Topic 1: Elephant Deaths on Railway Tracks

Why is it in News?

In 2025, India recorded the **fourth incident of elephant deaths on railway tracks**, taking the cumulative toll to **94 elephants since 2019**.
On **December 20, 2025**, a tragic accident occurred on the **Hojai–Nagaon railway section in Assam**, where **7–8 elephants were killed** after being hit by the **Rajdhani Express**.
This incident took place despite **prior warnings and mitigation advisories**, once again highlighting serious concerns related to **human–wildlife conflict, infrastructure alignment, and governance failures**.

Relevance

GS I – Geography

- Human–environment interaction.
- Ecological corridors and landscape fragmentation.
- Impact of linear infrastructure on ecosystems.

GS III – Environment & Internal Security

- Biodiversity conservation (elephants as Schedule I species).
- Human–wildlife conflict.
- Non-traditional security threats such as derailments and passenger safety risks.
- Sustainable infrastructure development.

Scale of the Problem

Between **2019 and 2025**, **94 elephants** have died due to train collisions, averaging **13–14 deaths per year**.
India is home to nearly **60% of Asia's elephants**, with an estimated population of **around 27,000**, as per **Project Elephant** data.

High-risk states include:

- Assam
- Odisha
- West Bengal
- Jharkhand
- Kerala
- Tamil Nadu

Major rail–elephant collision hotspots:

- Lumding–Badarpur section (Assam)

- Siliguri–Alipurduar section (West Bengal)
- Chakradharpur division (Jharkhand–Odisha belt)

Structural Causes

A. Infrastructure–Ecology Mismatch
Railway alignments, many of which date back to the colonial era, cut directly across **traditional elephant corridors**, which were not scientifically mapped at the time.
Habitat fragmentation has intensified due to the cumulative impact of:

- Railways
- Highways
- Mining belts
- Other linear infrastructure developed without wildlife sensitivity.

B. Governance and Planning Deficits
Environmental Impact Assessments (EIAs) are often:

- Insensitive to wildlife corridors.
- Static in nature, failing to incorporate dynamic elephant movement data.

Inter-agency coordination between the **Railways and Forest Departments** remains weak, resulting in mitigation strategies that are largely **reactive rather than preventive**.

C. Operational Failures

- Speed restrictions are inconsistently enforced, especially during night hours.
- Excessive reliance on human vigilance persists instead of automated systems.
- Dense fog, track curvature, and embankments significantly reduce driver visibility.

Existing Mitigation Measures

A. Technological Measures
Intrusion Detection Systems (IDS), combining **thermal cameras with AI-based analytics**, are designed to alert loco pilots and stations in real time.
These systems have been piloted in Assam and West Bengal, but face limitations due to **partial coverage and maintenance challenges**.

B. Administrative Measures

- Speed limits of **30–50 km/h** in notified corridors.
- Deployment of elephant watchers and patrol teams.
- Limited GPS-based tracking of elephant herds.

C. Ecological Measures

- Construction of underpasses and overpasses, though limited in number and costly.

- Habitat improvement away from railway tracks, progressing slowly.

Inference: While mitigation measures exist, their **scale, enforcement, and integration remain inadequate**.

Constitutional and Legal Dimensions

- **Article 48A**: State obligation to protect wildlife and the environment.
- **Article 51A(g)**: Fundamental duty of citizens to safeguard the natural environment.

Under the **Wildlife Protection Act, 1972**, elephants are classified under **Schedule I**, granting them the highest legal protection.
Project Elephant (1992) focuses on habitat protection, corridor preservation, and conflict mitigation, but **rail safety remains peripheral rather than central** to its mandate.

Governance Lens (GS II)

The issue reflects entrenched **policy silos**, where transport efficiency is prioritised over ecological sustainability.
It exemplifies **anticipatory governance failure**, stemming from an **implementation deficit rather than absence of policy**.
There is a clear need for **evidence-based, spatial governance using GIS and wildlife movement data**.

Internal Security and Disaster Angle

Elephant–train collisions can trigger:

- Train derailments.
- Passenger casualties.
- Significant economic losses.

Such wildlife-related accidents qualify as **non-traditional security threats**.

