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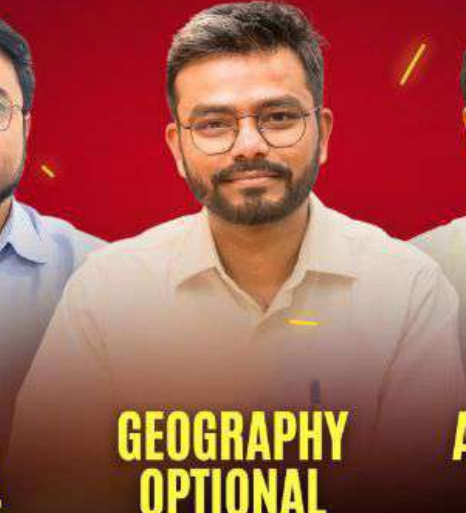
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MAINS FOCUS**1.General Studies I****1.1 AI's growing role in parenting**

Context: -

- I cannot imagine raising a newborn without ChatGPT': **OpenAI CEO Sam Altman highlights AI's growing role in parenting**

Link for the reference: - <https://indianexpress.com/article/trending/trending-globally/sam-altman-reveals-he-uses-chatgpt-for-parenting-advice-on-jimmy-fallon-the-tonight-show-10413343/>

Syllabus of Mains – GS-1- Salient features of Indian Society, Diversity of India, Effects of Globalization on Indian society.

Significance of Artificial Intelligence in Parenting

Personalised Support:

- AI provides advice that is **adapted to a child's age, growth stage, and individual needs**, helping parents respond better to developmental differences.

Lower Parenting Stress:

- Instant access to **reliable, research-based information reduces anxiety, especially for new** parents.
- For instance, surveys in the U.S. indicate that a large number of first-time parents depend on digital platforms for quick answers related to infant care.

Improved Access to Expert Advice:

- AI helps **families who have limited access to paediatricians by making professional** guidance more widely available.
- In India, the use of online medical consultations in rural areas increased significantly after the COVID-19 pandemic.

Support for First-Time Parents:

- AI-based **tools assist new parents in managing daily routines** such as feeding patterns, sleep schedules, and basic childcare practices. Globally, a substantial share of urban parents now use AI-powered parenting applications.

Encouraging Early Childhood Learning:

- AI-driven educational tools like **interactive stories and customised activities** help stimulate children's thinking skills and early learning development.

Concerns Associated with AI Parenting

- **Privacy Risks:** Children's sensitive data vulnerable to profiling, E.g., global studies show 70% parenting apps track behaviour, breaching the privacy.
- **Cultural Bias:** Algorithms may mirror Western parenting norms that are not aligned with Indian contexts.
- **Equity Divide:** Digital literacy gaps can worsen inequality in access to safe AI tools. E.g., UNESCO reports that ~2.6 billion people worldwide lack internet access (2023).

- **Accuracy Gaps:** AI may offer generic or unsafe medical advice without context, E.g., **MIT audit found 30% AI parenting answers lacked nuance.**
- **Over-Reliance:** Parents risk substituting judgment with AI recommendations.
- **Erosion of critical thinking:** By creating dependency on AI. E.g. creation of thought filter bubbles (content suggestion), limit children's self-expression.
- **Social isolation:** Due to reducing face-to-face bonding time, potentially impeding emotional regulation and empathy development.

Way Forward: -

- **Data Protection:** Enforce strong safeguards under Digital Personal Data Protection (DPDP) rules; E.g. ban behavioural profiling of minors.
- **Local Adaptation:** Train AI on Indian parenting norms, languages and paediatric protocols to remove the cultural bias towards Western style.
- **Medical Integration:** Enable AI tools to be vetted with Indian Academy of Paediatrics (IAP) inputs, ensuring evidence-based advice.
- **Clear Standards:** Define safety, medical accuracy, and age-appropriate AI guidelines; modelled on EU AI Act child-safety norms.
- **Parental Oversight:** Co-use frameworks where AI supports but never replaces human judgment.

Conclusion:

- AI tools offer benefits to both parents and children; however, they also pose risks and may create dependency that weakens essential skills. Hence, they should be used only as enablers that enhance the parent-child relationship, never replace it.
- From a **sociological perspective, Anthony Giddens' concept of the "reflexive modern society"** is relevant in **understanding the role of AI in parenting**. Giddens argues that individuals increasingly rely on expert systems to make everyday life decisions. AI in parenting reflects this shift, as parents use digital tools to guide childcare practices in a complex and fast-changing world. **While AI can reduce stress, improve access to knowledge, and support early learning, it should complement—not replace—human care, emotional bonding, and social values.** Therefore, the responsible use of AI can strengthen parenting practices while preserving the social foundations of family life.

Question for Practice:

- Technology is reshaping the institution of family in contemporary society. Critically evaluate the above statement

2.General Studies II

2.1 PM Modi's Visit to Jordan

Context:

- Prime Minister Narendra Modi **visited Jordan as the first leg of a three-nation tour to strengthen ties** with West Asia. This marked the **first bilateral visit to Jordan in 37 years**, coinciding with 75 years of diplomatic relations since 1950.

Link for the reference: - <https://www.pib.gov.in/PressReleaseDetail.aspx?PRID=2204507®=6&lang=1>

Syllabus of Mains – GS-2- Bilateral, Regional and Global Groupings and Agreements involving India and/or affecting India's interests.

