

Solutions

DATE : (3rd Nov- 9th Nov)

1) Answer (d) Ten proposers

Explanation

1. Legal Basis

- The **Representation of the People Act, 1951 (RPA, 1951)** is the key legislation governing election procedures in India.
- **Section 33** of the Act specifies the **nomination process**, including proposer requirements for candidates.

2. Key Provision

- **Independent candidates:** Must have **ten proposers** from the constituency in which they contest.
- **Recognized party candidates:** Require **only one proposer**.

3. Rationale

- Ensures **credibility** of nominations.
- Prevents **frivolous and non-serious candidatures**.
- Promotes **inclusive yet responsible participation** in democracy.

4. Contemporary Significance

- The rule remains vital in ensuring **electoral integrity**, especially amid rising independent candidatures.
- The **Election Commission of India (ECI)** continues to emphasize scrutiny of nomination papers to avoid misuse.

2) Answer (c) Ministry of Chemicals and Fertilizers

Explanation

1. Scheme Overview

- The **Promotion of Research and Innovation in Pharma & MedTech (PRIP) Scheme** aims to strengthen India's **pharmaceutical and medical technology innovation ecosystem**.

2. Nodal Agency

- Implemented by the **Department of Pharmaceuticals (DoP)** under the **Ministry of Chemicals and Fertilizers**.

3. Key Features

Institutes of Pharmaceutical Education and Research (NIPERs).

- Financial outlay of around **₹5,000 crore**.
- Focus on **R&D incentives**, innovation infrastructure, and global competitiveness.

4. Significance

- Aligns with the **Atmanirbhar Bharat** vision by enhancing domestic production and innovation.
- Strengthens India's role as a **global pharma hub**.

3) Answer (a) I only

Explanation

1. Relevant Legal Provisions

- **Section 33A** – Requires candidates to **disclose criminal antecedents**, assets, liabilities, and educational qualifications.
- **Section 34** – Mandates a **security deposit**, which is **forfeited** if the candidate fails to secure **1/6th of valid votes**.

2. Objective

- Promotes **transparency** and **accountability** in electoral candidatures.
- Deters **non-serious candidates** through financial and disclosure obligations.

3. Statement Analysis

- **Statement I:** Correct — Section 34 indeed provides for forfeiture of the deposit below 1/6th votes.
- **Statement II:** Incorrect — Section 33A (not 33B) governs disclosure of information.

4. Broader Impact

- These measures strengthen **voter awareness**, **ethical politics**, and **electoral reform efforts**.

4) Answer (b) II and III only

Explanation

1. Geographical Context

- **Denmark** lies between the **North Sea (west)** and the **Baltic Sea (east)**.
- The **Gulf Stream** moderates its climate, giving it **mild winters and cool summers**.

2. Territorial Extent

- Denmark comprises the **mainland Jutland Peninsula** and **islands** such as Zealand and Funen.
- It also includes **Greenland** and the **Faroe Islands** as **self-governing territories**.

3. Statement Analysis

- Statement I:** ❌ Incorrect — The seas are reversed in the statement.
- Statement II:** ✅ Correct — Climate influenced by the **Gulf Stream**.
- Statement III:** ✅ Correct — Includes **Greenland and Faroe Islands**.

4. Strategic Importance

- Denmark's maritime geography contributes to **NATO operations, Arctic policies, and renewable energy leadership**.

5) Answer ✅ (a) I and II only

Explanation

1. Biological Overview

- Rhesus Macaque (Macaca mulatta)** – A **highly adaptable primate** native to **South, Central, and Southeast Asia**.

2. Distribution and Ecology

- Found widely in **India, Nepal, China, Bangladesh, and Pakistan**.
- Occupies **forests, grasslands, urban areas**, showing **behavioral flexibility**.

3. Biological Significance

- Shares **93% genetic similarity** with humans.
- Used extensively in **biomedical and neurological research**.
- Plays a key role in **ecosystem balance and scientific studies**.

4. Statement Analysis

- Statement I:** ✅ Correct — Native to mainland Asia, widely distributed.
- Statement II:** ✅ Correct — Omnivorous and genetically similar to humans.
- Statement III:** ❌ Incorrect — Both **arboreal and terrestrial**, not purely one type.

5. Policy and Conservation Relevance

- Included in **Schedule II** of the **Wildlife Protection Act, 1972 (India)**.
- Conflict management measures are vital in **urbanizing regions**.

6) Answer ✅ (c) I and II only

Explanation

1. Concept Overview

- The **Tropical Forests Forever Facility (TFFF)** is a **Brazil-led initiative** launched during **COP-30 in Belem**, aimed at incentivizing **tropical forest conservation** through long-term financial mechanisms.

2. Objective and Framework

- Seeks to make **forest preservation economically rewarding** for nations with large tropical forest cover.
- Promotes **low-deforestation economic models** aligned with **climate and biodiversity goals**.

3. Funding Mechanism

- Targets **\$125 billion** in total capital:
 - Public funding:** 20–25%
 - Private investments:** 70–80%
- Annual payments** are made to countries maintaining **deforestation below 0.5%** annually.

4. Broader Impact

- Encourages **sustainable forest management, carbon sequestration, and livelihood protection**.
- Serves as a **replicable global model** for financing ecosystem preservation.

5. Statement Analysis

- Statement I:** ✅ Correct — Pays countries maintaining standing forests.
- Statement II:** ✅ Correct — Initiative launched by **Brazil at COP-30 in Belem**.
- Statement III:** ❌ Incorrect — The eligibility criterion is **below 0.5% deforestation**, not above 1%.

7) Answer ✅ (a) I, II and III

Explanation

1. Concept Overview

- Volcanic lightning** refers to **electrical discharges generated within volcanic plumes**, distinct from thunderstorm lightning.
- Occurs when **ash and ice particles collide**, generating **static electricity** during eruptions.

2. Scientific Mechanism

- The **collision and friction** of ash, rock, and ice particles produce **electrical charges**.
- Positive and negative charges separate vertically, resulting in **lightning discharges**.
- Lightning can occur **even in the absence of thunderstorms**.

3. Applications

- Acts as a **natural indicator** of volcanic eruptions.
- Used by **volcanologists** to **monitor eruption activity in real time** via lightning detection systems.

4. Statement Analysis

- **Statement I:** ✓ Correct — Caused by particle collision and friction.
- **Statement II:** ✓ Correct — Charge differentiation due to ash near surface and ice at higher altitudes.
- **Statement III:** ✓ Correct — Functions as a natural early warning system for eruptions.

8) Answer ✓ (b) I, II, III and IV

Explanation

1. Concept Overview

- The **BRAIN Initiative Cell Atlas Network (BICAN)** is an international collaboration under the U.S. National Institutes of Health (NIH).
- Aims to create **comprehensive, open-access atlases** mapping the human brain's cellular development and diversity.

