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Complete Syllabus • Conceptual Flowcharts • Comparative Tables • Solved Practice Questions

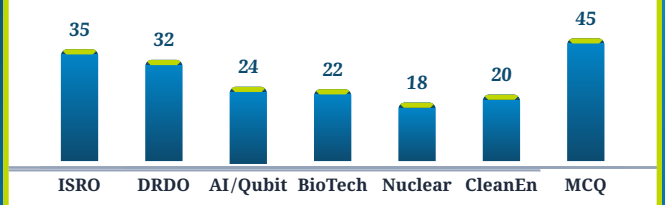
CURRENT AFFAIRS 2026 — SCIENCE, TECHNOLOGY, ISRO SPACE MISSIONS & DRDO DEFENCE

ISRO Missions 2026 (Gaganyaan-G1, Axiom-4 Shubhanshu Shukla, NISAR, SPADEX, Chandrayaan-4/5, Venus Orbiter, Bharatiya Antariksh Station, NGLV Soorya), DRDO Systems (Project Kusha, Divyastra, RudraM-II, Zorawar, INS Arighaat), IndiaAI & Quantum Mission

Topic-Wise Exam Weightage Distribution (%)



Previous Years' Question Trend Analysis



Target Competitive, Entrance & Departmental Examinations

UPSC CSE • State PCS • NDA/CDS/CAPF/AFCAT • SSC • Railway ALP/NTPC • Defence & Scientific Exams

Core Syllabus Pillars & Exam Question Weightage (%)

- ISRO Space Missions 2026 (Gaganyaan, NISAR, Chandrayaan-4, BAS) (30%)
- DRDO Missiles (Project Kusha, Divyastra), Zorawar & Arighaat (26%)
- IndiaAI Mission, National Quantum Mission & Supercomputing (18%)
- Biotechnology, Gene Therapy, Indigenous Vaccines & Health (14%)
- Green Hydrogen, Nuclear Energy & Semiconductor Mission (12%)

Complete Theory
NCERT & Official Sources

Visual Flowcharts
Comparative Matrices

Memory Tricks
Exam Trap Alerts

75+ Solved MCQs
Rapid Revision Points

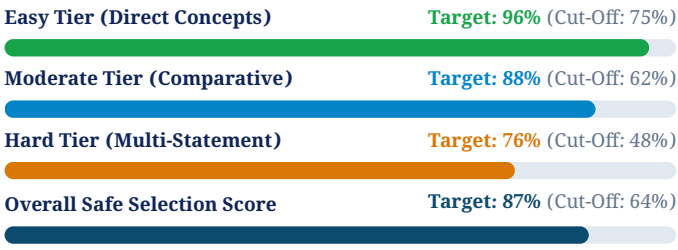
Preface, Exam Weightage Dashboard & Study Strategy — CURRENT AFFAIRS 2026 — SCIENCE, TECHNOLOGY, ISRO SPACE MISSIONS & DRDO DEFENCE

IUC Academy (Inclusive Universal Careers Academy | www.iucacademy.com) • Official English Medium Study Notes

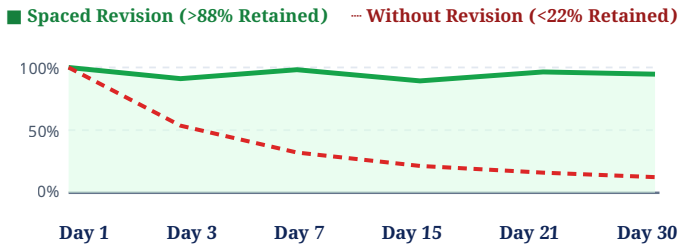
Dear Aspirants,

Modern competitive, entrance, and departmental promotion examinations demand a combination of deep conceptual clarity, statutory precision, and rapid revision tools. Prepared by **Inclusive Universal Careers Academy (IUC Academy — www.iucacademy.com)**, these comprehensive English-medium study notes integrate **structured chapter theory, 4-node conceptual process flowcharts, multi-column comparative tables, inline mathematical/scientific formulas, 'Did You Know?' boxes, 'Exam Trap Alert' callouts, 'Memory Trick' mnemonics, Chapter-End Analytical Synthesis Matrices, 75+ Step-by-Step Solved MCQs, and Rapid-Fire Revision Points**.

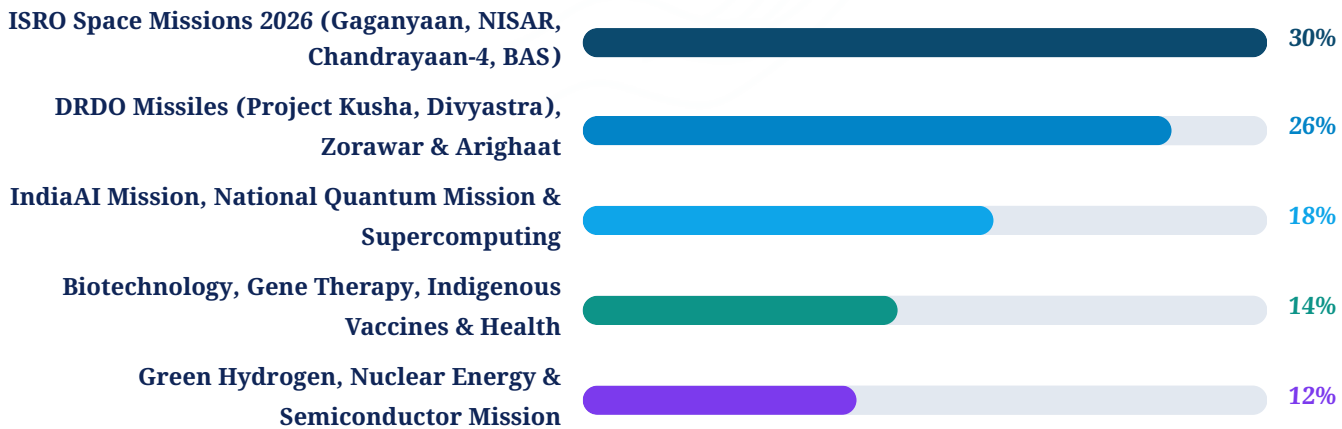
Target Accuracy vs Qualifying Cut-Off Benchmark (%)



Spaced Revision (1-3-7-21 Day Rule) & Retention Curve



Topic-Wise Exam Question Weightage Index (%)



Verified Official Curriculum & Statutory Reference Portals

- इसरो आधिकारिक पोर्टल (https://www.isro.gov.in/)
- डीआरडीओ आधिकारिक पोर्टल (https://www.drdo.gov.in/)
- पत्र सूचना कार्यालय (PIB) (https://www.pib.gov.in/)
- IUC अकादमी आधिकारिक पोर्टल (https://www.iucacademy.com)

Detailed Table of Contents & Chapter Architecture

CURRENT AFFAIRS 2026 — SCIENCE, TECHNOLOGY, ISRO SPACE MISSIONS & DRDO DEFENCE • Complete Chapters, Comparative Matrices, Solved MCQs & Rapid Revision

1. Executive Thematic Overview

2. Chapter 1: ISRO Human Spaceflight & Orbital Architecture 2026: Gaganyaan-1 (G1), Vyommitra & Bharatiya Antariksh Station

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

3. Chapter 2: ISRO Exploration, Earth Observation & Heavy-Lift Propulsion 2026: NISAR, SpaDeX, Chandrayaan-4 & NGLV Soorya

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

4. Chapter 3: DRDO Strategic & Tactical Missiles 2026: Project Kusha LR-SAM, RudraM-II, VSHORADS & Pralay

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

5. Chapter 4: DRDO Hypersonic Technology, Naval Weapons, Armoured Platforms & Directed Energy Systems 2026

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

6. Chapter 5: IndiaAI Mission 2026: 45,000+ GPU Sovereign Compute, AIKosh, BharatGen & Safe and Trusted AI

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

7. Chapter 6: National Quantum Mission (NQM) 2026: Four Thematic Hubs, 1,000-km QKD & Indigenous Qubit Roadmaps

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

8. Chapter 7: India Semiconductor Mission (ISM) & Semicon 2.0 in 2026: Commercial Fabs, ATMP/OSAT & DLI Ecosystem

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

9. Chapter 8: Biotechnology, BioE3 Policy, Supercomputing (PARAM Rudra & Arka/Arunika) & Deep-Ocean Mission 2026

- 1. Contextual & Institutional Overview (2026 Status)
- 2. Deep Analytical Breakdown & Technical Specifications
- 4. Comparative Data & Specification Matrix
- 5. High-Yield Examination Boxes
- 6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

10. BOOK CA11 — 45 Solved 4-Option Multiple-Choice Questions (MCQs)

11. Extended Comparative & Analytical Practice Set (Questions 46–85)

12. BOOK CA11 — 65 Rapid-Fire Revision Points

Publisher & Academic Platform: Inclusive Universal Careers Academy (IUC Academy)

Official Reference Portals: ISRO Official Portal | DRDO Official Portal | MoEFCC Official Portal | Forest Survey of India ISFR | Press Information Bureau (PIB) | IUC Academy

Target Examinations: UPSC Civil Services (Prelims & Mains), State PCS (UPPSC, BPSC, MPPSC, RAS), SSC CGL/CHSL, Banking, Railway, Defence (NDA/CDS/CAPF), and Departmental Competitive Examinations

Executive Thematic Overview

This comprehensive 2026 academic volume under **BOOK CA11** presents verified, factual, and policy-gcycleed analysis drawn strictly from official Government of India notifications and scientific institutions (PIB, IUC Academy). It is structured across **8 Deep Analytical Chapters**, each equipped with **4-Node Process Flowcharts**, **Comparative Technical Tables**, **Did You Know? Insights**, **Exam Trap Alerts**, and **Memory Formulas**, followed by **45 Solved 4-Option Multiple-Choice Questions (MCQs)** with exhaustive explanations and **65 Rapid-Fire Revision Points**.

