GENERAL AWARENESS – SCIENTIFIC & TECHNOLOGICAL DEVELOPMENTS

Chapter: General Scientific & Technological Developments – Space and Nuclear Programme of India

Subject:	General Awareness – Science & Technology
Total Questions:	70 MCQs
Question Type:	Multiple Choice (Single Correct Answer)
Exam Relevance:	UPSC, SSC CGL/CHSL, IBPS, RRB NTPC, State PSC, NDA, CDS, Defence Exams
Topics Covered:	ISRO Missions, Space Programme, Nuclear Programme, DRDO, Defence Tech, IT, Biotech, Renewable Energy
Based On:	Static GK + Latest Current Affairs 2023–2026 (Chandrayaan-3, SpaDeX, NISAR, Gaganyaan)

★ ■ ISRO – HISTORY & MILESTONES ★

Q1. The Indian Space Research Organisation (ISRO) was founded in which year and is headquartered in which city?

A) 1962 – Mumbai

B) 1969 – Bengaluru

C) 1972 – Hyderabad

D) 1975 – New Delhi

✔ Correct Answer: B) 1969 – Bengaluru

■ *Explanation: ISRO was formally established on 15 August 1969, replacing INCOSPAR (Indian National Committee for Space Research, est. 1962 by Dr. Vikram Sarabhai). Its headquarters is in Antariksh Bhavan, Bengaluru (Bangalore), Karnataka. Dr. Vikram Sarabhai is called the 'Father of the Indian Space Programme'.*

Q2. India's first satellite, Aryabhata, was launched in which year and by which country's rocket?

A) 1972 – French Rocket (Diamant)

B) 1975 – Soviet Union (USSR) Rocket

C) 1980 – Indian SLV-3

D) 1977 – USA (NASA)

✔ Correct Answer: B) 1975 – Soviet Union (USSR) Rocket

■ *Explanation: Aryabhata — India's first satellite — was launched on 19 April 1975 by the Soviet Union's Kosmos-3M rocket from Kapustin Yar, USSR. It was named after the ancient Indian astronomer-mathematician. India's first indigenously launched satellite was Rohini-1 (1980), launched by the Indian SLV-3.*

Q3. India's first indigenously developed Satellite Launch Vehicle (SLV-3) successfully launched which satellite in 1980?

A) Aryabhata

B) Rohini (RS-1)

C) APPLE

D) INSAT-1A

✔ Correct Answer: B) Rohini (RS-1)

■ *Explanation: India's SLV-3 (Satellite Launch Vehicle) successfully placed Rohini Satellite (RS-1) into orbit on 18 July 1980, making India the sixth country to achieve indigenous orbital launch capability. The SLV-3 project was led by Dr. A.P.J. Abdul Kalam, who was called the 'Missile Man of India'.*

Q4. Which ISRO mission made India the first country to successfully orbit Mars in its first attempt in 2014?

A) Chandrayaan-1

B) Aditya-L1

C) Mangalyaan (Mars Orbiter Mission)

D) AstroSat

✔ Correct Answer: C) Mangalyaan (Mars Orbiter Mission)

■ *Explanation: ISRO's Mars Orbiter Mission (MOM), popularly called Mangalyaan, was launched on 5 November 2013 and successfully entered Mars orbit on 24 September 2014. India became the first country to succeed in its first attempt and the fourth space agency globally to reach Mars, at the lowest cost ever (~■450 crore).*

Q5. Chandrayaan-1 (2008) made which major scientific discovery that changed our understanding of the Moon?

A) Discovered water ice at the lunar south pole

B) Confirmed presence of water molecules (H■O and OH) on the lunar surface

C) Detected a magnetic field on the Moon

D) Discovered volcanic activity on the Moon

✔ Correct Answer: B) Confirmed presence of water molecules (H■O and OH) on the lunar surface

■ *Explanation: Chandrayaan-1 (2008) made the landmark discovery of water molecules (H■O and hydroxyl OH) on the lunar surface using its Moon Impact Probe (MIP) and the M³ (Moon Mineralogy Mapper) instrument. This discovery — confirmed with NASA instruments aboard — fundamentally changed the scientific understanding of the Moon.*

Q6. Chandrayaan-3 made a historic soft landing near the Moon's south pole on which date, making India the first country to land on the lunar south pole?

A) 14 July 2023

B) 23 August 2023

C) 5 September 2023

D) 15 October 2023

✔ Correct Answer: B) 23 August 2023

■ *Explanation: Chandrayaan-3's Vikram lander successfully soft-landed near the lunar south polar region on 23 August 2023 at 18:04 IST — making India the first country to land near the Moon's south pole and the 4th country to achieve a soft Moon landing. 23 August is now observed as India's National Space Day.*

Q7. The Pragyan rover deployed from Chandrayaan-3's Vikram lander confirmed the presence of which element near the lunar south pole — a first-ever in-situ detection?

