Why the Deal Matters Now

Strategic diversification:

- Reduces EU dependence on traditional partners amid global instability.

Geopolitical context:

- Counters growing Chinese influence in Latin America.
- Strengthens EU engagement with the Global South.

Post-Trump trade disruption:

- Following Donald Trump's return to the White House and renewed tariffs, the EU seeks alternative markets to offset losses.

Mercosur credibility:

- Positions the 35-year-old bloc as a serious global trade partner despite internal divisions.

10. Critical Minerals and Strategic Resources

The deal enhances EU access to essential raw materials:

Brazil:

- 20% of global reserves of graphite, nickel, manganese, rare earths
- 94% of global niobium, crucial for aerospace and high-tech manufacturing

Argentina:

- World's third-largest lithium producer
- Key supplier for batteries and electric vehicles
- Supports EU ambitions in green energy, digitalization, and strategic autonomy.

11. Economic Impact

- **Bloomberg Economics estimates:**
  - Mercosur GDP boost: +0.7%
  - EU GDP boost: +0.1%
- While modest for Europe, gains are significant for South America.

QUESTIONS

6. Consider the following statements about **MERCOSUR (Southern Common Market)**:

1. The Treaty of Asunción was signed by Argentina, Brazil, Paraguay, and Uruguay to establish MERCOSUR.
2. Venezuela's MERCOSUR membership is fully active with all rights and obligations.
3. Bolivia delivered its instrument of ratification in 2024 and is in the process of incorporating the bloc's normative acquis.

Which of the statements given above are correct?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

7. With reference to **MERCOSUR**, consider the following statements:

   1. The official working languages of MERCOSUR include Spanish, Portuguese, and Guarani.
   2. The Treaty of Asunción allows accession by other Latin American Integration Association (ALADI) members.
   3. MERCOSUR's core objective is to create a common market that promotes economic integration and international trade opportunities.

   Which of the statements given above are correct?

   A. 1 and 2 only
   B. 2 and 3 only
   C. 1 and 3 only
   D. 1, 2 and 3

3. US leave India-headquartered International Solar Alliance after Trump order

Mass Withdrawal via Executive Order

- US President Donald Trump has withdrawn the United States from 66 international organisations, including 31 United Nations–linked bodies, through an executive order issued on January 7.
- This move is part of a broader review initiated at the start of his second presidential term in January 2025 under the "America First" doctrine.

Reason for the Exit

- Trump directed the State Department to assess which international organisations were "contrary to US interests."
- The review reflects Trump's long-standing criticism of multilateral institutions and claims of unfair treatment of the US.

International Solar Alliance (ISA) Among Major Exits

- One of the most notable withdrawals is from the International Solar Alliance (ISA), headquartered in Gurugram, Haryana, India.
- Other prominent exits include the Intergovernmental Panel on Climate Change (IPCC) and the International Union for Conservation of Nature (IUCN).

What is the International Solar Alliance (ISA)?

- Founded in 2015 on the sidelines of COP21 in Paris by India and France.
- Focuses on countries located between the Tropic of Cancer and the Tropic of Capricorn.
- Aims to promote solar energy adoption as a tool to combat climate change.

Core Strategy – 'Towards 1000'

- Mobilise $1 trillion in solar investments by 2030
- Provide clean energy access to 1 billion people
- Enable installation of 1,000 GW of solar capacity
- Expanded eligibility in 2020, allowing all UN member states to join.
- **Currently:**
  - 100+ signatory countries
  - 90+ full ratified members

ISA's Performance So Far

- Acts mainly as a facilitator, not a project implementer.
- Has supported countries—especially in Africa and Latin America—with:
  - Regulatory frameworks
  - Power purchase agreements
  - Capacity building and training
- However, project execution has been slow, with many initiatives still at the preparatory stage.
- **This is despite:**
  - Global solar capacity growing over 20% annually (2019–2024)

Sharp decline in solar costs

- China dominating global solar installations
- For India, ISA has also served as a strategic tool for engagement with the Global South.

Trump's Opposition to Solar Energy

- Trump has repeatedly dismissed climate change, calling it "the greatest con job."
- Strongly favors thermal and fossil fuel energy, linking them to American jobs.

During his first term:

- **Tariffs on imported solar panels led to:**
  - 10,000 solar job losses in 2017
  - 8,000 more in 2018
- **Despite earlier data showing:**
  - Solar accounted for 43% of electric power sector jobs
  - Fossil fuels accounted for 22%
  - Recent Developments Under Trump's Second Term
- **Since January 2025:**
  - Only one solar project approved on federal land
  - No new approvals since July 2024
  - Renewable energy decisions now require personal approval from Interior Secretary Doug Burgum, significantly slowing progress.

8. Consider the following statements regarding the **United States' withdrawal from international organisations in January 2026**:

1. The United States announced its withdrawal from a total of 66 international organisations, including both UN and non-UN bodies.
2. Among the targeted organisations, a larger number belonged to non-UN bodies than to United Nations entities.
3. The withdrawal directive was issued through a legislative act passed by the US Congress.

Which of the statements given above are correct?

A. 1 and 2 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2 and 3

9. With reference to the **climate and environmental organisations exited by the United States**, consider the following statements:

1. The UN Framework Convention on Climate Change (UNFCCC) forms the foundational legal framework for all global climate agreements.
2. The US withdrawal from UNFCCC makes it the only country not party to the convention.
3. The United States continues its membership in the Intergovernmental Panel on Climate Change (IPCC) despite exiting other climate institutions.

Which of the statements given above are correct?

A. 1 and 2 only
C. 1 and 3 only
B. 2 and 3 only
D. 1, 2 and 3

10. Consider the following statements regarding the **International Solar Alliance (ISA)**:

1. The International Solar Alliance was established jointly by India and France in 2015 as a treaty-based intergovernmental organisation.
2. The headquarters of the International Solar Alliance is located at the National Institute of Solar Energy in Gurugram, India.
3. Membership of the International Solar Alliance is restricted only to countries located between the Tropics of Cancer and Capricorn.
4. One of the key targets of the International Solar Alliance is to mobilise US$ 1 trillion in investment and facilitate the installation of 1,000 GW of solar capacity by 2030.

Which of the statements given above are correct?

A. 1, 2 and 4 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2, 3 and 4

4. India becomes first country to commercially produce bio-bitumen

- Road, Transport and Highways Minister Nitin Gadkari has said that India has become the first country in the world to commercially produce bio-bitumen in road construction.
- Bitumen is a black, viscous mixture of hydrocarbons produced by the fractionation of crude oil, and it serves as a crucial binder in road construction.
- While addressing the CSIR Technology Transfer Ceremony in New Delhi, the Minister congratulated CSIR on this historic milestone.
- Mr Gadkari said that the initiative will help in reducing pollution from crop residue burning.
- The Minister said that bio-bitumen is a transformative step towards the vision of Viksit Bharat 2047.
- Science and Technology Minister Dr Jitendra Singh said that by achieving this milestone, India has entered into a new era of clean and green highways.
- He said that the initiative will also aid the Waste to Wealth mission and support the country's vision of Atma Nirbhar Bharat.

Viksit Bharat 2047

- Viksit Bharat 2047 refers to India's long-term **national vision to become a fully developed nation by the year 2047, which will mark the 100th anniversary of India's independence.
- This is a strategic, multi-sector development goal endorsed by the Government of India and discussed in policy and public discourse.

Vision and Purpose

- The core idea of Viksit Bharat 2047 is that by 2047, India should achieve the status of a “developed nation” — not just in economic terms but also in social well-being, governance, sustainability, technology, and quality of life for all.
- **It seeks a comprehensive transformation that includes:**
  - High and sustained economic growth
  - World-class education and healthcare systems
  - Inclusive growth reducing inequalities
  - Advanced digital and physical infrastructure
  - Environmental sustainability and green technology
  - Good governance with citizen engagement
  - Empowering youth, women, farmers, and the poor (“four pillars”)
  - Global leadership in innovation and industry

Key Goals and Indicators

- While there isn’t a single fixed benchmark, many strategic targets associated with the vision include:
  - Transforming India into a $30–$40 trillion economy by 2047.
  - Significantly raising per capita income and human development indices.
  - Universal access to quality education and healthcare.
  - Major contributions from digital growth, manufacturing, services, exports, and innovation.
  - Sustainable infrastructure and climate-smart development.

Implementation and Participation

- The Government of India emphasizes a whole-of-nation approach that includes public participation (“Jan Bhagidari”), youth engagement, private sector collaboration, and policy reforms.
- Initiatives such as Voice of Youth aim to involve young people in shaping how the vision evolves.
- Some policies (*e.g.*, the Viksit Bharat Guarantee for Rozgar & Ajeevika Mission (Gramin) Act, 2025) are explicitly aligned with this vision, reforming rural employment and livelihoods as part of the long-term development path.

Why It Matters

- **2047 is symbolic:** it’s the centenary of India’s independence.

- The Viksit Bharat vision is both aspirational and strategic — aiming not just for economic metrics like GDP but for inclusive prosperity, resilience, technological leadership, and sustainable wellbeing for all citizens of India.

Waste to Wealth Mission

- The Waste to Wealth Mission is an initiative aimed at converting waste into valuable resources, supporting a circular economy, environmental sustainability, and job creation.