About Jordan: -

- Jordan is a **parliamentary constitutional monarchy** in the Middle East bordering Syria, Iraq, Saudi Arabia, Israel, & the West Bank. The Dead Sea, the world's lowest land point, lies at its western border.
- Despite regional instability, Jordan has **emerged as a moderate, stable, and peace-oriented actor**, making it a valuable partner for India.



Key Outcomes of PM Modi's Visit: -

Economic and Trade Cooperation

- Both sides set an ambitious target to nearly double bilateral trade to USD 5 billion within five years.
- India is currently Jordan's 4th largest trading partner, with bilateral trade at USD 2.875 billion in 2023–24.
- Trade remains skewed in Jordan's favour due to its exports of phosphates and potash, critical for India's fertiliser security.

Fertiliser and Resource Security

- The Jordan India Fertiliser Company (JIFCO) plays a vital role by producing phosphoric acid in Jordan for export to India, strengthening India's agricultural input supply chain and reducing import vulnerability.

Digital Public Infrastructure

- India agreed to share India Stack solutions to support Jordan's digital transformation.
- This reflects India's rising profile as a provider of Digital Public Goods (DPGs), reinforcing South-South cooperation.

Water and Renewable Energy Cooperation

- Collaboration in water conservation, rainwater harvesting, and renewable energy was agreed upon.
- This is especially relevant as Jordan is one of the most water-scarce countries in the world, while India has scalable low-cost solutions.

Cultural and People-to-People Ties

- A twinning agreement between Petra (Jordan) and Ellora Caves (India) was signed.
- Petra, the "Rose City," is a UNESCO World Heritage Site and one of the New Seven Wonders of the World, known for its rock-cut architecture and advanced water management.
- The agreement aims to boost tourism, cultural exchange, and academic collaboration.

Strategic and Security Convergence

- India **reaffirmed support for Jordan's Aqaba Process**, which focuses on counter-radicalisation and counter-terrorism.
- Jordan reiterated its **support for India's permanent membership of the UN Security Council**, reflecting growing political trust.
- Cooperation in counterterrorism aligns with **India's broader objective** of ensuring regional stability in West Asia, crucial for energy security and diaspora welfare.

Significance for India's West Asia Policy: -

Multi-alignment in Action:

- The visit **underscores India's ability to maintain balanced relations across West Asia**, engaging with Israel, Gulf states, Iran, and Arab monarchies simultaneously.

Economic and Resource Security:

- Strengthening ties with Jordan ensures **reliable access to fertiliser inputs**, critical for India's food security.

Soft Power and Development Diplomacy:

- Sharing India Stack and cultural linkages highlights **India's shift from aid-based diplomacy to capacity-building** partnerships.

Counter-terrorism Cooperation:

- Joint efforts **against radicalisation enhance India's internal and external** security interests.

Multilateral and Global Governance Support:

- Jordan's backing of India's permanent UNSC membership strengthens India's case for UN reforms and highlights shared commitment to rule-based international order.

Enhancing India's Image as a Responsible Global Actor:

- Cooperation in peace, sustainability, and development projects reflects India's identity as a responsible stakeholder committed to regional peace rather than power politics.

Gateway to the Levant and Mediterranean Region:

- Jordan's geographic location makes it a strategic gateway to the Levant and Mediterranean region, opening future opportunities for trade connectivity and regional cooperation.

Conclusion:

- PM Modi's visit to Jordan **represents a qualitative upgrade in India-Jordan relations**, moving beyond traditional political ties to a **comprehensive partnership encompassing** trade, technology, sustainability, and security.
- As India deepens its **engagement with West Asia, partnerships with stable and moderate actors like Jordan will play a crucial role in advancing India's strategic**, economic, and normative interests on the global stage.
- PM Modi's visit to Jordan strengthens **India's strategic footprint in West Asia** by integrating economic security, digital diplomacy, counter-terrorism cooperation, and civilisational outreach.

Question for Practice:

- India's engagement with West Asia has undergone a qualitative transformation in recent years. Examine this statement with reference to India-Jordan relations. (150W-10M)

3. General Studies III

3.1 Methane emission In India

Context:

- **Global Methane Status Report warns** India, the world's third-largest methane emitter of increasing agricultural emissions and missing policy action as global levels continue to climb.
- **Link for the reference:** <https://www.unep.org/resources/report/global-methane-status-report-2025>

Syllabus of Mains – GS-3- Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment.

Findings of the report:

- **Emissions are rising, but the outlook is improving:** Current emissions are still increasing, but new waste regulations in Europe and North America and slower growth in natural gas markets between 2020 and 2024 have lowered current projected levels and are expected to reduce further by 2030.
- **National action has the potential to deliver historic progress:** Nationally Determined Contributions (NDCs) and national Methane Action Plans could translate into an **8% cut by 2030 below 2020 levels**.
- **Meeting the 2030 Global Methane Pledge target requires raising ambition quickly:** Yet, to reduce emissions **30% by 2030, below 2020 levels**, full implementation of maximum technically feasible reductions globally is needed.
- **Solutions are ready and cost-effective:** Proven measures across emitting sectors need to be scaled up, such as leak detection and repair programmes, plugging of abandoned wells in the oil and gas sector, water management measures for rice cultivation, or source separation and treatment of organic waste in the agriculture and waste sector.
- **Benefits far outweigh the costs:** Full implementation of these technically feasible reductions globally could prevent over **180,000 premature deaths and 19 million tonnes of crop losses each year by 2030**. All fossil fuel mitigation could be deployed at just 2% of the sector's 2023 income.
- **Major economies and better data are key:** Seventy-two percent of global methane mitigation potential lies in G20+ countries, where emissions could fall by 36% by 2030 compared to 2020 levels. **Stronger measurement, reporting, and finance are essential to track progress, target major sources, and close the investment gap.**

