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- **Statement 3 is correct:** The agriculture sector is the largest anthropogenic source of N<sub>2</sub>O emissions, mainly due to the overuse of **nitrogen-based fertilizers and manures**, and other soil-based microbial activities that release N<sub>2</sub>O. Other anthropogenic sources include **industrial emissions, wastewater, biomass burning**, transport etc.

36. (b)

- **Option (b) is the correct answer:** The ‘Bharat Mart’ project, aimed at strengthening India’s trade outreach to the Middle East and Africa, was recently launched in **United Arab Emirates**.
- Specifically, the construction of the Bharat Mart was commenced in **Dubai, UAE**. This was announced in April 2025. The marketplace is designed to be a global hub for Indian businesses, particularly MSMEs, to showcase their products to buyers from the Middle East, Africa, and beyond.

37. (a)

- **Statement 1 is correct:** The INSTC is a multi-modal transport corridor established to promote trade connectivity between India, Iran, Azerbaijan, Russia, Central Asia, and Europe. It utilizes a combination of sea, rail, and road routes to facilitate the movement of goods.
- **Statement 2 is not correct:** The India-Middle East-Europe Economic Corridor (IMEC), announced in 2023, aims to connect India to Europe via the Middle East. The proposed network involves sea lanes connecting India to the UAE, Saudi Arabia, Jordan, and Israel, followed by rail links extending to Europe. It does **not** directly target Central Asian markets; those are more the focus of initiatives like INSTC.
- **Statement 3 is not correct:** India’s trilateral highway project aims to connect

India, Myanmar, and Thailand. The highway is intended to boost trade and connectivity within the ASEAN region.

38. (a)

- **Statement 1 is not correct:** The Indus Waters Treaty (IWT) was signed in 1960 between India and Pakistan with the **mediation of the World Bank**, not the United Nations. The World Bank played a pivotal role in facilitating negotiations and is also a signatory to the treaty.
- **Statement 2 is correct:** Under the IWT, the three eastern rivers—**Ravi, Beas, and Sutlej**—are allocated to India for **unrestricted use**, which includes purposes like irrigation, domestic use, and even hydropower generation.
- **Statement 3 is not correct:** The treaty permits India to use the waters of the western rivers—**Indus, Jhelum, and Chenab**—for **non-consumptive uses**, which include **hydropower generation, navigation, fishing, and industrial purposes**, including mining. However, these uses are subject to certain restrictions.
- **Statement 4 is not correct:** The IWT outlines a **graded dispute resolution mechanism**:
  1. **Permanent Indus Commission (PIC):** Initial discussions and resolution attempts.
  2. **Neutral Expert:** If PIC fails, a neutral expert is appointed for technical issues.
  3. **Court of Arbitration (CoA):** For legal disputes, a CoA can be constituted. The **Permanent Court of Arbitration (PCA)** acts as the secretariat for the CoA but does not automatically handle all disputes.

**Additional information:** The Indus Water Treaty of 1960 itself states that the treaty **cannot be altered unilaterally**.

39. (c)

- **Option (c) is the correct answer:** The **bald eagle**, a longstanding symbol of the

United States’ strength and independence, has officially been **designated as the national bird** of the United States of America (USA) for the first time by law.

- The **bald eagle has appeared on the Great Seal of the United States** since 1782.
- The bald eagle is **native to North America**, recognizable by its **white head, brown body, and yellow beak**.

40. (d)

- **Pair 1 is correctly matched:** Launched by the **Union Ministry of Fisheries**, the **first organic fish cluster** was inaugurated in **Soreng district of Sikkim** on January 6, 2024.

- The initiative promotes **sustainable aquaculture**, with fish raised **without antibiotics, chemicals, or pesticides**, targeting **eco-conscious markets**.

- **Pair 2 is correctly matched:** The **United Nations World Food Programme (WFP)** and the **Government of Odisha** launched India’s first **24x7 grain dispensing machine** in **Bhubaneswar**.

- Also called **Annapurti**, the machine improves ease of access to the **Public Distribution System (PDS)** for beneficiaries.

- **Pair 3 is correctly matched:** The **new Pamban railway bridge** in **Tamil Nadu** is India’s **first vertical-lift railway sea bridge**.

- It can lift vertically to allow ship movement and then lower back for trains to pass, enhancing connectivity to **Rameswaram Island**.

- **Additional information:**

- **What is a Vertical-Lift Railway Sea Bridge?**

- Imagine a bridge that trains use to go across the sea. Sometimes, big boats need to pass through the same area where the bridge is. A **vertical-lift railway sea bridge** is a special kind of

bridge that can **lift up in the middle**, just like an elevator going up, so the boats can safely go underneath it.

- Once the boat passes, the bridge comes back down so the train can continue its journey. It’s a moving bridge that helps both trains and boats go their way without getting in each other’s path.

41. (b)

- The correct order is 2-1-4-3. The length of India’s international border with different countries is as follows:

| Name of the country | Length of the border (in Km) |
|---------------------|------------------------------|
| Bangladesh          | 4,096.7                      |
| China               | 3,488                        |
| Pakistan            | 3,323                        |
| Nepal               | 1,751                        |
| Myanmar             | 1,643                        |
| Bhutan              | 699                          |
| Afghanistan         | 106                          |
| <b>Total</b>        | <b>15,106.7</b>              |

42. (c)

- **Statement 1 is correct:** Unlike ENSO, which is stationary, the MJO is an *eastward-moving* disturbance of clouds, rainfall, winds, and pressure that traverses the planet in the tropics and returns to its initial starting point in 30 to 60 days, on average.

- **Statement 2 is correct:** ENSO, once established, is associated with persistent features that last several seasons or longer over the Pacific Ocean basin. On the other hand, there can be multiple MJO events within a season, and so the MJO is best described as *intraseasonal* tropical climate variability (i.e. it varies on a week-to-week basis).

43. (c)

- **Pair 1 is correctly matched:** Critical minerals such as silicon, tellurium, indium, and gallium are vital for the production of photovoltaic (PV) cells used in solar panels.

- **Pair 2 is not correctly matched:** As explained above, gallium is mainly used in the production of photovoltaic (PV) cells used in solar panels. Rare earth elements

like dysprosium and neodymium are used in permanent magnets for wind turbines.

- **Pair 3 is correctly matched:** Lithium, nickel, and cobalt are key materials used in lithium-ion batteries.

44. (b)

- **Pair 1 is correctly matched:** Recent research has shown that the dried Aral Sea region is rising due to Earth's mantle, adjusting to lose water weight. The man-made environmental disaster has also led to the creation of the toxic Aralkum Desert, increasing hazardous dust levels and altering climate patterns in Central Asia. Aral Sea was a once-large saltwater lake of Central Asia. It straddles the boundary between Kazakhstan to the north and Uzbekistan to the south.
- **Pair 2 is not correctly matched:** Dead sea is also shrinking due to climate change and other reasons. The Dead Sea is the lowest body of water on the surface of Earth. Dead Sea, landlocked salt lake between Israel and Jordan in southwestern Asia. Its eastern shore belongs to Jordan, and the southern half of its western shore belongs to Israel. The northern half of the western shore lies within the Palestinian West Bank.
- **Pair 3 is correctly matched:** Environmentalists have been raising alarm over rapidly declining water level in Caspian Sea. Caspian Sea, world's largest inland body of water. It lies to the east of the Caucasus Mountains and to the west of the vast steppe of Central Asia. The sea is bordered in the northeast by Kazakhstan, in the southeast by Turkmenistan, in the south by Iran, in the southwest by Azerbaijan, and in the northwest by Russia.

45. (b)

- **Area 1:** It represents the Eastern Himalayan region and is likely to have montane forest.
- **Area 2:** It represents the heavy rainfall area of northeastern India and is likely to have evergreen forests.