A) Gold (Au)

B) Sulphur (S)

C) Carbon (C)

D) Silicon (Si)

✔ Correct Answer: B) Sulphur (S)

■ *Explanation: Chandrayaan-3's Pragyan rover, using its Laser-Induced Breakdown Spectroscope (LIBS) instrument, confirmed in-situ detection of Sulphur (S) near the lunar south pole for the first time — a historic finding. It also detected Aluminium, Calcium, Iron, Chromium, Titanium, Manganese, Silicon, and Oxygen.*

Q8. ISRO's SpaDeX (Space Docking Experiment) mission successfully demonstrated space docking technology in January 2025. This made India the ___ country to demonstrate this capability.

A) 2nd

B) 3rd

C) 4th

D) 5th

✔ Correct Answer: C) 4th

■ *Explanation: India's SpaDeX mission (PSLV-C60), launched on 30 December 2024, successfully demonstrated space docking in January 2025 — making India the 4th country after the USA (1966), USSR/Russia (1967), and China (2011) to master in-orbit space docking technology, critical for Gaganyaan and future space station missions.*

★ ■ ISRO LAUNCH VEHICLES & RECENT MISSIONS ★

Q9. PSLV (Polar Satellite Launch Vehicle) is known as the 'workhorse' of ISRO. NVS-02, launched on 29 January 2025, was ISRO's 100th mission. It was launched by which vehicle?

A) PSLV-C58

B) GSLV-F15

C) LVM3-M4

D) SSLV-D3

✔ Correct Answer: B) GSLV-F15

■ *Explanation: NVS-02 (NavIC Navigation Satellite) — ISRO's 100th mission — was launched on 29 January 2025 aboard GSLV-F15 (Geosynchronous Satellite Launch Vehicle). However, the satellite remained in an elliptical transfer orbit due to a stage anomaly and did not reach its intended GEO orbit.*

Q10. The LVM3 (Launch Vehicle Mark-3), previously called GSLV Mk-III, is ISRO's heaviest rocket. It uses which type of engine in its upper stage?

A) Solid fuel Vikas engine

B) Liquid hydrogen cryogenic engine (CE-20)

C) Semi-cryogenic engine SCE-200

D) Solid propellant PSOM engine

✔ Correct Answer: B) Liquid hydrogen cryogenic engine (CE-20)

■ *Explanation: LVM3 uses the CE-20 cryogenic engine (burning liquid hydrogen and liquid oxygen) in its upper stage (C25 cryogenic stage). India developed this cryogenic engine indigenously after the USA refused to transfer cryogenic technology in the 1990s. LVM3 can carry up to 8 tonnes to LEO and 4 tonnes to GTO.*

Q11. NISAR (NASA-ISRO Synthetic Aperture Radar) satellite launched in July 2025 is significant as it is the world's first:

A) Satellite with nuclear power source

B) Dual-band (L+S band) SAR satellite for global Earth observation every 12 days

C) Joint satellite between two developing nations

D) Satellite weighing more than 10 tonnes

✔ Correct Answer: B) Dual-band (L+S band) SAR satellite for global Earth observation every 12 days

■ *Explanation: NISAR (NASA-ISRO SAR) launched in July 2025 is the world's first dual-band (L-band + S-band) Synthetic Aperture Radar satellite. It maps the entire Earth's surface every 12 days from a 747 km Sun-Synchronous Polar Orbit, monitoring glaciers, forests, earthquakes, volcanoes, and sea level changes. NASA provided the L-band radar; ISRO provided the S-band radar and GSLV rocket.*

Q12. Aditya-L1, India's first solar observation mission, was placed in a halo orbit around which Lagrange Point between the Sun and Earth?

A) L2 (Sun-Earth)

B) L4 (Sun-Earth)

C) L1 (Sun-Earth)

D) L3 (Sun-Earth)

✔ Correct Answer: C) L1 (Sun-Earth)

■ *Explanation: Aditya-L1, launched on 2 September 2023, was placed in a halo orbit around the Sun-Earth Lagrange Point 1 (L1) — approximately 1.5 million km from Earth in January 2024. From this vantage point, it continuously observes the Sun (corona, solar wind, flares) without any eclipses, studying space weather.*

Q13. India's NavIC (Navigation with Indian Constellation) is India's own GPS-like navigation system. It provides accurate positioning over India and an area extending how far beyond India's borders?

A) 500 km

B) 1,000 km

C) 1,500 km

D) 3,000 km

✔ Correct Answer: C) 1,500 km

■ *Explanation: NavIC (Navigation with Indian Constellation), formerly called IRNSS (Indian Regional Navigation Satellite System), provides accurate positioning over India and up to 1,500 km beyond India's borders. It has 7 satellites (3 GEO + 4 GSO). It was developed after the USA denied GPS access to India during the 1999 Kargil War.*

Q14. XPoSat (X-ray Polarimeter Satellite), launched on 1 January 2024, made India only the second country after the USA to operate a dedicated space X-ray polarimetry mission. What does XPoSat study?