Methane emission In India-

A) Agriculture (Largest Source)

- **Livestock & Enteric Fermentation:** Methane is released during enteric fermentation, a digestive process in ruminants like cattle and buffalo. Estimates suggest this is a significant portion of India's methane footprint within agriculture.
- **Rice Cultivation:** Water-logged paddy fields create **anaerobic soil conditions**, which favour methane production during decomposition. Given India's large rice acreage, rice paddies are a major methane source and are projected to rise by about 8% by 2030 if current practices continue.
- **Crop-Residue Burning:** Seasonal stubble burning in northern states has become a growing methane source and is flagged as a key driver elevating India's methane emission above global average.

Note: The Global Methane Status Report also notes that **Indian agriculture contributes 12% of global agricultural methane** emissions, one of the highest shares in the world.

B) Energy Sector: Methane is emitted during **fossil fuel extraction, processing and combustion, including coal mining, oil & gas losses/leaks and biomass energy use**. While the energy sector emits less methane than agriculture in India, it remains a notable source.

C) Waste Sector: Methane arises from the anaerobic decomposition of organic waste in landfills and wastewater and open burning of waste. Methane from waste burning in India increased to a higher growth rate than the global average.

D) Natural Sources: Natural wetlands also emit methane; however, in India the human (anthropogenic) sources dominate the national methane profile

Why Methane Emissions Significantly Impact Climate Change?

- **Very High Global Warming Potential (GWP):** Methane traps far more heat per molecule than carbon dioxide. Over a 20-year period, methane is around 80 times more potent than CO₂. Over 100 years, it is still about 28–34 times stronger than CO₂.
- **Major Contributor to Near-Term Global Warming:** Methane has a short atmospheric lifetime. However, during this period it contributes almost half of the current rate of global warming.
- **Formation of Ground-Level Ozone (Tropospheric Ozone):** Methane reacts with other gases in the atmosphere to form ground-level ozone, a potent greenhouse gas and air pollutant. It reduces the ability of vegetation to absorb CO₂, weakening natural carbon sinks.
- **Positive Feedback Loops in the Climate System:** Methane plays a critical role in climate feedback mechanisms:
 - (a) **Permafrost Thaw:** Rising temperatures thaw Arctic permafrost, releasing large stores of trapped methane. This methane causes further warming → self-reinforcing cycle.
 - (b) **Wetland Expansion:** Warmer and wetter conditions increase methane emissions from natural wetlands.
- **Interaction with Cryosphere (Ice & Snow):** Methane-induced warming accelerates such as Glacier retreat, Polar ice melt. This reduces the Earth's albedo (reflectivity), causing more solar heat absorption.

Reasons for Gaps in India's Methane Inventory

- **Over-Reliance on Emission Factors Instead of Direct Measurement:** India largely follows IPCC Tier-1 or Tier-2 methodologies, such as Use global or regional emission factors. Multiply them with activity data (livestock numbers, rice area, waste volume).
- **Limited Use of Ground-Based and Satellite Monitoring:** Advanced methane inventories in developed countries rely on:
 - Continuous ground sensors
 - Aircraft-based measurement
 - High-resolution satellite data
- **Agriculture-Dominated Emissions Are Difficult to Measure:** India has the world's largest livestock population, predominantly smallholder and informal farms. Issues related to no centralized data on feed quality, animal productivity, manure management practices.
- **Energy Sector Data Gaps (Coal, Oil & Gas):** Methane leaks occur during Coal mining, Oil and gas extraction, Transmission and distribution.
- **Institutional Fragmentation and Weak Coordination:** Methane data is scattered across various organisations such as Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Agriculture, Ministry of Petroleum & Natural Gas. So, no single nodal agency for methane inventory and weak inter-ministerial data sharing.

Way forward:

- **Strengthening Policy and Governance Frameworks:** Integrate methane mitigation targets within India's Long-Term Low Emission Development Strategy and NDCs. Develop a National Methane Action Plan with sector-wise reduction pathways (agriculture, waste, energy).
- **Sustainable Agricultural Practices:** Promote climate-smart agriculture:
 - Alternate Wetting and Drying (AWD) in paddy cultivation.
 - Direct Seeded Rice (DSR) to reduce anaerobic conditions.
 - Encourage diet diversification and improved livestock feed to reduce enteric fermentation.
 - Support biogas and gobar-dhan schemes to convert cattle waste into energy.

- **Waste Management and Circular Economy:** Scale up scientific landfill management, including methane capture and flaring. Promote waste segregation at source and composting to reduce organic waste in landfills.
- **Cleaner Energy and Industrial Interventions:** Plug methane leaks in oil, gas and coal mining operations through Leak Detection and Repair (LDAR) technologies. Incentivize the use of renewables and green hydrogen to reduce fossil fuel dependence.
- **Technology, Innovation and Finance:** Invest in indigenous R&D for methane capture, utilization and monitoring technologies. Use carbon markets and climate finance to fund methane reduction projects.
- **International Cooperation:** Actively engage in global initiatives like the Global Methane Pledge, while ensuring equity and CBDR principles. Facilitate technology transfer and climate finance from developed countries.
- **Awareness and Capacity Building:** Conduct farmer and local body training programs on methane-reducing practices. Increase public awareness about the co-benefits of methane reduction such as improved air quality and energy security.