What it Means

- The mission focuses on utilizing different types of waste—solid, liquid, agricultural, industrial, and electronic—to generate wealth in the form of energy, materials, and economic opportunities instead of letting waste pollute land, water, and air.

Key Objectives

- Reduce environmental pollution
- Promote recycling, reuse, and recovery
- Generate energy and value-added products from waste
- Support startups, MSMEs, and innovation
- Create employment and boost local economies

Types of Waste Covered

- Solid waste (plastic, municipal waste)
- Agricultural waste (crop residue, biomass)
- Industrial waste
- E-waste
- Wastewater & sludge

Common Technologies Used

- Waste-to-energy (biogas, bio-CNG, electricity)
- Composting & bio-fertilizers
- Plastic recycling & road construction
- Pyrolysis and gasification
- E-waste metal recovery

In Indian Context

- **In India, the Waste to Wealth Mission is promoted by NITI Aayog and aligns with:**
    - Swachh Bharat Mission
    - Smart Cities Mission
    - Atmanirbhar Bharat
    - Net Zero & climate goals
- **Examples**
    - Biogas plants from food & cattle waste
    - Roads made from plastic waste
    - Bio-CNG from agricultural residue
    - Recycling lithium batteries & e-waste

11. India became the first country to commercially produce bio-bitumen**.** Consider the following statements regarding **bio-bitumen**:

1. Bio-bitumen is a bio-based alternative to petroleum bitumen used as a binder in road construction.
2. Bio-bitumen can completely replace conventional fossil-fuel-based bitumen without affecting pavement performance.
3. Bio-bitumen production in India primarily utilises agricultural residue such as rice straw.
4. Field trials of bio-bitumen roads have been conducted on a stretch of the Jorabat–Shillong Expressway in Meghalaya.

Which of the statements given above are correct?

A. 1, 3 and 4 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2, 3 and 4

12. With reference to the **manufacturing process and performance features of bio-bitumen**, consider the following statements:

1. Bio-bitumen is produced through pyrolysis, in which biomass pellets are heated in the absence of oxygen.
2. The bio-oil obtained from pyrolysis possesses adhesive properties and is blended with petroleum bitumen to form bio-bitumen.
3. Bio-char generated during pyrolysis is directly used as the primary road binder component.
4. The final bio-bitumen product undergoes rheological and mechanical testing to ensure compliance with highway performance standards.

Which of the statements given above are correct?

A. 1, 2 and 4 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2, 3 and 4

13. Consider the following statements regarding **commercial production of bio-bitumen in India**:

1. Bio-bitumen is produced using agricultural and organic waste materials that were previously discarded.
2. Commercial adoption of bio-bitumen aims to eliminate dependence on fossil fuels in road construction while promoting a circular economy.
3. Bio-bitumen failed durability and performance tests but was approved primarily due to its environmental benefits.
4. The use of bio-bitumen supports national initiatives related to Green Infrastructure, Waste to Wealth, and Sustainable Mobility.

Which of the statements given above are correct?

A. 1, 2 and 4 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2, 3 and 4

14. What is the use of **biochar** in farming?

1. Biochar can be used as a part of the growing medium in vertical farming.
2. When biochar is a part of the growing medium, it promotes the growth of nitrogen-fixing microorganisms.
3. When biochar is a part of the growing medium, it enables the growing medium to retain water for a longer time.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2 and 3

15. According to India's **National Policy on Biofuels (2020)**, which of the following can be used as raw materials for the production of biofuels?

1. Cassava
2. Damaged wheat grains
3. Groundnut seeds
4. Horse gram
5. Rotten potatoes
6. Sugar beet

Select the correct answer using the code given below:

A. 1, 2, 5 and 6 only
B. 1, 3, 4 and 6 only
C. 2, 3, 4 and 5 only
D. 1, 2, 3, 4, 5 and 6

5. Underwater 'Storms' Threaten Antarctica's Doomsday Glacier, Accelerating Sea Level Rise

New Scientific Warning

- A recent study published in Nature Geosciences reveals that fast-moving underwater "storms" are significantly accelerating the melting of two of Antarctica's most critical glaciers — Thwaites (the Doomsday Glacier) and Pine Island Glacier — with serious implications for global sea levels.

Why These Glaciers Matter

- Thwaites Glacier alone contains enough ice to raise global sea levels by more than 2 feet.
- Even more concerning, it acts as a natural barrier holding back the wider Antarctic ice sheet; its collapse could ultimately contribute to up to 10 feet of sea level rise.
- Pine Island Glacier, located nearby, is also rapidly thinning and contributes heavily to ice loss in West Antarctica.

What Are Underwater 'Storms'?

- Scientists refer to these phenomena as submesoscale ocean eddies — fast-changing, swirling currents beneath the ocean surface.
- These eddies behave similarly to atmospheric storms, forming when warm and cold waters collide.
- Though invisible from above, they can stretch up to 6 miles wide and move rapidly beneath floating ice shelves.

How These Storms Melt Ice Shelves

- The storms form in open water and race underneath ice shelves, where glaciers meet the ocean.
- Trapped between the rough underside of the ice shelf and the seafloor, the eddies churn warmer, deeper water upward.
- When this warm water hits vulnerable ice at the glacier base, it dramatically accelerates melting, particularly at grounding zones where ice transitions from land to floating shelf.

Short-Term Processes, Big Impact

- Unlike previous research that focused on seasonal or long-term melting trends, this study examined hourly and daily ocean activity, similar to weather patterns.
- Researchers found that underwater storms and other short-lived processes were responsible for around 20% of ice shelf melting over a nine-month period — a surprisingly large contribution.

Dangerous Feedback Loop Identified

- As ice melts, it releases cold, fresh water into the ocean.
- This fresh water mixes with warmer, saltier water below, increasing turbulence.
- More turbulence fuels more underwater storms, which in turn cause even more ice melting.
- Scientists warn this positive feedback loop could intensify as the climate warms.

Why Climate Change Makes It Worse

- Rising ocean temperatures increase the contrast between warm and cold waters, making storm formation more frequent and intense.
- In a warming world, these underwater storms may become a persistent and powerful driver of ice loss rather than a secondary factor.

How Scientists Studied the Phenomenon

- Researchers combined advanced computer simulations with real-world ocean instrument data collected near the glaciers.
- Due to Antarctica's extreme remoteness and harsh conditions, direct observations remain limited, making modeling essential — but also uncertain.

Scientific Caution and Uncertainty

- Experts not involved in the study caution that while the findings are compelling, more real-world measurements are needed.
- Antarctic ice shelves are among the least accessible places on Earth, meaning many processes remain poorly understood.
- Scientists emphasize that ice loss is driven by many interacting factors, and underwater storms are one important piece of a very complex puzzle.

Why This Research Is Important

- Ice shelves act as brakes, slowing the flow of glaciers into the ocean.
- Once ice shelves thin or collapse, glaciers can accelerate dramatically, leading to irreversible sea level rise.
- Understanding small-scale ocean processes is critical for improving future sea level rise predictions.

What Comes Next

- Researchers call for more long-term monitoring to track how underwater storms change across seasons and years.
- Future climate models must include these fine-scale ocean dynamics to more accurately forecast Antarctic ice loss.

QUESTIONS

16. With reference to the impact of underwater storms on Antarctic glacier stability and sea level rise, consider the following statements:

1. Short-lived underwater storms accounted for nearly one-fifth of ice shelf melting during the study period.
2. Thwaites Glacier alone has the potential to raise global sea levels by more than two feet if fully melted.
3. Melting ice increases freshwater input into the ocean, which reduces turbulence and slows storm formation.
4. Rising ocean temperatures are likely to intensify the frequency and strength of these underwater storms.

Which of the statements given above are correct?

A. 1, 2 and 4 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2, 3 and 4

17. Consider the following statements regarding underwater "storms" beneath Antarctic ice shelves:

1. These storms are scientifically referred to as Submesoscale Ocean eddies formed when warm and cold waters collide.
2. They originate beneath ice shelves and dissipate once they reach open ocean waters.
3. They can extend several miles in width and move rapidly beneath floating ice shelves.
4. Their primary melting impact occurs at grounding zones where glaciers transition from land to floating ice.

Which of the statements given above are correct?

A. 1, 3 and 4 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2, 3 and 4

18. The formation of the **ozone hole in the Antarctic region** has been a cause of concern. What could be the reason for the formation of this hole?

A. Presence of prominent tropospheric turbulence; and inflow of chlorofluorocarbons
B. Presence of prominent polar front and stratospheric clouds; and inflow of chlorofluorocarbons
C. Absence of polar front and stratospheric clouds; and inflow of methane and chlorofluorocarbons
D. Increased temperature at polar region due to global warming

19. With reference to the continent of **Antarctica**, which of the following statements are correct?

1. It is larger than Europe in terms of area.
2. It has the highest average elevation as compared to all other continents.
3. Mt. Ross is the highest peak of this continent.
4. Waters of the Southern Ocean (West Wind Drift) move in an anticlockwise direction around it.

Select the answer using the code given below:

A. 1 and 2 only
B. 1 and 3 only
C. 1, 2 and 3
D. 2, 3 and 4

20. With reference to the **Antarctic Treaty**, consider the following statements:

1. Antarctica is the only continent without a native human population and is designated as a scientific preserve under the treaty.
2. The Antarctic Treaty prohibits all military activity south of 60° South latitude.