- **Area 3:** Lies beside the heavy rainfall area and is likely to have tropical deciduous forest.
- **Option (a) is not correct:** Blue pine and spruce appear at altitudes of 2,225-3,048 m in the Himalayas. So, Blue Pine can be found in Area 1. Mahogany is a tree species found in the Evergreen forest, and hence can be found in Area 2. Deodar is a tree found mostly in the Western Himalayas and is not likely to be found in Area 3.
- **Option (b) is correct:** In the higher hill ranges of northeastern India, hilly areas of West Bengal and Uttaranchal, evergreen broadleaf trees such as oak and chestnut are predominant. Thus, Area 1 is likely to have Oak trees. Rosewood is an evergreen tree and is likely to be present in Area 2. Teak is a moist deciduous tree and is likely to be found in Area 3.
- **Option (c) is not correct:** Silver firs, junipers, pines, birch and rhododendrons, etc., occur between 3,000-4,000 m in the Himalayan region. So, Rhododendrons are likely to be found in Area 1. Teak is a moist deciduous tree and may or may not be found in Area 2. Neem is a tropical thorn tree and is less likely to be found in Area 3.
- **Option (d) is not correct:** As explained above, Silver firs can be found in Area 1. Sal is a moist deciduous tree and may or may not be found in Area 2. Palas is a tropical thorn tree and is less likely to be found in Area 3.

46. (a)

- **Statement-I is correct:** The mainland India extends between latitudes 8°4'N and 37°6'N and longitudes 68°7'E and 97°25'E. Thus, the latitudinal as well as longitudinal extent of India is roughly about 30 degrees. The actual distance measured from north to south extremity is 3,214 km, and that from east to west is only 2,933 km.
- **Statement-II and Statement-III are correct, and both of them provide the**

**correct explanation for Statement-I:**

This asymmetry between the latitudinal and longitudinal extent and north-south and east-west extent is based on the fact that the distance between two longitudes decreases towards the poles, whereas the distance between two latitudes remains the same everywhere.

47. (a)

- **About Absolute Humidity:** The actual amount of water vapour present in the atmosphere is known as the absolute humidity.
- **About Relative Humidity:** The percentage of moisture present in the atmosphere as compared to its full capacity at a given temperature is known as the relative humidity.
- **Statement 1 is correct:** As explained above, absolute humidity is the actual mass of water vapour present in a given volume of air (grams per cubic meter). So, even if the temperature increases, unless water vapour is added or removed, absolute humidity stays the same.
- **Statement 2 is correct:** If the temperature of an air parcel is changed, its capacity to hold moisture will change. However, if no water vapour is being added to the parcel, its absolute humidity will remain constant. Thus, with a change in temperature (and no addition or subtraction of water vapour), absolute humidity will remain constant, but relative humidity will change.
- **Statement 3 is not correct:** When an air parcel descends, it compresses and warms up. Warming decreases relative humidity because warm air can hold more moisture. So, in this case, relative humidity decreases, not increases.

48. (a)

- **All the three statements are correct and both Statement-II and Statement-III provide the correct explanation for Statement-I:** The mixing of warm and cold currents help to replenish the oxygen and favour the growth of planktons, the

primary food for fish population. The best fishing grounds of the world exist mainly in these mixing zones.

49. (c)

- **About Lokpal:** The Lokpal is an independent statutory body established under the Lokpal and Lokayuktas Act, 2013 to inquire into allegations of corruption against certain categories of public servants at the central level. The Lokayukta performs the same functions at the state level.
- **Lokpal inquires into complaints of corruption against:**
  - o The Prime Minister (with limitations)
  - o Union Ministers,
  - o Members of Parliament,
  - o Group A and B officers
  - o Officers and employees of public sector undertakings and autonomous bodies under the Centre. etc. (Thus, 1, 2, 3, and 4 are correct.)
- **5 is not correct:** Allegations of corruption against the Members of State legislative assemblies are inquired into by the Lokayuktas present at the state level, not by the Lokpal.

50. (d)

- **About Privileges of legislators in India:** These are the special rights, immunities, and exemptions enjoyed by Members of Parliament (MPs) and state legislatures (MLAs). They are granted to ensure that the members can perform their legislative duties without interference or fear of legal action. Members have certain Collective Privileges as well as Individual Privileges.
- **Statement 1 is correct:** In any case of breach of privileges, the Speaker of the Lok Sabha or the Chairman of the Rajya Sabha can suo motu (on their own) refer a question of breach of privilege to the Privileges Committee for examination.

- **Statement 2 is correct:** MPs enjoy **limited immunity from legal proceedings**. They cannot be arrested in civil cases during the session or 40 days before and after the session. However, this protection does **not extend to criminal matters or preventive detention**. So, MPs can be arrested under preventive detention laws like the National Security Act or Unlawful Activities (Prevention) Act.
- **Statement 3 is correct:** Parliament has the power to punish not only its own members but also **outsiders** (non-members) for acts that constitute a breach of its privileges or contempt of the House. Punishment can include **imprisonment**, admonitions etc.

51. (b)

- **Option (b) is the correct answer: About Protection of Life and Personal Liberty:** Article 21 states that “No person shall be deprived of his life or personal liberty except according to procedure established by law.” This guarantees not only the right to physical existence but also a broader concept of personal liberty, which includes the right to due process, fair trial, and freedom from arbitrary detention.
- **Scenario (b) and Violation:**
  - o **Deprivation of Personal Liberty:** Preventive detention, by its very nature, **restricts an individual’s freedom of movement and liberty before they have committed any crime**, based on a prediction of future behavior.
  - o **Lack of Substantive Evidence and Due Process:** If AI algorithms are used to predict criminal behavior and this prediction becomes the basis for detention without concrete evidence of a crime or a fair legal process (like proper investigation, charges, and trial), it directly undermines the “procedure established by law” safeguard of Article 21. The AI’s prediction, without human

oversight and verifiable evidence, could be considered an arbitrary basis for depriving someone of their liberty.

52. (c)

- **Statements 1 and 2 are correct:** Subordinate legislation is the legislation made by an authority subordinate to the legislature. Rules, regulations, bye-laws framed by executives are examples of the subordinate legislation. In modern times, it is not always possible for the legislatures to make laws providing every detail. What a legislature can possibly do and actually does is that it lays down the policy and purpose of the legislation and leaves it to the executive, experts and technocrats to provide for working details within the framework of the enactment by way of rules, regulations, bye-laws or other statutory instruments.
- **Statement 3 is not correct :** Subordinate legislation **does not** go through the full legislative process that an ordinary bill undergoes in Parliament (introduction, debate, voting in both houses, and presidential assent). While there are mechanisms for parliamentary scrutiny and control over subordinate legislation (as mentioned in statement 4), it does not follow the same rigorous procedure as primary legislation.
- **Statement 4 is correct :** Both the Lok Sabha and the Rajya Sabha have their own Committees on Subordinate Legislation. These committees examine rules, regulations, bye-laws, schemes, and other statutory instruments framed by the executive under the powers delegated by Parliament to ensure that they are within the powers conferred by the Constitution or the relevant Act, are consistent with the provisions of the Act, and do not have any unintended or undesirable consequences.

53. (c)

- **Statement 1 is not correct:** In India, the President is elected by an electoral college consisting of elected members of



both Houses of Parliament and the elected members of the Legislative Assemblies of the states. This is a method of indirect election.

- In the **United States**, the President is elected through the Electoral College. While voters cast ballots, they are technically voting for electors who then cast votes for the President. This is an indirect election as well, though it's closer to a direct election than India's system. While India's election is indirect, the **US election** is also indirect, **not directly by the people**.
- **Statement 2 is not correct:** In **India**, the **President can dissolve the Lok Sabha** (lower house) on the advice of the Council of Ministers. In the **United States**, the **President cannot dissolve** the House of Representatives.
- **Statement 3 is correct:** In India, the President's pardoning power extends to offenses under the Union laws and also to offence under the state laws where the punishment is that of a death sentence. In the United States, the President's pardoning power is limited to federal offenses.
- **Statement 4 is correct:** **India:** The President acts on the **advice of the Council of Ministers** whereas, In the **United States**, The President exercises the pardoning power **independently**.