2. Objectives

- Chart **brain cell origin, diversity, and maturation** from embryonic to adult stages.
- Facilitate research into **neurological and psychiatric disorders**, including autism and schizophrenia.

3. Implementation Mechanism

- Involves **neuroscientists, engineers, and computational biologists** worldwide.
- Generates **publicly available atlases** under an open science framework.

4. Global Significance

- Advances **precision neuroscience**, enabling diagnostic and therapeutic innovations.
- Strengthens international cooperation in **brain mapping and AI-assisted neurobiology**.

5. Statement Analysis

- **I:** ✓ Correct — Maps brain development across life stages.
- **II:** ✓ Correct — Findings relevant for autism and schizophrenia research.
- **III:** ✓ Correct — Collaboration under NIH's **BRAIN Initiative**.
- **IV:** ✓ Correct — Promotes **open-access brain atlas** development.

9) Answer ✓ (b) III only

Explanation

1. Policy Context

- **Stray dog management** in India operates under a constitutional and regulatory framework balancing public health and animal welfare.

- Governed primarily by **Article 243(W)** and the **Animal Birth Control (ABC) Rules, 2023**.

2. Legal and Administrative Framework

- **Article 243(W):** Assigns **urban local bodies (municipalities)** the duty to manage stray dog populations.
- **ABC Rules, 2023:** Mandate **Capture–Sterilize–Vaccinate–Release (CSV)** instead of permanent removal or killing.

3. Public Health Relevance

- India records over **1.5 crore stray dogs**.
- Dog bites are responsible for nearly **96% of rabies deaths** in the country, as per WHO estimates.

4. Statement Analysis

- **Statement I:** ✗ Incorrect — Dogs are **released** after sterilization, not relocated permanently.
- **Statement II:** ✗ Incorrect — 96% of **rabies deaths**, not just morbidity.
- **Statement III:** ✓ Correct — **Article 243(W)** makes municipalities responsible for stray management.

10) Answer ✓ (b) I, II and III

Explanation

1. Concept Overview

- **Deep technologies in agriculture** integrate AI, machine learning, computer vision, drones, and biotechnology to modernize farming.
- Address challenges of **climate change, low productivity, and rural labor decline**.

2. Key Technological Dimensions

- **Generative AI and CRISPR:** Used for **crop genome improvement**, pest resistance, and yield enhancement.
- **Computer Vision (by Intello Labs):** Enables **grading, sorting, and quality analysis** of produce.
- **Remote Sensing and Drones (PMFBY):** Facilitate **crop insurance, damage assessment, and risk management**.

3. Policy Framework

- Supported by **Pradhan Mantri Fasal Bima Yojana (PMFBY)** and **World Economic Forum's AI for Agriculture Innovation (AI4AI)** initiatives.
- Encourages **public-private partnerships** for scaling innovation.

4. Statement Analysis

- **Statement I:** ✓ Correct — AI and CRISPR are key in agricultural deep tech.
- **Statement II:** ✓ Correct — Intello Labs uses computer vision for produce analysis.

- **Statement III:** Correct — PMFBY employs remote sensing and drones for insurance.

5. Broader Relevance

- Enhances **sustainability, efficiency, and food security**.
- Positions India for **tech-driven agricultural modernization**.

- 11) Answer** (a) The right to be informed of the grounds of arrest for all offences

Explanation

1. Constitutional Foundation

- **Article 22(1)** of the **Constitution of India** guarantees fundamental **procedural safeguards** to any person arrested for an offence.
- These include:
 - The **right to be informed** of the **grounds of arrest**.
 - The **right to consult and be defended** by a **legal practitioner** of one's choice.

2. Judicial Interpretation

- The **Supreme Court (2024)** reaffirmed that this **right applies universally** — across **all categories of offences**, including those under **special laws** (e.g., PMLA, UAPA).
- The Court held that:
 - Grounds of arrest must be **communicated in writing**.
 - The accused must **understand** the grounds — hence, communication must be in a **language comprehensible** to them.

3. Relationship with Article 21

- Reinforces **Article 21**, which protects **life and personal liberty**, ensuring arrests are not arbitrary or unjustified.
- Prevents misuse of power and promotes **transparency and fairness** in criminal justice administration.

4. Significance

- Strengthens **rule of law** and procedural accountability.
- Ensures **uniform protection** irrespective of the nature of the offence.

5. Option Analysis

- **(a) Correct:** Right to be informed applies to all offences under Article 22(1).
- **(b) Incorrect:** Speedy trial is under Article 21, not 22(1).
- **(c) Incorrect:** The right is explicitly stated under Article 22(1).
- **(d) Incorrect:** Compensation is not covered under Article 22(1).

- 12) Answer** (b) Ministry of Skill Development and Entrepreneurship

Explanation

1. Scheme Overview

- **Pradhan Mantri Kaushal Vikas Yojana (PMKVY)** is India's **flagship skill development initiative**, launched in **2015** under the **Skill India Mission**.
- Objective: To **train, certify, and enhance employability** among Indian youth.

2. Implementing Agency

- Administered by the **Ministry of Skill Development and Entrepreneurship (MSDE)**.
- Implemented through the **National Skill Development Corporation (NSDC)**.

3. Key Components

- **Short-Term Training (STT)** and **Recognition of Prior Learning (RPL)**.
- Focus on **Aspirational Districts, rural-urban skill parity, and industry-linked modules**.
- Encourages **Digital and Green Skill Development** in its latest phase (PMKVY 4.0).

4. Policy Relevance

- Addresses India's **demographic dividend** by skilling youth for emerging sectors like **AI, robotics, and green energy**.

5. Option Analysis

- **(a) Rural Development** handles other livelihood schemes, not PMKVY.
- **(b) Implemented by MSDE.**
- **(c) Ministry of Education** covers formal education, not skill certification.
- **(d) Labour and Employment** manages regulation and welfare, not skills training.

- 13) Answer** (c) I and III only

Explanation

1. Ecological Context

- Vultures are **scavenging raptors** vital for ecosystem health through **carcass disposal and disease control**.
- India's vulture population declined by over **95% since the 1990s**, mainly due to **diclofenac poisoning**.

2. Conservation Status

- Several species — **White-rumped, Slender-billed, and Indian Vulture** — are listed as **Critically Endangered** (IUCN).
- However, **not all** Indian vultures share the same threat status.

3. Conservation Framework

- **Action Plan for Vulture Conservation (2020–25)** implemented by **MoEFCC**.
- Banned use of **diclofenac** and other **NSAIDs** **harmful** to vultures.
- Establishment of **Vulture Breeding Centres** and **safe feeding zones**.