3. The Antarctic Treaty Secretariat is headquartered in Geneva, Switzerland.
4. The original signatories to the treaty were the countries that were active in Antarctica during the International Geophysical Year (1957–58).

Which of the statements given above are correct?

A. 1, 2 and 3 only
B. 1, 2 and 4 only
C. 2 and 3 only
D. 1, 3 and 4 only

6. USA and Greenland issue

1. Renewed U.S. Push for Control or Acquisition

- U.S. President Donald Trump has publicly repeated his interest in acquiring Greenland — either through purchase or other means — arguing it's critical for national security and to counter Russian and Chinese influence in the Arctic.
- Trump has even suggested that the U.S. might take Greenland "one way or another," including hinting at military options, leading to sharp diplomatic fallout.

Countries contend control of the Arctic Ocean

U.S. President Donald Trump has said he wants to make mineral-rich, strategically placed Greenland a part of the United States.

By Alessandro Parodi and Johan Ahlander

2. Firm Rejection by Greenland and Denmark

- Greenland's government has categorically rejected any takeover or transfer of sovereignty and affirmed that the island is not for sale.
- Both the Greenlandic Prime Minister and Danish Prime Minister have stressed that Greenland remains part of the Kingdom of Denmark, and that they choose Denmark, NATO, and the EU — not U.S. ownership.

3. Domestic U.S. Political Response

- A bipartisan group of U.S. senators has introduced legislation to prevent the U.S. military from occupying or annexing NATO territories — directly in response to the Greenland comments.

4. International Backlash

- **European allies and China have criticized the U.S. rhetoric:**
  - The EU warns that a U.S. military takeover could end NATO and has discussed supporting Greenland's defense.
  - China has urged respect for international law and peaceful cooperation in the Arctic.

5. Diplomatic Efforts Ongoing

- Talks involving the U.S., Denmark, and Greenland are ongoing to de-escalate tensions and focus on cooperation in the Arctic.

Why Greenland Matters to the U.S.

1. Strategic Arctic Location

- Greenland sits between North America and Europe and dominates the GIUK Gap — a crucial naval and air route in the North Atlantic.
- This makes it strategically valuable for defense, surveillance, and projecting power in the Arctic.

2. U.S. Interest Goes Back Over a Century

- **Late 1800s:** U.S. leaders showed early interest in buying Greenland after purchasing Alaska.
- **1946:** After WWII, the U.S. offered $100 million in gold to buy Greenland from Denmark, but Denmark refused.
- **1951:** The U.S. and Denmark agreed on defense cooperation — leading to the establishment of the Thule Air Base (now Pituffik Space Base), a key part of U.S. early-warning and missile defense systems.

3. Strategic Shifts

- During the Cold War, Greenland was critical to U.S. defense against the Soviet Union.
- In the 21st century, Russian Arctic activity and growing Chinese interest in Arctic infrastructure and resources have revived strategic attention.

Greenland's Status and Sovereignty

- Greenland is a self-governing territory within the Kingdom of Denmark. Denmark controls foreign policy and defense, but Greenland's government manages many internal affairs.
- Since 2009, Greenland has had significant autonomy and can pursue economic agreements, but it cannot be "sold" without its own and Denmark's consent.

Why This Matters Globally

1. NATO and Transatlantic Relations

- Any attempt by the U.S. to seize Alaska — a NATO ally — risks undermining NATO solidarity, which has been the backbone of Western defense since WWII.

2. Arctic Security Competition

- The Arctic has become a zone of great power competition — involving Russia, China, the U.S., and Europe — because of:
  - Melting ice opening new shipping routes,
  - Natural resources (minerals, oil, gas),
  - Military strategic access.

3. Resource Potential

- Greenland is rich in rare earth minerals, uranium, and hydrocarbons, making it economically attractive beyond pure military strategy.

Greenland

- **Location**: Greenland is the world's largest island (excluding continents), situated between the Arctic and Atlantic Oceans, northeast of Canada.
- **Political status**: It is an autonomous territory within the Kingdom of Denmark.
- **Population:** Around 56,000 people (very sparsely populated).
- **Area:** About 2.16 million km², mostly covered by ice (≈80%).

2. Geography

- **Ice sheet:** Greenland has the second-largest ice sheet in the world after Antarctica. This ice sheet influences global sea levels.
- **Coastline:** Extremely rugged with many fjords; most population centers are along the southwest coast.
- **Climate:** Arctic climate; harsh winters and cool summers.
- **Natural resources:** Rich in minerals like zinc, lead, gold, rare earth elements, and potential oil reserves.

3. Geographical Importance

Strategic Location

- Greenland lies between North America and Europe, making it strategically important for military and shipping routes.
- During WWII and the Cold War, it hosted U.S. military bases due to its location near the Arctic.

Arctic Shipping Routes

- Melting ice due to climate change is opening new Arctic shipping routes (like the Northwest Passage), potentially reducing shipping distances between Europe and Asia.

Climate and Environmental Research

- Greenland's ice sheet is critical for studying climate change, as its melting contributes to global sea-level rise.

Natural Resources

- Greenland has untapped reserves of rare earth minerals, oil, and gas, which are increasingly important for global energy and technology industries.

Geopolitical Significance

- Its location makes it a point of interest for countries like the U.S., China, and Russia in terms of security, trade, and resource access.
- If Greenland's ice sheet completely melted, global sea levels could rise by about 7 meters, flooding many coastal cities worldwide.

QUESTIONS

21. Consider the following statements regarding **Greenland and the Pituffik Space Base**:

1. Greenland is the world's largest island (excluding continents) and lies between the Arctic and Atlantic Oceans, northeast of Canada.
2. Greenland is an independent sovereign country with full control over its defence and foreign policy.
3. The Thule Air Base, now known as Pituffik Space Base, forms a key part of the United States' early-warning and missile defence systems.

4. Greenland possesses the largest ice sheet in the world, exceeding that of Antarctica.

Which of the statements given above are correct?

A. 1 and 3 only
B. 1, 2 and 3 only
C. 2 and 4 only
D. 1, 3 and 4 only

22. Consider the following statements regarding the **Arctic Council**:

1. The Arctic Council was established under the Ottawa Declaration in 1996 to promote cooperation on Arctic governance, sustainable development, and environmental protection.
2. The Arctic Council is a legally binding treaty organisation with a formal voting mechanism for decision-making.
3. Indigenous organisations participate in the Arctic Council as Permanent Participants in its deliberations.
4. The permanent secretariat of the Arctic Council is located in Tromsø, Norway.

Which of the statements given above are correct?

A. 1, 3 and 4 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2, 3 and 4

23. Consider the following countries:

1. Canada
2. India
3. China
4. Sweden
5. Iceland
6. France

How many of the above are members of the Arctic Council?

A. Only three
B. Only four
C. Only five
D. All six countries

24. Consider the following statements regarding **Greenland**:

1. Greenland is the world's largest island, located between Europe and North America in the North Atlantic region.
2. Greenland is an autonomous territory within the Kingdom of Denmark, while defence and foreign affairs are handled by Denmark.
3. Nearly 80% of Greenland's land area is covered by the Greenland Ice Sheet, making it significant for climate and sea-level studies.
4. Greenland lifted its ban on uranium mining in 2021 to promote mineral-led economic growth.

Which of the statements given above are correct?

A. 1, 2 and 3 only
B. 1 and 4 only
C. 2 and 4 only
D. 1, 2, 3 and 4

25. Consider the following countries:

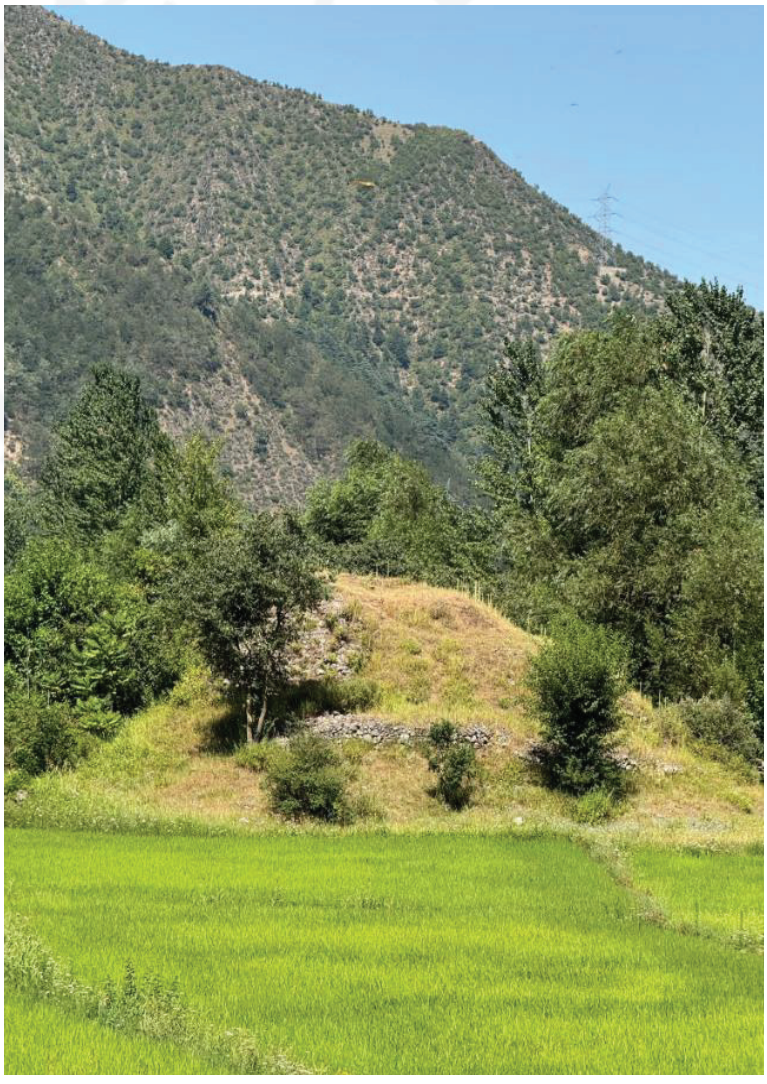
1. Denmark
2. Japan
3. Russian Federation
4. United Kingdom
5. United States of America

Which of the above are the members of the **Arctic Council**?