Conclusion:

- As the Hon'ble Prime Minister Shri Narendra Modi has emphasized, "Climate change is not just an environmental issue, it is a moral duty". Addressing methane emissions—one of the most potent drivers of short-term warming—offers India a strategic opportunity to align climate responsibility with developmental priorities.
- Methane is over 80 times more potent than carbon dioxide over a 20-year period, making its reduction a critical lever for slowing near-term global warming. Targeted action on methane emissions can help achieve rapid climate gains, complement long-term decarbonisation efforts, and strengthen India's leadership in climate action.

Mains question for practice:

- Short-lived climate pollutants like methane pose both a challenge and an opportunity for India's climate commitments. Examine in the context of India's developmental priorities. (15 Marks, 250 words)

3.2 India's Biosecurity Framework

Context:

- On the occasion of 50 years of the Biological Weapons Convention (BWC), External Affairs Minister S. Jaishankar highlighted the need to strengthen biosecurity, especially for the Global South.
- **Link For reference:** <https://www.thehindu.com/sci-tech/science/does-india-need-to-upgrade-its-biosecurity-measures-explained/article70400364.ece>

Syllabus of Mains –Science and Technology: Developments in biotechnology and their applications

What is Biosecurity?

- Biosecurity refers to the set of policies, practices, and institutional mechanisms aimed at preventing the intentional misuse of biological agents, toxins, or biotechnologies.
- It includes securing laboratories handling dangerous pathogens, regulating dual-use research, and controlling access to sensitive biological materials.
- Biosecurity also involves early detection, surveillance, and rapid containment of deliberate biological outbreaks.
- Its scope extends beyond human health to animal, plant, and agricultural health, reflecting the **One Health approach**.
- **Biosecurity is distinct from biosafety**, which focuses on preventing accidental release of pathogens, though strong biosafety systems are foundational to effective biosecurity.

Biological Weapons Convention (BWC)

- An international disarmament treaty that **prohibits biological and toxin weapons**.
- Formally known as the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction.
- **Opened for signature:** 1972
- **Entered into force:** 1975
- Depositary governments: United States, United Kingdom, and Russia.
- Aims to eliminate an entire category of weapons of mass destruction (WMDs).
- Prohibits development, production, acquisition, stockpiling, transfer, and use of biological and toxin weapons.
- Allows use of biological agents for peaceful purposes such as medicine, research, and agriculture.
- Lacks a formal verification mechanism, relying on confidence-building measures (CBMs).
- Review Conferences are held every five years to assess implementation.
- India and BWC
- India is a signatory and State Party to the BWC.
- Supports universalisation and strengthening of the convention.

Why Biosecurity is Increasingly Critical for India

- **Large and Dense Population:** High population density amplifies the impact of biological incidents, increasing the risk of rapid transmission and large-scale public health crises.
- **Agriculture-Dependent Economy:** A significant proportion of livelihoods depend on agriculture and allied activities, making India vulnerable to agro-terrorism and livestock disease outbreaks that can threaten food security.
- **Geographical and Ecological Diversity:** India's long land borders, extensive coastline, and diverse ecosystems heighten exposure to transboundary biological threats affecting humans, animals, and plants.
- **Emergence of Non-State Actors:** Instances such as the alleged preparation of toxins like ricin highlight how terrorist groups and lone actors may exploit biological agents due to their low cost and high impact.
- **Rapid Spread of Biotechnology:** Advances in synthetic biology, gene editing, and recombinant DNA research have lowered entry barriers, increasing the risk of dual-use research being misused.
- **Public Health System Constraints:** Variations in disease surveillance and response capacity across States can weaken early detection and coordinated containment of biological threats.
- **Global Interconnectedness:** Increased international travel, trade, and supply chains enhance exposure to cross-border bio-risks, reinforcing the need for robust biosecurity preparedness.

India's Existing Biosecurity Architecture

- **Institutional Mechanisms**
 - **Department of Biotechnology (DBT):** Oversees research governance, laboratory safety standards, and biosafety compliance in biological research institutions.
 - **National Centre for Disease Control (NCDC):** Responsible for disease surveillance, epidemic intelligence, and coordination of outbreak response.
 - **Department of Animal Husbandry and Dairying:** Monitors livestock health, zoonotic diseases, and transboundary animal disease risks.
 - **Plant Quarantine Organisation of India (PQOI):** Regulates import and export of plants and agricultural materials to prevent invasive pests and pathogens.
 - **National Disaster Management Authority (NDMA):** Issues guidelines for preparedness and management of biological disasters, including pandemics.
- **Legal and Regulatory Framework**
 - **Environment (Protection) Act, 1986:** Regulates hazardous microorganisms, genetically engineered organisms, and environmental safety.
 - **Biosafety Rules, 1989:** Provide procedures for handling, research, and approval of genetically modified organisms.

- **Recombinant DNA Research and Biocontainment Guidelines, 2017:** Set standards for containment, risk assessment, and safe conduct of advanced biological research.
- **Weapons of Mass Destruction and their Delivery Systems Act, 2005:** Criminalises the development, possession, or transfer of biological weapons.
- **International Engagement**
 - **Biological Weapons Convention (BWC):** India is a signatory, committing to prohibition and non-proliferation of biological weapons.
 - **Australia Group:** Participation in export control regimes to prevent diversion of dual-use biological materials.