Chapter *1:* ISRO Human Spaceflight & Orbital Architecture *2026:* Gaganyaan-*1 (G1),* Vyommitra & Bharatiya Antariksh Station

Chapter Key Study Pillars — Chapter 1: ISRO Human Spaceflight & Orbital Architecture 2026: Gaganyaan-1 (G1), Vyommitra & Bharatiya Antariksh Station

Key Study Pillar 1	Key Study Pillar 2	Key Study Pillar 3	Key Study Pillar 4
Contextual & Institutional Overview (2026 Status)	**Deep Analytical Breakdown & Technical Specifications**	**Comparative Data & Specification Matrix**	**High-Yield Examination Boxes**

Primary Official Sources : https://www.isro.gov.in/ | https://www.pib.gov.in/ | https://www.iucacademy.com

1. Contextual & Institutional Overview *(2026* Status*)*

In 2026, the Indian Space Research Organisation (ISRO) under Chairman Dr. V. Narayanan transitioned India's human spaceflight programme from sub-orbital testbeds to orbital qualification. The centrepiece of 2026 orbital validation is **Gaganyaan-1 (G1)**, the first uncrewed orbital flight scheduled for the final quarter of 2026 from the Second Launch Pad at Satish Dhawan Space Centre (SDSC-SHAR), Sriharikota (PIB). Aboard the human-rated launch vehicle **HLVM3**, the G1 mission carries the AI-enabled half-humanoid robot **Vyommitra** to validate the Environmental Control and Life Support System (ECLSS), Crew Escape System (CES), thermal protection shield, parachute deceleration architecture, and ocean recovery protocols in the Bay of Bengal and Arabian Sea.

2. Deep Analytical Breakdown & Technical Specifications

• 1. **Human-Rated LVM3 (HLVM3) Architecture**: HLVM3 is derived from ISRO's heaviest operational rocket, LVM3 (formerly GSLV Mk-III). It comprises three propulsion stages: two **HS200** solid strap-on stages burning HTPB fuel, a liquid core stage **L110** powered by twin Vikas engines, and a cryogenic upper stage **C32** powered

by the indigenous CE-20 cryogenic engine uprated to 22 tonnes of thrust. Fault detection, isolation, and reconfigurationavionics are integrated through the Integrated Vehicle Health Management (IVHM) computer.

• 2. **Orbital Unit (Crew Unit + Service Unit)**: The Gaganyaan spacecraft weighs approximately 8,200 kg (8.2 tonnes) and consists of two coupled compartments: the pressurised habitable **Crew Unit** (with an ablative silica-phenolic thermal protection system designed to withstand 1,600°C atmospheric re-entry temperatures) and the unpressurised **Service Unit** (housing bi-propellant liquid apogee motors, solar arrays, and radiator panels). During G1, **Vyommitra** monitors cabin pressure, carbon dioxide scrubbing, humidity levels, and voice/panel switch operations.

• 3. **Astronaut Training & Axiom-4 Precursor Integration**: India's four designated Gaganyaan astronaut-designates (**Prashanth Balakrishnan Nair, Ajit Krishnan, Angad Pratap, and Shubhanshu Shukla**) completed advanced simulator training at the Astronaut Training Facility in Bengaluru alongside international ISS mission integration (ISRO). These operational lessons directly feed into the uncrewed G1/G2/G3 sequence prior to the crewed **H1 Mission** targeted for 2027 in a 400 km Low Earth Orbit (LEO) for 3 days.

• 4. **Bharatiya Antariksh Station (BAS) Roadmap**: Approved by the Union Cabinet with an expanded Gaganyaan-linked budget of ₹20,193 crore (PIB), India's indigenous space station **Bharatiya Antariksh Station (BAS)** will have its first base unit (**BAS-1**, weighing ~10 tonnes) launched aboard LVM3 by **2028**, culminating in a five-unit, **52-tonne** orbital laboratory by **2035** in a 400–450 km orbit at 51.5° inclination.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow**:
[HLVM3 Liftoff from Sriharikota] [400 km LEO Injection with Vyommitra] [ECLSS & De-boost Validation] [10-Parachute Splashdown & Indian Navy Recovery]

4. Comparative Data & Specification Matrix

Parameter / Component	Technical Specification (2026 Status)	Nodal Centre / Agency	Primary Operational Role
Launch Vehicle	HLVM3 (3-stage: HS200 + L110 + C32 Cryogenic)	Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram	Human-rated launch to 400 km Low Earth Orbit
Uncrewed Flight G1	Q4 2026 Orbital Flight carrying Vyommitra	Human Space Flight Centre (HSFC), Bengaluru	End-to-end validation of ECLSS, avionics, and re-entry
Deceleration System	10-Parachute Complex (2 Apex + 2 Drogue + 3 Pilot + 3 Main)	ADRDE Agra (DRDO) & VSSC	Reduces terminal splashdown velocity below 7 m/s
Bharatiya Antariksh Station	BAS-1 Base Unit (2028); Full 52-tonne 5-unit Station (2035)	ISRO HSFC & URSC Bengaluru	Long-duration microgravity research in 400 km LEO
National Space Day 2026	3rd Edition observed on 23 August 2026 at Ahmedabad	Department of Space (ISRO)	Theme: Towards Viksit Bharat — Global Space Leadership

5. High-Yield Examination Boxes

Did You Know? Unlike earlier space missions where environmental control systems were imported, ISRO indigenously developed the Gaganyaan **Environmental Control and Life Support System (ECLSS)** to maintain a 1-atmosphere oxygen-nitrogen cabin mix and regenerate breathable air using lithium hydroxide and regenerable molecular sieves (ISRO).

Exam Trap Alert: Candidates often confuse the **Gaganyaan G1 uncrewed flight (2026)** with the **crewed H1 flight (targeted for 2027)**. Also note that **Vyommitra** is a legless half-humanoid female robot developed by the ISRO Inertial Systems Unit (IISU), Thiruvananthapuram—it does NOT walk, as legs are unnecessary in microgravity; instead, it uses upper-body dexterity to operate control panels.

★ **Memory Formula (HV-400-BAS)**: **H**LVM3 rocket + **V**yommitra humanoid + **400** km LEO orbit + **BAS**-1 by 2028 (52 tonnes by 2035).

6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

- **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 1 are cross-verified with https://www.isro.gov.in/ and https://www.pib.gov.in/.
- **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
- **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 2 Comprehensive Analytical & Statutory Revision Matrix

Core Sub-Domain	Key Concept / Provision	Verified Analytical Parameters & Exam Distinctions (इसरो आधिकारिक पोर्टल)
Contextual & Institutional Overview (2026 Status)	**Primary Nodal Portal Verification**	All quantitative parameters and mission timelines in Chapter 1 are cross-verified with https://www.isro.gov.in/ and https://www.pib.gov.in/.
Deep Analytical Breakdown & Technical Specifications	**Prelims Statement-Based Readiness**	Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
Four-Node Operational & Policy Flowchart	**Mains Analytical Integration**	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 2 Multi-Statement Exam Verification Drills

Chapter 2 Statement-Verification Drill #1 — Both Statements Verified Correct

Statement-I (Primary Nodal Portal Verification): All quantitative parameters and mission timelines in Chapter 1 are cross-verified with https://www.isro.gov.in/ and https://www.pib.gov.in/.

Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 2: ISRO Exploration, Earth Observation & Heavy-Lift Propulsion 2026: NISAR, SpaDeX, Chandrayaan-4 & NGLV Soorya

Chapter Key Study Pillars — Chapter 2: ISRO Exploration, Earth Observation & Heavy-Lift Propulsion 2026: NISAR, SpaDeX, Chandrayaan-4 & NGLV Soorya

Key Study Pillar 1	Key Study Pillar 2	Key Study Pillar 3	Key Study Pillar 4
Contextual & Institutional Overview (2026 Status)	Deep Analytical Breakdown & Technical Specifications	Comparative Data & Specification Matrix	High-Yield Examination Boxes

Primary Official Sources : https://www.isro.gov.in/ | https://www.pib.gov.in/ | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

The year 2026 marks a transformative phase in planetary exploration, autonomous orbital robotics, and next-generation reusable propulsion for ISRO. Following the orbital deployment of the joint NASA-ISRO **NISAR** radar observatory aboard GSLV-F16 and the completion of the **SpaDeX (Space Docking Experiment)** mission (whose two satellites SDX01 and SDX02 re-entered Earth's atmosphere in 2026 after ~21 months of orbital docking demonstrations), ISRO accelerated engineering realization for **Chandrayaan-4**, **Venus Orbiter Mission (Shukrayaan-1)**, and the **Next Generation Launch Vehicle (NGLV 'Soorya')** (PIB).