A. 1, 2 and 3
B. 2, 3 and 4
C. 1, 4 and 5
D. 1, 3 and 5

7. Zehanpora Stupas: Unveiling Kashmir's Rich Buddhist Heritage

- Recent discoveries in Zehanpora, a small village in Baramulla, North Kashmir, have brought to light an extraordinary chapter of the region's ancient Buddhist past.
- Spread across 10 acres, what locals long assumed to be natural mounds are now recognized as man-made structures, estimated to be over 2,000 years old.
- The significance of this site is gradually reshaping our understanding of Kashmir's historical, cultural, and religious landscape.



Significance of the Zehanpora Site

- **Previously overlooked:** For years, the mounds were seen as part of the natural landscape, with only passing references in earlier writings. The site remained largely unexplored despite its conspicuous presence.
- **Stupa-like structures:** The mounds resemble a stupa formation, indicating Buddhist religious architecture. While they have eroded over time, their shape still dominates the landscape.
- **Divided by modern development:** Since the 1970s, a canal has split the site, complicating preservation and archaeological exploration.

- **Evidence of complex structures:** Preliminary studies suggest the presence of wooden super-structures above the mounds, indicating advanced architectural planning in ancient times.

Excavation and Research Efforts

- **Institutional involvement:** Research and mapping have been undertaken by the Centre of Central Asian Studies at the University of Kashmir in collaboration with the J&K Department of Archives, Archaeology, and Museums.
- **Use of modern techniques:** Tools such as drones and remote sensing technology have been deployed to map the site comprehensively. Initial findings indicate that the area contains numerous interconnected structures.
- **Challenges and timeline:** Excavation was delayed due to winter conditions, and the project is expected to extend beyond the initially projected three years due to the vastness of the site.

Historical and Cultural Relevance

- **Trade and connectivity:** The site offers insights into ancient trade routes that passed through Kashmir, highlighting the region's role as a cultural and commercial hub.
- **Unique scale:** No other archaeological site in Kashmir matches Zehanpora in size or preservation, making it a crucial source for understanding the region's past.
- **Undisturbed mounds:** Certain mounds remain untouched, offering potential for groundbreaking discoveries regarding early Buddhist architecture and community life.

Connection with Global Research

- **Historical photographs:** In 2023, researchers discovered images of the Zehanpora site in a French museum archive. The photographs, likely taken by British travelers passing through Lahore and Taxila, provide a visual historical record of the site.
- **Global context:** These archival materials reinforce the significance of Kashmir as a prominent node in ancient trade and religious networks.

Buddhism in Kashmir

- **Introduction of Buddhism:** While popular belief attributes Buddhism's entry into Kashmir to Mauryan King Ashoka, textual evidence from Kalhana's Rajatarangini suggests that Buddhist practices existed in the region prior to Ashoka's reign.
- **Royal patronage:** Ashoka is known to have invited Kashmiri Buddhist scholars to the council at Pataliputra, indicating early recognition of the region's scholarly importance.
- **Kushan support:** Under rulers like Kanishka, Buddhism received substantial patronage, leading to the construction of monasteries, viharas, and stupas throughout Kashmir.

Kashmir's Role in the Evolution and Spread of Buddhism

- **Monastic and scholarly activities:** References in Rajatarangini highlight King Surendra's role in building monasteries, fostering religious learning.
- **Indo-Greek influence:** Dialogues between Indo-Greek rulers like Menander and Buddhist monks such as Nagasen in Kashmir helped refine Buddhist philosophy.
- **Mahayana Buddhism:** Kashmir played a crucial role in the development of Mahayana Buddhism, which later spread to Central Asia and China through Kashmiri missionary monks.

Visible Legacy of Buddhist Kashmir

- **Archaeological evidence:** Numerous sites across Kashmir preserve structural and artistic remnants of Buddhist traditions.

- **Northern Kashmir:** Sites like Kanispora, Ushkur, Zehanpora, and Parihaspora demonstrate strong Buddhist affiliations. Harwan in Srinagar represents a major Buddhist complex in central Kashmir.
- **Southern Kashmir:** Archaeological sites such as Semthan, Hutmur, Hoinar, and Kutbal reflect the widespread presence of Buddhism in the region.
- **Need for conservation:** While these sites collectively showcase Kashmir's Buddhist heritage, extensive research, preservation, and protection efforts are still required.

QUESTIONS

26. Consider the following statements regarding the **Zehanpora archaeological site in Kashmir**:

1. The Zehanpora site is spread across nearly 10 acres and consists of mounds that were earlier believed to be natural formations.
2. The structures at Zehanpora are estimated to be more than 2,000 years old and resemble Buddhist stupa formations.
3. A canal constructed in the 1970s has divided the site, creating challenges for conservation and excavation.
4. The site has already been fully excavated and formally protected under a national heritage programme.

Which of the statements given above are correct?

A. 1, 2 and 3 only
C. 2 and 4 only
B. 1 and 4 only
D. 1, 2, 3 and 4

27. Consider the following statements regarding **Kashmir's historical role in Buddhism**:

1. Rajatarangini suggests that Buddhist practices existed in Kashmir even before Ashoka's reign.
2. Under Kushan rulers such as Kanishka, monasteries and stupas expanded significantly across Kashmir.
3. Kashmir played a limited role in the development of Mahayana Buddhism compared to Central Asia.
4. Indo-Greek philosophical dialogues contributed to the refinement of Buddhist thought in the region.

Which of the statements given above are correct?

A. 1, 2 and 4 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2, 3 and 4

28. Consider the following pairs regarding the **Buddhist Councils**:

Council	**Patron**
1. Second Buddhist Council	Kalasoka
2. Third Buddhist Council	Ashoka
3. Fourth Buddhist Council	Kanishka
4. First Buddhist Council	Chandragupta Maurya

Which of the pairs given above are correctly matched?

A. 1, 2 and 3 only
C. 2 and 3 only
B. 1 and 4 only
D. 1, 2, 3 and 4

29. Consider the following statements regarding the **Fourth Buddhist Council (72 AD)**:

1. The Fourth Buddhist Council was convened in Kashmir under the patronage of Emperor Kanishka.
2. The council was presided over by Vasumitra and Ashvaghosha.
3. The main objective of the council was to reconcile doctrinal differences among various schools of Buddhism.
4. The formal divergence between Hinayana and Mahayana traditions took place after this council.

Which of the statements given above are correct?

A. 1 and 2 only
B. 1, 2 and 3 only
C. 1, 2, 3 and 4
D. 2 and 4 only

30. Which of the following kingdoms were associated with the life of the Buddha?

1. Avanti
2. Gandhara
3. Kosala
4. Magadha

Select the correct answer using the codes given below:

A. 1, 2 and 3 only
B. 2 and 3 only
C. 1, 3 and 4
D. 3 and 4 only

8. AayulSAT will become India's first on-orbit satellite refuelling demonstration

Historic Space Experiment

- Chennai-based startup OrbitAID Aerospace is set to make a landmark entry into on-orbit satellite servicing.
- The company will demonstrate satellite refuelling in space, followed by a docking test, marking a first-of-its-kind experiment for India.

AayulSAT Launch Details:

- The AayulSAT mission was launched aboard ISRO's PSLV-C62 on January 12, 2026 from Sriharikota's First Launch Pad.
- The satellite will ride alongside 15 other co-passengers, with EOS-N1 (Anvesha) as the primary payload for Earth observation.

India's First Refuelling Demonstration:

- AayulSAT will become India's first on-orbit satellite refuelling demonstration, leveraging OrbitAID's proprietary Satellite Interface for Docking and Refuelling Protocol (SIDRP).

- The protocol is designed to be compatible with both Indian and global satellites, opening avenues for international collaboration in space refuelling.

Innovative Green Fuel Use:

- The startup will use propane, a non-toxic and environmentally friendly fuel, commonly used for satellite attitude control, station-keeping, and minor orbit adjustments.
- Propane is safer and cheaper than traditional hydrazine, enabling the team to study fuel transfer dynamics in microgravity without the risks associated with toxic fuels.

Refuelling Process and Objectives:

- The mission will involve multiple refuelling cycles, testing the efficiency, safety, and repeatability of in-orbit fuel transfer.
- The aim is to create the foundation for a sustainable on-orbit economy, enabling reusable satellites, depot operations, and extended satellite lifespans.