54. (d)

- **Statement 1 is not correct:** Even with the increase in overall reserves, foreign currency assets still constitute the largest portion. Gold reserves, while significant, are still lower than FCAs.
  - As per the latest RBI data (April 2025), **foreign currency assets (FCA)** remain the **largest** component of India's forex reserves.
  - FCA: approx. **\$618 billion**
  - Gold reserves: approx. **\$56 billion**
  - Gold **has not** surpassed FCAs.
- **Statement 2 is not correct:** The import cover provided by India's foreign exchange

reserves is approximately **11 months**, not 24 months.

- **Statement 3 is not correct:** As of **September 2024**, India's **external debt** stood at around **\$711.8 billion**, whereas forex reserves were **~\$705 billion**.
- Therefore, forex reserves are **slightly less** than external debt.

● **Additional Information:**

**Components of India's Foreign Exchange Reserves:**

- **Foreign Currency Assets (FCA):** The largest component, including major currencies like USD, EUR, GBP, and investments in foreign government bonds, etc.
- **Gold Reserves:** Held as a store of value and for diversification.
- **Special Drawing Rights (SDRs):** International reserve assets created by the IMF.
- **Reserve Tranche Position (RTP) in the IMF:** Represents India's quota with the IMF that can be drawn upon.

55. (a)

- **Pair A-1 is correctly matched:** **PM Vishwakarma Yojana** was launched to support traditional artisans and craftspeople engaged in 18 trades, including carpenters, blacksmiths, and potters. It provides benefits such as toolkit incentives, collateral-free loans up to ₹3 lakh at 5% interest, skill training, and marketing support.
- **Pair B-2 is correctly matched:** **Prime Minister's Employment Generation Programme (PMEGP)** was implemented by the Ministry of MSME through the Khadi and Village Industries Commission (KVIC). It aims to generate employment opportunities by assisting in setting up micro-enterprises in the non-farm sector.
- **Pair C-3 is correctly matched:** **SFURTI Scheme (Scheme of Fund for Regeneration of Traditional Industries)** focuses on organizing traditional industries and artisans into

clusters to make them more competitive and market-driven. It provides support for infrastructure development, skill training, and capacity building.

- **Pair D-4 is correctly matched:** CHAMPIONS portal is a platform for speedy resolution, redressal and remedies. It is a facility provided by the Ministry of Micro, Small and Medium Enterprises.

56. (b)

- **About:** Public Private Partnership (PPP) means an arrangement between a Government / Government owned entity on one side and a private sector entity on the other. In this setup, the private company invests in or manages public assets or services for a fixed period. There is well defined allocation of risk between the private sector and the public entity and the private entity.
- **1 is not correct:** Build-Operate-Transfer (BOT) Model is the most common form of PPP used where the **private sector operator designs, builds, finances, owns and constructs the facility and operates it commercially for the concession period, after which the facility is transferred to the authority. In this case legal ownership of the asset vests with the public sector. The most common form of a BOT project is a Toll Road project.**
  - **Lease, Develop, Operate and Maintain is a variation of BOT** where Assets are leased out to the private sector under specific terms, to operate and maintain the asset for the term of the concession period.
- **2 is correct:** As per this Hybrid Annuity model, 40% of the Project Cost is to be provided by the Government as ‘Construction Support’ to the private developer during the construction period. Concessionaires shall initially bear the balance 60% of the project cost through a combination of equity and debt and construct the project highway. However, semi-annual annuity payments shall be

made to the concessionaire on completion of the project for the balance 60% of the project cost.

- **3 is not correct:** Build Own Operate (BOO) Model is a type of PPP project model in which a private organization builds, owns and operates a project or structure with some incentive from the government. Although the **government doesn't provide direct funding in this model**, it may offer other financial incentives such as tax-exempt status. The developer owns and operates the facility independently.
- **4 is not correct:** Engineering, Procurement, and Construction (EPC) Model is a PPP model in which **project cost is fully covered by the government** together with the majority of the risks—land acquisition, cost overruns due to delay, inflation and commercial. The private developers were supposed to design, construct and hand over the road projects to the government—maintenance, operation and toll collection being the government’s responsibilities.

57. (c)

- **Statement 1 is correct:** India uniquely produces all five major commercial varieties of silk:
  - **Mulberry Silk:** The most common and widely produced silk in India.
  - **Tasar Silk:** A wild silk produced from silkworms that feed on oak and other forest trees.
  - **Oak Tasar Silk:** A finer variety of Tasar, obtained from silkworms feeding specifically on oak leaves.
  - **Eri Silk:** Known for its thermal properties and often referred to as the “peace silk.”
  - **Muga Silk:** Exclusive to Assam, renowned for its natural golden sheen.
  - India’s diverse climatic conditions and rich biodiversity facilitate the production of these varied silk types.
- **Statement 2 is not correct:** While India is a significant player in the global silk industry, it ranks as the **second-largest**

producer of silk, following China. China dominates the global silk market, both in production and export.

- **Statement 3 is correct:** Eri silk is termed the “peace silk” because its production does not involve killing the silkworm; instead, the moth exits the cocoon naturally. This ethical process makes it the only vegan silk in the world. Assam is renowned for producing Eri silk, and it has been granted the Geographical Indication (GI) tag, recognizing its unique origin and quality.

**Additional Information:**

- **Major Silk-Producing States in India:** Karnataka leads in silk production, followed by Andhra Pradesh, West Bengal, Tamil Nadu, and Jammu & Kashmir.
- **Employment in Silk Industry:** The silk sector provides employment to approximately 7.9 million people in India, highlighting its significance in the rural economy.
- **Eri Silk’s Ethical Production:** Eri silk is harvested after the moth exits the cocoon naturally, aligning with ethical and sustainable practices.
- **Export Status:** India is a significant exporter of silk and silk products, but China remains the largest exporter globally. India is the second largest producer of silk in the world.

58. (b)

- **Option (b) is the correct answer:** A **finfluencer** is an individual who shares financial advice, tips, or personal finance content on social media platforms such as YouTube, Instagram, Twitter, and Facebook. These individuals often lack formal qualifications or registration with financial regulatory bodies like the Securities and Exchange Board of India (SEBI). Despite this, they can significantly influence their audience’s financial decisions.

59. (c)

- **Statement 1 is correct:** The **Fiscal Health Index (FHI) 2025** is an initiative

launched by **NITI Aayog** to evaluate and understand the fiscal health of Indian states. It assesses states based on five key parameters: Quality of Expenditure, Revenue Mobilization, Fiscal Prudence, Debt Index, and Debt Sustainability. The index aims to provide a comprehensive overview of state finances and assist policymakers in identifying areas requiring intervention.

- **Statement 2 is correct:** According to the **Fiscal Health Index 2025** report released by NITI Aayog, **Odisha** secured the highest overall index score of **67.8**, ranking number one among the 18 major Indian states evaluated. Odisha’s strong performance is attributed to its effective debt management, revenue mobilization, and fiscal prudence.

**Additional Information:**

- **Top Performing States:** Following Odisha, the top-performing states in the Fiscal Health Index 2025 are **Chhattisgarh, Goa, Jharkhand, and Gujarat**.
- **Purpose of the Index:** The index serves as a tool for benchmarking state fiscal performance, promoting transparency, and encouraging the adoption of best practices in fiscal management across states.

60. (a)

- **Statement 1 is correct:** **ANEEL** (Advanced Nuclear Energy for Enriched Life) is a **proprietary nuclear fuel** developed by **Clean Core Thorium Energy (CCTE)**. It combines **thorium** with **high-assay low-enriched uranium (HALEU)**.
  - This combination aims to enhance the performance and safety of nuclear reactors, particularly **Pressurized Heavy Water Reactors (PHWRs)** like **CANDU** reactors.
- **Statement 2 is correct:** ANEEL fuel offers **proliferation resistance** because its **spent fuel is less suitable for weaponization**.

