1. **Gene Bank:** India to establish Second National Gene Bank to conserve 10 lakh crop germplasm, ensuring future food and nutritional security under the "Investing in Innovations" theme of Union Budget 2025-26.
   - **About Gene Bank:** It is a storage facility that preserves seeds, pollen, and plant tissues to protect plant species.
     - Ensures availability of plant genetic resources for future use.
     - Supports crop breeding, scientific research, and biodiversity conservation.
     - Maintains genetic diversity, crucial for climate resilience and food security.
   - **About India's First National Gene Bank:** It was established in 1996 by ICAR-NBPGR (Indian Council of Agricultural Research - National Bureau of Plant Genetic Resources), New Delhi.
   - **Global Ranking: Second-largest** Gene Bank after **Svalbard Global Seed Vault (Norway)**.
   - **Current Status:** Houses **4,71,561 accessions** of **2,157 species**.
     - Provides plant genetic resources for crop improvement and conservation in both public and private sectors.
   - **National Bureau of Plant Genetic Resources (NBPGR):** Apex Institution under ICAR.
     - **Objective: Conservation, evaluation, and utilization** of plant genetic resources for **sustainable agriculture and food security**.
     - **Headquarters**: New Delhi
   - **National Gene Fund**: Established under section 45 of the Protection of Plant Varieties and Farmers' Rights Act, 2001 (PPVFR Act), to ensures fair distribution of benefits from genetic resources.
2. **Photonic chips:** The Government of India is supporting research in Photonic Chips to advance next-generation computing, including 6G, AI, quantum computing, and data centers.
   - **About Photonic Chips:** It use light instead of **electricity** for data processing and transmission.
     - Offer ultra-high speed, high bandwidth, and good energy efficiency.
     - Generate minimal heat and are immune to electromagnetic interference.
     - Support dense parallelism, making them suitable for 6G, AI, quantum computing, data centers, optical interconnects, neural network acceleration, and quantum communication.

- **Recent Government Initiatives & Targets:**
  - **Research Support for Photonic Chips:** The Ministry of Electronics and IT, supporting research in Photonic Integrated Circuits (PICs) based on various material platforms such as Silicon, Lithium Niobate, Diamond, Polymer, or Composite, along with packaging technology.
  - **Department of Science and Technology (DST):** Implementing the National Quantum Mission, to set up a Thematic Hub on Quantum Computing at IISc Bengaluru.
    - ✓ Focus on developing photonic qubits and photonic quantum processors to drive research in photonic chip technology.
  - **Cybersecurity & AI Initiatives by CERT-In (MEITY):** CERT-In issues alerts and advisories on cyber threats, vulnerabilities, and ML-based malicious attacks.
  - **Safe & Trusted AI (IndiaAI Mission):** Safe and Trusted AI is one of the seven pillars of the IndiaAI Mission.
  - **Development of Quantum Technologies:** Government institutions like **CDOT and CDAC** are developing **quantum technologies** such as: Post-Quantum Cryptography (PQC) solutions → Quantum Key Distribution (QKD) → Quantum-secure smart Video IP phone with quantum-secured voice/video calling.
  - **Neuromorphic Computing Research:** Brain-inspired approach to designing hardware systems using neural networks and spiking signals.

3. **Semicryogenic Propulsion System:** Recently, ISRO has announced significant progress in the development of a Semicryogenic engine (Liquid Oxygen/Kerosene engine) with a high thrust of 2000kN for the Semicryogenic booster stage of Launch Vehicle Mark-3 (LVM3).
   - **About Semicryogenic Propulsion System:** Uses Liquid Oxygen (LOX) and Kerosene as propellants, which are non-toxic and non-hazardous.
     - **Developed by** ISRO's Liquid Propulsion Systems Centre (LPSC).
     - SC120 stage, powered by the 2000kN Semicryogenic engine (SE2000), will replace the current L110 core liquid stage in LVM3, enhancing payload capacity.
     - Works on oxidiser-rich staged combustion cycle.
   - **Key Subsystems of SE2000 Engine:** Thrust chamber, pre-burner, turbo pump system, control components, and startup system.

- **About Launch Vehicle Mark-3 (LVM3):** India's heaviest launch vehicle, formerly known as GSLV Mk-III, used for launching heavy satellites into Geostationary Transfer Orbit (GTO) and deep-space missions.
  - Features three stages: Solid rocket boosters (S200) → Liquid core stage (L110) – to be replaced by the new Semicryogenic SC120 stage → Cryogenic upper stage (C25).
  - Played a key role in Chandrayaan-2, Chandrayaan-3, and Gaganyaan missions.