Chaser Satellite Docking Test:

- Following the completion of the refuelling phase, OrbitAID plans to launch a chaser satellite within 8–10 months.

- This satellite will intercept, rendezvous, and dock with AayulSAT, validating India's capabilities in satellite docking and in-space servicing.
- The test builds on ISRO's SPADeX mission in early 2025, India's first successful satellite docking, and aims to commercialize in-orbit services such as refuelling, robotic servicing, and satellite maintenance.

Leadership Vision:

- Sakthikumar Ramachandran, Founder-CEO of OrbitAID, emphasizes prudent capital deployment and strategic collaborations with universities, startups, and international partners.
- According to Ramachandran, the mission positions India in the global space infrastructure race, demonstrating the country's ability to achieve audacious technological milestones responsibly.

PSLV-C62: A Comeback Mission:

- PSLV-C62 marks ISRO's first launch of 2026 and the 64th flight of PSLV, featuring the DL variant with two strap-on boosters.
- The launch comes after the PSLV-C61 setback in May 2025, when EOS-09 failed due to third-stage issues, reaffirming PSLV's reliability with C62.

Other payloads on the mission include:

- MOI-1 (Hyderabad): An AI-driven imaging satellite.
- Indo-Mauritius IMJS joint satellite: Collaborative smallsat mission.
- KID reentry capsule (Spain): Demonstrating PSLV's versatility in smallsat deployment.

Strategic and Economic Implications:

- Success of AayulSAT could kickstart India's on-orbit servicing industry, reducing launch costs and supporting sustainable satellite operations.
- OrbitAID's approach aligns with global trends in space sustainability, debris mitigation, and cislunar logistics.
- The project demonstrates how private startups amplify ISRO's capabilities, turning government missions like SPADeX into commercial opportunities and international collaborations.

Funding and Future Plans:

- OrbitAID is using private and institutional funding to develop in-space depots and refuelling infrastructure, aiming to establish India as a major player in the commercial on-orbit economy.
- The company envisions future services including satellite life extension, robotic maintenance, and fuel depots, reducing space debris and enhancing sustainability.

Global Competitiveness:

- The mission showcases India's potential to compete with leading space nations in in-orbit servicing.
- By combining technological innovation, environmental responsibility, and cost efficiency, OrbitAID aims to create a blueprint for private sector-led space infrastructure.
- The AayulSAT mission represents a major leap in India's space capabilities, from refuelling to docking, underpinning the emergence of a new space economy.
- It reinforces the role of private startups in driving innovative, sustainable, and commercially viable space missions, positioning India at the forefront of global on-orbit servicing.

31. Consider the following statements regarding **AayulSAT mission**:

1. AayulSAT will demonstrate India's first on-orbit satellite refuelling using OrbitAID's proprietary docking and refuelling protocol.
2. The satellite was launched aboard PSLV-C62 as the primary payload of the mission.
3. Propane is being used as a green, non-toxic fuel for studying fuel transfer dynamics in microgravity.
4. The refuelling experiment will be followed by a docking test using a chaser satellite launched several months later.

Which of the statements given above are correct?

A. 1, 3 and 4 only
C. 2 and 3 only
B. 1 and 2 only
D. 1, 2, 3 and 4

32. With reference to the **PSLV-C62 mission and associated payloads**, consider the following statements:

1. PSLV-C62 was ISRO's first launch of 2026 and the 64th flight of the PSLV vehicle.
2. The mission used the DL variant with two strap-on boosters.
3. The launch marked ISRO's return to flight after the PSLV-C61 failure in 2025.
4. All payloads on PSLV-C62 were Indian satellites with no international participation.

Which of the statements given above are correct?

A. 1, 2 and 3 only
C. 2 and 4 only
B. 1 and 4 only
D. 1, 2, 3 and 4

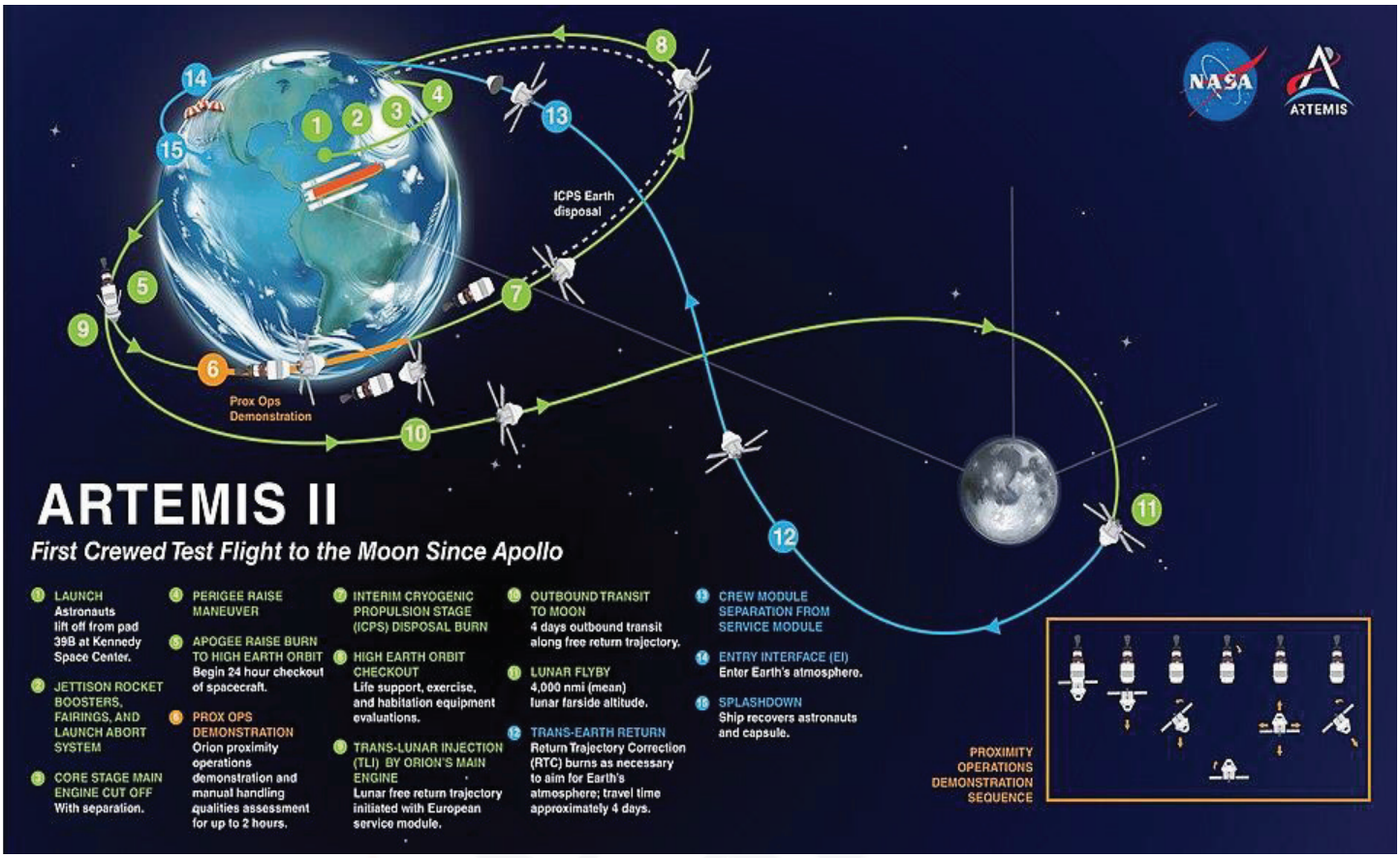
33. Consider the following statements regarding the **strategic significance of on-orbit refuelling demonstrated by AayulSAT**:

1. On-orbit refuelling enables satellite life extension, reusable platforms, and reduced launch frequency.
2. The initiative supports space sustainability by reducing debris generation and improving resource efficiency.
3. The technology is intended exclusively for Indian government satellites and excludes international compatibility.
4. The mission builds upon ISRO's SPADeX satellite docking success achieved in early 2025.

Which of the statements given above are correct?