- The thorium-uranium composition results in **spent fuel that is more challenging to repurpose for nuclear weapons**, thereby reducing proliferation risks.
- **Statement 3 is not correct:** ANEEL was **not developed by Nuclear Power Corporation of India Limited (NPCIL)**.
- It is a **U.S.-based innovation by Clean Core Thorium Energy**.
- While NPCIL has been involved in developing thorium-based reactors like the **Advanced Heavy Water Reactor (AHWR)**, ANEEL is a separate initiative.
- **Additional information:** Other advantages of ANEEL are:
  - **Better safety:** Thorium makes the fuel more stable and reduces the risk of meltdown in nuclear reactors.
  - **Less nuclear waste:** Produces less long-lived radioactive waste compared to traditional uranium fuel.
  - **Higher efficiency:** More efficient fuel utilization — reactors can extract more energy from the same amount of fuel.
- Sun's surface caused by **intense magnetic activity** that inhibits convection.
- These regions are about **1,500°C cooler** than the surrounding photosphere.
- **Pair 2 is not correctly matched:** This description actually fits **solar flares**, not solar wind.
  - **Solar wind** is a **continuous stream of charged particles** (mostly electrons and protons) emitted from the **Sun's corona** into space.
- **Pair 3 is not correctly matched:** **Solar flares** are **sudden, intense bursts of radiation**, not continuous flows.
  - They occur when magnetic energy built up in the solar atmosphere is suddenly released.
- **Additional information:**
  - **Solar cycle:** The solar cycle is a roughly 11-year cycle during which the Sun's magnetic activity increases and decreases. This cycle is tracked by counting sunspots (dark spots on the Sun's surface linked to magnetic activity). More solar spot implies more solar activity.
  - Solar maximum is the peak of the Sun's 11-year solar cycle, characterized by increased solar activity, including more frequent sunspots, solar flares, and coronal mass ejections.

61. (b)

- **Option (b) is the correct answer:** A quantum satellite is a term for a communications satellite that uses quantum physics to secure its signals. They enable ultra-secure communication based on quantum entanglement and quantum key distribution (QKD). Quantum entanglement allows two particles to be connected in such a way that changing one instantly affects the other, even across vast distances. Using this, quantum satellites can transmit encryption keys that are impossible to intercept or hack without detection.

62. (a)

- **Pair 1 is correctly matched:** **Sunspots** are temporary, cooler, darker areas on the

63. (c)

- **Statement 1 is correct:** In early 2024, researchers at Linköping University in Sweden successfully created Goldene, a free-standing, two-dimensional sheet of gold atoms. It is only one atom thick. This makes gold the first metal to be formulated into (freestanding) 2D sheets — opening up a host of exciting possibilities for the future. To create goldene, researchers first sandwiched an atomic monolayer of silicon between layers of titanium carbide. When they deposited gold on top of this sandwich structure, the gold atoms diffused into the material and replaced the silicon atoms,

forming a trapped monolayer of gold atoms.

- **Statement 2 is correct:** The unique properties of Goldene, stemming from its 2D structure and the behavior of gold atoms at this scale, suggest potential applications in various fields:
  - **Hydrogen Production:** Its high surface area and unique electronic properties could make it an efficient catalyst for electrochemical reactions, including hydrogen evolution.
  - **Water Purification:** The material's properties might be useful in filtration or catalytic degradation of pollutants in water. Research is ongoing to explore these possibilities.

64. (b)

- **Statement 1 is correct:** Nanozymes are engineered nanomaterials (typically nanoparticles) that exhibit enzyme-like catalytic activity. They can catalyze various biochemical reactions similar to natural enzymes.
- **Statement 2 is correct:** Natural enzymes are proteins and can be sensitive to factors like temperature, pH, and proteases, leading to denaturation and loss of activity. Nanozymes, being made of more robust materials like metal oxides, carbon nanotubes, or noble metals, often exhibit higher stability under harsh conditions.
- **Statement 3 is not correct:** They are not used in improving EV battery efficiency. Their major research and use areas are in biomedicine, environmental protection, and diagnostics, not EV batteries.
- **Statement 4 is correct:** The catalytic activity and unique properties of nanozymes make them highly suitable for applications in disease diagnostics and biosensors. They can be used to enhance signal generation in biosensing assays for detecting various analytes, including disease biomarkers. Their stability and cost-effectiveness compared to natural enzymes are advantages in these applications.

65. (c)

- **Pair 1 is correctly matched:** Perovskites are a family of materials that have shown potential for high performance and low production costs in solar cells. The name "perovskite" comes from their crystal structure. These materials are utilized in other energy technologies, such as fuel cells and catalysts.
- **Pair 2 is not correctly matched:** Vishvasya is a Blockchain Technology Stack launched by Ministry of Electronics and Information Technology (MeitY) to offer Blockchain-as-a-Service with a geographically distributed infrastructure designed to support various permissioned Blockchain based applications.
- **Pair 3 is correctly matched:** Qartemi is India's second CAR-T cell therapy approved in India (after NexCAR19). It is a "living drug" therapy. A "living drug" is a therapy which involves removing and modifying a patient's cells, then infusing them back into the patient. They are also known as cellular therapies.

66. (a)

- **Statement 1 is correct:** LiDAR (Light Detection and Ranging) is an active remote sensing technology that uses laser pulses to measure distances to the Earth's surface, generating precise three-dimensional information and maps.
- **Statement 2 is not correct:** One of the significant advantages of LiDAR, especially airborne LiDAR, is its ability to penetrate vegetation and forest canopies. The laser pulses can pass through gaps in the foliage and reflect off the ground surface, allowing for the creation of bare earth models and the measurement of vegetation height and structure. While extremely dense vegetation might limit full penetration, LiDAR is specifically used in forestry and land management for this capability.
- **Statement 3 is correct:** LiDAR is a crucial sensor technology for autonomous

vehicles. It provides accurate, real-time 3D mapping of the vehicle's surroundings, enabling the detection of other vehicles, pedestrians, obstacles, and road features, which is essential for safe navigation.

67. (b)

- **Statement 1 is correct:** The IVC script is characterized by numerous **pictorial signs** representing various objects, animals, and abstract forms. The estimated number of distinct **signs is around 400**.
- **Statement 2 is correct:** **Boustrophedon** is a writing style where **lines alternate in direction** (one line written from left to right, the next from right to left, and so on), resembling the way an ox plows a field. Evidence suggests that the IVC script was written in this style.
- **Statement 3 is not correct:** Alexander Cunningham was a pioneering archaeologist and the first Director-General of the Archaeological Survey of India. He made significant contributions to the study of the IVC, but the **script remains undeciphered to this day**. Numerous attempts have been made by various scholars, but no definitive decipherment has been universally accepted.
- **Statement 4 is correct:** The IVC script is predominantly found on seals and sealings, as well as on pottery (including rims of jars).

68. (b)

- **Statement 1 is correct:** Ashwini Kumar Dutt's organization, the Swadesh Bandhab Samiti, played a central role in mobilizing and leading the Muslim peasants of the Barisal region during the Swadeshi Movement. This highlights the Samiti's ability to transcend religious lines and unite diverse sections of the peasantry against the partition of Bengal and in support of Swadeshi ideals.
- **Statement 2 is not correct:** The declaration of *Swaraj* as the goal of the Indian National Congress occurred in the 1906 Calcutta session, presided over by

Dadabhai Naoroji, not in the 1905 Benaras session.

- **Statement 3 is correct:** Subramania Bharati's contributed significantly to nationalist literature in Tamil through his writings, including the collection of nationalistic songs 'Swadesa Geethangal'.