2. Deep Analytical Breakdown & Technical Specifications

• 1. **NISAR (NASA-ISRO Synthetic Aperture Radar) Scientific Operations in 2026**: Launched aboard **GSLV-F16** into a 747 km Sun-Synchronous Dawn-Dusk Orbit, the 2,392 kg NISAR spacecraft ($1.5+ billion joint mission) is the world's first satellite to carry dual-frequency Synthetic Aperture Radar on a single platform: NASA JPL's **L-band SAR** (24 cm wavelength, penetrating dense forest canopies) and ISRO SAC's **S-band SAR** (12 cm wavelength, sensitive to agricultural crops and soil moisture). Using its 12-metre deployable gold-plated wire-mesh reflector antenna and **SweepSAR** technique, NISAR maps the entire globe every **12 days** to detect sub-centimetre crustal deformation, Himalayan glacier velocity, and forest biomass.

• 2. **SpaDeX Mission Completion & Atmospheric Re-entry (2026)**: Launched on PSLV-C60 with twin 220-kg spacecraft (**SDX01 Chaser** and **SDX02 Target**), SpaDeX made India the **4th country in the world** (after the USA, Russia, and China) to achieve autonomous orbital docking using an indigenous low-impact **Bharatiya**

Docking System (BDS) with a 450 mm androgynous mechanism and laser rangefinder suite. In 2026, both satellites completed controlled atmospheric re-entry roughly seven hours apart, concluding a 21-month technology validation campaign.

• 3. **Chandrayaan-4 (Lunar Sample Return Mission)**: Sanctioned at **₹2,104.06 crore** (PIB), Chandrayaan-4 consists of **five spacecraft units**—Propulsion Unit (PM), Descender Unit (DM), Ascender Unit (AM), Transfer Unit (TM), and Re-entry Unit (RM). Because the combined wet mass (~9,200 kg) exceeds the capacity of a single rocket, ISRO will launch it in **two separate LVM3 flights** and dock the stacks in Earth orbit before trans-lunar injection to collect ~2–3 kg of lunar south polar regolith.

• 4. **NGLV 'Soorya' & Aditya-L1 2026 Science**: Approved with an outlay of **₹8,239 crore**, the Next Generation Launch Vehicle (**Soorya**) is a 93-metre-tall, partially reusable three-stage heavy-lift rocket powered by **LOX-Methane** engines capable of placing **30 tonnes into LEO** (3x LVM3 capacity). Simultaneously, in 2026, **Aditya-L1**'s Visible Emission Line Coronagraph (**VELC**) reconstructed a solar Coronal Mass Ejection (CME) in 3D from Halo Orbit acycle Lagrange Point L1 (1.5 million km from Earth).

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow:** **[NISAR Dual L+S Band SweepSAR] [SpaDeX Androgynous Docking Proof] [Chandrayaan-4 Two-Launch Lunar Sample Return] [NGLV Soorya 30-Tonne Reusable Rocket]**

4. Comparative Data & Specification Matrix

Mission / Vehicle	Key Technical Architecture	Cabinet Outlay / Cost	2026 Milestone & Strategic Significance
NISAR (GSLV-F16)	L-Band (24 cm, NASA) + S-Band (12 cm, ISRO) SAR; 12m Antenna	$1.5+ Billion Joint Mission	Full 12-day global repeat radar mapping of cryosphere & biomass in 2026
SpaDeX (SDX01 & SDX02)	Bharatiya Docking System (450 mm androgynous ring), Laser/GNSS	Indigenous Tech Demonstrator	India became 4th nation in space docking; mission completed re-entry in 2026
Chandrayaan-4	5 Spacecraft Units (PM, DM, AM, TM, RM) via 2 LVM3 Launches	₹2,104.06 Crore (PIB)	Lunar South Pole sample collection, lunar-orbit docking & Earth re-entry
NGLV 'Soorya'	LOX-Methane Reusable First Stage; 93 m height; 30-tonne LEO payload	₹8,239 Crore (plus Third Launch Pad)	Enables heavy Bharatiya Antariksh Station assembly and crewed lunar flights
Venus Orbiter (VOM)	S-Band Synthetic Aperture Radar & Sub-surface Radar payloads	₹1,236 Crore (ISRO)	Studies Venusian sulfuric acid clouds, super-rotation, and volcanic resurfacing

5. High-Yield Examination Boxes

Did You Know? In the **NISAR** mission, the longer-wavelength **L-band radar (24 cm)** supplied by NASA penetrates through dense tropical forest leaves to bounce off tree trunks and the gcycle, while ISRO's shorter-wavelength **S-band radar (12 cm)** reflects off upper canopy leaves and light vegetation—giving scientists a complete 3D cross-section of forest carbon stocks (ISRO).

Exam Trap Alert: Do not confuse the frequencies contributed by each partner in **NISAR**: **NASA provided the L-Band SAR** and the 12m deployable boom/reflector, whereas **ISRO provided the S-Band SAR**, the I-3K spacecraft bus, and the **GSLV-F16** launch vehicle. Also remember that **Chandrayaan-4** uses **5 units** launched across **2 LVM3 rockets**, not a single rocket.

★ **Memory Formula (LS-45-30)**: **L**-band (NASA) + **S**-band (ISRO) in NISAR | **4**th country in docking (SpaDeX) | **5** units in Chandrayaan-4 | **30** tonnes LEO capacity in NGLV Soorya.

6. Key Statutory, Institutional & Exam-Oriented Takeaways *(2026)*

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 2 are cross-verified with https://www.isro.gov.in/ and https://www.pib.gov.in/.

• **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter *3* Comprehensive Analytical & Statutory Revision Matrix

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Four-Node Operational & Policy Flowchart	Mains Analytical Integration	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter *3* Multi-Statement Exam Verification Drills

Chapter 3 Statement-Verification Drill #1 — Both Statements Verified Correct

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Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 3: DRDO Strategic & Tactical Missiles 2026: Project Kusha LR-SAM, RudraM-II, VSHORADS & Pralay

Chapter Key Study Pillars — Chapter 3: DRDO Strategic & Tactical Missiles 2026: Project Kusha LR-SAM, RudraM-II, VSHORADS & Pralay

Key Study Pillar 1	Key Study Pillar 2	Key Study Pillar 3	Key Study Pillar 4
Contextual & Institutional Overview (2026 Status)	Deep Analytical Breakdown & Technical Specifications	Comparative Data & Specification Matrix	High-Yield Examination Boxes

Primary Official Sources : https://www.drdo.gov.in/ | https://www.pib.gov.in/ | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

Throughout 2026, the Defence Research and Development Organisation (DRDO) achieved landmark flight-test successes across multi-layered air defence, air-to-surface anti-radiation strike, and quasi-ballistic tactical deterrence (PIB). On **23 July 2026**, DRDO conducted the maiden flight-test of the indigenous **'Kusha' Long-Range Surface-to-Air Missile (LR-SAM)** from APJ Abdul Kalam Island off the coast of Odisha. This was preceded by the successful flight-trials of **VSHORADS** on **27 February 2026** and **RudraM-II** from a Su-30 MKI fighter on **2 June 2026**, and followed by the user-readiness flight test of the **Pralay** quasi-ballistic missile on **5 November 2026**.

2. Deep Analytical Breakdown & Technical Specifications

• 1. **Project 'Kusha' Long-Range Surface-to-Air Missile (Maiden Flight-Test: 23 July 2026)**: Conducted from APJ Abdul Kalam Island, Odisha (PIB), the maiden flight-test of the **Kusha** LR-SAM successfully intercepted an electronic target simulating a high-speed, high-altitude aerial threat. Developed as a three-tier indigenous air defence shield (with intercept envelopes spanning 150 km, 250 km, and up to 350–400 km, comparable to the S-400 Triumf), Project Kusha neutralises stealth fighters, AWACS aircraft, cruise missiles, and unmanned aerial vehicles.

• 2. **RudraM-II Air-to-Surface Missile (Flight-Test: 2 June 2026)**: Jointly flight-tested by DRDO and the Indian Air Force (IAF) from a **Su-30 MKI** platform off the Odisha coast (PIB), **RudraM-II** is an indigenously developed solid-propelled air-launched missile with a strike range of **300 km**, Mach 5.5 peak velocity, and an internal Inertial Navigation System (INS) coupled with GPS/NavIC satellite guidance and a Passive Homing Head (PHH) + Imaging Infrared (IIR) seeker to destroy enemy radar installations and fortified bunkers.