Best Practices

- **Canada and the USA**: Extensive wildlife overpasses and fencing systems, notably the Banff National Park model.
- **Sri Lanka**: Integration of electric fencing with rail alert systems.

Key takeaway: Structural and engineering solutions outperform vigilance-based approaches.

Way Forward

Planning and Regulation

- Mandatory **Wildlife Corridor Impact Assessments** for all rail projects.
- Dynamic corridor mapping using satellite imagery and GPS collar data.
- Declaration of corridor stretches as **Eco-Sensitive Rail Sections**.

Technology Scaling

- Full IDS coverage across high-risk sections.
- Automated braking systems linked with IDS alerts.
- Speed governors for night-time operations in corridor zones.

Ecological Engineering

- Standardised wildlife underpasses in all new rail lines.
- Retrofitting existing tracks with funnel fencing and designated crossings.

Institutional Reform

- Establishment of permanent **Rail–Forest Joint Command Centres**.
- Dedicated funding through **CAMPA** and the **Green Railways Policy**.

Indian Elephant (Asian Elephant – *Elephas maximus indicus*)

- Scientific name: *Elephas maximus* (Indian subspecies: *E. m. indicus*).
- Distribution: Western Ghats, Northeast India, Eastern India, parts of Central India.
- Population in India: ~27,000 (≈ 60% of Asia's elephants).
- Legal status: Schedule I under the Wildlife Protection Act, 1972.
- Conservation framework: Flagship species under **Project Elephant (1992)**.
- Ecological role: Keystone species facilitating seed dispersal and forest–grassland maintenance.
- IUCN status: **Endangered (EN)**.

Topic 2: Speedy Justice Eludes Consumers – Consumer Commissions

Why is it in News?

Recent media reports have highlighted **systemic delays in consumer dispute redressal**, undermining the promise of **speedy and inexpensive justice** under the **Consumer Protection Act, 2019**.
Persistent challenges include **chronic vacancies, rising pendency, logistical shortages, and procedural delays** across District, State, and National Consumer Commissions.

Relevance

GS II – Polity and Governance

- Access to justice.
- Tribunalisation and quasi-judicial bodies.
- Implementation of the Consumer Protection Act, 2019.
- Judicial capacity and administrative efficiency.

GS II – Constitution

- **Article 21**: Right to timely justice as part of the right to life.
- **Article 39A**: Equal justice and free legal aid.
- Rule of law and procedural fairness.

Constitutional and Governance Context

Judicial interpretation has expanded **Article 21** to include timely access to justice.
Article 39A, as a Directive Principle, mandates equal justice and free legal aid.
Consumer Commissions were conceived as **decentralised, quasi-judicial mechanisms** to reduce the burden on regular courts.

Consumer Commissions: Intended Design vs Reality

Intended Design

- Simple procedures without rigid CPC or CrPC norms.
- Time-bound disposal of cases.
- Low-cost, citizen-friendly access.

Ground Reality

- Long-distance travel to State and National Commissions.
- Frequent adjournments.
- High pendency resembling civil courts.
- Appeals escalating disputes across all three tiers.

Pendency and Disposal: Empirical Data

Overall Pendency
As of **January 30, 2024**, **5.43 lakh cases** were pending across all consumer commissions nationwide.

Case Flow Trends

- **2024**:

  - New cases filed: **1.73 lakh**
  - Cases disposed: **1.58 lakh**
  - Net backlog increase: ~14,900
- **2025 (till July)**:
  - New cases: **78,031**
  - Cases disposed: **65,537**

Inference: Disposal rates consistently lag behind institution rates, leading to structural backlog accumulation.

Human Cost of Delay

- Repeated inter-state travel, often exceeding 24 hours.
- Financial stress on small entrepreneurs and MSMEs.
- Justice delayed effectively becomes justice denied, particularly for rural consumers and first-generation entrepreneurs.
- Erosion of trust in formal grievance redressal mechanisms, pushing citizens towards informal settlements or legal disengagement.

Staffing Crisis: Quantified Vacancies (as of 19 August 2025)

State Commissions

- Presidents: **18 vacancies**
- Members: **62 vacancies**

District Commissions

- Presidents: **218 vacancies**
- Members: **518 vacancies**

Impact

- Benches remain incompletely constituted.
- Cases are listed but not heard.
- Judicial time is wasted due to quorum deficiencies.