69. (a)

- **Option (a) is correct:** The given paragraph describe Guru Padmasambhava. The important information about him are as follows:
  - **Second Buddha:** This is a well-known epithet associated with Guru Padmasambhava, particularly in Tibetan Buddhism.
  - **8th Century Buddhist Mystic:** Padmasambhava lived in the 8th century CE and was a renowned Buddhist tantric master and mystic.
  - **Founding Father of Tibetan Buddhism:** He is widely revered as one of the key figures in the establishment of Buddhism in Tibet, alongside King Trisong Detsen and the scholar Shantarakshita.
  - **Dissemination Across the Himalayan Belt:** Padmasambhava's influence and the traditions he established spread throughout the Himalayan regions, including Bhutan, Nepal, and parts of India.
  - **Recent Conference at Nalanda:** The organization of an International Conference on his Life and Legacy by the International Buddhist Confederation at Nalanda, Bihar, further strengthens the identification with a significant historical Buddhist figure. While other figures are important in Buddhism, Padmasambhava's specific association with the "second Buddha" title and his pivotal role in Tibetan Buddhism make him the most fitting answer.
- **Option (b) is not correct:** Nagarjuna is a 2nd-century CE Indian Mahayana Buddhist philosopher, known for his

Madhyamaka school of thought. While highly influential, he is not typically referred to as the “second Buddha” nor is he primarily associated with the founding of Tibetan Buddhism in the 8th century.

- **Option (c) is not correct: Asvaghosha** is a 1st-2nd century CE Indian Buddhist philosopher and poet, known for his Buddhist epic poems like the *Buddhacharita*. He predates the 8th century and is not primarily linked with the establishment of Buddhism in Tibet.
- **Option (d) is not correct: Lokeshvara** is a Bodhisattva figure in Mahayana Buddhism, often associated with compassion (*Avalokitesvara*). While important, it's not a specific historical personality credited as a founder of Tibetan Buddhism in the 8th century and referred to as the ‘second Buddha’.

70. (d)

- **Pair 1 is correctly matched:** The Veerabhadra Temple (Lepakshi) in Andhra Pradesh is famous for its mysterious hanging pillars. One pillar in particular does not touch the ground fully, allowing objects to pass beneath it.
- **Pair 2 is correctly matched:** The Airavatesvara Temple in Tamil Nadu is well known for its musical steps.
- **Pair 3 is correctly matched:** The Vijay Vitthala Temple (Hampi) is renowned for its musical pillars, which produce distinct musical notes when tapped. Each pillar represents a different musical instrument.
- **Pair 4 is correctly matched:** The Rudreshwara Swamy Temple in Telangana is often called the “Temple of a Thousand Pillars” due to its intricately carved pillars, which are about a thousand in number.

71. (d)

- **Option (d) is correct:** Lord Basavanna was a prominent social reformer, poet, and philosopher during the 12th century in Karnataka, India. He is the central figure of the Lingayatism or Virashaivism movement.

- Kayakave Kailasa is a core tenet of Basavanna’s philosophy. It emphasizes the dignity of labor, stating that honest work itself is a path to spiritual realization (Kailasa, the abode of Lord Shiva). He advocated that all forms of work, regardless of social status, are sacred.
- Dasoha principle is also central to Basavanna’s teachings, stresses selfless service to the community and the sharing of one’s earnings. It involves providing food, shelter, and other necessities to those in need without any expectation of return. It’s an active manifestation of compassion and social responsibility.
- **Option (a) is not correct:** Sant Kabir (15th Century): A mystic poet and saint of the Bhakti movement, Kabir emphasized the unity of God and criticized religious dogmatism. His teachings promoted social equality.
- **Option (b) is not correct:** Sri Narayan Guru (19th-20th Century) is a social reformer from Kerala who championed equality and fought against caste discrimination. His famous saying was “One Caste, One Religion, One God for Mankind”.
- **Option (d) is not correct:** Adi Shankaracharya (8th Century) is a key figure in the Advaita Vedanta school of Hindu philosophy. His teachings focused on the nature of reality and the oneness of the individual soul with Brahman.

72. (a)

- **Statement 1 is correct:** In his book *Nuh Siphir*, Amir Khusrau extensively praised India and its various aspects, including its climate, languages, arts, music, and even animals. He presented arguments for India being superior to other lands and specifically highlighted the moderate and pleasant climate of India compared to his Central Asian homeland.
- **Statement 2 is correct:** It is believed that Amir Khusrau invented the Sitar by modifying the Tritantri Veena (making

it a “Sehtar,” meaning three-stringed in Persian, which evolved into the Sitar).

- **Statement 3 is not correct:** Amir Khusrau lived from 1253 to 1325 AD. He served under several rulers of the Delhi Sultanate, including the Mamluk, Khalji, and Tughlaq dynasties. Babur was the founder of the Mughal Empire and ruled from 1526 to 1530 AD. There is a significant chronological gap between the lifetime of Amir Khusrau and the reign of Babur. Therefore, He was not a contemporary of Mughal emperor Babur.

73. (d)

- **Pair 1 is correctly matched:** Major Rock Edict II mentions the South Indian kingdoms including the Cholas, Pandyas, Satyaputras, and Keralaputras.
- **Pair 2 is correctly matched:** Major Rock Edict XIII details Ashoka’s remorse and sorrow over the devastation caused by the Kalinga War. This edict is a key source for understanding Ashoka’s transformation and his adoption of Dhamma.
- **Pair 3 is correctly matched:** Major Rock Edict XII contains Ashoka’s strong appeal for tolerance and harmony among all religious sects. He emphasizes the importance of understanding and respecting the doctrines of others.

74. (c)

- **Statement 1 is correct:** The Provisional Government of Free India, under Subhash Chandra Bose, declared war on Britain and the United States. This declaration was made in October, 1943, shortly after the formation of the government in Singapore.
- **Statement 2 is correct:** The Provisional Government of Free India was recognized by several Axis powers and their allies. These included Japan, Germany, Italy, and their allies like Thailand, Burma, etc.
- **Statement 3 is correct:** Subhash Chandra Bose was the central figure and the Head of State (President) of the Provisional Government of Free India. He also held the positions of Prime Minister and

Minister for War and Foreign Affairs in this government.

75. (b)

- **Statement 1 is correct:** India has **reduced the emission intensity of its GDP by approximately 35% by 2020**, compared to 2005 levels. This shows India has progressively continued decoupling its economic growth from GHG emissions; and is aligned with India’s Nationally Determined Contributions (NDCs).
- **Statement 2 is correct: Methane (CH<sub>4</sub>)** was the **second largest contributor** to India’s GHG emissions, after **carbon dioxide (CO<sub>2</sub>)**, as per the BUR-4 data. **Details of gas-wise emissions is as follows:**
  - Carbon dioxide - 80%
  - Methane - 13%
  - Nitrous oxide - 5%
  - Others 1%.
- **Statement 3 is not correct:** The **Energy sector** contributed the **most to overall GHG emissions**, accounting for over **75%** of total emissions. It was followed by agriculture (13 %), **Industrial Processes and Product Use (8%)**, and Waste (2%).
- **Statement 4 is not correct:** As of **2024, non-fossil fuel sources** account for around **46% of India’s installed electricity generation capacity**. India’s updated NDCs to the UNFCCC have a **target of achieving about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy** resources by 2030.
- **Additional information:** Other achievements of India, as highlighted in its 4th Biennial Update Report include:
  - India’s forest and tree cover has consistently increased and currently stands at 25.17% of the total geographical area of the country.
  - During 2005 to 2021, an **additional carbon sink of 2.29 billion tonnes of CO<sub>2</sub> equivalent** has been created.