• 3. **VSHORADS (Very Short-Range Air Defence System — Flight-Trials: 27 February 2026)**: Revalidated off the coast of Chandipur, Odisha (PIB), VSHORADS is a 4th-generation Man-Portable Air Defence System (MANPADS) developed by Research Centre Imarat (RCI), Hyderabad. It features a miniaturised **Reaction Control System (RCS)** for high agility and an uncooled Imaging Infrared seeker, with an effective interception range of up to **6 km** against low-flying helicopters and drones.

• 4. **Pralay Tactical Quasi-Ballistic Missile (Flight-Test: 5 November 2026) & Gaurav Glide Bomb**: Powered by a solid propellant composite motor, **Pralay** has a strike range of **150 to 500 km** (carrying a 350–700 kg

conventional warhead) and follows a depressed quasi-ballistic trajectory with mid-air manoeuvrability to defeat ballistic missile defence interceptors. Additionally, DRDO tested **Gaurav**, a 1,000-kg winged Long-Range Glide Bomb launched from Su-30 MKI that glides ~100 km using INS/NavIC guidance.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow:** **[VSHORADS Point Defence (6 km)] [Project Kusha 3-Tier LR-SAM Shield (150-350 km)] [RudraM-II Air-to-Surface Strike (300 km)] [Pralay Quasi-Ballistic Deterrence (150-500 km)]**

4. Comparative Data & Specification Matrix

Weapon System	2026 Test Date & Site	Category & Propulsion	Range & Key Technical Capability	
Project 'Kusha' LR-SAM	23 July 2026	APJ Abdul Kalam Island, Odisha	Long-Range Surface-to-Air Missile (3-Tier)	150–350+ km range; intercepts fighters, AWACS, cruise missiles (PIB)
RudraM-II	2 June 2026	Off Odisha Coast (Su-30 MKI)	Solid-Propelled Air-to-Surface / Anti-Radiation	~300 km range; Mach 5.5; Passive Homing Head + IIR seeker
VSHORADS	27 February 2026	ITR Chandipur, Odisha	4th-Gen MANPADS (Dual-Thrust Solid Motor)	Up to 6 km range; Reaction Control System (RCS) for high-G agility
Pralay	5 November 2026	Off Odisha Coast	Surface-to-Surface Quasi-Ballistic Tactical Missile	150–500 km range; 350–700 kg conventional payload; mid-air manoeuvring
Gaurav Glide Bomb	2026 Operational Trials	ITR Chandipur (Su-30 MKI)	1,000-kg Class Winged Precision Glide Bomb	~100 km stand-off range; developed by RCI, ARDE & ITR (DRDO)

5. High-Yield Examination Boxes

Did You Know? Unlike conventional ballistic missiles that follow a predictable parabolic arc above the atmosphere, **Pralay** is a **quasi-ballistic** missile: it stays largely within the endo-atmosphere and performs terminal pull-up and lateral manoeuvres using jet-vane thrust vector control, making interception by enemy air defence radars extremely difficult (DRDO).

Exam Trap Alert: Do not confuse **Project Kusha** (an indigenous 3-tier **Surface-to-Air** missile system tested on 23 July 2026) with **Pralay** (a **Surface-to-Surface** tactical quasi-ballistic missile) or **RudraM-II** (an **Air-to-Surface** missile fired from Su-30 MKI). Also note that **Gaurav** (1,000 kg winged bomb, ~100 km range) is larger than **Gautham** (550 kg non-winged glide bomb, 30 km range).

★ **Memory Formula (V-R-K-P 2026 Chronology)**: **V**SHORADS (Feb 2026) **R**udraM-II (June 2026) **K**usha LR-SAM (July 2026) **P**ralay (Nov 2026).

6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 3 are cross-verified with https://www.drdo.gov.in/ and https://www.pib.gov.in/.

• **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 4 Comprehensive Analytical & Statutory Revision Matrix

Core Sub-Domain	Key Concept / Provision	Verified Analytical Parameters & Exam Distinctions (इसरो आधिकारिक पोर्टल)
Contextual & Institutional Overview (2026 Status)	Primary Nodal Portal Verification	All quantitative parameters and mission timelines in Chapter 3 are cross-verified with https://www.drdo.gov.in/ and https://www.pib.gov.in/.
Deep Analytical Breakdown & Technical Specifications	Prelims Statement-Based Readiness	Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
Four-Node Operational & Policy Flowchart	Mains Analytical Integration	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 4 Multi-Statement Exam Verification Drills

Chapter 4 Statement-Verification Drill #1 — Both Statements Verified Correct

Statement-I (Primary Nodal Portal Verification): All quantitative parameters and mission timelines in Chapter 3 are cross-verified with https://www.drdo.gov.in/ and https://www.pib.gov.in/.

Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 4: DRDO Hypersonic Technology, Naval Weapons, Armoured Platforms & Directed Energy Systems 2026

Chapter Key Study Pillars — Chapter 4: DRDO Hypersonic Technology, Naval Weapons, Armoured Platforms & Directed Energy Systems 2026

Key Study Pillar 1	Key Study Pillar 2	Key Study Pillar 3	Key Study Pillar 4
Contextual & Institutional Overview (2026 Status)	Deep Analytical Breakdown & Technical Specifications	Comparative Data & Specification Matrix	High-Yield Examination Boxes

Primary Official Sources : https://www.drdo.gov.in/ | https://www.pib.gov.in/ | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

Beyond air defence and air-launched strike weapons, DRDO in 2026 consolidated India's entry into the elite club of nations possessing indigenous **hypersonic glide and scramjet propulsion**, high-altitude light armoured warfare (**Zorawar Light Tank**), undersea anti-submarine weapons (**SMART** & **Varunastra**), and **Directed Energy Weapons (DEW)** (PIB). These systems directly reinforce deterrence along both high-altitude Himalayan borders and the Indian Ocean Region.

2. Deep Analytical Breakdown & Technical Specifications

• 1. **Long-Range Hypersonic Missile & Scramjet Combustor Gcycle Testing**: Following the historic flight test of India's first **Long-Range Anti-Ship/Land-Attack Hypersonic Missile** from APJ Abdul Kalam Island (designed for a **>1,500 km** range at speeds exceeding **Mach 6**), DRDO's Defence Research & Development Laboratory (**DRDL, Hyderabad**) achieved continuous gcycle testing of an active-cooled **Supersonic Combustion Ramjet (Scramjet) combustor for over 1,000 seconds**, validating endothermic scramjet fuel and thermal barrier coatings.

• 2. **Agni-V with MIRV (Mission Divyastra) & Agni-Prime**: Developed under Mission Divyastra, **Agni-V (5,000+ km range)** integrates indigenous **MIRV (Multiple Independently Targetable Re-entry Vehicle)** technology, allowing a single three-stage solid-fuel intercontinental-class missile to deliver multiple nuclear warheads to separate targets hundreds of kilometres apart. Concurrently, **Agni-Prime (Agni-P)**—a canisterised 1,000–2,000 km range new-generation ballistic missile with composite rocket motor casings—entered strategic forces service.

• 3. **Zorawar Indigenous Light Tank (2026 High-Altitude Trials)**: Jointly developed in record time by DRDO's **Combat Vehicles Research & Development Establishment (CVRDE, Avadi)** and **Larsen & Toubro (L&T)**, **Zorawar** is a **25-tonne** amphibious light tank engineered for rapid deployment in Eastern Ladakh and Sikkim at altitudes above 15,000 feet. Equipped with a **105 mm high-pressure rifled gun** capable of firing anti-tank guided missiles (ATGMs), loitering munitions, and an active protection system, Zorawar completed desert and high-altitude firing trials in 2026.

• 4. **Guided Pinaka ER, SMART Anti-Submarine System & DURGA-II Laser**: DRDO completed user validation of **Guided Pinaka Mk-II Extended Range (75 km)** rockets (with export deliveries to Armenia and European interest), the **SMART (Supersonic Missile-Assisted Release of Torpedo)** system (extending lightweight torpedo engagement to **643 km** via a canisterised supersonic missile carrier), and high-energy laser/microwave counter-drone Directed Energy Weapons under Project **DURGA-II** and **KALI**.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow:** **[DRDL 1,000-Sec Scramjet Combustor] [1,500+ km Hypersonic Glide Missile] [Zorawar 25-Tonne High-Altitude Tank] [SMART 643 km Stand-Off Anti-Submarine Torpedo]**

4. Comparative Data & Specification Matrix

Indigenous Defence System	Developing DRDO Lab / Partner	Weight / Range / Speed	Core Tactical / Strategic Application	
Long-Range Hypersonic Missile	DRDL Hyderabad (DRDO)	>1,500 km range	Speed > Mach 6	Anti-ship and land-attack strike immune to conventional naval air defences
Zorawar Light Tank	CVRDE Avadi (DRDO) & L&T	25 Tonnes	105 mm Gun + ATGM + Drone integration	High-altitude armoured warfare in Ladakh & North-East; air-transportable by C-17
SMART System	DRDL, RCI Hyderabad & NSTL Visakhapatnam	643 km Range	Carries Shyena Lightweight Torpedo	Stand-off anti-submarine warfare far beyond shipborne sonar range
Agni-V (Mission Divyastra)	ASL & DRDL Hyderabad	5,000+ km Range	3-Stage Solid Fuel	MIRV capability delivering multiple independent warheads from one missile
Guided Pinaka Mk-II ER	ARDE Pune & HEMRL Pune	75 km Extended Range (44 sec for 12 rockets)	Precision multi-barrel rocket artillery with INS/NavIC trajectory correction	

5. High-Yield Examination Boxes

Did You Know? The indigenous 25-tonne light tank **Zorawar** is named after the legendary 19th-century Dogra military general **General Zorawar Singh Kahluria** (1786–1841), known as the 'Conqueror of Ladakh', who led audacious high-altitude Himalayan campaigns across Ladakh, Baltistan, and Western Tibet (PIB).