A. 1, 2 and 4 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2, 3 and 4

9. NASA Artemis II mission

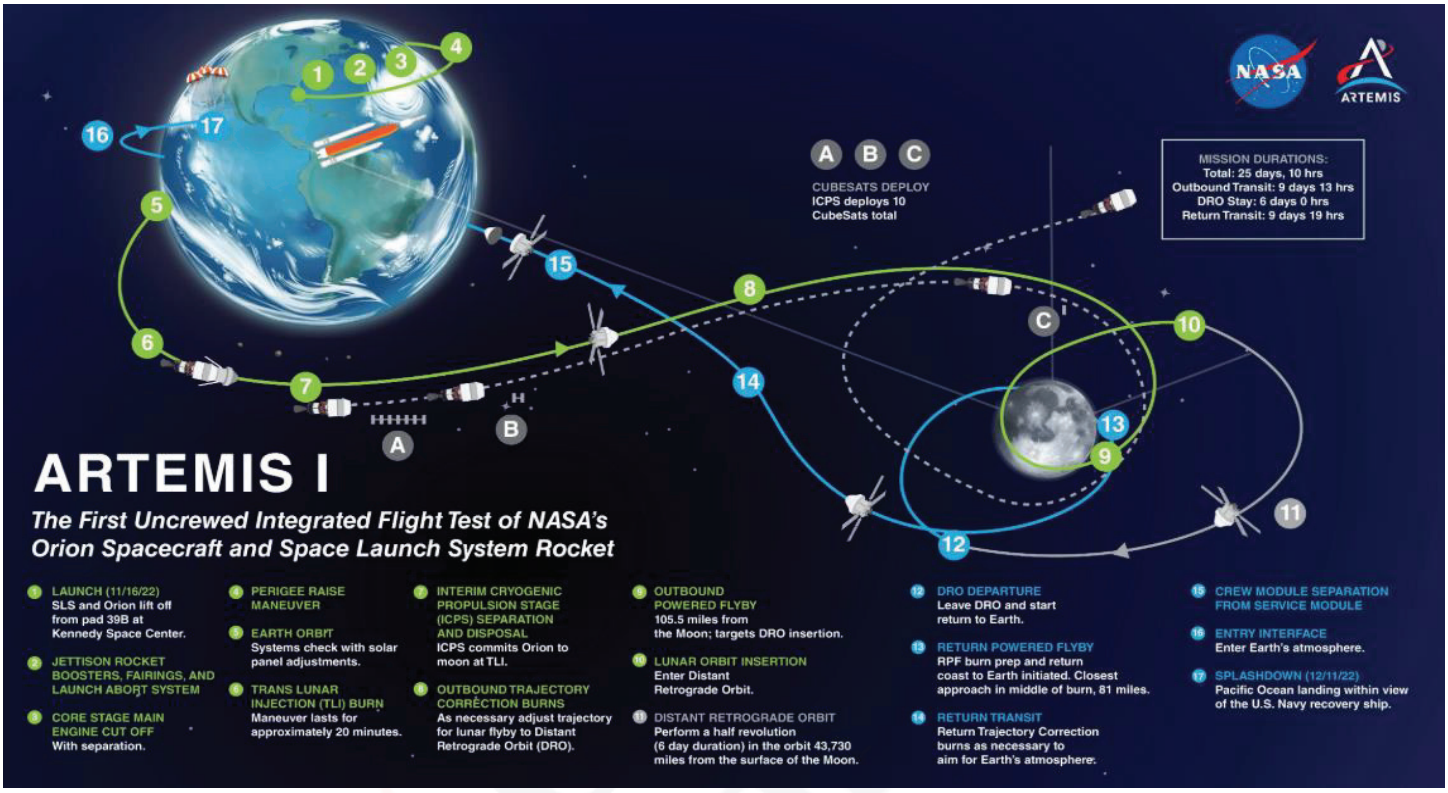


- Artemis II is the first crewed mission of NASA's Artemis programme.
- It will be the first time humans will travel to the vicinity of the moon since 1972.
- The 10-day flight will test the Space Launch System (SLS) rocket and the Orion spacecraft to ensure all life-support and navigation systems are safe for future lunar missions.
- NASA said the mission was in its final preparation stages.
- The earliest targeted launch date is February 6, 2026.
- NASA has also identified launch windows across February, March, and April 2026.
- The rocket stack is expected to be rolled out to Launch Pad 39B at the Kennedy Space Centre in mid-January for the final tests.
- Artemis II has a four-person crew. The commander is Reid Wiseman; the pilot, Victor Glover; and Christina Koch and Jeremy Hansen are the mission specialists.
- Mr. Hansen is from the Canadian Space Agency, the rest are from NASA.
- Rather than land on the moon, the crew will fly in a hybrid free-return trajectory.
- Specifically, after liftoff onboard the SLS, the Orion spacecraft will orbit the earth twice to check life support and manual handling capabilities.
- Then, it will travel around 10,300 km beyond the far side of the moon, after which gravity will pull the spacecraft back towards the earth for a splashdown in the Pacific Ocean.

- This mission is a critical test flight.
- If it is successful, NASA will greenlight Artemis III, which aims to land astronauts on the lunar South Pole.

Artemis I

- Artemis I was NASA's first integrated test flight of the Artemis program, aimed at returning humans to the Moon and eventually going to Mars.



- **Launch:** November 16, 2022
  - Spacecraft:
  - Space Launch System (SLS) rocket
  - Orion crew capsule (uncrewed on this mission)
- **Mission duration:** ~25.5 days
- **Type:** Uncrewed test mission
- **Main objectives:**
  - Test the SLS rocket and Orion spacecraft together for the first time
  - Send Orion into a distant retrograde orbit around the Moon
  - Evaluate Orion's systems (navigation, propulsion, life-support simulators, communications)
  - Test heat shield performance during high-speed re-entry into Earth's atmosphere

Outcome:

- Mission was successful
- Orion traveled over 2 million km (1.3 million miles)
- Safely splashed down in the Pacific Ocean on December 11, 2022
- Cleared the way for Artemis II (crewed lunar flyby) and Artemis III (planned lunar landing)

34. Consider the following statements regarding the **Artemis II mission**:

1. Artemis II will be the first crewed mission under NASA's Artemis programme and the first human lunar vicinity mission since 1972.
2. The mission involves landing astronauts on the lunar surface to test surface operations and habitation systems.
3. The crewed spacecraft will follow a hybrid free-return trajectory after flying beyond the far side of the Moon.
4. One member of the Artemis II crew belongs to the Canadian Space Agency.

Which of the statements given above are correct?

A. 1, 3 and 4 only
B. 1 and 2 only
C. 2 and 4 only
D. 1, 2, 3 and 4

35. With reference to the **Artemis I mission**, consider the following statements:

1. Artemis I was an uncrewed integrated test flight of the Space Launch System rocket and Orion spacecraft.
2. During the mission, Orion entered a low lunar orbit to simulate future landing operations.
3. The mission tested the heat shield during high-speed atmospheric re-entry.
4. The successful completion of Artemis I cleared the pathway for Artemis II and Artemis III missions.

Which of the statements given above are correct?

A. 1, 3 and 4 only
B. 2 and 3 only
C. 1 and 2 only
D. 1, 2, 3 and 4

36. Consider the following statements regarding the **Artemis Accords**:

1. The Artemis Accords are legally binding multilateral treaties governing conduct in outer space.
2. The Accords are grounded in the principles of the United Nations Outer Space Treaty of 1967.
3. As of January 2026, more than 60 countries have signed the Artemis Accords.
4. India joined the Artemis Accords in June 2023 as the 27th signatory.

Which of the statements given above are correct?

A. 2, 3 and 4 only
B. 1 and 3 only
C. 1, 2 and 4 only
D. 2 and 4 only

37. Consider the following statements regarding the **Artemis programme and related milestones**:

1. The Artemis programme aims to return humans to the Moon by 2027 and subsequently enable human missions to Mars.
2. The Apollo 11 mission achieved the first human soft landing on the Moon in July 1969.

3. During Apollo 11, all three astronauts landed together on the lunar surface.
4. The Artemis Accords were framed to encourage peaceful, transparent, and sustainable exploration of outer space.

Which of the statements given above are correct?

A. 1, 2 and 4 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2, 3 and 4

38. With reference to the **origin and scope of the Artemis Accords**, consider the following statements:

1. The Accords were originally signed in October 2020 by eight founding countries including the United States, Japan, and the United Kingdom.
2. The Accords establish a framework for cooperation exclusively limited to lunar exploration activities.
3. The Accords were drafted jointly by NASA and the U.S. Department of State.
4. The Accords remain open-ended for accession by additional countries.

Which of the statements given above are correct?

A. 1, 3 and 4 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2, 3 and 4

QUESTIONS

1. B 1 and 3 only

- **Statement 1 is correct.** Shaksgam Valley is also called the Trans-Karakoram Tract and lies north of the Siachen Glacier in the Hunza–Gilgit region.
- **Statement 2 is incorrect.** The area was under Pakistani control before being ceded to China in 1963, not under Chinese control earlier.
- **Statement 3 is correct.** The valley is harsh, sparsely populated, and covers over 5,000 sq km.

2. C 1 and 3 only

- **Statement 1 is correct.** Pakistan ceded about 5,180 sq km of Shaksgam Valley to China.
- **Statement 2 is incorrect.** Article 6 clearly states that the agreement was provisional, pending final settlement of the Kashmir dispute.
- **Statement 3 is correct.** India rejects the agreement as illegal, asserting that Pakistan lacked authority to cede Indian territory.

3. A 1 and 2 only

- **Statement 1 is correct.** India objects to CPEC because it passes through Pakistan-occupied Kashmir, which India claims as its own territory.
- **Statement 2 is correct.** China views CPEC as a strategic corridor to bypass the Malacca Strait for trade and energy security.
- **Statement 3 is incorrect.** India does not recognise Chinese sovereignty over Shaksgam Valley and rejects both Chinese and Pakistani claims over the region.

4. C Only four

- Four Indian states and one union territory share a 3,488 km border with China, primarily along the Line of Actual Control (LAC). These include the Union Territory of Ladakh (formerly Jammu & Kashmir), and the states of Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh. **Jammu and Kashmir** does **not** directly share a border with China in administrative terms as the China-facing region lies largely in **Ladakh**, which is a separate Union Territory. Therefore, **four** of the listed entities—**Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh**—share a border with China. Hence, the correct answer is **(C) Only four**.