76. (c)

- **Option (c) is the correct answer:** The species described above refer to the plant of *Dicliptera polymorpha*. Its key features include:
  - **Fire-resilient dual blooming:** It has a normal blooming phase, and a **second blooming phase that is triggered by grassland fires**, a rare ecological trait among flowering plants.
  - **Limited habitat range:** It is found in a very restricted area of the **Western Ghats**, making it endemic and ecologically significant.
  - **Adaptation to local fire regimes:** Fires are often **set by locals to maintain grassland ecosystems**, and this plant has evolved to take advantage of post-fire conditions, showing a vigorous burst of flowers after fires.

77. (a)

- **Option (a) is the correct answer:** The **Vikramshila Gangetic Dolphin Sanctuary** is one of Asia's few protected areas for the endangered Gangetic dolphin. It is located in the **Bhagalpur** district of **Bihar**. It covers a **60-kilometer stretch of the Ganges River** from Sultanganj to Kahalgaon, and **hosts about half of India's Gangetic dolphin population**.

78. (a)

- **Statement 1 is correct:** The **Carbon Border Adjustment Mechanism (CBAM)** is a measure introduced by the **European Union (EU)** to place a **carbon price** on imports of certain goods from outside the EU. It aims to prevent **carbon leakage** by ensuring that imported goods are subject to the same carbon costs as goods produced within the EU. Thus, CBAM functions **like a carbon tariff**.
- **Statement 2 is correct:** CBAM applies **only to imports into the EU from non-EU countries**. It targets goods from countries **without equivalent carbon pricing mechanisms**, ensuring

that foreign producers do not gain an unfair advantage over EU producers. It specifically targets emissions embedded in goods **imported into the EU** to level the playing field with EU industries subject to carbon pricing.

- **Statement 3 is not correct:** CBAM does not apply only to iron & steel and electricity. It **currently covers six sectors: cement, iron and steel, aluminum, fertilizers, hydrogen, and electricity**.
- **Statement 4 is not correct:** Contrary to assumptions about climate equity, **CBAM does not provide exemptions for Least Developed Countries (LDCs)**. The **EU has explicitly stated that CBAM will apply uniformly**, including to LDCs, which has raised concerns among developing nations. The **principle of Common But Differentiated Responsibilities (CBDR)** is **not reflected** in the CBAM design.

79. (b)

- **Statement 1 is correct:** Sea Anemones are **invertebrate marine animals** from the phylum **Cnidaria**. They are **soft-bodied, predatory polyps** that **resemble flowers** because of their radial symmetry and tentacles surrounding a central mouth.
- **Statement 2 is not correct:** The association between **clownfish and sea anemones** is an example of **Commensalism**. The clown fish that lives among stinging tentacles of sea anemone. The **fish gets protection from predators which stay away from the stinging tentacles**, whereas the **anemone does not** appear to derive any **benefit** by hosting the clown fish.
- **Statement 3 is correct:** Just like corals, **sea anemones also undergo bleaching**. Bleaching occurs due to stressors like **temperature rise**, leading to a **loss of color and function**.
- **Additional information:** Sea Anemones are **sedentary marine animals** which

can be found in the tidal zone of **almost all oceans** till the depths of about 10,000 metres. Some anemones also live in brackish water.

80. (c)

- **About Triple Planetary Crisis:** According to the **The United Nations Framework Convention on Climate Change**, Triple Planetary Crisis refers to the **three main interlinked issues that humanity currently faces:** climate change, pollution and biodiversity loss.
- **1 is correct: Pollution** is one of the three key components of the **Triple Planetary Crisis**. It includes air, water, and soil pollution, which harm ecosystems and human health on a massive scale.
- **2 is not correct:** While ocean acidification is a serious environmental issue related to climate change, it is **not** specifically listed as one of the three constituents of the Triple Planetary Crisis. It is often considered a sub-effect of broader **climate change**.
- **3 is correct :** **Climate change** is a central pillar of the Triple Planetary Crisis, driving extreme weather, rising sea levels, and long-term shifts in temperature and weather patterns.
- **4 is not correct:** Overpopulation is a contributing factor to environmental degradation but is **not** one of the three recognized components of the Triple Planetary Crisis.
- **5 is correct: Biodiversity loss** is the third component of the crisis. The rapid decline in species due to habitat destruction, pollution, and climate change threatens ecosystems and the services they provide.

81. (b)

- **Statement 1 is not correct: Biofloc technology** is used in aquaculture, not in agriculture or crop production. It involves the **use of beneficial microbes to convert fish/shrimp waste into protein-rich feed** in water, thereby improving water quality and reducing the need for external feed inputs. The

**microbes**, as part of biofloc, **compete with infectious pathogens for resources**, limiting the latter's growth and proliferation.

- **Statement 2 is correct:** The **Fukuoka method**, developed by **Masanobu Fukuoka**, is a **natural farming** approach. It emphasizes upon **working with nature's processes to achieve healthy, productive ecosystems**. It involves techniques like **no-plowing, no-tilling, no herbicides or pesticides, and minimal weeding**, all while encouraging a self-sustaining, diverse, and resilient farming system. This technique has emerged to be a **sustainable and regenerative farming practice**.

82. (c)

- **About Coastal wetlands:** They include **mangroves, salt marshes, and seagrass meadows** etc. They are highly effective at long-term carbon storage.
- **Statement II is correct and correctly explains Statement I:** Coastal wetlands are **waterlogged** and often have **anaerobic (low-oxygen) soil conditions**. In the absence of oxygen, **organic material** like plant matter **decomposes slowly**. This reduced decomposition rate **prevents the full release of carbon dioxide, thus allowing carbon to accumulate in the soil**.
- Additionally, coastal wetlands are among the most **productive ecosystems**. Their **rapid growth leads to large amounts of carbon being captured through photosynthesis and stored as biomass**. This makes them important long-term carbon sinks and helps in **long-Term Carbon Sequestration**.
- **Statement III is not correct: Anaerobic conditions** prevalent in coastal wetlands **slow down the rate of decomposition** of organic matter compared to terrestrial ecosystems. The **terrestrial ecosystems have well-oxygenated soils**, in which **organic matter decomposes more quickly**, and less is stored in the soil.

83. (d)

- **Statement 1 is correct:** If the **Security Council recommends** the applicant State for membership, the General Assembly shall consider whether the applicant is a peace-loving State and is able and willing to carry out the obligations contained in the Charter and shall decide, by a two-thirds majority of the members present and voting, upon its application for membership.
- **Statement 2 is correct:** Under the United Nations Charter, the functions and powers of the Security Council are:
  - to maintain international peace and security in accordance with the principles and purposes of the United Nations.
  - to investigate any dispute or situation which might lead to international friction.
  - to recommend methods of adjusting such disputes or the terms of settlement.
  - to formulate plans for the establishment of a system to regulate armaments.
  - to determine the existence of a threat to the peace or act of aggression and to recommend what action should be taken.
  - to call on Members to apply economic sanctions and other measures not involving the use of force to prevent or stop aggression.
  - to take **military action against an aggressor.**
  - to recommend the admission of new Members.
  - to exercise the trusteeship functions of the United Nations in “strategic areas”.
  - to recommend to the General Assembly the appointment of the Secretary-General and, together with the Assembly, to elect the Judges of the International Court of Justice.
- **Statement 3 is correct:** The International Court of Justice is composed of 15 judges elected to nine-year terms of office by the United Nations General Assembly and the Security Council. These organs vote simultaneously but separately. In order to be elected, a candidate must receive an

**absolute majority of the votes in both bodies.**

84. (a)

- **Pair 1 is correctly matched:** The Amhara Region is one of the administrative regions of Ethiopia, located in the northern part of the country. It has been in the news due to conflicts between Ethiopian government forces and regional militias (e.g., Fano).
- **Pair 2 is not correctly matched:** Yatenga is not in Ukraine; it is a historical province in Burkina Faso, West Africa.
- **Pair 3 is not correctly matched:** Accra is the capital city of Ghana, not Sudan.
- Sudan’s capital is Khartoum, which has been in the news due to the ongoing civil war.