Statutory Timelines vs Ground Reality

Under **Section 38(7) of the Consumer Protection Act, 2019**:

- Cases without testing should be resolved within **3 months**.
- Cases requiring expert evidence should be resolved within **5 months**.

Adjournments are not to be granted routinely and must be reasoned in writing.
In practice, cases remain pending for **5–10 years**, severely weakening the rule of law.

Structural Bottlenecks

Institutional Deficits

- Insufficient courtrooms.
- Weak digital case management systems.
- Inadequate registry staff.

Human Capital Mismatch
Members often lack specialised expertise in:

- Insurance disputes.
- Medical negligence.
- Technical goods and e-commerce.

This increases dependence on expert opinions and laboratory reports, prolonging proceedings.

Procedural Frictions

- Delayed service of notices.
- Late affidavits.
- Tactical appeals by sellers to exhaust complainants.

Executive Oversight and Accountability Gap

Parliamentary replies acknowledge pendency but reveal:

- Absence of mission-mode recruitment.
- No binding appointment timelines.

This reflects **administrative inertia rather than legal vacuum**.

Economic and Market Implications

Weak consumer protection:

- Raises transaction costs.
- Encourages unfair trade practices.
- Undermines MSME confidence.
- Distorts insurance, e-commerce, and digital markets.
- Weakens Ease of Doing Business from a consumer-trust perspective.

Comparative Insight

Advanced jurisdictions rely on:

- Single-tier consumer tribunals.
- Mandatory pre-litigation mediation.
- Online Dispute Resolution (ODR) as a default mechanism.

In India, ODR remains **supplementary rather than central**.

Way Forward

Institutional Measures

- Statutory timelines for filling vacancies.
- Circuit benches for State and National Commissions.

Procedural Measures

- Mandatory pre-litigation mediation for non-complex disputes.
- Strict adjournment caps with cost penalties.

Technological Measures

- End-to-end e-filing and virtual hearings.
- AI-based case triaging systems.

Capacity Building

- Domain-specific training for members.
- Panels of standing technical experts.

Governance Reforms

- Annual Consumer Justice Performance Audits.
- Parliamentary oversight through standing committee reviews.

Topic 3: ISRO Set to Launch Mobile Broadband Satellite

Why is it in News?

The **Indian Space Research Organisation (ISRO)** is scheduled to launch the **BlueBird Block-2 satellite** on **24 December** under the **LVM3-M6 mission**.
The launch is being conducted as part of a **commercial launch agreement** with **AST SpaceMobile**.
The satellite is designed to provide **direct-to-smartphone cellular broadband connectivity from space**, without the need for specialised satellite phones.

Relevance

GS III – Science & Technology

- Space technology applications.
- Satellite communication systems.
- Low Earth Orbit (LEO) constellations and direct-to-device broadband.
- Commercialisation of India's space sector.

Mission at a Glance

- **Launch Vehicle:** LVM3 (Gaganyaan-class heavy-lift rocket).
- **Payload:** BlueBird Block-2 satellite.
- **Orbit:** Low Earth Orbit (LEO).
- **Client:** AST SpaceMobile.
- **Nature of Mission:** Commercial launch executed by ISRO.

What is BlueBird Block-2?

BlueBird Block-2 is projected to be the **largest commercial communication satellite deployed in Low Earth Orbit**.
Its core capability is **space-based cellular broadband**, enabling **direct connectivity to ordinary smartphones** without intermediate satellite handsets.
It forms a key component of **AST SpaceMobile's planned global satellite-cellular constellation**.

AST SpaceMobile Network: Key Features

The AST SpaceMobile network aims to **bridge global digital connectivity gaps**, particularly in regions lacking terrestrial telecom infrastructure.

- **BlueBird satellites 1–5**, launched in **September 2024**, enabled continuous internet coverage over the **United States and select other regions**.
- The company has partnerships with **more than 50 mobile network operators globally**.
- Intended end-users include **commercial consumers, government agencies, and emergency response services**.

