

# Gallant IAS Academy

## Gurushishya 3.0 Prelims Telepathy

### Important Subtopics for Science & Technology - UPSC Prelims 2024

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#### # Space Technology

##### Indian Space Research Organisation (ISRO)

##### - Key Missions:

- Chandrayaan Missions (Chandrayaan-1, Chandrayaan-2).
- Mars Orbiter Mission (Mangalyaan).
- Gaganyaan Mission (India's human spaceflight program).
- Aditya-L1 (solar observation mission).
- Astrosat (India's first dedicated multi-wavelength space observatory).
- PSLV and GSLV series (key satellite launch vehicles).

##### - Technological Developments:

- Development of cryogenic engine technology.
- Reusable Launch Vehicle (RLV) technology.
- Satellite Navigation Systems (NavIC).
- Space Capsule Recovery Experiment (SRE).
- Indigenous development of satellite components.
- Collaboration with international space agencies.

##### - Future Projects:

- Chandrayaan-3 (lunar mission).
- Mangalyaan-2 (Mars mission).
- Shukrayaan (Venus mission).
- Small Satellite Launch Vehicle (SSLV).
- Development of space habitats and long-duration missions.
- Space situational awareness and debris management.

##### International Space Missions

##### - NASA Missions:

- Artemis program (return to the Moon).
- James Webb Space Telescope (JWST).
- Mars Perseverance Rover and Ingenuity helicopter.
- Hubble Space Telescope.
- Space Launch System (SLS).

- International Space Station (ISS) collaborations.
- **ESA (European Space Agency) Missions:**
  - Rosetta and Philae lander (comet exploration).
  - Gaia mission (astrometry).
  - ExoMars mission.
  - BepiColombo (Mercury mission).
  - Earth observation satellites (Copernicus program).
  - Collaboration on ISS and lunar missions.
- **Other International Efforts:**
  - China's Chang'e missions (lunar exploration).
  - SpaceX Starship program.
  - Russia's Luna program.
  - Japan's Hayabusa2 mission (asteroid exploration).
  - UAE's Hope Mars Mission.
  - Private space ventures (Blue Origin, Virgin Galactic).

## # Information Technology

### Digital India Initiative

- Components:
  - BharatNet (broadband to rural areas).
  - Digital Locker (secure cloud storage).
  - e-Governance services (e-Kranti).
  - DigiLocker (digital document storage).
  - UMANG app (unified mobile application).
  - Common Service Centers (CSCs).
- **Achievements:**
  - Increase in internet penetration and digital literacy.
  - Growth in e-Governance services and online transactions.
  - Development of digital infrastructure.
  - Initiatives like BHIM, UPI, and Jan Dhan Yojana for financial inclusion.
  - Start-up India and Make in India initiatives.
  - Enhancing cybersecurity measures.

### Cyber Security( Keep these in mind, will help in solving statements)

- Threats and Challenges:
  - Cyber-attacks (phishing, ransomware, malware).

- Data breaches and privacy issues.
  - Cyber espionage and warfare.
  - Identity theft and financial fraud.
  - Emerging threats (IoT, AI vulnerabilities).
- Government Initiatives:**
- National Cyber Security Policy (NCSP).
  - Indian Computer Emergency Response Team (CERT-In).
  - Cyber Swachhta Kendra (Botnet Cleaning and Malware Analysis Center).
  - National Critical Information Infrastructure Protection Centre (NCIIPC).
  - Cyber Surakshit Bharat initiative.
  - Collaborations with international cybersecurity agencies.

**Artificial Intelligence (AI) and Machine Learning (ML)( Keep these in mind, will help in solving statements)**

- Applications:**
- Healthcare (diagnosis, personalized medicine).
  - Agriculture (crop monitoring, predictive analytics).
  - Finance (fraud detection, algorithmic trading).
  - Education (personalized learning, smart content).
  - Transportation (autonomous vehicles, traffic management).
  - Governance (smart cities, e-Governance).
- Challenges:**
- Ethical and bias issues in AI algorithms.
  - Data privacy and security concerns.
  - Job displacement and economic impact.
  - Need for regulatory frameworks.
  - AI in defense and security.
  - Balancing innovation with societal impacts.

**# Biotechnology (Keep these in mind, will help in solving statements)**

Genetic Engineering and CRISPR

- Applications:**
- Genetic modification of crops (GMOs).
  - Gene therapy for hereditary diseases.
  - Development of transgenic animals.

- CRISPR-Cas9 gene editing technology.
- Biopharmaceuticals and personalized medicine.
- Ethical considerations and regulations.
- **Indian Initiatives:**
  - Department of Biotechnology (DBT) projects.
  - BIRAC (Biotechnology Industry Research Assistance Council).
  - National Biotechnology Development Strategy.
  - Genome India Project.
  - Research in agricultural biotechnology.
  - Collaboration with international biotech agencies.

### **Health and Medicine (Keep these in mind, will help in solving statements)**

- **Innovations:**
  - Development of vaccines (e.g., COVID-19 vaccines).
  - Stem cell therapy and regenerative medicine.
  - Precision medicine and genomics.
  - Advances in diagnostics and medical devices.
  - Telemedicine and health informatics.
  - Research in infectious diseases and epidemiology.
- **Government Programs:**
  - National Health Mission (NHM).
  - Ayushman Bharat (PM-JAY) scheme.
  - National AIDS Control Programme (NACP).
  - National Vector Borne Disease Control Programme (NVBDCP).
  - Universal Immunization Programme (UIP).
  - Efforts to combat antimicrobial resistance (AMR).

### **# Renewable Energy and Sustainability (Keep these in mind, will help in solving statements)**

#### **Renewable Energy Sources**

- Types:
  - Solar energy (photovoltaic cells, solar thermal).
  - Wind energy (onshore and offshore).
  - Biomass and biofuels.
  - Hydropower (small and large-scale).

- Geothermal energy.
- Ocean energy (tidal, wave).
- **Indian Initiatives:**
  - National Solar Mission (NSM).
  - National Wind Energy Mission.
  - Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM).
  - Development of solar parks and ultra mega solar power projects.
  - Incentives for rooftop solar installations.
  - Collaboration with international renewable energy organizations.

### **Climate Change and Environmental Policies**

- International Agreements:
  - Paris Agreement and India's commitments.
  - United Nations Framework Convention on Climate Change (UNFCCC).
  - Kyoto Protocol and subsequent COP meetings.
  - India's Nationally Determined Contributions (NDCs).
  - Green Climate Fund (GCF).
  - Intergovernmental Panel on Climate Change (IPCC) reports.
- **Indian Policies:**
  - National Action Plan on Climate Change (NAPCC).
  - State Action Plans on Climate Change (SAPCC).
  - Bharat Stage Emission Standards.
  - National Clean Energy Fund (NCEF).
  - Swachh Bharat Mission.
  - Initiatives for sustainable urbanization and smart cities.

Sustainable Development Goals (SDGs) **(Keep these in mind, will help in solving statements)**

- **Overview:**
  - United Nations 2030 Agenda for Sustainable Development.
  - 17 Goals and 169 targets.
  - India's role and progress in achieving SDGs.
  - Integration of SDGs in national policies and schemes.
  - Monitoring and evaluation frameworks.
  - Collaboration with international organizations.

- **Key Areas:( Keep these in mind, will help in solving statements)**

- Poverty alleviation and social welfare.
- Quality education and healthcare.
- Gender equality and women's empowerment.
- Clean water and sanitation.
- Affordable and clean energy.
- Climate action and environmental conservation.