85. (d)

- **Statement 1 is correct:** The **new Lok Sabha chamber** features **peacock themed** designs carved on the walls and ceiling, enhanced by teal carpets that complement the overall theme. The **Rajya Sabha chamber** has a **lotus-themed** decor.
- **Statement 2 is correct:** The golden sceptre, **Sengol**, presented to Jawaharlal Nehru by Tamil Nadu priests on the eve of Independence, is **stationed in the new Lok Sabha** chamber near the Speaker’s podium.
- **Statement 3 is correct:** The **new Parliament building** houses a **Foucault pendulum**, showcasing the Earth’s rotation.

86. (b)

- **Option (b) is correct:** The Kafala system ties a migrant worker’s legal residency and employment status to a sponsoring employer (kafeel) in countries like Saudi Arabia, the United Arab Emirates, Bahrain, Kuwait, Oman, and Qatar. Under this system, the employer often has significant control over the worker’s ability to change jobs, leave the country, or even obtain legal status.

87. (d)

- **Option (d) is not correct:** Gulf of Aqaba opens into the Mediterranean Sea via the Strait of Gibraltar. This statement is not correct. The Gulf of Aqaba is located at the northern tip of the Red Sea. The Red Sea connects to the Mediterranean Sea via the Suez Canal, which is a man-made waterway. The Strait of Gibraltar connects the Atlantic Ocean to the Mediterranean Sea, and is geographically separate from the Gulf of Aqaba and the Red Sea.
- **Option (a) is correct:** The Gulf of Aden is situated between Yemen to its north and Somalia to its south. This statement is correct. Multiple sources confirm this geographical location.
- **Option (b) is correct:** The Persian Gulf lies east of Saudi Arabia and west of the Gulf of Oman. This statement is correct. The Persian Gulf is located between the Arabian Peninsula (including Saudi Arabia) to the west and southwest, and Iran to the east and northeast. The Strait of Hormuz connects the Persian Gulf to the Gulf of Oman to its east.
- **Option (c) is correct:** The Gulf of Mexico is bordered by the United States, Mexico, and Cuba. This statement is correct. These three countries form the coastline around the Gulf of Mexico.

88. (c)

- **Statement 1 is correct:** Mass movements transfer the mass of rock debris down the slopes under the direct influence of gravity. Mass movements are aided by gravity, and no geomorphic agent, like running water, glaciers, wind, waves or currents, participates in the process of mass movements. That means mass movements do not come under erosion, though there is a shift (aided by gravity) of materials from one place to another.
- **Statement 2 is not correct:** The erosion and transportation of earth materials is brought about by wind, running water, glaciers, waves and ground water. Of

these, the first three agents are controlled by climatic conditions. The work of the other two agents of erosion- waves and ground water is not controlled by climate. In the case of waves, it is the location along the interface of litho and hydro sphere — coastal region — that will determine the work of waves, whereas the work of ground water is determined more by the lithological character of the region. If the rocks are permeable and soluble and water is available only then karst topography develops.

- **Statement 3 is correct:** Deposition is a consequence of erosion. The erosional agents lose their velocity and, hence, energy on gentler slopes and the materials carried by them start to settle themselves. The same erosional agents, viz., running water, glaciers, wind, waves and groundwater, also act as aggradational or depositional agents.

89. (c)

- **About Rare Earth Elements (REEs):** Rare Earths are a group of 17 elements starting with lanthanum in the periodic table of elements and include scandium and yttrium.
- **Statement 1 is not correct:** With the exception of the highly unstable promethium, rare-earth elements are found in relatively high concentrations in the Earth's crust, with cerium being the 25th most abundant element in the Earth's crust at 68 parts per million. They are moderately abundant in Earth's crust but not concentrated enough to make them economically exploitable.
- **Statement 2 is correct:** The Government has released a list of 30 critical minerals for India. These minerals are Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE, Phosphorous, Potash, REE, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium and

Cadmium. Thus, not all 17 REEs are included in the list of critical minerals in India.

- **Statement 3 is correct:** The principal sources of REE are bastnaesite (a fluorocarbonate which occurs in carbonatites and related igneous rocks), xenotime (yttrium phosphate), commonly found in mineral sand deposits, loparite, which occurs in alkaline igneous rocks and monazite (a phosphate). The rare earths occur in many other minerals and are recoverable as by-products from phosphate rock and from spent uranium leaching. In India, monazite is the principal source of rare earths and thorium. Monazite is a complex phosphate of thorium and Rare-earth minerals [(Ce, La, Nd, Th, Y) PO<sub>4</sub> ], and this is radioactive in nature.

90. (a)

- **Statement I is correct:** Magma is mainly of three types - Granitic or Rhyolitic magma, Andesitic magma and Basaltic magma. The order of **viscosity** of these magmas is: **Granitic or Rhyolitic > Andesitic > Basaltic**. Accordingly, the granitic magma is more likely to cause an explosive eruption as compared to basaltic magma.
- **Statement II is correct:** The chemical composition of the three types of magmas is as follows:
  - o **Basaltic magma** -- SiO<sub>2</sub> 45-55 wt%, high in Fe, Mg, Ca, low in K, Na
  - o **Andesitic magma** -- SiO<sub>2</sub> 55-65 wt%, intermediate. in Fe, Mg, Ca, Na, K
  - o **Rhyolitic (Granitic) magma** -- SiO<sub>2</sub> 65-75%, low in Fe, Mg, Ca, high in K, Na

Thus, Granitic magma has more silica content, which makes it more viscous as compared to Basaltic magma.

- **Statement III is correct:** Granitic magmas usually have higher gas contents than basaltic magmas.
- **Both Statement II and Statement III explain Statement I:** Gas gives

magmas their explosive character because the volume of gas expands as pressure is reduced. At depth in the Earth, high pressure keeps the gas in solution in the liquid magma. But, as magma comes up on the surface, the pressure is reduced and the gas comes out of the solution and forms a separate gas phase.

- o If the liquid part of the magma has a low viscosity, then the gas can expand relatively easily. When the magma reaches the Earth's surface, the gas bubble will simply burst, the gas will easily expand to atmospheric pressure, and a non-explosive eruption will occur, usually as a lava flow. If the liquid part of the magma has a high viscosity, then the gas will not be able to expand very easily, and thus, pressure will build up inside of the gas bubble(s). When this magma reaches the surface, the gas bubbles will have a high pressure inside, which will cause them to burst explosively on reaching atmospheric pressure. This will cause an explosive volcanic eruption.

91. (c)

- **Statement 1 is not correct:** In summer, when the sun is overhead at the Tropic of Cancer, the belt of influence of the Westerlies is shifted little polewards. Rain-bearing winds are, therefore, not likely to reach the Mediterranean lands. The prevailing wind in the region at this time is Trade Winds, which blow off-shore. Thus, there is no rain in summer.
- **Statement 2 is correct:** Mediterranean lands receive most of their precipitation in winter when the Westerlies shift equatorwards. In the northern hemisphere, the prevailing on-shore Westerlies bring much cyclonic rain from the Atlantic to the countries bordering the Mediterranean Sea. Thus, rainfall occurs during the winter months.
- **Statement 3 is correct:** The relief of Mediterranean lands also play an important role in its climatic pattern. The

Mediterranean regions are often backed by mountains of some kind. These mountains present an effective barrier to the on-coming Westerlies.

92. (a)

- **Pair 1 is correctly matched:** Tirupati city is located in southeastern Andhra Pradesh. It lies in the Palkonda Hills, about 8 miles (13 km) northeast of Chandragiri and 67 miles (108 km) northwest of Chennai in Tamil Nadu state. Tirupati is known as the abode of the Hindu god Venkateshvara, Lord of Seven Hills.
- **Pair 2 is not correctly matched:** Sabarimala is located in Kerala. It is the ‘Sacred Abode of Lord Ayyappa’ and one of the most important Hindu pilgrimage centres in the country. The holy shrine is located amidst dense forests in the rugged terrains of the Western Ghats. The Pachamalai Hills are a part of the Eastern Ghats and are located in Tamil Nadu.
- **Pair 3 is not correctly matched:** Shravanabelagola is situated about 150 km northwest of Bangalore, the capital of Karnataka. The town has been a prominent centre for Jain art, architecture, religion and culture for over two millennia. Anaimalai Hills is a mountain range in the Western Ghats, Tamil Nadu.