A) Solar corona and solar wind

B) X-ray polarisation of celestial sources like black holes, neutron stars, and pulsars

C) Exoplanets and habitable zones

D) Cosmic microwave background radiation

✔ Correct Answer: B) X-ray polarisation of celestial sources like black holes, neutron stars, and pulsars

■ *Explanation: XPoSat (X-ray Polarimeter Satellite), launched on New Year's Day 2024, carries two scientific payloads — POLIX (Polarimeter Instrument in X-rays) and XSPECT (X-ray Spectroscopy and Timing). It studies X-ray polarisation from about 50 bright astronomical sources including black holes, neutron stars, and pulsars.*

★ ■■■ GAGANYAAN & HUMAN SPACEFLIGHT ★

Q15. India's Gaganyaan mission aims to send Indian astronauts (Vyomanauts) to space. Which test vehicle was successfully tested in October 2023 to validate the Crew Escape System?

A) TV-D2

B) TV-D1 (Test Vehicle-D1)

C) HLVM3

D) CE-20 CryoTest

✔ Correct Answer: B) TV-D1 (Test Vehicle-D1)

■ *Explanation: On 21 October 2023, ISRO successfully conducted the TV-D1 (Test Vehicle Demonstration Flight 1), validating the Crew Escape System (CES) for Gaganyaan. The Crew Module was jettisoned at an altitude of 17 km, the parachutes deployed, and the capsule was recovered from the sea off Sriharikota — a critical safety milestone.*

Q16. The four astronaut-designates (Vyomanauts) selected for India's Gaganyaan mission are from which service?

A) Indian Navy

B) Indian Air Force

C) Indian Army

D) ISRO civilian scientists

✔ Correct Answer: B) Indian Air Force

■ *Explanation: The four Gaganyaan Vyomanauts selected by ISRO are Group Captains Prashanth Balakrishnan Nair, Ajit Krishnan, Angad Pratap, and Wing Commander Shubhanshu Shukla — all Indian Air Force (IAF) test pilots. They trained at Yuri Gagarin Cosmonaut Training Centre (GCTC) in Russia. Wing Commander Shukla will also go to the ISS on the AXIOM-4 mission in 2025.*

Q17. Shubhanshu Shukla, Indian Air Force officer selected as a Gaganyaan Vyomanaut, was scheduled to visit the ISS on which private commercial mission in 2025?

A) SpaceX Crew Dragon Mission-9

B) Axiom Space Mission-4 (Axiom-4)

C) Blue Origin Orbital Mission

D) Boeing Starliner Mission-3

✔ Correct Answer: B) Axiom Space Mission-4 (Axiom-4)

■ *Explanation: Wing Commander Shubhanshu Shukla is India's representative on the Axiom Space Mission-4 (Ax-4) to the International Space Station (ISS), making him the first Indian to go to the ISS and the second Indian in space (after Rakesh Sharma in 1984). The mission is scheduled to launch on a SpaceX Falcon 9 rocket in 2025.*

Q18. Rakesh Sharma was the first Indian to go to space in 1984 aboard a Soviet Soyuz rocket. When PM Indira Gandhi asked him how India looked from space, his famous reply was:

A) 'It looks like heaven from up here'

B) 'Saare Jahan Se Accha' (Better than the whole world)

C) 'It is just as beautiful as I imagined'

D) 'Like a blue marble floating in darkness'

✔ Correct Answer: B) 'Saare Jahan Se Accha' (Better than the whole world)

■ *Explanation: Rakesh Sharma became the first Indian in space on 3 April 1984 aboard the Soviet Soyuz T-11 spacecraft. When PM Indira Gandhi asked 'How does India look from up there?', he replied 'Saare Jahan Se Accha' — quoting the famous patriotic poem by Allama Iqbal — becoming one of the most iconic moments in Indian space history.*

★ ■■ NUCLEAR PROGRAMME OF INDIA ★

Q19. India's proposed Bharatiya Antariksh Station (BAS-1 — Indian Space Station) is planned to be launched by approximately which year?

A) 2025

B) 2027

C) 2028

D) 2035

✔ Correct Answer: C) 2028

■ *Explanation: India's Bharatiya Antariksh Station (BAS-1) — India's own space station — is planned to be launched by approximately 2028 in a 400 km orbit, with an initial operational capability of 15–20 tonnes. The full Indian Space Station is envisioned to be completed by 2035.*

Q20. India conducted its first successful nuclear test (Pokhran-I / Smiling Buddha) in which year?