Gaps and Challenges in India's Biosecurity Preparedness

- **Absence of a Unified National Biosecurity Framework:** Biosecurity responsibilities are fragmented across multiple ministries and agencies, leading to coordination gaps and overlapping mandates.
- **Outdated Regulatory Architecture:** Several laws and guidelines were framed before the advent of advanced biotechnologies such as synthetic biology, gene drives, and AI-enabled bioengineering.
- **Weak Inter-Agency Coordination:** Limited real-time information sharing between health, agriculture, defence, and intelligence agencies hampers integrated threat assessment and response.
- **Inadequate Surveillance and Response Capacity:** While detection mechanisms have improved, response readiness, rapid deployment, and containment capabilities remain uneven across States.
- **Laboratory Oversight Challenges:** Variations in biosafety and biosecurity standards across public and private laboratories increase risks of misuse or leakage.
- **Limited Focus on Non-State Actor Threats:** Existing frameworks are primarily state-centric and insufficiently tailored to address bioterrorism and lone-actor risks.
- **Human Resource and Skill Gaps:** Shortage of trained personnel in microbial forensics, biodefence technologies, and bio-risk assessment constrains preparedness.
- **Global Health Security Concerns:** India's relatively low ranking in the Global Health Security Index reflects declining capacity to effectively respond to biological threats despite improved detection.

Global Best Practices: Comparative Insights

- **United States:** Operates an integrated National Biodefense Strategy (2022–2028) that aligns public health, defence, intelligence, and biotechnology governance. Mandatory screening of synthetic DNA orders helps prevent misuse of gene synthesis technologies.
- **European Union:** Follows a One Health-based biosecurity framework, integrating human, animal, and environmental health through the EU Health Security Framework, with strict oversight of dual-use research under Horizon Europe.
- **China:** Enforces a comprehensive Biosecurity Law (2021) that treats biotechnology, pathogen research, and genetic data as matters of national security, mandating centralised control and strict compliance.
- **Australia:** Implements a unified Biosecurity Act (2015) covering human, animal, and plant health, with recent extensions to regulate risks from synthetic biology and emerging biotechnologies.
- **United Kingdom:** Adopts a Biological Security Strategy (2023) focused on advanced biosurveillance, early-warning systems, and rapid response capabilities against deliberate biological threats.

Conclusion

- As External Affairs Minister S. Jaishankar highlighted the need to strengthen biosecurity, particularly for the Global South, India must move towards a coordinated and future-ready biosecurity framework. Such an approach will be crucial to safeguard public health, food security, and national resilience in an increasingly uncertain biological landscape.

Mains practice question:

- In the context of rapid advances in biotechnology, critically examine the need to strengthen India's biosecurity framework. (10 M, 150 Words)

PRAYAAS Shorts- UPSC & MPSC

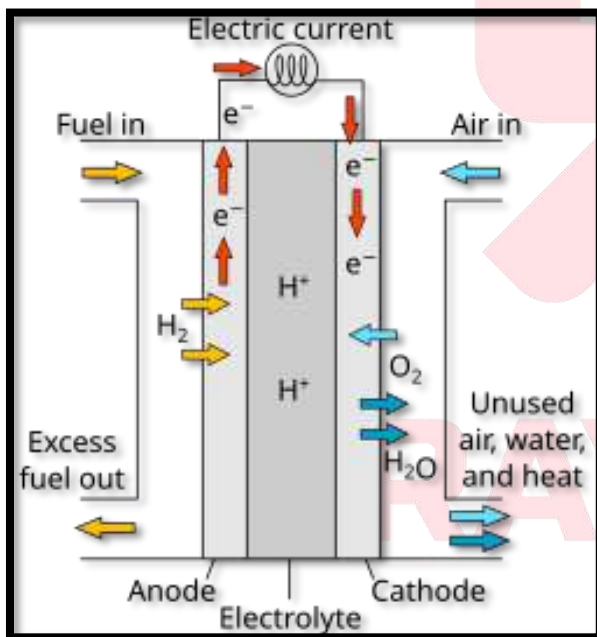
1. Hydrogen-Powered Passenger Vessel on Ganga

Context

- India recently flagged off its first fully indigenous hydrogen fuel cell-powered passenger vessel at Namo Ghat, Varanasi, marking a push towards net-zero inland waterways.

About

- Indigenously designed and developed, showcasing domestic clean-energy capability.
- Uses Hydrogen Fuel Cell propulsion, resulting in zero carbon emissions.
- Operates on a Low-Temperature **Proton Exchange Membrane (PEM) fuel cell system**.



1.1 Proton Exchange Membrane (PEM) fuel cell system.

- PEM fuel cell generates electricity through electrochemical reaction, not combustion, between hydrogen (anode) and oxygen (cathode).
- The polymer electrolyte membrane conducts protons only, forcing electrons through an external circuit to produce power.
- Operates at low temperature (60–80°C) with high power density and fast start-up.

- Uses platinum-based catalysts and requires high-purity hydrogen to avoid catalyst poisoning.
- Produces water as the only emission, making it suitable for fuel-cell electric vehicles (FCEVs) and space applications.

2. Project Suncatcher: Data Centres in Space

Context

- Google recently announced Project Suncatcher, a long-term research initiative to explore solar-powered data centres in space.

About Project Suncatcher

- A research initiative by Google to deploy data-centre-like computing infrastructure in space by 2027.
- Involves launching small satellite-based computing racks as an initial learning mission.
- Implemented in partnership with Planet Labs, an Earth-imaging company.
- Two prototype satellites planned to be launched by early 2027.
- Uses solar-powered satellite constellations equipped with:
 - Tensor Processing Units (TPUs)** for large-scale AI and machine learning computation.
 - Optical (laser) links to enable high-speed inter-satellite communication.
- Aims to create data-centre-level computation networks in space.
- Google claims its chips have been tested for radiation tolerance and can operate in harsh space conditions.