93. (d)

- **Statement 1 is correct:** The Indus (Sindhu), is the westernmost of the Himalayan rivers in India. It originates from a glacier near Bokhar Chu in the Tibetan region in the Kailash Mountain range. In Tibet, it is known as ‘*Singi Khamban*’; or Lion’s mouth.
- **Statement 2 is correct:** After flowing in the northwest direction between the Ladakh and Zaskar ranges, it passes through Ladakh and Baltistan. It cuts across the Ladakh range.
- **Statement 3 is correct:** The Chenab is the largest tributary of the Indus. It is formed by two streams, the Chandra and the

Bhaga, which join at Tandi near Keylong in Himachal Pradesh.

**Statement 4 is not correct:** While Zaskar is a left-bank tributary of the Indus, Shyok is its right-bank tributary.

94. (d)

**Option (d) is the correct answer:** Kallakkadal (a Malayalam term meaning “freak sea”) refers to **sudden and unexplained flooding** along the southwest coast of India, especially **during the pre-monsoon season**.

These events are **not linked to local weather systems** but are **caused by swell waves that originate from distant storms** in the **southern Indian Ocean**, traveling thousands of kilometers. Since they arrive without significant changes in local wind or pressure, they are **often mistaken for tsunamis**, especially by coastal communities.

95. (a)

**Statement 1 is correct:** The oceans in the northern hemisphere record relatively higher temperatures than those in the southern hemisphere. The average annual temperatures for the northern and southern hemispheres are around 19 °c and 16°c, respectively.

**Statement 2 is correct:** The highest temperature is not recorded at the equator but slightly towards the north of it.

**Statement 3 is correct and provides the correct explanation for both Statement 1 and Statement 2:** Unequal distribution of land and water is an important factor that affects the distribution of the temperature of ocean waters. The northern hemisphere has a larger landmass compared to the southern hemisphere. The oceans in the northern hemisphere receive more heat due to their contact with a larger extent of land than the oceans in the southern hemisphere. As a result, the oceans in the northern hemisphere record relatively

higher temperatures as compared to those in the southern hemisphere. This is also the reason that the peak of oceanic temperatures is recorded not at the equator but slightly north of it.

96. (a)

- Under Section 2(47A) of the Income Tax Act, 1961, introduced by the Finance Act 2022, **Virtual Digital Assets (VDAs)** are defined as:
- “Any information, code, number, or token (not being Indian currency or foreign currency), generated through cryptographic means or otherwise, providing a digital representation of value exchanged with or without consideration, with the promise or representation of having inherent value, or functions as a store of value or a unit of account, including its use in any financial transaction or investment, and which can be transferred, stored, or traded electronically.”
- **1 is not correct: The Digital Rupee** (Central Bank Digital Currency or CBDC) is explicitly **excluded** from the definition of VDA under the Indian tax laws. It is considered a digital form of the official Indian currency.
- **2 is correct: The Non-Fungible Tokens (NFTs)** are **included** within the definition of Virtual Digital Assets under Indian law. They are unique cryptographic tokens representing ownership of digital or physical assets.
- **3 is not correct: Gift cards** or vouchers that can be used to obtain goods, services, or discounts are specifically **excluded** from the definition of VDA.
- **4 is correct: Cryptocurrencies** are explicitly **included** within the definition of Virtual Digital Assets.
- **5 is not correct: Reward points credited by e-commerce platforms:** Reward points or loyalty cards that can only be used to obtain goods, services, or discounts on the respective platforms are **excluded** from the definition of VDA.

97. (d)

- **Statement 1 is correct:** When RBI intervenes in the forex market (e.g., buying foreign currency to prevent rupee appreciation), it increases rupee liquidity in the system.
  - To neutralize this effect and prevent inflationary pressure, RBI conducts **sterilization operations** by absorbing excess liquidity.
- **Statement 2 is correct:** Though sterilization primarily involves **liquidity absorption**, in certain situations (e.g., when the rupee is depreciating), RBI might sell foreign exchange and may need to **inject liquidity** to support growth.
  - Tools like **repo, reverse repo, and OMO (Open Market Operations)** can be used flexibly to either absorb or inject liquidity.
- **Statement 3 is correct:** OMOs, involving the sale or purchase of government securities, are the **most common tools** used by RBI for sterilization.
  - **Selling securities** absorbs excess liquidity.
  - **Buying securities** injects liquidity when needed.

98. (a)

- **Statement 1 is correct:** PCA norm is a supervisory tool and is imposed when a bank breaches certain regulatory thresholds on capital to risk weighted assets ratio (CRAR), net NPAs and return on assets (RoA).
- **Statement 2 is correct:** The PCA framework provides various mandatory and discretionary actions that the RBI can take. These actions can include restrictions on lending activities, branch expansion, dividend distribution, and, in more severe cases, may also involve recommending or requiring changes in the bank’s management.
- **Statement 3 is not correct:** While the PCA framework aims for the bank to take corrective actions to improve its financial

health and eventually exit the framework, it does **not** prohibit merger or restructuring while the bank is under PCA. In fact, the RBI may even advise or push for merger or amalgamation as a resolution strategy for a bank under PCA, especially if other corrective measures are not yielding the desired results.

• **Additional information:**

- If a bank is put under PCA framework, RBI can take following actions:
  - The RBI can impose restrictions on expanding branches, paying dividends, and setting limits on the compensation and fees of the bank’s management and directors.
  - In severe situations, the central bank may prohibit lending altogether or impose limits on lending to certain sectors or specific entities.
  - It can also raise the provisioning requirements that banks must maintain.
  - Additionally, the RBI has the authority to introduce new management or a new Board, appoint consultants for business or organizational restructuring, implement changes in ownership, initiate the merger of the bank, and even supersede the existing bank board.
- PCA framework is also applicable for NBFCs.
- Recently, RBI revealed the PCA framework for Co-operative banks. Under the PCA framework, co-operative banks with more than 6-12% net NPA ratio can be placed under restriction. UCBs which have been posting net losses for two consecutive years can also be placed under the framework.

99. (d)

- **Statement-I is not correct:** According to Article 244, the provisions of the Sixth

Schedule shall apply to the administration of the tribal areas in the States of Assam Meghalaya, Tripura and Mizoram. So, the application of the Sixth Schedule to tribal areas of any State other than Assam, Meghalaya, Tripura and Mizoram requires an amendment of Article 244, which in turn, requires a Constitutional amendment under Article 368.

- **Statement-II is correct:** Sixth schedule states that Parliament may from time to time by law amend by way of addition, variation or repeal any of the provisions of the sixth Schedule. And no such law shall be deemed to be an amendment of this Constitution for the purposes of article 368.

100.(c)

- **Statement 1 is correct:** Under Article 358, the rights guaranteed under Article 19 are automatically suspended only when a National Emergency is declared on the grounds of war or external aggression. However, if the Emergency is proclaimed on the ground of armed rebellion, Article 19 remains operative, and the right to freedom of speech and expression continues to be available to the citizens.
- **Statement 2 is correct:** The right to move freely (Article 19(1)(d)) is part of Article 19, which—as explained above—gets suspended automatically during an emergency on the grounds of war and external aggression. So, this right would not be available during an emergency proclaimed on the ground of war.

**Statement 3 is correct:** Under Article 359, the President can suspend the right to move any court to enforce Fundamental Rights except Articles 20 and 21 in case of National emergency on any grounds. Therefore, Rights against Exploitation (Articles 23 and 24) can have their enforcement suspended under Article 359 if the President specifically orders it.