5. A 1 and 3 only

- **Statement 1 is correct.** The McMahon Line was drawn in 1914 during the Simla Convention and serves as the de facto eastern boundary between India (Arunachal Pradesh) and China (Tibet), though it is disputed by China.
- **Statement 2 is incorrect.** While the Durand Line is recognized internationally as Pakistan's western border, **Afghanistan does not officially accept it** as a legitimate international boundary.
- **Statement 3 is correct.** The Radcliffe Line was drawn in 1947 to divide British India into India and Pakistan, mainly on the basis of religious demographics in Punjab and Bengal.
- **Statement 4 is incorrect.** The Radcliffe Line was officially published on **17 August 1947**, after India attained independence on 15 August 1947. Therefore, the correct answer is **(A) 1 and 3 only**.

6. B 1 and 3 only

- **Statement 1 is correct.** The Treaty of Asunción was signed in 1991 by **Argentina, Brazil, Paraguay, and Uruguay** as founding signatories to establish MERCOSUR.
- **Statement 2 is incorrect.** Venezuela is a member but has been **suspended from all rights and obligations** under MERCOSUR as per the Protocol of Ushuaia.
- **Statement 3 is correct.** Bolivia delivered its instrument of ratification in **July 2024** and has up to four years to adopt the bloc's normative framework.

7. B 2 and 3 only

- **Statement 1 is incorrect.** The official **working languages** of MERCOSUR are **Spanish and Portuguese**. Guarani has been **incorporated as one of the languages of the bloc**, but it is not an official working language for documents across all meetings.
- **Statement 2 is correct.** The Treaty of Asunción is open for accession by other members of the **Latin American Integration Association (ALADI)**, enabling countries such as Venezuela and Bolivia to join.
- **Statement 3 is correct.** MERCOSUR aims to promote **a common space for business and investment** by integrating national economies into the international market.

8. A 1 and 2 only

- **Statement 1 is correct.** The directive ordered withdrawal from **66 international organisations**.
- **Statement 2 is correct.** The list included **31 UN entities and 35 non-UN bodies**, meaning non-UN bodies were numerically higher.
- **Statement 3 is incorrect.** The action was taken through a **presidential memorandum**, not a congressional legislative act.

9. A 1 and 2 only

- **Statement 1 is correct.** UNFCCC underpins the global climate governance architecture.
- **Statement 2 is correct.** The passage states that the US becomes **the only nation not party to UNFCCC** after withdrawal.
- **Statement 3 is incorrect.** The US is also exiting the **IPCC**, along with IRENA, Green Climate Fund, and International Solar Alliance.

10. A 1, 2 and 4 only

- **Statement 1 is correct.** The International Solar Alliance was established by **India and France on November 30, 2015**, and functions as a **treaty-based, intergovernmental organisation**.
- **Statement 2 is correct.** The headquarters of ISA is located at the **National Institute of Solar Energy (NISE), Gurugram, Haryana**.
- **Statement 3 is incorrect.** While ISA was initially restricted to **sunshine countries** between the Tropics of Cancer and Capricorn, it is now **open to all UN member states**, with more than 100 signatories.
- **Statement 4 is correct.** Under the "Towards 1000" vision, ISA aims to mobilise **US$ 1 trillion in investment**, install **1,000 GW of solar capacity**, and provide energy access to **1,000 million people by 2030**. Hence, the correct answer is **(A) 1, 2 and 4 only**.

11. A 1, 3 and 4 only

- **Statement 1 is correct.** Bio-bitumen is a bio-based alternative binder used in road construction.
- **Statement 2 is incorrect.** Bio-bitumen can only **partially replace conventional bitumen (about 20–30%)**, not fully replace it.
- **Statement 3 is correct.** It is produced mainly from **agricultural residues, especially rice straw**.
- **Statement 4 is correct.** A **100-metre trial stretch** was laid on the **Jorabat–Shillong Expressway (NH-40), Meghalaya** to validate real-world feasibility.

12. A 1, 2 and 4 only

- **Statement 1 is correct.** Pyrolysis involves heating biomass in the **absence of oxygen**, producing bio-oil, gas, and bio-char.
- **Statement 2 is correct.** The **bio-oil fraction** is refined and blended with conventional bitumen (20–30%).
- **Statement 3 is incorrect.** Bio-char is a by-product and is **not used as the primary road binder**.
- **Statement 4 is correct.** The product undergoes **physical, chemical, rheological, and mechanical tests** such as rutting and cracking resistance.

13. A 1, 2 and 4 only

- **Statement 1 is correct.** Bio-bitumen is developed using agricultural and organic waste materials that were earlier discarded.
- **Statement 2 is correct.** The initiative supports a **circular economy model** and seeks to reduce dependence on fossil fuels while lowering carbon emissions in road construction.
- **Statement 3 is incorrect.** The study confirmed that bio-bitumen **successfully met performance and durability evaluations**, which enabled its commercial adoption.
- **Statement 4 is correct.** The innovation aligns with national programmes related to **Green Infrastructure, Waste to Wealth, and Sustainable Mobility**. Hence, the correct answer is **(A) 1, 2 and 4 only**.

14. D 1, 2 and 3

- **Statement 1 is correct.** Biochar is increasingly used as a component of growing media in **soilless agriculture and vertical farming** because of its porous structure, light weight, and ability to improve aeration and root development.
- **Statement 2 is correct.** Biochar provides a **favourable habitat for beneficial microorganisms**, including nitrogen-fixing bacteria. Its porous surface offers shelter and improves microbial colonisation, which enhances soil fertility and nutrient cycling.
- **Statement 3 is correct.** Biochar has a high **water-holding capacity** due to its large surface area and micro-porosity, allowing the growing medium to retain moisture for longer durations and improve drought resilience. Therefore, all three statements are correct, and the correct answer is **(D) 1, 2 and 3**.

15. A 1, 2, 5 and 6 only

- The National Policy on Biofuels permits the use of surplus, damaged, or non-edible agricultural produce for biofuel production to avoid affecting food security. Cassava and sugar beet are starch- and sugar-rich energy crops suitable for ethanol production. Damaged wheat grains and rotten potatoes are allowed as waste biomass feedstock. Edible food crops like groundnut seeds and horse gram are excluded.

16. A 1, 2 and 4 only

- **Statement 1 is correct.** The study found that underwater storms contributed **around 20% of ice shelf melting** over nine months.
- **Statement 2 is correct.** Thwaites Glacier alone holds enough ice to raise sea levels by **over two feet**.
- **Statement 3 is incorrect.** Freshwater mixing actually **increases turbulence**, strengthening the feedback loop and storm activity.
- **Statement 4 is correct.** Warmer oceans increase temperature contrasts, making storm formation more frequent and intense.

17. A 1, 3 and 4 only

- **Statement 1 is correct.** The storms are **submesoscale ocean eddies** formed by interaction of warm and cold water masses.
- **Statement 2 is incorrect.** The storms **form in open water and then move underneath ice shelves**, not the reverse.
- **Statement 3 is correct.** They can stretch up to **about 6 miles wide** and move rapidly under floating ice shelves.
- **Statement 4 is correct.** The strongest melting occurs near **grounding zones**, where ice shifts from land-based to floating.

18. B 1 and 2 only

- The Antarctic ozone hole forms primarily due to a combination of **extreme cold conditions in the stratosphere and the presence of chlorofluorocarbons (CFCs)**. During the Antarctic winter, very low temperatures lead to the formation of **polar stratospheric clouds (PSCs)**. These clouds provide surfaces on which inactive chlorine compounds (from CFCs) are converted into highly reactive chlorine forms. When sunlight returns in spring, these reactive chlorine atoms rapidly destroy ozone molecules. Additionally, the **strong polar vortex and polar front isolate Antarctic air**, preventing the mixing of ozone-rich air from lower latitudes, which allows ozone depletion to intensify. Therefore, the correct explanation involves the presence of **polar stratospheric clouds along with CFC inflow**, making option **(B)** correct.

19. A 1 and 2 only

- **Statement 1 is correct.** Antarctica covers about **14 million square kilometres**, making it **larger than Europe**, which has roughly 10 million square kilometres of area.
- **Statement 2 is correct.** Antarctica has the **highest average elevation among all continents** (around 2,300 metres) due to its thick ice sheet.
- **Statement 3 is incorrect.** The highest peak of Antarctica is **Mount Vinson**, not Mount Ross. Mount Ross is a volcanic mountain, not the highest peak.
- **Statement 4 is incorrect.** The **West Wind Drift (Antarctic Circumpolar Current)** flows **clockwise** around Antarctica when viewed from the South Pole (from west to east), not anticlockwise. Therefore, the correct answer is **(A) 1 and 2 only**.

20. B 1, 2 and 4 only

- **Statement 1 is correct.** Antarctica has no native human population, and the treaty designates it as a **scientific preserve** with freedom of scientific investigation.

- **Statement 2 is correct.** The treaty bans **military activity** in all areas south of **60°S latitude**, including land and ice shelves.
- **Statement 3 is incorrect.** The **Antarctic Treaty Secretariat is headquartered in Buenos Aires, Argentina**, not Geneva.
- **Statement 4 is correct.** The original 12 signatories were nations actively involved in Antarctic research during the **International Geophysical Year (1957–58)**. Hence, the correct answer is **(B)**.