Exam Trap Alert: Understand the distinction between a **Hypersonic Glide Vehicle (HGV)** (boosted by a solid rocket motor and gliding unpowered at >Mach 5 inside the upper atmosphere with aerodynamic fins) and a **Hypersonic Cruise Missile (HCM)** (powered continuously throughout flight by an air-breathing **Scramjet engine** with no moving compressor parts). DRDO is developing both architectures.

★ **Memory Formula (Z-25 / S-643 / H-1500):** **Z**orawar = **25** tonnes | **S**MART = **643** km torpedo delivery | **H**ypersonic missile = **1,500**+ km.

6. Key Statutory, Institutional & Exam-Oriented Takeaways *(2026)*

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 4 are cross-verified with https://www.drdo.gov.in/ and https://www.pib.gov.in/.

• **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter *5* Comprehensive Analytical & Statutory Revision Matrix

Core Sub-Domain	Key Concept / Provision	Verified Analytical Parameters & Exam Distinctions (इसरो आधिकारिक पोर्टल)
Contextual & Institutional Overview (2026 Status)	**Primary Nodal Portal Verification**	All quantitative parameters and mission timelines in Chapter 4 are cross-verified with https://www.drdo.gov.in/ and https://www.pib.gov.in/.
Deep Analytical Breakdown & Technical Specifications	**Prelims Statement-Based Readiness**	Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
Four-Node Operational & Policy Flowchart	**Mains Analytical Integration**	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter *5* Multi-Statement Exam Verification Drills

Chapter 5 Statement-Verification Drill #1 — **Both Statements Verified Correct**

Statement-I (Primary Nodal Portal Verification): All quantitative parameters and mission timelines in Chapter 4 are cross-verified with https://www.drdo.gov.in/ and https://www.pib.gov.in/.

Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 5: IndiaAI Mission 2026: 45,000+ GPU Sovereign Compute, AIKosh, BharatGen & Safe and Trusted AI

Chapter Key Study Pillars — Chapter 5: IndiaAI Mission 2026: 45,000+ GPU Sovereign Compute, AIKosh, BharatGen & Safe and Trusted AI

Key Study Pillar 1	Key Study Pillar 2	Key Study Pillar 3	Key Study Pillar 4
Contextual & Institutional Overview (2026 Status)	Deep Analytical Breakdown & Technical Specifications	Comparative Data & Specification Matrix	High-Yield Examination Boxes

Primary Official Sources : https://www.pib.gov.in/ | https://www.iucacademy.com | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

In 2026, the Ministry of Electronics and Information Technology (MeitY) scaled the **IndiaAI Mission** (approved with a five-year outlay of **₹10,371.92 crore**) into one of the world's largest public-private sovereign artificial intelligence infrastructures (PIB). According to official government releases in August and November 2026, shared AI compute capacity under the IndiaAI Mission expanded to **over 45,000 Graphics Processing Units (GPUs)** as of June 2026—more than four times the initial 10,000-GPU benchmark. By August 2026, **237 research and startup projects** had utilised **93.18 lakh GPU hours** of subsidised high-performance computing, while **13 Responsible AI projects** were approved in July 2026 under the Safe & Trusted AI pillar (PIB).

2. Deep Analytical Breakdown & Technical Specifications

• 1. **Seven Pillars of the IndiaAI Mission (2026 Operational Status)**: Implemented by the **IndiaAI Independent Business Division (IBD)** under **Digital India Corporation (DIC)**, the mission operates across 7 integrated pillars: (i) **IndiaAI Compute Capacity** (45,000+ GPUs empanelled via public-private cloud providers at subsidised rates under ₹100/GPU-hour), (ii) **IndiaAI Innovation Centre** (developing indigenous Large Multimodal Models), (iii) **IndiaAI Datasets Platform (AIKosh)**, (iv) **IndiaAI Application Development Initiative** (healthcare, agriculture, governance, climate), (v) **IndiaAI FutureSkills** (fellowships across B.Tech, M.Tech, PhD, and Tier-2/3 Data & AI Labs), (vi) **IndiaAI Startup Financing**, and (vii) **Safe & Trusted AI**.

• 2. **Indigenous Sovereign Foundation Models (Sarvam, BharatGen, Soket & Gnani)**: Under the IndiaAI Innovation Centre, Indian consortia and startups were selected to build sovereign foundational models trained on Indian languages, scripts, and socio-cultural contexts. **BharatGen** (led by IIT Bombay consortium under NM-ICPS), **Sarvam AI** (developing large parameter sovereign models with voice and Indic reasoning), **Soket AI Labs**, and **Gnani.ai** (speech-to-speech multilingual foundation models) are building models spanning all **22 Eighth Schedule languages**.

• 3. **AIKosh (IndiaAI Datasets Platform)**: Launched as a unified national repository of non-personal, anonymised datasets and AI models, **AIKosh** integrates thousands of public datasets from central ministries, weather agencies, agricultural universities, and Bhashini voice corpora to solve data scarcity for low-resource Indian languages.

• 4. **Safe & Trusted AI Pillar (July 2026 Milestone)**: As of July 2026, the government approved **13 Responsible AI projects** (PIB) developed by leading IITs and IIITs focusing on machine unlearning, deepfake watermarking and detection, algorithmic bias auditing, privacy-preserving federated learning, and explainable AI governance frameworks.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow:** *[45,000+ Shared GPUs Empanelled] [AIKosh National Datasets + Bhashini] [Sovereign Indic LMMs: BharatGen & Sarvam] [13 Safe & Trusted AI Governance Tools]*

4. Comparative Data & Specification Matrix

IndiaAI Mission Pillar / Metric	Verified 2026 Official Figure / Status	Implementing Agency / Partners	Core Objective & Impact
Total Financial Outlay	₹10,371.92 Crore (5-Year Outlay)	MeitY / Digital India Corporation (IndiaAI IBD)	End-to-end sovereign AI ecosystem across compute, data, models, and skills
Shared AI Compute Capacity	45,000+ GPUs (as of June 2026)	Empanelled Cloud & Data Centre Providers	Subsidised compute access; 237 projects used 93.18 lakh GPU hours by Aug 2026 (PIB)
Safe & Trusted AI Projects	13 Responsible AI Projects approved (July 2026)	IITs, IIITs, and Academic Consortia	Deepfake detection, machine unlearning, bias mitigation, privacy tools
Indigenous Foundation Models	BharatGen, Sarvam AI, Soket AI, Gnani.ai	IndiaAI Innovation Centre & IIT Bombay Consortium	Multimodal text, speech, and vision models across 22 scheduled Indian languages
AIKosh Platform	National Datasets & Model Repository	IndiaAI IBD & Line Ministries	High-quality non-personal datasets for agriculture, health, education & Indic NLP

5. High-Yield Examination Boxes

Did You Know? While the original cabinet approval for the IndiaAI Mission targeted a minimum of **10,000 GPUs**, competitive bidding by Indian data centre operators in 2025–2026 enabled MeitY to empanel **more than 45,000 GPUs** (including NVIDIA H100, H200, AMD MI300X, and Intel Gaudi accelerators) at some of the lowest per-hour compute rates in the world (PIB).

Exam Trap Alert: In 2026 competitive exams, remember BOTH figures: the **statutory baseline target** of the IndiaAI Mission was **10,000+ GPUs**, whereas the **actual achieved empanelled capacity as of June 2026 is 45,000+ GPUs** (with 93.18 lakh GPU hours utilised across 237 projects by August 2026). Also note that **AIKosh** is the official name of the IndiaAI Datasets Platform.

★ **Memory Formula (10371-45K-13):** **₹10,371.92** Cr budget | **45,000+** GPUs live in June 2026 | **13** Responsible AI projects approved in July 2026.