Strategic Significance for India

A. Space Commercialisation
The mission demonstrates ISRO's transition from a **captive national launcher** to a **global commercial launch service provider**.

It strengthens the **NSIL-led commercial space ecosystem** and enhances India's participation in the **$10+ billion global launch market**.

B. Heavy-Lift Credibility
The successful use of **LVM3** for commercial payloads reinforces its reliability beyond human spaceflight missions.
It positions India competitively alongside global launch providers such as:

- SpaceX (Falcon 9)
- Arianespace (Ariane 6)
- China's Long March series

Digital and Developmental Implications

Space-based broadband directly addresses **last-mile connectivity challenges**, particularly in:

- Remote rural regions.
- Maritime zones.
- Disaster-affected areas.

It supports:

- Digital governance delivery.
- Financial inclusion.
- Tele-medicine and e-education services.

The mission complements India's broader **Digital Public Infrastructure (DPI)** vision.

Geopolitical and Strategic Dimensions

Satellite-based broadband is increasingly recognised as **strategic and dual-use infrastructure**.
India's role as a **trusted, non-aligned launch partner** enhances its geopolitical standing.
The mission strengthens **India–US techno-commercial cooperation** without entangling India in data sovereignty concerns.

Regulatory and Policy Context

The launch aligns with the **Indian Space Policy, 2023**, which promotes private and foreign participation in the space sector.
It also raises emerging policy questions related to:

- Spectrum coordination between satellite and terrestrial telecom networks.
- Cybersecurity and cross-border data flows.
- Space traffic management in an increasingly congested LEO environment.

Challenges and Concerns

- Rising congestion and space debris risks in Low Earth Orbit.
- Potential spectrum interference with terrestrial telecom systems.
- Dependence on foreign satellite constellations for critical connectivity.
- Need for robust international governance frameworks for outer space.

Way Forward

- Strengthen **space situational awareness (SSA)** capabilities.
- Enforce stringent **debris mitigation protocols**.
- Encourage Indian private players in satellite manufacturing and direct-to-device technologies.
- Develop a clear regulatory framework integrating satellite and telecom governance.

Topic 4: Southern Ocean Carbon Anomaly

Why is it in News?

Recent **peer-reviewed research published in *Nature Climate Change* (October 2024)** reveals that the **Southern Ocean has absorbed more carbon dioxide since the early 2000s**, contrary to long-standing climate model projections.
The findings highlight the **limits of existing climate models**, the importance of direct observations, and the potential risk of **abrupt future shifts in the global carbon cycle**.

Relevance

GS III – Environment & Climate Change

- Global carbon cycle dynamics.
- Oceanic carbon sinks.
- Climate feedback mechanisms.
- Non-linear climate responses.

GS I – Physical Geography

- Ocean circulation systems.
- Stratification, upwelling, and westerly winds.
- Southern Ocean's role in regulating global climate.

Why the Southern Ocean is Critical

The Southern Ocean covers approximately **25–30% of the global ocean area**, yet accounts for nearly **40% of the oceanic uptake of anthropogenic CO_2** .
It acts as a major **global climate regulator** by absorbing excess heat and functioning as a key carbon sink.
Even small physical changes in this region can therefore produce **disproportionately large global climate impacts**.

Mechanism of the Southern Ocean Carbon Sink

Cold, relatively fresh surface waters form a **stable "lid"**.
Below this lies warmer, saltier, and carbon-rich deep water.
Strong stratification restricts vertical mixing, trapping carbon below the surface and limiting atmospheric CO_2 release.

What Climate Models Previously Predicted

Earlier models projected that rising greenhouse gas concentrations would:

- Strengthen and shift westerly winds poleward.
- Intensify the Southern Ocean Meridional Overturning Circulation.
- Increase upwelling of deep, carbon-rich waters.

This would have resulted in **greater CO_2 outgassing** and a **weakened carbon sink**.

What Observations Actually Reveal

Empirical data confirms that:

- Circumpolar Deep Water has risen by around **40 metres since the 1990s**.
- Subsurface CO_2 pressure has increased by approximately **10 microatmospheres**.

Despite these changes, **net CO_2 absorption increased**, revealing an unexpected anomaly.