4. Statement Analysis

- **Statement I:** Correct — Red-headed Vultures inhabit dense forests and have fragmented populations.
- **Statement II:** Incorrect — Not all species are Critically Endangered.
- **Statement III:** Correct — Ban on diclofenac is a core conservation measure.

14) Answer (a) I, II and III only

Explanation

1. Geographical Overview

- **Peru** lies on the **western coast of South America**, facing the **Pacific Ocean**.
- A nation known for its **Andean mountain system**, **Amazon Basin**, and **cultural heritage (Inca civilization)**.

2. Political Geography

- **Capital:** Lima.
- **Borders:** Ecuador and Colombia (north), Brazil (east), Bolivia (southeast), Chile (south), and **Pacific Ocean (west)**.

3. Major Physical Features

- **Mount Huascarán:** Highest peak (~6,768 meters).
- **Lake Titicaca:** Shared with Bolivia, world's highest navigable lake.

4. Statement Analysis

- **Statement I:** Correct — Lima is the capital.
- **Statement II:** Correct — Borders Chile to the south.
- **Statement III:** Correct — Mount Huascarán is highest point.
- **Statement IV:** Incorrect — Borders **Pacific Ocean to the west**, not otherwise.

15) Answer (c) Both I and II

Explanation

1. Legislative Context

- The **Arbitration and Conciliation Act, 1996** was enacted to modernize India's **alternative dispute resolution (ADR)** framework.
- Inspired by the **UNCITRAL Model Law (1985)** and **UNCITRAL Arbitration Rules (1976)** to align with **international standards**.

2. Objectives

- Streamline **domestic and international arbitration**.
- Facilitate **recognition and enforcement of foreign arbitral awards**.
- Promote **speed, efficiency, and minimal judicial intervention** in dispute resolution.

3. Judicial Interpretation

- The **Supreme Court** has clarified:
 - Arbitral awards can only be set aside on **limited grounds** such as **fraud, corruption, or procedural irregularity**.
 - **Delay or minor procedural defects** do not invalidate an award.

4. Global Significance

- Enhances **ease of doing business** by ensuring **legal certainty**.
- Strengthens India's image as an **arbitration-friendly jurisdiction**.

5. Statement Analysis

- **Statement I:** Correct — Derived from **UNCITRAL Model Law (1985)**.
- **Statement II:** Correct — Consolidates laws on arbitration and enforcement of foreign awards.

16) Answer (b) I and II only

Explanation

1. Concept Overview

- **GPS spoofing** is a **cyberattack** where **fake GPS signals** are transmitted to **deceive navigation systems**, leading to **incorrect positioning or timing data**.
- Unlike **GPS jamming** (which blocks signals), spoofing **overrides legitimate signals** with false data.

2. Mechanism of Spoofing

- Attackers generate **false satellite signals** stronger than genuine ones.
- Receivers interpret these false signals as authentic, leading to **erroneous location or timing readings**.

3. Affected Sectors

- **Aviation:** Misguides aircraft navigation systems.
- **Shipping and logistics:** Alters vessel routes and cargo tracking.
- **Telecom and energy:** Disrupts time synchronization in networks and grids.
- **Defense:** Compromises situational awareness and missile guidance.

4. Statement Analysis

- **Statement I:** Correct — GPS spoofing affects multiple critical sectors beyond aviation.

- **Statement II:** Correct — Works by transmitting **false navigation signals**.
- **Statement III:** Incorrect — Does not physically block signals; it **overpowers** them with fabricated data.

5. Broader Impact

- Threatens **national security, transport safety, and digital infrastructure**.
- Highlights the need for **cyber resilience frameworks** under India's **National Cyber Security Policy**.

17) Answer (d) II and III only

Explanation

1. Legal Context

- The **Insolvency and Bankruptcy Code (IBC), 2016** and the **Prevention of Money Laundering Act (PMLA), 2002** occasionally overlap regarding **asset attachment**.
- Both laws contain **non-obstante clauses** granting them overriding powers, leading to **jurisdictional conflicts**.

2. Core Issue

- Assets of a company under insolvency may also be attached by the **Enforcement Directorate (ED)** under PMLA, complicating resolution.
- Recent legal interpretation balances **insolvency resolution** and **anti-money laundering objectives**.

3. Institutional Role

- **Special PMLA Courts** now have explicit authority to **unfreeze attached assets** upon application by **Insolvency Professionals (IPs)**, not NCLTs.

4. Statement Analysis

- **Statement I:** Incorrect — Authority lies with **Special PMLA Courts**, not NCLT.
- **Statement II:** Correct — **PMLA Courts** can unfreeze attached assets.
- **Statement III:** Correct — Both **IBC and PMLA** have **non-obstante clauses**, creating overlapping jurisdiction.

5. Contemporary Significance

- Strengthens **creditor confidence**, ensures **asset utility**, and supports India's **financial stability framework**.

18) Answer (c) I, II and III

Explanation

1. Context of the Abraham Accords

- Signed in **2020**, the **Abraham Accords** marked a diplomatic breakthrough between **Israel and Arab nations** such as the **UAE, Bahrain, and Morocco**.
- Brokered by the **United States**, the Accords sought to **normalize diplomatic, economic, and security ties**.

2. Objectives and Significance

- Aim to **establish peace and cooperation** in the Middle East.
- Named after **Abraham**, regarded as a **common patriarch** in Judaism, Christianity, and Islam — symbolizing unity.

3. Strategic Dimensions

- Encourages **trade and investment, counterterrorism cooperation, and technological partnerships**.
- Realigns Middle Eastern geopolitics, potentially isolating extremist forces and Iran's influence.

4. Statement Analysis

- **Statement I:** Correct — Seeks normalization in various fields.
- **Statement II:** Correct — Signed in 2020 by Israel and multiple Arab states.
- **Statement III:** Correct — Symbolically named after Abraham, representing shared ancestry.

5. Broader Relevance

- Reinforces India's balanced diplomacy in West Asia under its **"Link West Policy"** and economic partnerships (e.g., **I2U2 grouping**).

19) Answer (b) Both Statement-I and Statement-II are correct, but Statement-II does not explain Statement-I

Explanation

1. Concept Overview

- **Universal Basic Income (UBI)** proposes **unconditional, periodic cash transfers** to all citizens, aiming to ensure **minimum economic security**.
- It is **universal** (for everyone) and **unconditional** (no eligibility restrictions).

2. Policy Context

- Discussed in India's **Economic Survey (2016–17)** as a potential **social safety net**.
- Global pilots conducted in **Finland, Canada, and Kenya** demonstrated improved well-being and reduced poverty stress.

3. Socioeconomic Relevance

- Addresses challenges of:
 - **Automation-induced job loss**
 - **Rural distress**

- **Inequality and exclusion errors** in welfare delivery.