A) 1962

B) 1968

C) 1974

D) 1998

✔ Correct Answer: C) 1974

■ *Explanation: India conducted its first nuclear test called 'Smiling Buddha' (Pokhran-I) on 18 May 1974 at Pokhran in Rajasthan's Thar Desert, under PM Indira Gandhi. India claimed it was a 'peaceful nuclear explosion (PNE)'. This made India the 6th country to test nuclear devices after the US, USSR, UK, France, and China.*

Q21. India conducted its second series of nuclear tests 'Operation Shakti' (Pokhran-II) in May 1998. Under which PM was this done and what was the total number of tests conducted?

A) Rajiv Gandhi – 3 tests

B) P.V. Narasimha Rao – 2 tests

C) Atal Bihari Vajpayee – 5 tests

D) H.D. Deve Gowda – 4 tests

✔ Correct Answer: C) Atal Bihari Vajpayee – 5 tests

■ *Explanation: Operation Shakti (Pokhran-II) was conducted on 11–13 May 1998 under PM Atal Bihari Vajpayee — a total of 5 nuclear tests including thermonuclear (hydrogen bomb) and fission devices. Scientific leadership was provided by Dr. A.P.J. Abdul Kalam (DRDO) and Dr. R. Chidambaram (BARC). India declared itself a nuclear weapons state.*

Q22. India follows a 'No First Use' (NFU) nuclear policy. This means India will use nuclear weapons only:

A) When authorised by the UN Security Council

B) Only in retaliation to a nuclear attack on India or Indian forces

C) Against any country that threatens India militarily

D) Only against non-nuclear states

✔ Correct Answer: B) Only in retaliation to a nuclear attack on India or Indian forces

■ *Explanation: India's 'No First Use' (NFU) nuclear doctrine (adopted after 1998 Pokhran-II tests) states that India will not be the first to use nuclear weapons in a conflict. Nuclear weapons will only be used in retaliation to a nuclear attack. India's nuclear command authority is the Nuclear Command Authority (NCA), chaired by the PM.*

Q23. The Department of Atomic Energy (DAE) operates under which authority and the Atomic Energy Commission of India was set up in which year?

A) Ministry of Science – 1954

B) Prime Minister's Office – 1954

C) Ministry of Defence – 1962

D) NITI Aayog – 1969

✔ Correct Answer: B) Prime Minister's Office – 1954

■ *Explanation: The Atomic Energy Commission of India was set up on 1 August 1954, with Dr. Homi J. Bhabha as its first Chairman. The Department of Atomic Energy (DAE), established in 1954, functions directly under the Prime Minister of India — reflecting the strategic importance of nuclear energy.*

Q24. Dr. Homi J. Bhabha is called the 'Father of the Indian Nuclear Programme'. He founded which institution in 1945?

A) DRDO (Delhi)

B) TIFR – Tata Institute of Fundamental Research (Mumbai)

C) BARC – Bhabha Atomic Research Centre

D) IGCAR – Indira Gandhi Centre for Atomic Research

✔ Correct Answer: B) TIFR – Tata Institute of Fundamental Research (Mumbai)

■ *Explanation: Dr. Homi J. Bhabha founded the Tata Institute of Fundamental Research (TIFR) in Mumbai in 1945. He also established the Atomic Energy Establishment Trombay (AEET) in 1954, which was renamed Bhabha Atomic Research Centre (BARC) after his death in 1966 in an air crash on Mont Blanc.*

Q25. India's nuclear power programme is based on a 3-stage plan conceived by Dr. Homi J. Bhabha. What are the three stages?

A) Uranium → Thorium → Fusion

B) Pressurised Heavy Water Reactors → Fast Breeder Reactors → Thorium-based Reactors

C) Fission → Fusion → Hydrogen

D) Natural Uranium → Enriched Uranium → Plutonium only

✔ Correct Answer: B) Pressurised Heavy Water Reactors → Fast Breeder Reactors → Thorium-based Reactors

■ *Explanation: Bhabha's 3-Stage Nuclear Programme: Stage 1 – PHWRs (Pressurised Heavy Water Reactors) using natural uranium to produce plutonium; Stage 2 – Fast Breeder Reactors (FBRs) using plutonium to produce U-233 from thorium; Stage 3 – Advanced Heavy Water Reactors using U-233 and thorium. India has the world's largest thorium reserves (25% global reserves).*

Q26. The India-US Nuclear Deal (123 Agreement) was signed in 2008. It allowed India to access civilian nuclear technology from the US despite not being an NPT signatory. Under which PM was it finalised?