6. Key Statutory, Institutional & Exam-Oriented Takeaways (2026)

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 5 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

• **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 6 Comprehensive Analytical & Statutory Revision Matrix

Core Sub-Domain	Key Concept / Provision	Verified Analytical Parameters & Exam Distinctions (इसरो आधिकारिक पोर्टल)
Contextual & Institutional Overview (2026 Status)	Primary Nodal Portal Verification	All quantitative parameters and mission timelines in Chapter 5 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.
Deep Analytical Breakdown & Technical Specifications	Prelims Statement-Based Readiness	Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
Four-Node Operational & Policy Flowchart	Mains Analytical Integration	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 6 Multi-Statement Exam Verification Drills

Chapter 6 Statement-Verification Drill #1 — Both Statements Verified Correct

Statement-I (Primary Nodal Portal Verification): All quantitative parameters and mission timelines in Chapter 5 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 6: National Quantum Mission (NQM) 2026: Four Thematic Hubs, 1,000-km QKD & Indigenous Qubit Roadmaps

Chapter Key Study Pillars — Chapter 6: National Quantum Mission (NQM) 2026: Four Thematic Hubs, 1,000-km QKD & Indigenous Qubit Roadmaps

Key Study Pillar 1	Key Study Pillar 2	Key Study Pillar 3	Key Study Pillar 4
Contextual & Institutional Overview (2026 Status)	Deep Analytical Breakdown & Technical Specifications	Comparative Data & Specification Matrix	High-Yield Examination Boxes

Primary Official Sources : https://www.pib.gov.in/ | https://www.iucacademy.com | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

Coordinated by the Department of Science and Technology (DST) and guided by the Office of the Principal Scientific Adviser, the **National Quantum Mission (NQM)**—backed by a cabinet outlay of **₹6,003.65 crore (2023–2031)**—achieved major operational milestones in 2026 (PIB). Through its **Four Thematic Hubs (T-Hubs)** established at premier institutions, India advanced toward building intermediate-scale quantum computers (**50 to 1,000 physical qubits**), demonstrated a **1,000-km quantum communication link** , and supported deep-tech quantum startups such as **QpiAI, QNu Labs, Dimira Technologies, and Prenishq**.

2. Deep Analytical Breakdown & Technical Specifications

• 1. **Four Thematic Hubs (T-Hubs) and Host Institutions**: The National Quantum Mission operates through four specialised consortia comprising 43 institutions across 17 states/UTs (PIB): (i) **Quantum Computing Hub** at **IISc Bengaluru** (superconducting, photonic, and neutral-atom quantum processors), (ii) **Quantum Communication Hub** at **IIT Madras** in collaboration with **C-DOT** (Quantum Key Distribution over optical fibre and free-space satellite links), (iii) **Quantum Sensing & Metrology Hub** at **IIT Bombay** (nitrogen-vacancy diamond magnetometers, atomic clocks, and gravimeters for navigation without GPS), and (iv) **Quantum Materials & Devices Hub** at **IIT Delhi** (topological superconductors, single-photon sources, and dilution refrigerator components).

• 2. **Phased Qubit Roadmap (50 to 1,000 Physical Qubits)**: NQM mandates a three-stage indigenous quantum computing timeline: **20–50 physical qubits** in the first 3 years, **50–100 physical qubits** in 5 years, and **50–1,000 physical qubits** within 8 years (by 2031) across superconducting transmon and photonic architectures.

• 3. **2026 Quantum Communication & Post-Quantum Cryptography (PQC) Milestones**: In 2026, India demonstrated long-distance **Quantum Key Distribution (QKD)** across a **1,000-km optical fibre and trusted-node network** (PIB) and integrated C-DOT's indigenous QKD systems with Post-Quantum Cryptography (PQC) routers to protect military, banking, and power-grid communications against 'harvest-now, decrypt-later' quantum cyber threats.

• 4. **Quantum Sensing for Strategic Defence & Healthcare**: At IIT Bombay's T-Hub, diamond-based quantum magnetometers and cold-atom interferometers are being engineered in 2026 both for ultra-sensitive brain

magnetocardiography/magnetoencephalography (MCG/MEG) and for GPS-denied submarine inertial navigation.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow:** **[IISc Bengaluru: Quantum Computing] [IIT Madras + C-DOT: 1,000-km QKD Link] [IIT Bombay: Quantum Sensing & Atomic Clocks] [IIT Delhi: Quantum Materials & Cryo-Devices]**

4. Comparative Data & Specification Matrix

Thematic Hub (T-Hub) Domain	Lead Host Institution	Key 2026 Technical Target / Deliverable	Strategic Application
Quantum Computing	Indian Institute of Science (IISc), Bengaluru	20–50 to 1,000 physical qubits (Superconducting & Photonic)	Drug discovery, financial optimization, cryptography simulation
Quantum Communication	IIT Madras (with C-DOT)	1,000-km fibre QKD & satellite-based free-space quantum link	Unhackable defence, banking, and diplomatic communications (PIB)
Quantum Sensing & Metrology	IIT Bombay	Atomic clocks, NV-diamond magnetometers, quantum gravimeters	Submarine navigation in GPS-denied environments & medical imaging
Quantum Materials & Devices	IIT Delhi	Superconducting resonators, single-photon detectors, topological materials	Domestic supply chain for quantum chips and cryogenic hardware

5. High-Yield Examination Boxes

Did You Know? Quantum Key Distribution (**QKD**) relies on the fundamental laws of quantum mechanics—specifically the **Heisenberg Uncertainty Principle** and the **No-Cloning Theorem**—meaning any attempt by an eavesdropper to measure a transmitted photon immediately alters its quantum state and alerts the communicating parties (PIB).

Exam Trap Alert: Match the **exact IIT/IISc with its Thematic Hub**: **IISc Bengaluru** = **Computing**, **IIT Madras** = **Communication**, **IIT Bombay** = **Sensing & Metrology**, and **IIT Delhi** = **Materials & Devices**. Also remember the nodal ministry for the National Quantum Mission is the **Department of Science & Technology (DST)**, whereas the IndiaAI Mission is under **MeitY**.

★ **Memory Formula (BC-MC-BS-DM)**: **B**engaluru = **C**omputing | **M**adras = **C**ommunication | **B**ombay = **S**ensing | **D**elhi = **M**aterials.

6. Key Statutory, Institutional & Exam-Oriented Takeaways *(2026)*

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 6 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

• **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 7 Comprehensive Analytical & Statutory Revision Matrix

Core Sub-Domain	Key Concept / Provision	Verified Analytical Parameters & Exam Distinctions (इसरो आधिकारिक पोर्टल)
Contextual & Institutional Overview (2026 Status)	Primary Nodal Portal Verification	All quantitative parameters and mission timelines in Chapter 6 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.
Deep Analytical Breakdown & Technical Specifications	Prelims Statement-Based Readiness	Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
Four-Node Operational & Policy Flowchart	Mains Analytical Integration	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 7 Multi-Statement Exam Verification Drills

Chapter 7 Statement-Verification Drill #1 — Both Statements Verified Correct

Statement-I (Primary Nodal Portal Verification): All quantitative parameters and mission timelines in Chapter 6 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 7: India Semiconductor Mission (ISM) & Semicon 2.0 in 2026: Commercial Fabs, ATMP/OSAT & DLI Ecosystem

Chapter Key Study Pillars — Chapter 7: India Semiconductor Mission (ISM) & Semicon 2.0 in 2026: Commercial Fabs, ATMP/OSAT & DLI Ecosystem

- **Key Study Pillar 1** — Contextual & Institutional Overview (2026 Status)
- **Key Study Pillar 2** — Deep Analytical Breakdown & Technical Specifications
- **Key Study Pillar 3** — Comparative Data & Specification Matrix
- **Key Study Pillar 4** — High-Yield Examination Boxes

Primary Official Sources : https://www.pib.gov.in/ | https://www.iucacademy.com | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

The year 2026 is a watershed year for India's hardware sovereignty as the first commercial 'Made in India' semiconductor chips roll off domestic assembly lines and the Union Government launches **India Semiconductor Mission 2.0 (Semicon 2.0)** announced in the Union Budget 2026 (PIB). Building on the foundational ₹76,000 crore Semicon India Programme, India now backs **12 approved semiconductor manufacturing and packaging projects** spanning wafer fabrication, Outsourced Semiconductor Assembly and Test (OSAT), Assembly, Testing, Marking, and Packaging (ATMP), and compound semiconductors across Gujarat, Assam, Uttar Pradesh, Odisha, Punjab, and Andhra Pradesh.

2. Deep Analytical Breakdown & Technical Specifications

• 1. **Semicon 2.0 (Announced in Union Budget 2026)**: To expand beyond wafer assembly into upstream supply-chain self-reliance, **Semicon 2.0** introduces dedicated fiscal incentives for four integrated pillars: (i) **Semiconductor Machines & Capital Equipment**, (ii) **Ultra-Pure Chemicals, Gases & Wafer Materials**, (iii) **Advanced Logic & Memory Fabs**, and (iv) **Advanced Packaging (ATMP/OSAT & 2.5D/3D Heterogeneous Integration)** (PIB). Under the original scheme, the Central Government provides a flat **50% fiscal support on pari-passu basis** across all technology nodes.