The Missing Mechanism: Freshwater-Driven Stratification

Increased Antarctic ice melt and precipitation have produced **fresher, lighter surface waters**, strengthening stratification.
This freshwater layer traps carbon-rich waters **100–200 metres below the surface**, preventing atmospheric release.
Thus, a **temporary freshwater "mask"** has counteracted the effects of enhanced upwelling.

Why This Stability is Temporary

Observations since the early 2010s indicate:

- Thinning of the stratified layer.
- Rising surface salinity in parts of the Southern Ocean.

Stronger winds could eventually penetrate this weakened stratification, triggering **sudden CO_2 release**, rather than gradual change.

Why Climate Models Struggle

The system involves competing processes such as upwelling and stratification, governed by multi-scale physics including:

- Ocean eddies only a few kilometres wide.
- Ice-shelf cavities spanning tens to hundreds of kilometres.

Sparse year-round observations further constrain model accuracy.
This reflects **data and scale limitations**, not outright model failure.

Climate Governance Implications

The findings underscore the need for:

- Continuous ocean monitoring through floats, moorings, and satellites.
- Caution against assuming long-term ocean buffering in carbon budgets.
- Re-evaluation of net-zero timelines and climate tipping point assessments.

Conclusion

The Southern Ocean carbon anomaly illustrates how **temporary resilience can conceal deeper systemic vulnerabilities**.
Effective climate policy must integrate **model-based projections with observational evidence**, recognising the risk of delayed but abrupt climate feedbacks.

Topic 5: Tiger Conservation and the 6th Cycle of All India Tiger Estimation

Why is it in News?

The **6th cycle of the All India Tiger Estimation (AITE)** has been launched.
The Union Environment Minister emphasised that India's tiger conservation strategy must remain **science-based**, rather than driven by political or symbolic numerical targets.
The announcement comes amid rising **human–wildlife conflict**, elephant deaths, and mounting pressure on protected areas.

Relevance

GS III – Environment & Biodiversity

- Wildlife conservation and Project Tiger.
- Habitat carrying capacity.
- Human–wildlife conflict management.

All India Tiger Estimation: Core Facts

- Conducted once every **four years**.
- World's **largest wildlife monitoring exercise**.
- Coordinated by the **National Tiger Conservation Authority (NTCA)** with the **Wildlife Institute of India (WII)**.
- Covers tiger population, prey base, habitat quality, and human pressure indicators.

India's Tiger Population: Trend Data

- 2006: 1,411
- 2010: 1,706
- 2014: 2,226
- 2018: 2,967
- 2022: 3,167

India now hosts nearly **75% of the world's wild tiger population**.

Why Science-Based Conservation is Emphasised

Artificial pressure to increase numbers risks:

- Overstocking of reserves.
- Increased dispersal into human landscapes.
- Escalation of human–wildlife conflict.

Each tiger requires substantial territory, and ignoring **ecological carrying capacity** can trigger ecological stress and conflict.

Emerging Conflict Challenges

Nearly **70% of tiger landscapes lie outside protected areas**, increasing interactions with human settlements.
The Minister highlighted conflict as the most significant emerging threat to conservation success.

New Scientific Interventions

- Landscape-level planning inspired by international models.
- Early warning systems and conflict hotspot mapping.
- Predictive analytics focused on tiger dispersal behaviour.

Governance and Policy Challenges

- Fragmented landscapes beyond reserves.
- Delayed compensation mechanisms.
- Infrastructure development intersecting wildlife corridors.
- Limited integration of wildlife data into transport and urban planning.

Way Forward

- Corridor-based conservation beyond reserve boundaries.
- Dynamic carrying capacity assessment.
- AI-enabled early warning systems.
- Faster, transparent compensation and community stewardship incentives.
- Inter-ministerial coordination between environment, railways, and roads.

Topic 6: Transfusion Safety Gaps and HIV Risk for Thalassaemia Patients

Why is it in News?

Advocacy groups have demanded **mandatory NAAT testing** for blood screening, citing risks posed by reliance on **ELISA-only testing**.
Concerns have intensified regarding the vulnerability of **thalassaemia and other multi-transfused patients** to HIV and hepatitis infections.
The issue has gained prominence in the context of the proposed **National Blood Transfusion Services Commission Bill, 2025**.