A) Atal Bihari Vajpayee

B) Manmohan Singh

C) Narendra Modi

D) P.V. Narasimha Rao

✔ Correct Answer: B) Manmohan Singh

■ *Explanation: The India-US Civil Nuclear Agreement (known as the 123 Agreement or Hyde Act) was finalised under PM Manmohan Singh and US President George W. Bush in 2008. It allowed India access to civilian nuclear fuel and technology in exchange for IAEA safeguards on civilian nuclear facilities. It was a landmark shift in India's nuclear isolation post-1974.*

★ ■■ DRDO & DEFENCE TECHNOLOGY ★

Q27. Kudankulam Nuclear Power Plant in Tamil Nadu was built with collaboration of which country and is India's largest nuclear power plant?

A) France

B) USA

C) Russia

D) Japan

✔ Correct Answer: C) Russia

■ *Explanation: Kudankulam Nuclear Power Plant in Tirunelveli district, Tamil Nadu, was built with Russian collaboration (VVER-1000 pressurised water reactors). It is India's largest nuclear power plant with 6 reactors planned (Units 1 & 2 operational; 3–6 under construction). The plant has a total planned capacity of 6,000 MW.*

Q28. India's Prototype Fast Breeder Reactor (PFBR) — a key part of Stage 2 of the nuclear programme — is located in which city?

A) Trombay, Mumbai

B) Kalpakkam, Tamil Nadu

C) Tarapur, Maharashtra

D) Rawatbhata, Rajasthan

✔ Correct Answer: B) Kalpakkam, Tamil Nadu

■ *Explanation: The Prototype Fast Breeder Reactor (PFBR) of 500 MWe is located at Kalpakkam (near Chennai), Tamil Nadu, operated by BHAVINI (Bharatiya Nabhikiya Vidyut Nigam Limited). It is a sodium-cooled fast neutron reactor fuelled by plutonium, designed to produce (breed) more fuel than it consumes.*

Q29. India's nuclear power target as announced in the Union Budget 2025 is to achieve how much nuclear power capacity by 2047?

A) 20 GW

B) 50 GW

C) 100 GW

D) 200 GW

✔ Correct Answer: C) 100 GW

■ *Explanation: India announced an ambitious nuclear power expansion plan to achieve 100 GW of nuclear power capacity by 2047 (Viksit Bharat@100). Currently India has about 7.5 GW of nuclear capacity. The Nuclear Energy Mission announced in Budget 2025 includes Small Modular Reactors (SMRs), international partnerships, and private sector participation.*

Q30. DRDO stands for Defence Research and Development Organisation. It was established in which year and is headquartered in which city?

A) 1947 – Mumbai

B) 1958 – New Delhi

C) 1969 – Bengaluru

D) 1962 – Pune

✔ Correct Answer: B) 1958 – New Delhi

■ *Explanation: DRDO (Defence Research and Development Organisation) was established in 1958, headquartered in DRDO Bhavan, New Delhi. It operates 50+ laboratories across India working on missile systems, electronics, combat vehicles, armaments, naval systems, and advanced materials for all three defence forces.*

Q31. BrahMos, the world's fastest operational supersonic cruise missile (Mach 2.8), is a joint venture between India and which country?

A) France

B) Israel

C) Russia

D) USA

✔ Correct Answer: C) Russia

■ *Explanation: BrahMos Aerospace is a joint venture between India's DRDO and Russia's NPO Mashinostroyeniya (NPOM). The name combines 'Brahmaputra' (India) and 'Moskva' (Russia). BrahMos can be launched from land, sea, and air platforms. An extended-range BrahMos can travel 450–800 km. Philippines has purchased BrahMos from India.*

★ ■ INFORMATION TECHNOLOGY & DIGITAL INDIA ★

Q32. India's Agni missile series are long-range ballistic missiles. Agni-V, which can strike targets at a range of over 5,000 km, is classified as which type of missile?

A) Short-Range Ballistic Missile (SRBM)

B) Medium-Range Ballistic Missile (MRBM)

C) Intermediate-Range Ballistic Missile (IRBM)

D) Intercontinental Ballistic Missile (ICBM)

✔ Correct Answer: D) Intercontinental Ballistic Missile (ICBM)

■ *Explanation: Agni-V, with a range of 5,000–8,000 km, is classified as an Intercontinental Ballistic Missile (ICBM) and is nuclear-capable. It was first tested on 19 April 2012. Agni-V can be fired from road-mobile launchers and is India's longest-range missile, placing all of China and most of Europe within its reach.*

Q33. The Tejas Light Combat Aircraft (LCA) is India's indigenous fighter jet. Its full-scale development was initiated in which year and the aircraft entered Indian Air Force service in which year?

A) 1983 – 2016

B) 1990 – 2020

C) 1978 – 2010

D) 1995 – 2018

✔ Correct Answer: A) 1983 – 2016

■ *Explanation: Development of Tejas LCA was formally sanctioned in 1983 by the Indian government under Dr. Kota Harinarayana as chief designer. It achieved Initial Operational Clearance (IOC) in 2014 and Full Operational Clearance (FOC) in 2019. No. 45 Squadron 'Flying Daggers' of IAF became the first unit to operate Tejas in 2016.*

Q34. INS Vikrant, India's first indigenously built aircraft carrier, was commissioned in which year?