4. Statement Analysis

- **Statement I:** Correct — UBI assures a **minimum income**, reducing anxiety about poverty.
- **Statement II:** Correct — Universality ensures **no exclusion errors**, but it **does not explain** psychological assurance in Statement I.

5. Challenges

- **Fiscal burden** on government finances.
- Potential reduction in **work incentives** if not designed properly.

20) Answer (b) Both Statement-I and Statement-II are correct, but Statement-II does not explain Statement-I

Explanation

1. Constitutional Basis

- The **Comptroller and Auditor General (CAG) of India** is established under **Article 148** of the **Constitution**.
- Serves as the **guardian of the public purse** and ensures **accountability of government expenditure**.

2. Institutional Safeguards

- **Appointment:** By the **President of India**.
- **Removal:** Same as a **Supreme Court judge** — via a **special majority in Parliament**, ensuring **security of tenure**.
- **Service Conditions:** Determined by **Parliament by law**, not by the executive.

3. Significance

- Ensures **independence from the executive**, thereby strengthening **parliamentary oversight**.
- CAG reports form the basis for **Public Accounts Committee (PAC)** scrutiny in Parliament.

4. Statement Analysis

- **Statement I:** Correct — Removal process mirrors that of Supreme Court judges.
- **Statement II:** Correct — Article 148 authorizes Parliament to define service conditions.
- However, **Statement II does not explain Statement I**, as it concerns a different safeguard.

5. Broader Impact

- Enhances **fiscal transparency, accountability, and institutional integrity** in governance.

21) Answer (b) Secure distribution of encryption keys for data communication

Explanation

1. Concept Overview

- **Quantum Key Distribution (QKD)** is a **quantum communication technique** used to **securely share encryption keys** between two parties.
- It applies **quantum mechanics principles** such as *superposition* and *entanglement* to detect any eavesdropping attempts.

2. Mechanism

- If a third party tries to intercept the quantum key, the **quantum state changes**, immediately alerting the communicating users.
- Hence, **QKD ensures absolute security** by making interception physically detectable.

3. Policy and Institutional Framework

- Supported under:
 - **National Quantum Mission (NQM)** – to advance India's quantum research ecosystem.
 - **National Mission on Interdisciplinary Cyber-Physical Systems (NMICPS)** – focuses on secure communications technology.

4. Implementation in India

- India successfully demonstrated **QKD over 500 km** of optical fiber, showing indigenous capacity in **quantum cryptography**.

5. Strategic Importance

- Strengthens **data protection** for critical sectors such as **defense, finance, and governance**.
- Shields against **quantum computer-based hacking threats**.

6. Option Analysis

- **(a)** Inaccurate — Does not affect internet speed.
- **(b)** Correct — Used for secure encryption key distribution.
- **(c)** Not for powering satellites.
- **(d)** Does not increase data storage capacity.

22) Answer (b) II and III only

Explanation

1. Concept Overview

- **NexCAR19** is India's **first indigenously developed CAR T-cell therapy**, marking a major leap in **personalized cancer treatment**.
- Developed collaboratively with **Department of Biotechnology (DBT)** and **BIRAC**, it targets **B-cell malignancies**.

2. Mechanism

- Involves **genetic modification of T-cells** (a type of white blood cell) to express **Chimeric Antigen**

Receptors (CARs) that can detect and destroy **cancer cells**.

3. Scope and Limitations

- Effective mainly against **B-cell blood cancers** like **leukemia and lymphoma**.
- Not a **universal cancer cure** — each CAR T-cell therapy is **target-specific**.
- Potential **side effects** include cytokine release syndrome and neurotoxicity.

4. Institutional Support

- Supported under **Make in India for healthcare innovation** and **Biotech Industry Research Assistance Council (BIRAC)** initiatives.

5. Statement Analysis

- **(I):** ✗ Incorrect — Not effective for all cancers.
- **(II):** ✓ Correct — Involves modifying WBCs to attack cancer.
- **(III):** ✓ Correct — NexCAR19 targets **B-cell cancers**, developed with **DBT-BIRAC**.

23) Answer ✓ (b) II, III and IV only

Explanation

1. Concept Overview

- **Gogabeel Lake** is an **oxbow wetland** formed by the meandering of rivers **Ganga, Mahananda, and Kankhar** in **Katihar district, Bihar**.
- It is Bihar's **first community reserve** and recognized as a **Ramsar site** for its ecological and community value.

2. Ecological Importance

- Serves as a **habitat for resident and migratory birds**, contributing to **biodiversity conservation**.
- Wetlands like Gogabeel provide **flood buffering, groundwater recharge, and carbon sequestration**.

3. Community Management

- Managed through **local community participation**, ensuring **sustainable resource use** under **state wetland conservation policies**.

4. Statement Analysis

- **(I):** ✗ Incorrect — Not Ganga-Yamuna, but Ganga-Mahananda-Kankhar system.
- **(II):** ✓ Correct — Bihar's first community reserve.
- **(III):** ✓ Correct — Located in **Katihar district, Bihar**.
- **(IV):** ✓ Correct — Supports both **resident and migratory bird species**.

24) Answer ✓ (c) II, III and IV only

Explanation

1. Overview of the UN Water Convention

- The **United Nations Water Convention (UNECE, 1992)**—formally called the *Convention on the Protection and Use of Transboundary Watercourses and International Lakes*—provides a **legally binding framework** for **shared water management**.

2. Objectives

- Promote **equitable and sustainable use** of transboundary waters.
- Prevent and reduce **cross-border environmental harm**.
- Foster **cooperation among riparian states**.

3. Implementation Framework

- Countries must enter into **bilateral/multilateral agreements** and establish **joint bodies** for shared water management.

4. Recent Development

- **Bangladesh** became the **first South Asian country** to accede to the Convention (2023), marking a major step for **regional water diplomacy**.

5. Statement Analysis

- **(I):** ✗ Incorrect — No specific accession condition as described.
- **(II):** ✓ Correct — Adopted in **Helsinki (1992)**, in force since **1996**.
- **(III):** ✓ Correct — **Legally binding**, mandates cooperation.
- **(IV):** ✓ Correct — **Bangladesh** is the **first South Asian signatory**.

25) Answer ✓ (b) II and III only

Explanation

1. Institutional Overview

- The **Enforcement Directorate (ED)**, established in **1956**, is India's **key financial investigative agency** under the **Department of Revenue, Ministry of Finance**.
- It enforces laws related to **money laundering, foreign exchange violations, and fugitive offenders**.

2. Legal Mandate

- Enforces three major laws:
 - **Prevention of Money Laundering Act (PMLA), 2002)**
 - **Foreign Exchange Management Act (FEMA), 1999)**
 - **Fugitive Economic Offenders Act (FEOA), 2018)**

3. Institutional Role

- Investigates **financial crimes**, **seizes assets**, and **prosecutes offenders**.
- Recognized globally by the **Financial Action Task Force (FATF)** for its asset recovery mechanisms.