2.1 Tensor Operations

- Tensor operations are mathematical computations on tensors, which are multi-dimensional arrays of data.
- Common operations include matrix multiplication, addition, convolution, and reduction.
- They form the core computations in machine learning and deep learning algorithms.

- Widely used in neural networks, image processing, and natural language processing.

3. International Fund for Agricultural Development (IFAD)

Context

- The Government of India recently highlighted its achievements in rural transformation and development at the **IFAD-India Day** event held in Rome.

About IFAD

- A specialised agency of the United Nations dedicated to rural poverty reduction.
- Established in 1977 following the **World Food Conference (1974)**.
- **Headquarters:** Rome, Italy.
- Focuses on improving food security, nutrition, and incomes of rural poor, especially small farmers and women.
- Provides low-interest loans, grants, and technical assistance to developing countries.
- Works in areas such as agriculture, rural livelihoods, climate-resilient farming, women's empowerment, and community-led development.
- Member states include both developed and developing countries.
- India is a founding member and one of the major beneficiaries and contributors.

4. Fentanyl

Context

- Recently US President Donald Trump stated that fentanyl should be treated as a "weapon of mass destruction", accusing US adversaries of facilitating its trafficking into the country.

About Fentanyl

- A synthetic opioid that is 50 times stronger than heroin and 100 times stronger than morphine.
- Primarily used in medical settings for pain management and anesthesia.
- Illicitly manufactured fentanyl is a major contributor to the opioid overdose crisis.
- Even small doses can be fatal, making it highly dangerous when misused.

Why it is a Major Security and Health Concern

- Leading cause of drug overdose deaths in the United States.
- Often mixed with other drugs (heroin, cocaine) without user knowledge, increasing fatality risk.
- Easy to manufacture, transport, and conceal due to high potency and small volume.
- Considered a non-traditional security threat, blurring lines between public health and national security.

5.Supernova

Context

- NASA's James Webb Space Telescope (JWST) has recently observed one of the earliest recorded supernovae, offering insights into the early universe.

About Supernova

- A supernova is a powerful stellar explosion marking the death of a massive star or a white dwarf.
- It occurs due to core collapse of a massive star or thermonuclear explosion of a white dwarf (Type Ia).
- Produces heavy elements like iron, gold, and uranium through nucleosynthesis.
- Releases enormous energy, briefly outshining entire galaxies.
- Leaves behind neutron stars or black holes as remnants.

About James Webb Space Telescope

- A joint mission of NASA, European Space Agency (ESA), and Canadian Space Agency (CSA).
- Designed to study the early universe, star formation, and exoplanets.
- Operates mainly in the infrared spectrum.
- Orbits the Sun near the second Lagrange point (L2).

Lagrange points

- Lagrange points are five positions (L1-L5) in a two-body system where gravitational and centrifugal forces balance.
- An object placed at these points can maintain a stable or semi-stable position relative to the two bodies.
- L1, L2, and L3 are unstable, while L4 and L5 are stable equilibrium points.

- Widely used for space observatories and satellites (e.g., James Webb Space Telescope at Sun–Earth L2).
- Reduce fuel requirement for station-keeping in space missions.

6. National Film Heritage Mission

Context

- The Government of India recently informed the Lok Sabha about the progress of the National Film Heritage Mission, under which large-scale digitisation of old Indian films is being undertaken.

About National Film Heritage Mission

- A Government of India initiative aimed at preserving and digitising India's cinematic heritage.
- It was launched in 2015 by the Ministry of Information and Broadcasting for restoring and preserving the film heritage of India.
- Focuses on restoration of old, rare, and historically significant films.
- Covers feature films, short films, and documentaries across Indian languages.
- 1,469 film titles have been digitised so far. Digitised and restored films are preserved and maintained by the National Film Archives of India (NFAI).
- Supports filmmakers across all Indian languages, including regional cinema such as Bengali films.

7. Pax Silica Initiative

Context

- India was recently left out of the US-led critical mineral diversification plan known as the Pax Silica Initiative.

About Pax Silica Initiative

- A US-led strategic initiative focused on building a secure, resilient, and innovation-driven silicon supply chain.
- Covers the entire value chain—from critical minerals and energy inputs to advanced manufacturing, semiconductors, AI infrastructure, and logistics.
- Aims to reduce strategic dependencies, especially on concentrated or adversarial supply chains.

- Seeks to enable like-minded and aligned nations to jointly develop and deploy transformative technologies at scale.
- Part of broader US efforts to strengthen tech and supply-chain security in emerging and critical technologies.
- **Member Countries:** Japan, Republic of Korea (South Korea), Singapore, Netherlands, United Kingdom, Israel, United Arab Emirates, Australia.

8. Ponduru Khadi

Context

- Ponduru Khadi was recently granted the Geographical Indication (GI) tag by the Geographical Indications Registry under the Ministry of Commerce and Industry.

About Ponduru Khadi

- A traditional hand-spun and handwoven khadi fabric from Ponduru region of Srikakulam district, Andhra Pradesh.
- Known for its exceptional fineness, softness, and durability.
- Made using locally grown indigenous cotton varieties.
- Yarn is spun manually using a traditional wooden charkha (Ratnam), unique to the region.
- Weaving is done entirely by hand, preserving centuries-old artisanal techniques.
- Production involves rice starch (ganji) for strengthening yarn, giving the fabric its distinctive texture.
- Considered one of the finest khadi fabrics in India.