A) 2018

B) 2020

C) 2022

D) 2024

✔ Correct Answer: C) 2022

■ *Explanation: INS Vikrant (IAC-1 – Indigenous Aircraft Carrier 1) was commissioned into the Indian Navy by PM Narendra Modi on 2 September 2022 in Kochi. Built by Cochin Shipyard Limited (CSL), it is India's first indigenously designed and built aircraft carrier, with over 76% indigenisation. It is named after India's first aircraft carrier INS Vikrant (decommissioned 1997).*

Q35. India's Unified Payments Interface (UPI) is a real-time payment system. It is managed by which organisation?

A) Reserve Bank of India (RBI)

B) Ministry of Finance

C) National Payments Corporation of India (NPCI)

D) Department of Telecommunications

✔ Correct Answer: C) National Payments Corporation of India (NPCI)

■ *Explanation: UPI (Unified Payments Interface) is managed by the National Payments Corporation of India (NPCI), an umbrella organisation for retail payments in India. UPI was launched in April 2016. India accounts for over 46% of all real-time digital payment transactions globally. UPI processes over 18 billion transactions monthly (2025).*

Q36. The India AI Mission, approved by the Union Cabinet in March 2024 with an outlay of ■10,372 crore, aims to build which major infrastructure?

A) Quantum computing centres in IITs

B) A National AI Supercomputing Facility with 10,000+ GPUs

C) AI-powered defence surveillance systems

D) A national AI training programme for 1 crore students

✔ Correct Answer: B) A National AI Supercomputing Facility with 10,000+ GPUs

■ *Explanation: The India AI Mission (■10,372 crore, 2024–29) focuses on: building a national AI computing infrastructure (10,000+ GPU supercomputer facility), AI datasets platform, application development, research & innovation hubs in IITs/IIMs, AI skilling, and safe & trusted AI ecosystem — positioning India as a global AI hub.*

★ ■ BIOTECHNOLOGY & HEALTH TECHNOLOGY ★

Q37. India's National Quantum Mission (NQM), approved in 2023 with ■6,003 crore, aims to develop quantum computers with how many qubits by 2031?

A) 50–100 qubits

B) 100–500 qubits

C) 1,000 qubits

D) 50–1,000 qubits (phased targets)

✔ Correct Answer: D) 50–1,000 qubits (phased targets)

■ *Explanation: The National Quantum Mission (NQM), approved in April 2023 with ■6,003 crore (2023–2031), targets development of intermediate-scale quantum computers (50–1,000 qubits) in different phases. It also focuses on quantum communication, quantum sensing, and quantum materials, aiming to make India among the top 6 countries in quantum technology.*

Q38. 5G services were launched in India in October 2022. How many frequency bands/spectrum was auctioned for 5G in India in the 2022 spectrum auction?

A) 2 bands

B) 3 bands

C) 5 bands (700 MHz, 800 MHz, 900 MHz, 1800 MHz, 3.5 GHz)

D) 7 bands

✔ Correct Answer: C) 5 bands (700 MHz, 800 MHz, 900 MHz, 1800 MHz, 3.5 GHz)

■ *Explanation: In the 2022 5G spectrum auction (India's largest telecom auction at ■1.5 lakh crore), spectrum was auctioned across multiple bands including sub-GHz bands (700, 800, 900 MHz), mid-band (1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz), and mmWave (26 GHz). 5G was launched by PM Modi in October 2022 at IMC.*

Q39. The DigiYatra initiative, providing paperless and seamless air travel using facial recognition, was launched across Indian airports in which year?

A) 2021

B) 2022

C) 2023

D) 2024

✔ Correct Answer: B) 2022

■ *Explanation: DigiYatra was launched on 1 December 2022 at Delhi, Bengaluru, and Varanasi airports, expanding to over 24 airports by 2024. It uses facial recognition biometrics to provide paperless boarding — passengers can check in, pass security, and board flights without physical ID/boarding pass after one-time registration on the DigiYatra app.*

Q40. Covaxin (BBV152) — India's first indigenously developed COVID-19 vaccine — was developed by which institution/company?

A) AIIMS, New Delhi

B) Bharat Biotech International Limited + ICMR

C) Serum Institute of India

D) Zydus Cadila

✔ Correct Answer: B) Bharat Biotech International Limited + ICMR

■ *Explanation: Covaxin (BBV152) was indigenously developed by Bharat Biotech International Limited in collaboration with ICMR (Indian Council of Medical Research) and the National Institute of Virology (NIV). It is a whole-virion inactivated vero cell-derived vaccine. The Serum Institute developed Covishield (AstraZeneca's vaccine under licence).*

★ ■ RENEWABLE ENERGY & GREEN TECHNOLOGY ★

Q41. India's first gene therapy for a genetic blood disorder was initiated. Which organisation coordinates India's gene therapy and biotechnology research under the Ministry of Science & Technology?