4. Statement Analysis

- (I): Incorrect — ED operates under **Department of Revenue, Ministry of Finance**, not independently.
- (II): Correct — ED enforces the **Fugitive Economic Offenders Act, 2018**.
- (III): Correct — ED is India's main **anti-money laundering agency** under **PMLA, 2002**.

26) Answer (b) II and III only

Explanation

1. Concept Overview

- **Tidal Disruption Events (TDEs)** occur when a **star ventures too close to a supermassive black hole**, leading to the star being **torn apart by immense tidal forces**.
- These events emit **high-energy radiation** detectable across multiple electromagnetic spectra (X-ray, optical, UV, and radio).

2. Scientific Importance

- Provide insight into **black hole accretion dynamics**, **mass estimation**, and **feedback mechanisms** that influence **galaxy evolution**.
- Offer evidence of how **black holes consume stellar material** and shape surrounding **galactic environments**.

3. Observation Tools

- Detected by telescopes like **NASA's Swift Observatory**, **ESA's XMM-Newton**, and **Zwicky Transient Facility (ZTF)**.
- Play a vital role in **high-energy astrophysics** and **black hole physics research**.

4. Statement Analysis

- (I) Incorrect — TDEs result from **stellar disruption**, not **neutron star collisions**.
- (II) Correct — TDEs help study **black hole environmental impacts**.
- (III) Correct — Occur when a **star is disrupted by a supermassive black hole**.

27) Answer (a) II and III only

Explanation

1. Historical Context

- The **World Summit for Social Development (1995)** was a **UN General Assembly-convened** event held in **Copenhagen, Denmark**.

- It emphasized the **three core pillars** of social progress:
 - **Poverty eradication**
 - **Employment generation**
 - **Social integration**

2. Follow-up Framework

- The **Doha Declaration (2008)** reaffirmed these commitments, focusing on **inclusive and equitable development**, especially in developing nations.

3. Relevance

- Reinforces the **global social development agenda**, influencing frameworks like **SDG 1 (No Poverty)** and **SDG 10 (Reduced Inequalities)**.

4. Statement Analysis

- (I) Incorrect — The summit was **convened by the UNGA**, not any other body.
- (II) Correct — The **first summit was held in Copenhagen**.
- (III) Correct — The **Doha Declaration** emphasized integrated social development and justice.

28) Answer (c) I and III only

Explanation

1. Cultural Context

- **Baliyatra**, meaning "Voyage to Bali," is one of **India's largest open-air cultural festivals**, held annually in **Odisha**.
- Celebrated on **Kartika Purnima**, it marks ancient maritime trade between **Kalinga (Odisha)** and **Southeast Asia**, especially **Bali**.

2. Cultural and Historical Significance

- Symbolizes Odisha's **ancient maritime glory** and **trade links** with Java, Sumatra, and Sri Lanka.
- Associated with **rituals like Taapoi and Bhalukuni Osha**, honoring seafaring traders (*Sadhabas*).

3. Socioeconomic Impact

- Promotes **cultural tourism**, **heritage awareness**, and **community identity**.

4. Statement Analysis

- (I) Correct — Observed on **Kartika Purnima** in **coastal Odisha**.
- (II) Incorrect — Associated with **maritime legends**, not limited to **Lord Jagannath worship**.
- (III) Correct — Commemorates **Odisha's maritime traditions** and **Southeast Asian connections**.

29) Answer (c) Both I and II

Explanation

1. Concept Overview

- **Project Suncatcher** is a **Google-led experimental initiative** to test **AI data processing in outer space** using **solar-powered satellites** equipped with **Tensor Processing Units (TPUs)**.
- Aims to establish **energy-efficient, space-based computing** systems.

2. Objectives

- Test **feasibility of AI computation** in space conditions.
- Evaluate **power generation, data transfer, and hardware resilience** in **low-Earth orbit**.

3. Strategic Importance

- Could revolutionize **data center operations**, enabling **cloud AI processing** beyond Earth.
- Promotes **green computing** through **solar power utilization**.

4. Statement Analysis

- **(I):** Correct — Satellites will carry **Google's TPU chips** for AI processing.
- **(II):** Correct — Explores **AI computing via solar-powered satellites** in space.

30) Answer (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I

Explanation

1. Concept Overview

- **Quantum Key Distribution (QKD)** applies **quantum mechanics principles** to securely share encryption keys.
- Ensures **communication confidentiality** even against **quantum computer attacks**.

2. Mechanism

- Uses quantum properties such as **photon polarization** and **measurement disturbance** to detect any interception.
- If a hacker tries to intercept, the **quantum state collapses**, revealing the intrusion attempt.

3. Implementation and Support

- Promoted under **India's National Quantum Mission (NQM)** and **National Mission on Interdisciplinary Cyber-Physical Systems (NMICPS)**.
- Applications in **defence, banking, government communication networks**.

4. Relevance

- Critical for **digital sovereignty, national security, and future-proof encryption**.

5. Statement Analysis

- **Statement I:** Correct — QKD ensures **ultra-secure encryption** vital for defence and finance.
- **Statement II:** Correct — QKD's **quantum detection properties** explain its high security; thus, it **explains Statement I**.

31) Answer (b) 97th Amendment Act, 2011

Explanation

1. Constitutional Context

- The **97th Constitutional Amendment Act, 2011** granted **constitutional status** to **cooperative societies**, emphasizing their role in India's socio-economic structure.
- It made the **right to form cooperative societies** a **fundamental right** under **Article 19(1)(c)**.

2. Key Provisions Introduced

- **Part IXB** was added to the Constitution (Articles **243ZH to 243ZT**) dealing exclusively with cooperatives.
- **Article 43B** was inserted into the **Directive Principles of State Policy (DPSP)** — directing the State to promote **voluntary, autonomous, and democratic functioning** of cooperatives.

3. Significance

- Recognizes cooperatives as an **instrument of economic democracy**.
- Promotes **people-centric economic participation**, aligning with **Gandhian ideals of self-reliance**.

4. Institutional Strengthening

- Strengthened by **Ministry of Cooperation (2021)** and agencies like **NCDC, NABARD, and IFFCO**.
- Supports rural credit, collective farming, and small-scale entrepreneurship.

5. Option Analysis

- **(a)** Panchayati Raj relates to **73rd Amendment**.
- **(b)** Inserted **right to form cooperatives** and **Article 43B** — correct.
- **(c)** Unrelated to cooperatives.
- **(d)** Relates to **Right to Education (86th Amendment)**.

32) Answer (c) Ministry of Civil Aviation

Explanation

1. Institutional Context

- The **Commission of Railway Safety (CRS)** ensures **railway safety regulation, inspection, and accident investigation** in India.