21. A 1 and 3 only

- **Statement 1 is correct.** Greenland is the **largest island in the world (excluding continents)** and is located between the Arctic and Atlantic Oceans, northeast of Canada.
- **Statement 2 is incorrect.** Greenland is an **autonomous territory within the Kingdom of Denmark**, not a fully sovereign independent state.
- **Statement 3 is correct.** The **Thule Air Base (Pituffik Space Base)** was established under U.S.–Denmark defence cooperation and plays a major role in **early-warning and missile defence systems**.
- **Statement 4 is incorrect.** Greenland has the **second-largest ice sheet in the world**, after Antarctica. Hence, the correct answer is **(A) 1 and 3 only**.

22. A 1, 3 and 4 only

- **Statement 1 is correct.** The Arctic Council was created in **1996 under the Ottawa Declaration** to promote cooperation on sustainable development and environmental protection in the Arctic region.
- **Statement 2 is incorrect.** The Arctic Council is **not a legally binding body** and has **no formal voting system**; decisions are taken by consensus.
- **Statement 3 is correct.** Six indigenous organisations participate as **Permanent Participants**, ensuring representation of Arctic indigenous populations.
- **Statement 4 is correct.** The **permanent secretariat is headquartered in Tromsø, Norway**. Hence, the correct answer is **(A) 1, 3 and 4 only**.

23. A Only three

- The Arctic Council has **eight member states** that have sovereign territory within the Arctic Circle: **Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States**. The Council includes over 38 non-Arctic states, intergovernmental organizations, and NGOs (e.g., India, China, UK) as observers.

24. A 1, 2 and 3 only

- **Statement 1 is correct.** Greenland is the world's largest island and lies between Europe and North America in the North Atlantic–Arctic region.
- **Statement 2 is correct.** It is an **autonomous territory within the Kingdom of Denmark**, with Denmark retaining control over defence and foreign policy.
- **Statement 3 is correct.** About **80% of Greenland is covered by the Greenland Ice Sheet**, making it crucial for climate change and sea-level rise studies.
- **Statement 4 is incorrect.** Greenland **banned uranium mining in 2021 for environmental reasons**, not lifted the ban. Hence, the correct answer is **(A)**.

25. D 1, 3 and 5

- The Arctic Council consists of **eight member states** that have sovereign territory within the Arctic Circle:

  Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States. Evaluating the given countries: **Denmark – Member** (Includes Greenland and Faroe Islands). **Japan – Not a member** (Observer state.). **Russian Federation – Member. United Kingdom – Not a member** (Observer state). **United States of America – Member.** Therefore, the correct combination is **1, 3 and 5**, making option **(D)** the correct answer.

26. A 1, 2 and 3 only

- **Statement 1 is correct.** The mounds were long considered natural and cover about **10 acres**.
- **Statement 2 is correct.** The formations resemble **stupa architecture** and are over **2,000 years old**.
- **Statement 3 is correct.** A **canal built in the 1970s** has divided the site, complicating preservation.
- **Statement 4 is incorrect.** Excavation is still ongoing and has not been fully completed or formally secured under a national programme.

27. A 1, 2 and 4 only

- **Statement 1 is correct.** Rajatarangini indicates Buddhist presence prior to Ashoka.
- **Statement 2 is correct.** Kushan patronage, especially under **Kanishka**, led to expansion of Buddhist infrastructure.
- **Statement 3 is incorrect.** Kashmir played a **significant role** in Mahayana development and transmission to Central Asia and China.
- **Statement 4 is correct.** Indo-Greek dialogues helped shape Buddhist philosophical development.

28. A 1, 2 and 3 only

- **Pair 1 is correct.** The Second Buddhist Council (383 BC, Vaishali) was patronised by **Kalasoka**.
- **Pair 2 is correct.** The Third Buddhist Council (250 BC, Pataliputra) was patronised by **Emperor Ashoka**.
- **Pair 3 is correct.** The Fourth Buddhist Council (72 AD, Kashmir) was patronised by **Emperor Kanishka**.
- **Pair 4 is incorrect.** The First Buddhist Council was patronised by **King Ajatashatru**, not Chandragupta Maurya.

29. C 1, 2, 3 and 4

- **Statement 1 is correct.** The Fourth Buddhist Council was held in **Kashmir** under the patronage of **Emperor Kanishka**.
- **Statement 2 is correct.** The council was presided over by **Vasumitra and Ashvaghosha**.
- **Statement 3 is correct.** The agenda was to **reconcile conflicts among different Buddhist schools** and systematise doctrinal positions.
- **Statement 4 is correct.** After this council, the **Hinayana and Mahayana traditions diverged more clearly**, marking a significant doctrinal evolution. Hence, the correct answer is **(C)**.

30. D 3 and 4 only

- **Kosala – Correct.** Important events of the Buddha's life occurred in the Kingdom of Kosala. **Sravasti**, the capital of Kosala, was a major centre where Buddha delivered many sermons.
- **Magadha – Correct.** The Buddha attained **enlightenment at Bodh Gaya** and delivered his first sermon at **Sarnath**, both located in the region associated with Magadha. Kings like **Bimbisara and Ajatashatru** were his patrons.
- **Avanti – Incorrect.** Although Avanti later became an important centre for Buddhism, it was **not directly associated with the major events of Buddha's life**.
- **Gandhara – Incorrect.** Gandhara became prominent as a Buddhist centre **after the Buddha's lifetime**, especially under Kushana patronage. Therefore, the correct answer is **(D) 3 and 4 only**.

31. A 1, 3 and 4 only

- **Statement 1 is correct.** AayulSAT uses OrbitAID's **Satellite Interface for Docking and Refuelling Protocol (SIDRP)** for India's first on-orbit refuelling demonstration.
- **Statement 2 is incorrect. EOS-N1 (Anvesha)** was the primary payload; AayulSAT flew as a co-passenger.
- **Statement 3 is correct. Propane** is a non-toxic, environmentally safer alternative to hydrazine.
- **Statement 4 is correct.** A **chaser satellite docking test** is planned 8–10 months after refuelling.

32. A 1, 2 and 3 only

- **Statement 1 is correct.** PSLV-C62 was the **first launch of 2026 and 64th PSLV flight**.
- **Statement 2 is correct.** It used the **DL configuration with two strap-on boosters**.
- **Statement 3 is correct.** It followed the **PSLV-C61 setback in May 2025**.
- **Statement 4 is incorrect.** The mission carried **international payloads**, including a Spanish re-entry capsule and an Indo-Mauritius satellite.

33. A 1, 2 and 4 only

- **Statement 1 is correct.** Refuelling allows **extended satellite lifetimes and reusable orbital infrastructure**.
- **Statement 2 is correct.** It supports **space sustainability and debris mitigation**.
- **Statement 3 is incorrect.** The SIDRP protocol is designed to be **globally compatible**, enabling international collaboration.
- **Statement 4 is correct.** The docking test builds upon **ISRO's SPADeX mission (2025)**.

34. A 1, 3 and 4 only

- **Statement 1 is correct.** Artemis II is the **first crewed Artemis mission** and the first human lunar vicinity flight since **Apollo 17 (1972)**.
- **Statement 2 is incorrect.** Artemis II is a **flyby mission**; no lunar landing will occur.
- **Statement 3 is correct.** The mission uses a **hybrid free-return trajectory**, allowing gravity-assisted return.
- **Statement 4 is correct. Jeremy Hansen** represents the **Canadian Space Agency**.

35. A 1, 3 and 4 only

- **Statement 1 is correct.** Artemis I was an **uncrewed integrated test mission** of SLS and Orion.
- **Statement 2 is incorrect.** Orion entered a **distant retrograde orbit**, not low lunar orbit.
- **Statement 3 is correct.** The mission tested the **heat shield during high-speed re-entry**.
- **Statement 4 is correct.** The success enabled progression toward **Artemis II (crewed flyby)** and **Artemis III (planned landing)**.

36. A 2, 3 and 4 only

- **Statement 1 is incorrect.** The Artemis Accords are **non-binding multilateral arrangements**, not legally binding treaties.
- **Statement 2 is correct.** They are explicitly grounded in the **UN Outer Space Treaty (1967)** and related space law conventions.
- **Statement 3 is correct.** As of **26 January 2026**, **61 countries** have signed the Accords.
- **Statement 4 is correct. India joined on June 21, 2023**, becoming the **27th signatory**.

37. A 1, 2 and 4 only

- **Statement 1 is correct.** The Artemis programme targets **human return to the Moon by 2027** with a longer-term goal of **Mars exploration**.
- **Statement 2 is correct. Apollo 11 achieved the first successful human Moon landing on 20 July 1969.**
- **Statement 3 is incorrect.** Only **Neil Armstrong and Buzz Aldrin landed on the Moon**, while **Michael Collins remained in lunar orbit**.
- **Statement 4 is correct.** The Artemis Accords promote **peaceful, transparent, and sustainable space exploration norms.** Hence, the correct answer is **(A)**.

38. A 1, 3 and 4 only

- **Statement 1 is correct.** The initial signatories in October 2020 included **Australia, Canada, Italy, Japan, Luxembourg, UAE, UK, and USA**.
- **Statement 2 is incorrect.** The framework applies to **Moon, Mars, and other celestial bodies**, not only the Moon.
- **Statement 3 is correct.** The Accords were drafted by **NASA and the U.S. Department of State**.
- **Statement 4 is correct.** The Accords remain **open for signature indefinitely**.