A) ICMR

B) CSIR

C) Department of Biotechnology (DBT)

D) DRDO

✔ Correct Answer: C) Department of Biotechnology (DBT)

■ *Explanation: The Department of Biotechnology (DBT) under the Ministry of Science & Technology coordinates India's biotech research including gene therapy, vaccines, genomics, and bioinformatics. DBT oversees bodies like BIRAC (Biotechnology Industry Research Assistance Council) and funds research under the Biotech-PRIDE and Mission COVID Suraksha programmes.*

Q42. India launched 'Mission Elimination of Sickle Cell Anaemia' in 2023, a priority health initiative targeting which tribal communities?

A) Communities in Ladakh

B) Tribal communities of central and western India

C) Fishing communities in coastal states

D) Scheduled Castes in eastern India

✔ Correct Answer: B) Tribal communities of central and western India

■ *Explanation: PM Modi launched the National Sickle Cell Anaemia Elimination Mission in July 2023 in Shahdol, Madhya Pradesh, targeting elimination of sickle cell disease by 2047. Sickle cell anaemia disproportionately affects tribal communities in central India (Madhya Pradesh, Chhattisgarh, Gujarat, Jharkhand, Maharashtra). Universal screening of tribals aged 0–40 is being carried out.*

Q43. India's Genome India Project aims to sequence the genomes of how many Indian individuals to build a comprehensive Indian genetic database?

A) 10,000

B) 20,000

C) 1,00,000 (1 Lakh)

D) 10,00,000 (10 Lakh)

✔ Correct Answer: C) 1,00,000 (1 Lakh)

■ *Explanation: The Genome India Project (GIP), launched by the Department of Biotechnology (DBT), aims to sequence the genomes of 1 lakh (100,000) Indians representing India's diverse population. The project will create India's first comprehensive reference database of genetic variations, enabling precision medicine tailored to Indian genetics.*

Q44. India's National Green Hydrogen Mission, launched in January 2023, targets production of how much green hydrogen annually by 2030?

A) 1 Million Metric Tonnes (MMT)

B) 5 MMT

C) 10 MMT

D) 25 MMT

✔ Correct Answer: B) 5 MMT

■ *Explanation: India's National Green Hydrogen Mission (approved January 2023, outlay ■19,744 crore) targets production of 5 MMT (Million Metric Tonnes) of green hydrogen per year by 2030, along with 125 GW of associated renewable energy capacity. Green hydrogen is produced by electrolysis of water using renewable electricity.*

Q45. PM KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Uttham Mahabhiyan) scheme is aimed at which sector?

A) Providing solar power to urban households

B) Installing solar pumps for farmers and solar power plants on barren/agricultural lands

C) Building solar-powered schools and hospitals

D) Creating solar microgrids for remote villages

✔ Correct Answer: B) Installing solar pumps for farmers and solar power plants on barren/agricultural lands

■ *Explanation: PM KUSUM scheme focuses on: Component A – 10,000 MW solar power plants on farmers' barren land; Component B – 20 lakh solar-powered agricultural pumps; Component C – solarisation of grid-connected agricultural pumps. It aims to provide energy security to farmers, reduce diesel use, and earn extra income from selling solar power.*

Q46. India reached 100 GW of installed solar energy capacity in which year, becoming one of the few countries to achieve this milestone?

A) 2022

B) 2023

C) 2024

D) 2025

✔ Correct Answer: C) 2024

■ *Explanation: India crossed 100 GW of installed solar power capacity in 2024, becoming the 4th country globally to achieve this milestone after China, USA, and the EU. India's total renewable energy capacity exceeded 200 GW in 2024 (including solar, wind, hydro, and others). India targets 500 GW of non-fossil fuel capacity by 2030.*

Q47. EOS-09 (Earth Observation Satellite-09) launched on PSLV-C61 in May 2025 ended in a launch failure. Which ISRO launch vehicle stage failed?

A) First stage (PSOM strap-on boosters)

B) Second stage (liquid fuel stage)

C) Third stage (PS3 solid fuel stage)

D) Fourth stage (PS4 liquid stage)

✔ Correct Answer: C) Third stage (PS3 solid fuel stage)

■ *Explanation: PSLV-C61 carrying EOS-09 (a SAR-based earth observation satellite) failed on 18 May 2025 due to an anomaly in the PS3 (third stage) solid propellant motor. This was a rare PSLV failure — PSLV had an excellent track record of 50+ consecutive successes before this. ISRO is investigating the PS3 stage failure.*

Q48. India's IN-SPACe (Indian National Space Promotion and Authorisation Centre) was established to promote which aspect of India's space sector?