- Despite its railway focus, CRS functions under the **Ministry of Civil Aviation**, ensuring **independence from the Ministry of Railways**.

2. Core Functions

- **Inspects** new railway lines and safety installations.
- **Investigates** serious train accidents.
- **Advises** the Central Government on railway safety policies and technical standards.

3. Policy Rationale

- The placement under **Ministry of Civil Aviation** prevents **conflict of interest** between operational and regulatory authorities, strengthening impartiality.

4. Relevance

- CRS plays a key role in India's **rail safety ecosystem**, complementing initiatives like **KAVACH** and **Rashtriya Rail Sanraksha Kosh**.

5. Option Analysis

- (a) Transport safety handled by multiple ministries, not this one.
- (b) CRS operates independently from **Ministry of Railways**.
- (c) Correct — functions under **Ministry of Civil Aviation**.
- (d) Not related to any central authority here.

33) Answer (c) Ministry of Science and Technology

Explanation

1. Overview

- **VAIBHAV Fellowship (Vaishwik Bharatiya Vaigyanik)** aims to connect the **Indian scientific diaspora** with **domestic research institutions** to foster **knowledge exchange and collaboration**.

2. Administrative Framework

- Implemented by the **Department of Science and Technology (DST)** under the **Ministry of Science and Technology**.
- Launched in **2023** as part of India's efforts to globalize its **research and innovation ecosystem**.

3. Key Features

- Enables **Indian-origin scientists abroad** to work in Indian institutions for **up to 2 months a year** for **three years**.
- Focus on **mutual research, capacity building, and mentorship** of Indian researchers.

4. Significance

- Strengthens India's **R&D capacity** and aligns with **Atmanirbhar Bharat** and **Vision 2047**.
- Enhances global **science diplomacy** and diaspora engagement.

5. Option Analysis

- (a) IT and electronics ministry not involved.
- (b) Not under education ministry.
- (c) Correct — Under **DST, Ministry of Science and Technology**.
- (d) Diaspora engagement ministry deals with NRIs but not scientific fellowships.

34) Answer (a) National Company Law Tribunal

Explanation

1. Institutional Overview

- The **National Company Law Appellate Tribunal (NCLAT)**, established under **Section 410** of the **Companies Act, 2013**, serves as the **appellate authority** in matters of corporate law and insolvency.

2. Jurisdiction

- Hears appeals against orders from:
 - **National Company Law Tribunal (NCLT)** under Companies Act and IBC.
 - **Competition Commission of India (CCI)** regarding competition cases.
 - **Insolvency and Bankruptcy Board of India (IBBI)**.
 - **National Financial Reporting Authority (NFRA)**.

3. Role and Relevance

- Ensures **uniform interpretation of corporate laws** and **consistency in insolvency decisions**.
- Strengthens **corporate governance, investor protection, and ease of doing business**.

4. Option Analysis

- (a) Correct — NCLAT hears appeals from NCLT.
- (b) CAT (Central Administrative Tribunal) is for civil services matters.
- (c) Securities Appellate Tribunal (SAT) has separate jurisdiction.
- (d) Redundant restatement; only (a) is valid.

35) Answer (c) II and III only

Explanation

1. Context

- Railway safety is a **top national priority**, considering India's vast rail network and passenger volume.
- Recent policies emphasize **technology-driven safety enhancement** and **independent safety audits**.

2. Institutional Framework

- **Rashtriya Rail Sanraksha Kosh (RRSK):** Fund for renewing and maintaining safety assets (tracks, bridges, signals).
- **Commission of Railway Safety (CRS):** Oversees safety compliance (under Ministry of Civil Aviation).
- **Technological Tools:**
 - **KAVACH:** Automatic Train Protection (ATP) system developed by **RDSO**.
 - **Electronic Interlocking:** Prevents human signal errors.

3. Achievements

- Marked **decline in consequential accidents**.
- **Adoption of AI and IoT** in predictive maintenance and accident prevention.

4. Statement Analysis

- **(I):** ✗ Incorrect — RRSK focuses on safety asset renewal, not route expansion.
- **(II):** ✓ Correct — Systems like **electronic interlocking** reduce accidents due to human error.
- **(III):** ✓ Correct — **KAVACH** is an **indigenous ATP system** developed by **RDSO**.

36) Answer ✓ (a) I and II only

Explanation

1. Concept Overview

- **Black Hole 'Morsels'** are **theoretical micro-black holes**, smaller and hotter than normal black holes.
- They are studied to understand **quantum gravitational behavior** at extreme conditions — bridging **quantum mechanics** and **Einstein's relativity**.
- **Quantum Gravity**, meanwhile, is the theoretical framework seeking to unify **General Relativity** (macroscopic scale) with **Quantum Mechanics** (microscopic scale).

2. Scientific Relevance

- Key to solving paradoxes such as the **Black Hole Information Paradox**.
- Theoretical models include **String Theory**, **Loop Quantum Gravity**, and **Holographic Principle**.

3. Statement Analysis

- **(I)** ✓ Correct — Quantum gravity reconciles **quantum theory** with **gravity**.
- **(II)** ✓ Correct — It is indeed a **theoretical branch** of physics.
- **(III)** ✗ Incorrect — Black hole morsels are **much smaller** and **hotter** than standard black holes, not comparable to asteroids.

4. Broader Significance

- Fundamental for **cosmology**, **space-time geometry**, and **early universe physics**.
- Could influence future **quantum computing** and **gravitational wave research**.

37) Answer ✓ (b) I and III only

Explanation

1. Geographical Overview

- The **Umngot River (Dawki River)**, located in **Meghalaya**, is famous for its **crystal-clear waters** and **scenic value**.
- Originates from the **eastern slopes of Shillong Peak** and flows through **Dawki**, entering **Bangladesh**.

2. Ecological and Socioeconomic Importance

- Supports **local livelihoods**, **fishing**, and **eco-tourism**.
- Forms a **natural boundary** between **Jaintia Hills** and **Khasi Hills**.

3. Environmental Concerns

- Facing pollution from **mining and tourism activities**.
- Conservation initiatives are under **state environmental programs**.

4. Statement Analysis

- **(I)** ✓ Correct — Flows through Dawki and into Bangladesh.
- **(II)** ✗ Incorrect — Originates in **eastern**, not western, part of Shillong Peak.
- **(III)** ✓ Correct — Forms a **natural boundary** between hill regions.

38) Answer ✓ (a) I, II and III

Explanation

1. Concept Overview

- **Advanced Driver Assistance Systems (ADAS)** integrate **AI, sensors, and automation** to enhance **driver safety and comfort**.
- Serve as precursors to **autonomous driving technologies**.