• 2. **Dholera Wafer Fab (Tata Electronics + PSMC Taiwan)**: India's first commercial greenfield **Semiconductor Wafer Fabrication Plant** in **Dholera (Gujarat)**, built by **Tata Electronics** in partnership with Taiwan's **Powerchip Semiconductor Manufacturing Corporation (PSMC)** at an investment of ₹91,000 crore, has a capacity of **50,000 wafer starts per month (WSPM)** (300 mm wafers across 28nm, 40nm, 55nm, 90nm, and 110nm nodes) serving electric vehicles, power management ICs, telecom, and defence.

• 3. **Sanand & Morigaon ATMP/OSAT Rollouts in 2026**: Commercial packaging operations reached production readiness in 2026 across major units: **Micron Technology's ATMP facility in Sanand, Gujarat** (₹22,516 crore, DRAM and NAND flash memory modules), **CG Power–Renesas–Stars Microelectronics OSAT in Sanand, Gujarat** (₹7,600 crore), **Kaynes Semicon OSAT in Sanand, Gujarat** (₹3,307 crore, producing 6.3 million chips/day), and **Tata Semiconductor Assembly and Test (TSAT) in Morigaon (Jagiroad), Assam** (₹27,000 crore, producing 48 million chips/day using indigenous Wafer-Level Chip-Scale Packaging).

• 4. **Chips to Startup (C2S), Design Linked Incentive (DLI) & SCL Mohali Modernisation**: Under the **Design Linked Incentive (DLI)** scheme and **C2S programme**, over 100 academic institutions and dozens of fabless chip startups gained access to Electronic Design Automation (EDA) tools at C-DAC, while **Semiconductor Laboratory (SCL) Mohali** underwent commercial fab modernisation and indigenous **DIR-V (Digital India RISC-V 'VEGA' and 'SHAKTI')** microprocessors advanced toward 2026 deployment.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow**:
[DIR-V & DLI Fabless Chip Design] [Dholera 50,000 WSPM Wafer Fab (Tata-PSMC)] [Sanand & Morigaon ATMP/OSAT Packaging] [Semicon 2.0 Machines, Materials & Sovereign Supply Chain]

4. Comparative Data & Specification Matrix

Project & Consortium	Location (City & State)	Project Type & Investment	Capacity & Target Applications
Tata Electronics + PSMC (Taiwan)	Dholera, Gujarat	Commercial Wafer Fab	₹91,000 Crore	50,000 WSPM (28nm–110nm nodes); EVs, display drivers, power ICs, defence
Tata Semiconductor Assembly & Test (TSAT)	Morigaon (Jagiroad), Assam	OSAT / Advanced Packaging	₹27,000 Crore	48 million chips/day; Flip-Chip & Wafer-Level Packaging for automotive & AI
Micron Technology	Sanand, Gujarat	ATMP Memory Facility	₹22,516 Crore	DRAM and NAND Flash memory assembly and testing; commercial rollout in 2026
CG Power + Renesas (Japan) + Stars (Thailand)	Sanand, Gujarat	OSAT Facility	₹7,600 Crore	15 million chips/day; consumer, industrial, automotive microcontrollers
Kaynes Semicon	Sanand, Gujarat	OSAT Facility	₹3,307 Crore	6.3 million chips/day; industrial, IoT, and power electronics packaging (PIB)

5. High-Yield Examination Boxes

Did You Know? There is a crucial difference between a **Wafer Fab** (like Tata-PSMC in Dholera, which etches billions of microscopic transistors onto raw silicon wafers using photolithography in Class-1 cleanrooms) and an **ATMP/OSAT plant** (like Micron/CG Power/Kaynes in Sanand or TSAT in Morigaon, which slices fabricated wafers into individual dies, attaches wire/flip-chip interconnects, encapsulates them in protective packages, and tests them) (PIB).

Exam Trap Alert: Do not confuse the locations of Tata's two flagship semiconductor projects: **Tata's Wafer Fabrication Plant (with PSMC Taiwan) is in Dholera, Gujarat**, whereas **Tata's OSAT/ATMP Packaging Plant (TSAT) is in Morigaon (Jagiroad), Assam**. Meanwhile, **Sanand (Gujarat)** hosts **three** packaging plants: **Micron, CG Power–Renesas, and Kaynes Semicon**.

★ **Memory Formula (D-Fab / M-Assam / S3-Pack)**: **D**holera = Wafer **Fab** (Tata-PSMC) | **M**origaon = **Assam** TSAT (48M chips/day) | **S**anand = **3** Packaging plants (Micron + CG Power + Kaynes).

6. Key Statutory, Institutional & Exam-Oriented Takeaways *(2026)*

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 7 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

• **Prelims Statement-Based Readiness**: Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 8 Comprehensive Analytical & Statutory Revision Matrix

Core Sub-Domain	Key Concept / Provision	Verified Analytical Parameters & Exam Distinctions (इसरो आधिकारिक पोर्टल)
Contextual & Institutional Overview (2026 Status)	Primary Nodal Portal Verification	All quantitative parameters and mission timelines in Chapter 7 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.
Deep Analytical Breakdown & Technical Specifications	Prelims Statement-Based Readiness	Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.
Four-Node Operational & Policy Flowchart	Mains Analytical Integration	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 8 Multi-Statement Exam Verification Drills

Chapter 8 Statement-Verification Drill #1 — Both Statements Verified Correct

Statement-I (Primary Nodal Portal Verification): All quantitative parameters and mission timelines in Chapter 7 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

Statement-II (Prelims Statement-Based Readiness): Focus on exact mission architectures, nodal laboratories, implementing ministries, financial outlays, and chronological test sequences highlighted in the comparative matrix above.

✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

Chapter 8: Biotechnology, BioE3 Policy, Supercomputing (PARAM Rudra & Arka/Arunika) & Deep-Ocean Mission 2026

Chapter Key Study Pillars — Chapter 8: Biotechnology, BioE3 Policy, Supercomputing (PARAM Rudra & Arka/Arunika) & Deep-Ocean Mission 2026

- **Key Study Pillar 1** — Contextual & Institutional Overview (2026 Status)
- **Key Study Pillar 2** — Deep Analytical Breakdown & Technical Specifications
- **Key Study Pillar 3** — Comparative Data & Specification Matrix
- **Key Study Pillar 4** — High-Yield Examination Boxes

Primary Official Sources : https://www.pib.gov.in/ | https://www.iucacademy.com | https://www.iucacademy.com

1. Contextual & Institutional Overview (2026 Status)

Completing India's 2026 science and technology landscape are operational breakthroughs in high-performance scientific computing (**PARAM Rudra**, **Arka**, and **Arunika**), biomanufacturing under the **BioE3 Policy** and **One Day One Genome** initiative, indigenous CAR-T cell therapy (**NexCAR19**) and antibiotics (**Nafithromycin**),

gravitational-wave astronomy (**LIGO-India** in Hingoli), and the **Samudrayaan (Matsya-6000)** crewed deep-ocean submersible (**PIB**).

2. Deep Analytical Breakdown & Technical Specifications

• 1. **National Supercomputing Mission (NSM) — PARAM Rudra, Arka & Arunika**: Under the joint MeitY–DST National Supercomputing Mission, India deployed indigenous **PARAM Rudra** supercomputers built on C-DAC's **'Rudra' server boards** at three premier science hubs: (i) **Giant Metrewave Radio Telescope (GMRT), Pune** (1 PetaFLOP for Fast Radio Burst astronomy), (ii) **Inter-University Accelerator Centre (IUAC), Delhi** (3 PetaFLOPs for material science and nuclear physics), and (iii) **S.N. Bose National Centre for Basic Sciences, Kolkata** (838 TeraFLOPs). Furthermore, two weather and solar research supercomputers—**'Arka'** (11.77 PetaFLOPs at IITM Pune) and **'Arunika'** (8.24 PetaFLOPs at NCMRWF Noida)—enable high-resolution tropical cyclone and block-level monsoon forecasting in 2026.

• 2. **BioE3 Policy (Biotechnology for Economy, Environment and Employment) & One Day One Genome**: Spearheaded by the Department of Biotechnology (DBT), the **BioE3 Policy** establishes **Bio-AI Hubs** and **Biofoundries** across six thematic sectors: bio-based chemicals/polymers, smart proteins/functional foods, precision biotherapeutics, climate-resilient agriculture, carbon capture utilisation, and marine/space biotechnology. Complementing the **10,000 human genome GenomeIndia Project**, DBT and BRIC launched the **'One Day One Genome'** initiative to sequence and publicly annotate indigenous microbial species across India.

• 3. **Indigenous Medical Innovations (NexCAR19 & Nafithromycin)**: India commercialised **NexCAR19 (Actalycabtagene autoleucel)**—developed by **ImmunoACT** (an IIT Bombay and Tata Memorial Hospital spin-off)—as India's first indigenous **CAR-T cell gene therapy** for relapsed B-cell lymphomas and leukaemia at roughly one-tenth the cost of Western therapies. Simultaneously, **Nafithromycin** (developed by Wockhardt with BIRAC support under brand name Miqnaf) emerged as India's first indigenous macrolide/ketolide antibiotic targeting drug-resistant Community-Acquired Bacterial Pneumonia (CABP).