Relevance

GS II – Governance & Social Justice

- Public health governance.
- Regulatory oversight of health services.
- Patient safety and rights.

GS II – Constitution

- **Article 21**: Right to health and safe medical care.

GS III – Science & Technology

- Diagnostic technologies.
- Health infrastructure capacity.
- Cost–benefit analysis of preventive screening.

Why Thalassaemia Patients are High-Risk

Patients require **lifelong, frequent blood transfusions**, often every **2–4 weeks**.
Repeated exposure significantly increases the probability of transfusion-transmitted infections.
A single unsafe transfusion can result in **HIV, Hepatitis B, or Hepatitis C**.

Screening Technologies Compared

ELISA

- Detects antibodies rather than viral genetic material.
- Window period:
  - HIV: 3–6 weeks
  - Hepatitis C: 6–8 weeks
- Low cost and widely used.

NAAT

- Detects viral DNA/RNA directly.
- Reduces window period to:
  - HIV: 7–10 days
  - Hepatitis C: 10–14 days
- Considered the global gold standard.

Scale of the Risk

India has approximately **1–1.2 lakh thalassaemia major patients**, with **10,000–15,000 new births annually**.
Millions of blood transfusions are conducted each year, meaning even minimal failure rates translate into significant infections.

Regulatory and Ethical Dimensions

The proposed Bill seeks centralised regulation but does **not mandate NAAT testing**, perpetuating uneven safety standards.
Ethically, blood safety must prioritise **patient protection**, especially for vulnerable groups.

Way Forward

- Amend legislation to mandate NAAT testing with phased implementation.
- Establish regional NAAT laboratories.
- Public funding support under NHM.
- National transfusion safety audits and real-time surveillance systems.

23rd December 2025: Daily MCQs

MCQ 1:

With reference to elephant deaths on railway tracks in India, consider the following statements:

1. Most rail–elephant collision hotspots coincide with railway alignments laid during the colonial period.
2. Elephants are protected under Schedule I of the Wildlife Protection Act, 1972, but railway safety mitigation does not form a core mandate under Project Elephant.
3. Intrusion Detection Systems (IDS) currently provide full coverage across all identified elephant corridors in India.

Which of the statements given above is/are correct?

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

Correct Answer: A

Explanation:

- **Statement 1 is correct**: Many collision-prone rail sections follow colonial-era alignments that ignored wildlife corridors.
- **Statement 2 is correct**: Elephants are Schedule I species, but rail safety is not a central pillar of Project Elephant.
- **Statement 3 is incorrect**: IDS coverage is partial, pilot-based, and uneven—not nationwide or comprehensive.

MCQ 2:

Consider the following statements regarding Consumer Commissions in India:

1. The Consumer Protection Act, 2019 prescribes strict timelines for disposal of cases, but non-compliance attracts no direct statutory penalty.

2. The rise in pendency is partly due to the disposal rate consistently remaining below the rate of institution of new cases.
3. Consumer Commissions were constitutionally created bodies under Article 323B of the Constitution.

Which of the statements given above is/are correct?

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

Correct Answer: A

Explanation:

- **Statement 1 is correct**: Timelines exist, but enforcement mechanisms are weak.
- **Statement 2 is correct**: Data shows disposal < institution → structural backlog.
- **Statement 3 is incorrect**: Consumer Commissions are statutory bodies, not constitutional tribunals under Article 323B.

MCQ 3:

With reference to ISRO's launch of a mobile broadband satellite, consider the following:

1. The satellite aims to provide direct-to-device connectivity without the need for specialised satellite phones.
2. The mission reinforces India's heavy-lift launch capability beyond human spaceflight objectives.
3. Such satellite-based broadband systems are classified purely as civilian infrastructure with no strategic implications.

Which of the statements given above is/are correct?

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

Correct Answer: A

Explanation:

- **Statement 1 is correct**: Direct smartphone connectivity is the core feature.
- **Statement 2 is correct**: LVM3's commercial use strengthens heavy-lift credibility.
- **Statement 3 is incorrect**: Space-based broadband is increasingly seen as dual-use (civil + strategic).