9. Operation Thunder 2025

Context

- Under Operation Thunder 2025, authorities recently seized around 30,000 live animals as part of a global crackdown on wildlife trafficking.

World Customs Organization (WCO)

- World Customs Organization (WCO) is an intergovernmental body established in 1952 (as the Customs Cooperation Council).
- Headquartered in Brussels, Belgium, it works to enhance effectiveness of customs administrations worldwide.
- Develops global standards like the Harmonized System (HS) of commodity classification.
- Focuses on trade facilitation, supply-chain security, and combating illicit trade.
- Has 180+ member countries, including India.

About Operation Thunder

- A global law-enforcement operation targeting illegal wildlife and forestry trade.
- **Coordinated by:**
 - INTERPOL
 - World Customs Organization (WCO)
- Conducted with support from the International Consortium on Combating Wildlife and Forestry Crime (ICWC).
- Aimed to intercept and seize illegally traded wildlife and forest products across the entire global supply chain.
- Focused on identifying, disrupting, and dismantling organised criminal networks involved in environmental crimes.
- Addresses transnational threats such as biodiversity loss, species extinction, and illegal resource exploitation.

10. Lunarcrete

Context

- Scientists are recently exploring Lunarcrete as a construction material to support long-term human settlements on the Moon.

About Lunarcrete

- A hypothetical construction material made primarily from lunar regolith (moon soil).
- Designed to function like concrete for building lunar habitats and infrastructure.

- Objective is to reduce the cost of transporting construction materials from Earth.
- Tailored for the Moon's low gravity and airless (no atmosphere) environment.
- Proposed basic components are similar to conventional concrete:
 - Aggregate (lunar regolith)
 - Cement-like binder
 - Water
- Major challenge lies in the scarcity of water on the Moon, making large-scale production difficult.
- Considered crucial for future lunar bases, landing pads, and radiation-shielded habitats.

11. Jordan

Context

- The Prime Minister of India recently embarked on an official visit to Jordan, highlighting India's growing engagement with West Asia.

About Jordan



- **Official name:** Hashemite Kingdom of Jordan.
- Capital: Amman.
- Located in West Asia (Middle East).
- Bordered by Israel and the West Bank (west), Saudi Arabia (south and east), Iraq (north-east), and Syria (north).
- Has a narrow coastline along the Gulf of Aqaba, providing access to the Red Sea.

12. Central Information Commission (CIC)

Context

- Raj Goyal recently assumed charge as the Chief Information Commissioner of India.

About CIC

- A statutory body established under the Right to Information Act, 2005.

- Ensures transparency and accountability in the functioning of public authorities.
- Headed by a Chief Information Commissioner and can have up to 10 Information Commissioners.
- **Functions include:**
 - Receiving and inquiring into complaints related to denial or misuse of information under the RTI Act.
 - Hearing appeals against decisions of public information officers.
 - Ordering disclosure of information and imposing penalties where applicable.
- **Appointment:**
 - CIC and ICs are appointed by the President of India.
 - On the recommendation of a committee consisting of:
 - Prime Minister (Chairperson)
 - Leader of Opposition in the Lok Sabha
 - Union Cabinet Minister nominated by the Prime Minister.
- **RTI (Amendment) Act, 2019:** Empowered the Central Government to determine the tenure, salary, allowances, and service conditions of the CIC and ICs.

13. DHRUV64

Context

- India recently launched DHRUV64, marking a major milestone in the country's push for indigenous microprocessor development.

About DHRUV64

- India's first fully indigenous 1.0 GHz, 64-bit, dual-core microprocessor.
- Designed to power modern electronic systems such as computers, mobile devices, and embedded platforms.
- Developed by the Centre for Development of Advanced Computing (C-DAC).
- Part of the **Microprocessor Development Programme (MDP)** under the Government of India.
- Strengthens India's capabilities in trusted hardware, electronics manufacturing, and strategic technologies.
- **Other Indigenous Indian Microprocessors**

- SHAKTI – developed by IIT Madras (2018).
- AJIT – developed by IIT Bombay (2018).
- VIKRAM – developed by ISRO–Semiconductor Laboratory (SCL) (2025).
- THEJAS64 – developed by C-DAC (2025).

14. Nitrofurans

Context

- The Food Safety and Standards Authority of India (FSSAI) recently directed its regional offices to collect egg samples for testing the presence of nitrofurans residues.

About Nitrofurans

- A group of synthetic broad-spectrum antibiotics.
- Commonly used in the past in veterinary medicine to treat bacterial infections in poultry and livestock.
- Known for their antimicrobial properties, effective against a wide range of bacteria.
- Banned or restricted in many countries, including India, due to health risks.
- Nitrofurans can leave residues in animal-derived food products such as eggs, meat, and milk.
- Associated health concerns include carcinogenicity, genotoxic effects, and antimicrobial resistance.
- Under food safety regulations, presence of nitrofurans residues in food is not permitted.

15. Champions of the Earth Award 2025

Context

- Supriya Sahu was recently awarded the 2025 Champions of the Earth Award at UNEA-7 in Nairobi.

About Champions of the Earth Award

- Highest environmental honour of the United Nations Environment Programme (UNEP).
- Instituted in 2005.
- Recognises transformative environmental leadership and impactful actions.
- Awarded to leaders from government, civil society, and the private sector whose work brings systemic environmental change.
- Presented annually across multiple categories.