A) International space diplomacy and treaties

B) Private sector participation in space activities

C) Government satellite communications

D) ISRO's annual budget allocation

✔ Correct Answer: B) Private sector participation in space activities

■ *Explanation: IN-SPACe (Indian National Space Promotion and Authorisation Centre) was established in June 2020 under the Indian Space Policy 2023 to: authorise, promote, and regulate private sector entities in space activities; provide ISRO's facilities to private players; and attract investment in the Indian space economy (currently ~$8.4 billion; target $44 billion by 2033).*

Q49. The Nobel Prize in Physics 2024 was awarded for foundational discoveries enabling machine learning with artificial neural networks. Who were the recipients?

A) Yann LeCun and Yoshua Bengio

B) John Hopfield and Geoffrey Hinton

C) Alan Turing and Claude Shannon

D) Demis Hassabis and John Jumper

✔ Correct Answer: B) John Hopfield and Geoffrey Hinton

■ *Explanation: John Hopfield (USA) and Geoffrey Hinton (UK/Canada, known as 'Godfather of AI') shared the 2024 Nobel Prize in Physics for foundational discoveries enabling machine learning with artificial neural networks — Hopfield networks and the Boltzmann machine. Geoffrey Hinton had left Google in 2023 to speak freely about AI risks.*

Q50. India's semiconductor mission — the India Semiconductor Mission (ISM) — attracted its first fab (semiconductor fabrication) plants. Which company established India's first commercial semiconductor fab in Dholera, Gujarat?

A) Intel

B) TSMC

C) Tata Electronics + Powerchip Semiconductor (PSMC)

D) Samsung

✔ Correct Answer: C) Tata Electronics + Powerchip Semiconductor (PSMC)

■ *Explanation: Tata Electronics, in partnership with Taiwan's Powerchip Semiconductor Manufacturing Corporation (PSMC), received government approval to set up India's first commercial semiconductor fabrication plant in Dholera, Gujarat (28nm chips). Another fab is being set up by Micron Technology in Sanand, Gujarat (semiconductor packaging/assembly). The India Semiconductor Mission (ISM) has a ■76,000 crore outlay.*

Q51. India's Chandrayaan-4 mission (planned 2027–28) has what primary objective, making it different from Chandrayaan-3?

A) Orbiting the Moon to study its geology from space

B) Soft landing near the Moon's north pole

C) Sample return mission – collecting and bringing lunar soil back to Earth

D) Deploying a permanent robotic station on the Moon

✔ Correct Answer: C) Sample return mission – collecting and bringing lunar soil back to Earth

■ *Explanation: Chandrayaan-4 is India's first lunar sample return mission — it will land on the Moon, collect rock/soil samples, and bring them back to Earth for detailed analysis. It requires two LVM3 rocket launches: one for the lander/ascent vehicle and one for the transfer module. It will make India only the 4th country to return lunar samples (after USSR, USA, China).*

Q52. India's first quantum computer, developed under the National Quantum Mission, was demonstrated by which IIT?

A) IIT Bombay

B) IIT Madras

C) IIT Delhi

D) IIT Roorkee

✔ Correct Answer: A) IIT Bombay

■ *Explanation: IIT Bombay demonstrated India's first indigenously developed superconducting quantum computer (5-qubit system) in 2024 as part of the National Quantum Mission. This was a critical milestone in India's quantum computing journey. Multiple IITs and institutions are participating in India's quantum technology ecosystem under NQM.*

Q53. The PRAHAR Light Machine Gun (LMG), which is replacing the INSAS LMG in the Indian Army, was developed by which DRDO laboratory?

A) DRDL (Hyderabad)

B) ARDE – Armament Research and Development Establishment (Pune)

C) SAC (Ahmedabad)

D) DMRL (Hyderabad)

✔ Correct Answer: B) ARDE – Armament Research and Development Establishment (Pune)

■ *Explanation: The Prahar LMG (Light Machine Gun) was developed by ARDE (Armament Research and Development Establishment) in Pune under DRDO. It is a modern 5.56mm LMG designed to replace the aging INSAS LMG. Prahar fires 600–700 rounds per minute and is lighter and more reliable than its predecessor.*

Q54. Under the 'Make in India' Defence initiative, India has put how many items on its Positive Indigenisation List (PIL) — barring their import?

A) Over 100 items

B) Over 300 items

C) Over 500 items

D) Over 5,600 items

✔ Correct Answer: D) Over 5,600 items

■ *Explanation: India's Ministry of Defence has released five Positive Indigenisation Lists (PILs) banning imports of over 5,600 items (including ammunition, equipment, platforms, and weapons systems) to promote domestic defence manufacturing. The target is 70% indigenisation in defence by 2027. India's defence exports reached ■21,083 crore in 2023–24.*