4. **Bodh Gaya Temple:** Since February 2024, nearly 100 Buddhist monks under the All India Buddhist Forum (AIBF) have been protesting against the Bodh Gaya Temple Act (BTA), 1949.
   - **About Bodh Gaya Temple:** Bodh Gaya is one of the four sacred sites of Buddhism, along with Lumbini (birthplace of Buddha), Sarnath (first sermon), and Kusinagar (parinirvana).
   - **Historical Background:**
     - **3rd Century BCE:** Mauryan Emperor Ashoka worshipped the Bodhi tree and built a temple.
     - **Harshavardhana's reign (629 AD):** Hiuen Tsang visited Bodh Gaya, identifying it as a Buddhist site.
     - **13th Century:** Bakhtiyar Khilji's invasion led to the decline of Buddhism in the region.
     - **1590 (Akbar's reign):** A Hindu monk established the Bodh Gaya mutt, bringing the temple under Hindu control.
     - **1949 (Post-Independence):** Bihar Assembly passed the BTA, transferring temple control to the management committee.
   - **About Buddhism:** Founded by Siddhartha Gautama in 6th century BCE in ancient India.
     - Emerged during the second urbanization in the Gangetic plain, amid social changes.
     - Spread rapidly as Buddha's teachings appealed to those discontented with Vedic rituals and caste system.
     - Merchants and artisans politically and economically supported Buddhism.
   - **Mauryan Empire (Ashoka's rule):** Buddhism expanded within India and internationally.
     - Doctrinal divisions led to the emergence of Theravāda and Mahāyāna schools.

5. **Sarhul Festival:** Adivasis in Jharkhand and the larger Chhotanagpur region recently celebrated the Sarhul festival, marking the New Year and the arrival of spring.
   - **About Sarhul Festival:** Sarhul is a major tribal festival deeply rooted in nature worship and the

- veneration of Sal trees (Shorea robusta), considered the abode of Sarna Maa, the protective deity of villages.

- **Nature Worship:** Sal trees (Shorea robusta) are venerated in Adivasi tradition and seen as the abode of Sarna Maa, the deity protecting villages from natural forces.
  - Sarhul, literally meaning "worship of the Sal tree," celebrates the symbolic union of the Sun and the Earth.
  - A village priest (pahan) represents the Sun, while his wife (pahen) represents the Earth, signifying the foundation of life.
  - Only after the rituals do Adivasis begin ploughing their fields, sowing crops, or gathering forest produce.
- **Three-Day Festival:** The main rituals occur on the second day at Sarna Sthals (sacred groves) found in villages across Jharkhand, Chhattisgarh, Odisha, and Bihar.
- **Evolution of Sarhul:** In the 1960s, Adivasi leader Baba Karthik Oraon initiated a Sarhul procession from Hatma to Siram Toli Sarna Sthal in Ranchi.

6. **Deep Sea Mining:** As per the recent new study published in the journal Nature found that a seabed strip mined 40 years ago in the Pacific Ocean has still not recovered.
   - **Findings of the Study:** Scientists analysed the **8-metre strip in 2023** and found Long-term changes in seabed sediment → Reduced population of deep-sea organisms → Some species showing early signs of recolonisation.
   - **Previous research on deep sea mining impacts:** Sediment plumes, noise, vibration, and light pollution disrupt ecosystems.
   - **About Deep Sea Mining:** It involves extracting mineral deposits and metals from the ocean's seabed.
   - **Three types of deep sea mining:**
     - **Polymetallic nodules mining** – collecting metal-rich nodules from the ocean floor.
     - **Seafloor sulphide deposits mining** – extracting materials from hydrothermal vent systems.
     - **Cobalt crust mining** – from underwater mountains and volcanoes.
   - These sources contain nickel, rare earths, cobalt, and other materials essential for renewable energy technologies and electronics.

- **Engineering & Technology Used:** Vacuum extraction using massive pumps, and AI-based deep sea robots to collect nodules.
  - Advanced underwater machines to mine materials from underwater mountains and volcanoes.
  - Governments and companies consider these deposits strategically important as onshore reserves deplete and demand rises.

7. **Nation's First Textile Machine Park:** Recently, the Uttar Pradesh MSME Minister announced the establishment of India's first Textile Machine Park near Kanpur on 875 acres of land.
   - **About the Park:**
     - **Location:** Chaparghata village, Bhongaon area, near **Kanpur**.
     - **Development Model:** PPP (Public-Private Partnership) model to reduce import dependence and promote Make in India.
     - **Objective:** Indigenous manufacturing of textile machines currently imported from China, Vietnam, South Korea, Taiwan, and Europe.
     - **Scale:** 200+ large and medium units to be set up.
     - **Key Benefits:** Machines such as circular knitting, flat knitting, diving, printing, sewing, patient gown, and technical textile machines will now be manufactured in Uttar Pradesh.
     - **Skill development:** Local technical experts to be trained for repair and maintenance.
   - **Textile Sector in Uttar Pradesh:** The state is witnessing rapid growth in the textile industry.
     - **Famous industries:** Banarasi silk, chikankari, handloom, and powerloom.
     - **Government Initiatives:** Textile and Apparel Policy-2022 aims to develop Uttar Pradesh as a textile hub.
     - Ten new textile parks planned across 10 districts, including **PM Mitra Park near Lucknow**.
   - **About Make in India Initiative:** Launched in 2014 to boost investment, innovation, and skill development.
     - **Led by:** Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry.
     - **Objective:** Open invitation to **global investors** to contribute to India's **growth story**.