MCQ 4:

Which of the following best explains why the Southern Ocean continued to absorb carbon dioxide despite increased upwelling?

A. Weakening of westerly winds reduced vertical mixing
B. Increased biological carbon sequestration by phytoplankton
C. Freshwater-driven surface stratification limiting CO_2 outgassing
D. Decline in anthropogenic emissions since the early 2000s

Correct Answer: C

Explanation:
Enhanced freshwater input from ice melt and precipitation strengthened surface stratification, trapping carbon-rich waters below the surface and preventing CO_2 release—counteracting upwelling effects.

MCQ 5: Climate Models & Southern Ocean

Consider the following statements:

1. Climate models failed because they ignored the role of freshwater stratification entirely.
2. Observational data shows that the current Southern Ocean carbon sink may weaken abruptly rather than gradually.
3. The Southern Ocean absorbs a disproportionately large share of anthropogenic CO_2 relative to its surface area.

Which of the statements given above is/are correct?

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

Correct Answer: A

Explanation:

- **Statement 1 is incorrect**: Models struggled due to scale and data constraints, not total ignorance.
- **Statement 2 is correct**: Weakening stratification risks sudden CO_2 release.
- **Statement 3 is correct**: ~25–30% area but ~40% CO_2 uptake.

MCQ 6:

With reference to tiger conservation in India, consider the following statements:

1. All India Tiger Estimation assesses only tiger population numbers.
2. Artificial pressure to increase tiger numbers may intensify human–wildlife conflict.
3. A majority of India's tiger landscapes lie outside protected areas.

Which of the statements given above is/are correct?

A. 2 and 3 only
B. 1 and 2 only

C. 3 only
D. 1, 2 and 3

Correct Answer: A

Explanation:

- **Statement 1 is incorrect**: AITE also covers prey base, habitat quality, and human pressure.
- **Statement 2 is correct**: Overstocking leads to dispersal and conflict.
- **Statement 3 is correct**: ~70% tiger landscapes lie outside reserves.

MCQ 7: Thalassaemia & Blood Safety

Which of the following correctly explains why NAAT is considered superior to ELISA in transfusion safety?

A. NAAT detects antibodies earlier than ELISA
B. NAAT eliminates the diagnostic window period entirely
C. NAAT directly detects viral genetic material, reducing window-period risk
D. NAAT is cheaper and easier to deploy than ELISA

Correct Answer: C

Explanation:
NAAT detects viral DNA/RNA directly, significantly shortening—but not eliminating—the window period, unlike ELISA which detects antibodies.

MCQ 8:

Consider the following statements regarding blood transfusion safety in India:

1. Current regulations mandate uniform NAAT testing across all public blood banks.
2. Multi-transfused patients face cumulative infection risk even if failure rates are low.
3. Preventive screening technologies can reduce long-term public health expenditure.

Which of the statements given above is/are correct?

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

Correct Answer: A

Explanation:

- **Statement 1 is incorrect**: NAAT is not uniformly mandated.
- **Statement 2 is correct**: Repeated exposure raises cumulative risk.
- **Statement 3 is correct**: Prevention is economically and ethically rational.

MCQ 9:

Which one of the following best captures a common governance challenge cutting across elephant conservation, tiger management, and climate adaptation?

A. Absence of constitutional provisions
B. Lack of scientific knowledge
C. Weak inter-sectoral coordination and anticipatory planning
D. Judicial overreach

Correct Answer: C

Explanation:
Across all themes, policies exist, science exists—but **coordination failures, silos, and reactive governance** remain the core problem.

MCQ 10:

Which of the following can be legitimately classified as a non-traditional security threat?

1. Elephant–train collisions causing derailment risks
2. Abrupt release of oceanic carbon due to climate feedbacks
3. Systemic collapse of consumer justice mechanisms

Select the correct answer using the code below:

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

Correct Answer: D

Explanation:
All three threaten **human safety, economic stability, and governance capacity** without being conventional military threats.

Mains: Human–wildlife conflict increasingly reflects governance and planning failures rather than ecological inevitability. Examine this statement with reference to elephant deaths on railway tracks in India. (10 marks | 150 words)