2. Core Components

- Sensors: **Lidar, Radar, Cameras**, and **Ultrasonic systems**.
- Features include:
 - **Lane departure warning**,
 - **Adaptive cruise control**,
 - **Blind spot detection**,
 - **Parking assistance**,
 - **Collision avoidance**.

3. Policy Significance

- Encouraged by **automotive safety standards** (e.g., Bharat NCAP, Euro NCAP).

- Supports **UN SDG 3.6** – reducing road traffic deaths.

4. Statement Analysis

- **(I)** Correct — Designed to **minimize human error**.
- **(II)** Correct — Parking assist and blind spot detection are **ADAS features**.
- **(III)** Correct — All sensors are **integrated for real-time data analysis**.

39) Answer (d) I and III only

Explanation

1. Concept Overview

- **Quantum Gravity** is the theoretical framework aiming to **merge Quantum Mechanics and General Relativity**.
- Attempts to explain **gravitational behavior at subatomic scales** — near **black holes** and the **Big Bang singularity**.

2. Scientific Models

- Theories exploring quantum gravity include:
 - **String Theory**,
 - **Loop Quantum Gravity**,
 - **Causal Dynamical Triangulation**, and
 - **Holographic Principle**.

3. Relevance

- Helps understand **space-time fabric, black hole entropy**, and **quantum entanglement**.
- May provide insights into **early universe evolution**.

4. Statement Analysis

- **(I)** Correct — Relevant to black hole studies and entanglement.
- **(II)** Incorrect — Not confined to condensed matter physics.
- **(III)** Correct — Explains gravity using **quantum mechanical laws**.

40) Answer (d) Statement-I is incorrect, but Statement-II is correct

Explanation

1. Context

- The **UNEP Emission Gap Report 2025** evaluates the gap between **current GHG emissions** and **Paris Agreement targets**.
- It highlights India's **growing total emissions** alongside its **low per capita emissions** compared to the global average.

2. India's Position

- **Total emissions:** Increased due to industrialization and energy demand.

- **Per capita emissions:** Remain **below the world average** (approx. 2.3 tCO₂e vs. global 6.3 tCO₂e).
- India's emissions constitute ~7% of global total but per capita output is low due to its **large population**.

3. Relevance

- Supports India's "**common but differentiated responsibilities**" stance in climate negotiations.
- Reinforces its **commitment to low-carbon growth** via **Nationally Determined Contributions (NDCs)**.

4. Statement Analysis

- **(I):** Incorrect — India's **per capita emissions are below**, not above, global average.
- **(II):** Correct — Emissions increased in total terms but per capita remain lower.

41) Answer (b) The third interstellar object detected passing through the solar system

Explanation

1. Concept Overview

- **Comet 3I/ATLAS** is an **interstellar comet** discovered by the **ATLAS telescope in Chile**.
- It is classified as the **third known interstellar object** detected in our solar system after:
 - **1I/'Oumuamua (2017)** and
 - **2I/Borisov (2019)**.

2. Scientific Significance

- Unlike ordinary comets, 3I/ATLAS follows a **hyperbolic trajectory**, meaning it is **not gravitationally bound** to the Sun.
- Its study helps astronomers:
 - Understand **interstellar matter composition**.
 - Analyze **solar system boundaries**.
 - Examine **planetary formation models**.

3. Broader Implications

- Offers clues about the **interstellar medium** and **chemical diversity** of cosmic materials.
- Enhances **planetary defense** and **early detection technologies** for near-Earth objects.

4. Option Analysis

- **(a)** Incorrect — Discovered by **ATLAS telescope**, not Hubble.
- **(b)** Correct — The **third interstellar object** detected.
- **(c)** Incorrect — Not a short-period comet; its orbit is hyperbolic.
- **(d)** Incorrect — Not from the **asteroid belt**.

42) Answer (a) Rotary tillers are used for improving soil health at the production stage

Explanation

1. Concept Overview

- **Rotary tillers** (or rotavators) are mechanized implements used in **soil preparation** prior to sowing.
- They are part of **production-stage technologies** in the **agricultural value chain**.

2. Function and Benefits

- Improve **soil aeration, moisture retention, and root penetration**.
- Help incorporate **organic matter** and break up clods, leading to improved **soil fertility and health**.

3. Policy Context

- Promoted under **Digital Agriculture Mission 2.0** and **Sub-Mission on Agricultural Mechanization (SMAM)**.
- Aimed at reducing **labor dependency** and **enhancing efficiency** in small and medium farms.

4. Option Analysis

- **(a) ✓** Correct — Used during the **production stage** for soil improvement.
- **(b) ✗** Incorrect — AI grading tools belong to post-harvest stage.
- **(c) ✗** Incorrect — IoT chambers relate to market readiness, not production.
- **(d) ✗** Incorrect — Post-harvest stage technology.

43) Answer ✓ (c) Both I and II

Explanation

1. Sectoral Overview

- The **Indian IT industry** is a global powerhouse, contributing significantly to GDP, exports, and employment.
- It is also a leader in **digital innovation, artificial intelligence, and software services exports**.

2. Key Economic Indicators

- **Contribution to GDP:** ~7%.
- **Employment:** ~1% of India's total workforce (~5 million people).
- **Gender Inclusion:** Women make up approximately **36%** of the IT workforce.

3. Policy Framework

- Supported by **Digital India, National Policy on Software Products, and Atmanirbhar Bharat initiatives**.
- Encourages **reskilling, cybersecurity, and women participation** in tech fields.

4. Statement Analysis

- **(I) ✓** Correct — Employs 1% of total workforce; 36% women.
- **(II) ✓** Correct — Contributes nearly 7% of GDP.

44) Answer ✓ (c) I and III only

Explanation

1. Concept Overview

- India's **technology self-reliance scheme** seeks to enhance national capabilities in **R&D, deep-tech innovation, and critical technology acquisition**.
- It aligns with the broader vision of **Atmanirbhar Bharat**.

2. Institutional Framework

- **Nodal Department: Department of Science and Technology (DST)**.
- **Funding:** ₹1 lakh crore corpus managed through a **two-tier system** —
 - **Special Purpose Fund** (within the **Anusandhan National Research Foundation – ANRF**), and
 - **Second-level fund managers** for implementation.

3. Objectives

- Finance **high Technology Readiness Level (TRL)** projects.
- Promote **innovation-led startups and strategic technology autonomy**.

4. Statement Analysis

- **(I) ✓** Correct — Finances high TRL and critical technologies.
- **(II) ✗** Incorrect — Nodal agency is **DST**, not MeitY.
- **(III) ✓** Correct — Operates through **two-tier funding** under ANRF.

45) Answer ✓ (a) I and II only

Explanation

1. Institutional Framework

- **State Human Rights Commissions (SHRCs)** are established under the **Protection of Human Rights Act, 1993**, to address violations at the **state level**.
- Operate alongside the **National Human Rights Commission (NHRC)** but focus on **State and Concurrent List subjects**.