PRAYAAS Shorts- MPSC Specific

1. Khelo India University Games 2025

Context

- The 5th edition of the Khelo India University Games (KIUG) was held for the first time in Rajasthan, showcasing competitive university-level sports across multiple cities.

About

- Top 3 Universities (Overall Ranking):
 - Chandigarh University** – 67 medals
 - Lovely Professional University (LPU)** – 78 medals
 - Guru Nanak Dev University** – 72 medals
- LPU won the highest number of total medals (78) but finished second due to a lower gold medal count compared to Chandigarh University.
- Other Notable Performance:** Savitribai Phule Pune University secured 8th position with 38 medals.

2. Raveena Tandon Honoured as PETA India 'Person of the Year 2025'

- Actor and animal rights advocate Raveena Tandon was recognised by PETA India for her sustained contributions towards the protection and ethical treatment of animals.
- Other PETA India Awards 2025:
 - Priyanka Kolwekar:** Volunteer of the Year Award
 - Kolkata:** Declared as the Most Vegan-Friendly City

3. TIME Magazine 'Person of the Year 2025'

- TIME magazine has named "The Architects of AI" as its Person of the Year 2025, recognising individuals shaping artificial intelligence at the intersection of technology, society, and power.
- Among those honoured are two Indian-American figures, Karandeep Anand and Sriram Krishnan, whose work reflects how AI is

simultaneously transforming personal lives and global geopolitics.

- TIME Person of the Year (2020–2024):
 - 2024:** Donald Trump
 - 2023:** Taylor Swift
 - 2022:** Volodymyr Zelensky and the Spirit of Ukraine
 - 2021:** Elon Musk
 - 2020:** Joe Biden and Kamala Harris

4. Golden Globe Horizon Award

- Alia Bhatt was recently conferred the Golden Globe Horizon Award at the Red Sea International Film Festival held in Saudi Arabia.
- The Golden Globe Horizon Award recognises artists for their outstanding contribution to international cinema, global cultural impact, and efforts to promote diverse and women-centric narratives.
- Alia Bhatt was honoured for her international cinematic presence, global influence, and role in amplifying women's stories in cinema.

5. Shivraj Vishwanath Patil (Former Union Home Minister)

Context

- Former Union Home Minister Shivraj Vishwanath Patil recently passed away on 12 December 2025 at the age of 91 years.

About Shivraj Vishwanath Patil

- Born:** Chakur, Latur district, Maharashtra.
- Began his political career from Latur Municipal Council, serving as Mayor of Latur.
- Served as Speaker of the Maharashtra Legislative Assembly from 1978 to 1979.
- Elected as Member of Parliament (Lok Sabha) from Latur constituency for seven consecutive terms (1980–2004).
- Served as the 10th Speaker of the Lok Sabha from 1991 to 1996.
- Held key Union Cabinet portfolios between 2004 and 2008, including:
 - Minister of Home Affairs
 - Minister of Defence
 - Minister of Science and Technology

- Resigned from the post of Union Home Minister in 2007 following the Mumbai terror attacks.
- Served as the Governor of Punjab from 2010 to 2015.

6. Sangeeta Barooah Pisharoty was recently elected as the first woman President of the Press Club of India (PCI).

- In its 68-year history, PCI elected a woman President for the first time.
- She secured a clean sweep, winning all 21 out of 21 seats contested.
- Previously served as Vice-President of PCI in 2024.
- Recipient of the Ramnath Goenka Excellence in Journalism Award (2017).
- Author of the book "Assam: The Accord, The Discord".

7. Filmfare OTT Awards 2025

- The 6th edition of the Filmfare OTT Awards was recently held to honour excellence in OTT content.
- Recognises artistic and technical excellence in:
 - Web series
 - OTT original films
 - Short films
- Awards were given across 49 categories.
- Focuses on content released on OTT platforms.
- **Major Award Winners**
 - **Best Web Series:** Black Warrant
 - **Best Director (Series):** Nagesh Kukunoor – The Hunt
 - **Best Series (Critics):** Paatal Lok Season 2
 - **Best Actor (Drama Series):** Jaideep Ahlawat
 - **Best Actress (Drama Series):** Monica Pawar
 - **Best Film (OTT):** Girls Will Be Girls

- **Best Actor (Film):** Abhishek Banerjee – Stolen
- **Best Actress (Film):** Sanya Malhotra – Mrs.

8. Global AI Index 2025

- India recently secured the 3rd position in the Global AI Index 2025, as per Stanford University's Global AI Vibrancy Tool.
- Assesses countries on their artificial intelligence ecosystem and vibrancy.
- **Rankings**
 - 1st: United States
 - 2nd: China
 - 3rd: India

9. Pagdi System (Pagdi Pratha)

Context

- The Maharashtra government recently announced the abolition of the Pagdi System in the State, with the declaration made in the Maharashtra Legislative Assembly.

About Pagdi System

- An old tenant-landlord arrangement prevalent in Mumbai, especially in South and Central Mumbai.
- Originated in the pre-Independence period (before 1940).
- Under this system, a tenant pays a large one-time lump sum (pagdi) to the landlord at the time of entry.
- In return, the tenant gets the right to occupy the premises permanently at a very low monthly rent.
- Tenants were allowed to transfer or sell their tenancy rights to another person.
- The system led to frozen rents, discouraging landlords from maintaining buildings.
- Resulted in many buildings becoming old, dilapidated, and structurally unsafe, posing safety risks.