2. Composition and Powers

- **Chairperson:** A retired **Chief Justice or Judge** of a High Court.
- **Members:** Include legal and human rights experts, appointed by the **Governor** on recommendation of a **selection committee**.

- Powers include **inquiry, recommendations, and report submission** — but **not binding directions**.

3. Relevance

- Strengthens **federal human rights oversight**.
- Addresses violations by **state agencies** like police, prisons, and local bodies.

4. Statement Analysis

- **(I) ✓** Correct — Can inquire into violations under **State and Concurrent Lists**.
- **(II) ✓** Correct — Recommendations are **advisory, not binding**.
- **(III) ✗** Incorrect — Cannot issue binding directions like High Courts.
- **(IV) ✗** Incorrect — Chairperson must be a retired **Chief Justice or Judge**, not necessarily Chief Justice.

46) Answer ✓ (a) It allows for passive safety mechanisms, such as salt plug melting to stop the reaction

Explanation

1. Concept Overview

- **Thorium Molten Salt Reactors (TMSRs)** are **fourth-generation nuclear reactors** that use **molten salt** both as **fuel carrier** and **coolant**.
- They operate at **atmospheric pressure** and possess **passive safety mechanisms**, making them inherently safer than traditional pressurized water reactors.

2. Key Technological Features

- **Fuel Medium:** Thorium and uranium dissolved in molten fluoride salt.
- **Safety:** Equipped with a **freeze plug** (salt plug) that melts if temperatures rise, passively draining the molten fuel into a safe subcritical tank, **halting the reaction**.
- **Efficiency:** Operates at higher thermal efficiency (up to 45%) due to high-temperature operation.
- **Waste:** Produces significantly **less long-lived radioactive waste** compared to uranium reactors.

3. India's Context

- TMSR technology aligns with **India's three-stage nuclear program**, designed to exploit abundant **thorium reserves**.
- Research and development are being pursued by **BARC** and **IGCAR** to strengthen India's **energy security**.

4. Option Analysis

- **(a) ✓** Correct — Passive safety through **salt plug melting** is a hallmark feature.

- **(b) ✗** Incorrect — Operates at **atmospheric**, not high, pressure.
- **(c) ✗** Incorrect — Uses **molten salt**, not water.
- **(d) ✗** Incorrect — Generates **less**, not more, radioactive waste.

47) Answer ✓ (a) They are not recognized as advocates under the Advocates Act, 1961

Explanation

1. Concept Overview

- **Client-attorney privilege** under **Section 132 of the Bharatiya Sakshya Adhiniyam (BSA)** protects **confidential communications** between a **client** and an **advocate**.
- The privilege ensures **legal confidentiality** and **trust** in legal advice and defense.

2. Supreme Court Clarification (2024)

- The Court ruled that **in-house counsels** (corporate employees with legal degrees) **do not qualify as "advocates"** unless they are **enrolled** under the **Advocates Act, 1961**.
- Therefore, communications with them **do not enjoy statutory privilege**.

3. Legal Framework

- **Section 132 (BSA)** corresponds to **Section 126 (Evidence Act, 1872)**.
- Privilege applies only when:
 - The person is an **enrolled advocate**.
 - The communication is **in the course of professional employment**.

4. Implications

- Corporate legal departments must rely on **external counsel** for privileged communications.
- Reinforces **professional accountability** and **ethical legal practice**.

5. Option Analysis

- **(a) ✓** Correct — In-house counsels not recognized as advocates.
- **(b) ✗** Incorrect — Company counsels are not judges.
- **(c) ✗** Incorrect — Law degree origin irrelevant to privilege.
- **(d) ✗** Incorrect — Enrollment necessary, but recognition as an **advocate** is the core issue.

48) Answer ✓ (b) Laboratory-produced proteins engineered to bind specific antigens

Explanation

1. Concept Overview

- **Monoclonal Antibodies (mAbs)** are **lab-engineered immune proteins** designed to **bind specific antigens** with high precision.
- Derived from a **single clone of B-cells**, ensuring **uniformity and targeted action**.

2. Functional Mechanism

- Recognize and attach to **antigens** (foreign molecules like pathogens or tumor markers).
- Either **neutralize** them directly or **trigger immune responses** to eliminate them.

3. Applications

- **Cancer Therapy:** Rituximab, Trastuzumab.
- **Autoimmune Disorders:** In rheumatoid arthritis, multiple sclerosis.
- **Infectious Diseases:** Developed against **Nipah, COVID-19**, etc.
- **Diagnostics:** Used in **ELISA** and **rapid test kits**.

4. Policy Context

- Indian Council of Medical Research (ICMR) and **BIRAC** are investing in **indigenous mAb development** under **Make in India for Biopharma**.

5. Option Analysis

- (a) ✗ Incorrect — Not liver proteins.
- (b) ✓ Correct — Lab-produced, antigen-specific proteins.
- (c) ✗ Incorrect — Not digestive enzymes.
- (d) ✗ Incorrect — Not pituitary hormones.

49) Answer ✓ (b) II only

Explanation

1. Legal Framework

- Under the **Advocates Act, 1961**, only **enrolled advocates** are authorized to **practice law** in India.
- The term “lawyer” merely denotes anyone possessing a **law degree (LL.B)**, but **not all lawyers are advocates**.

2. Professional Regulation

- The **Bar Council of India (BCI)** regulates legal practice and conduct.
- Enrolment requires clearing the **All India Bar Examination (AIBE)**.
- Only **advocates** can appear in courts, file pleadings, or represent clients.

3. Significance

- Ensures **ethical standards, competence, and disciplinary accountability** in the legal profession.

4. Statement Analysis

- (I) ✗ Incorrect — The two terms are **not interchangeable**.
- (II) ✓ Correct — Only **enrolled advocates** can practice law.

50) Answer ✓ (c) I and II only

Explanation

1. Concept Overview

- **Coal India Limited (CIL)** is a **Maharatna PSU** under the **Ministry of Coal**, established in **November 1975** after the **nationalisation of coal mines**.
- It is the **world’s largest coal producer**, playing a pivotal role in India’s **energy and industrial growth**.

2. Core Functions

- Operates **310 mines** across **8 Indian states**.
- Supplies **~80% of India’s domestic coal production**.
- Employs over **2.2 lakh workers**, contributing heavily to **energy security and power generation**.

3. Policy Significance

- Crucial for **electricity generation, steel, and cement industries**.
- Key player in India’s **energy transition**, balancing coal supply with **clean energy commitments**.

4. Statement Analysis

- (I) ✓ Correct — Supplies **~80% of domestic coal**.
- (II) ✓ Correct — Established in **1975 post-nationalisation**.