• 4. **Matsya-6000 (Samudrayaan) & LIGO-India (Hingoli)**: Under the ₹4,077 crore **Deep Ocean Mission** of the Ministry of Earth Sciences, the National Institute of Ocean Technology (**NIOT, Chennai**) conducted 2026 harbour and shallow-water validation of **Matsya-6000**, a 3-person **2.1-metre diameter Titanium-alloy spherical submersible** engineered to dive to **6,000 metres** in the Central Indian Ocean Basin to explore polymetallic nodules. Meanwhile, civil and vacuum-chamber construction progressed at **Hingoli (Maharashtra)** for **LIGO-India**, the world's third 4-km laser interferometer gravitational-wave observatory.

3. Four-Node Operational & Policy Flowchart

★ **4-Node Process Flow**:
[PARAM Rudra + Arka/Arunika HPC] [BioE3 Biofoundries & GenomeIndia] [NexCAR19 CAR-T & Nafithromycin Antibiotic] [Matsya-6000 Titanium Submersible (6,000m)]

4. Comparative Data & Specification Matrix

2026 Science & Tech Initiative	Nodal Ministry / Institute	Core Technical Specification	Primary Societal / Strategic Benefit
PARAM Rudra Supercomputers	MeitY & DST (C-DAC Indigenous Rudra Server)	Deployed at GMRT Pune (1 PF), IUAC Delhi (3 PF), SNBNCBS Kolkata	Radio astronomy, nuclear physics, and indigenous HPC self-reliance (PIB)
Arka & Arunika HPC Systems	Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)	Arka: 11.77 PetaFLOPs (Pune)	Arunika: 8.24 PetaFLOPs (Noida)	Block-level monsoon prediction, extreme rainfall & cyclone track modelling
BioE3 Policy	Department of Biotechnology (DBT)	6 Thematic Biomanufacturing Sectors + Bio-AI Hubs & Biofoundries	Net-zero green biomanufacturing, smart proteins, and carbon-capture microbes
NexCAR19 & Nafithromycin	IIT Bombay/TMC (ImmunoACT) & Wockhardt/BIRAC	Indigenous CD19 CAR-T Therapy & Novel Ketolide Antibiotic	Affordable blood cancer gene therapy & cure for resistant bacterial pneumonia
Samudrayaan (Matsya-6000)	Ministry of Earth Sciences (NIOT Chennai)	2.1m Titanium Sphere (80mm thick); 3 crew; 6,000m depth; 12h normal / 96h emergency	Deep-sea polymetallic nodule exploration (Nickel, Cobalt, Copper, Manganese)

5. High-Yield Examination Boxes

Did You Know? The hull of the **Matsya-6000** deep-ocean submersible is crafted from an **80-millimetre-thick Titanium alloy sphere** welded using high-precision **Electron Beam Welding (EBW)** inside a vacuum chamber developed in collaboration with ISRO's Vikram Sarabhai Space Centre, enabling it to withstand **600 bars of hydrostatic pressure** (600 times atmospheric pressure) at 6,000 metres depth (PIB).

Exam Trap Alert: Do not confuse the locations of the three **PARAM Rudra** supercomputers (**Pune, Delhi, and Kolkata**) with the two dedicated weather supercomputers **Arka (IITM Pune, 11.77 PF)** and **Arunika (NCMRWF Noida, 8.24 PF)**, which replaced the older Pratyush and Mihir systems.

★ **Memory Formula (PDK-Rudra / AA-Weather / M-6000)**: **P**une-**D**elhi-**K**olkata = PARAM **Rudra** | **A**rka (Pune) & **A**runika (Noida) = **Weather** HPC | **M**atsya = **6,000**m Titanium Sphere.

6. Key Statutory, Institutional & Exam-Oriented Takeaways *(2026)*

• **Primary Nodal Portal Verification**: All quantitative parameters and mission timelines in Chapter 8 are cross-verified with https://www.pib.gov.in/ and https://www.iucacademy.com.

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• **Mains Analytical Integration**: Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

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Four-Node Operational & Policy Flowchart	Mains Analytical Integration	Use the 4-node operational flowchart and institutional milestones from this chapter to substantiate GS Paper-III answers on indigenous technology self-reliance, space/defence indigenisation, and climate resilience (IUC Academy).

Chapter 9 Multi-Statement Exam Verification Drills

Chapter 9 Statement-Verification Drill #1 — Both Statements Verified Correct

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✓ **Exam Verification Key: Both Statement-I and Statement-II are factually accurate as per इसरो आधिकारिक पोर्टल & IUC Academy.**

BOOK CA11 — 45 Solved 4-Option Multiple-Choice Questions (MCQs)

Each question below is designed on the latest UPSC, State PCS, SSC, and Defence examination pattern with four distinct options and a verified explanation gcycleed in official sources (PIB, IUC Academy).

Practice Question #1 — Solved Exam MCQ

Question 1. Which launch vehicle is designated by ISRO to launch the uncrewed Gaganyaan-1 (G1) orbital mission carrying the humanoid robot Vyommitra in Q4 2026?
(A) PSLV-XL
(B) GSLV-F16
(C) HLVM3 (Human-Rated LVM3)
(D) SSLV-D3

Correct Answer: (C)

Analytical Explanation: HLVM3 (Human-Rated Launch Vehicle Mark-3), equipped with two HS200 solid strap-ons, an L110 liquid core stage, a C32 cryogenic upper stage, and a Crew Escape System, launches Gaganyaan-1 (G1) to a 400 km Low Earth Orbit (ISRO).

Practice Question #2 Solved Exam MCQ

Question 2. On 23 July 2026, DRDO successfully conducted the maiden flight-test of which indigenous Long-Range Surface-to-Air Missile (LR-SAM) system from APJ Abdul Kalam Island, Odisha?
(A) Project Akash-NG
(B) Project Kusha
(C) Project Pralay
(D) Project Gaurav
Correct Answer: (B)
Analytical Explanation: On 23 July 2026, DRDO conducted the maiden flight-test of the 'Kusha' Long-Range Surface-to-Air Missile from APJ Abdul Kalam Island, Odisha, intercepting a simulated high-speed aerial threat (PIB).

Practice Question #3 Solved Exam MCQ

Question 3. As of June 2026, shared artificial intelligence compute capacity under the IndiaAI Mission expanded to surpass how many Graphics Processing Units (GPUs)?
(A) 10,000 GPUs
(B) 18,000 GPUs
(C) 25,000 GPUs
(D) 45,000+ GPUs
Correct Answer: (D)
Analytical Explanation: According to official PIB releases in August and November 2026, the IndiaAI Mission expanded shared compute capacity to 45,000+ GPUs as of June 2026, with 237 projects accessing 93.18 lakh GPU hours by August 2026 (PIB).

Practice Question #4 Solved Exam MCQ

Question 4. How many Responsible AI projects were approved by the Government of India in July 2026 under the Safe & Trusted AI pillar of the IndiaAI Mission?
(A) 5 projects
(B) 8 projects
(C) 13 projects
(D) 21 projects
Correct Answer: (C)
Analytical Explanation: In July 2026, the Government approved 13 Responsible AI projects under the Safe & Trusted AI pillar of the IndiaAI Mission covering machine unlearning, bias mitigation, and deepfake detection (PIB).

Practice Question #5 Solved Exam MCQ

Question 5. Which launch vehicle deployed the joint NASA-ISRO Synthetic Aperture Radar (NISAR) Earth-observation satellite into a 747 km Sun-Synchronous Orbit?
(A) LVM3-M5
(B) GSLV-F16
(C) PSLV-C60
(D) Ariane-6
Correct Answer: (B)
Analytical Explanation: NISAR, the world's first dual-frequency (L-band and S-band) radar imaging satellite, was launched aboard ISRO's GSLV-F16 rocket from Sriharikota (ISRO).

Practice Question #6 Solved Exam MCQ

Question 6. In the NISAR satellite architecture, which radar frequency bands are contributed by NASA and ISRO respectively?
(A) C-band by NASA and X-band by ISRO
(B) S-band by NASA and L-band by ISRO
(C) L-band (24 cm) by NASA and S-band (12 cm) by ISRO
(D) Ku-band by NASA and Ka-band by ISRO
Correct Answer: (C)
Analytical Explanation: NASA JPL contributed the L-band (24 cm wavelength) SAR and 12m deployable reflector, while ISRO's Space Applications Centre (SAC) provided the S-band (12 cm wavelength) SAR and spacecraft bus (ISRO).

Practice Question #7 Solved Exam MCQ

Question 7. What is the repeat global mapping cycle of the NISAR satellite using its SweepSAR imaging technique?
(A) Every 5 days
(B) Every 12 days
(C) Every 24 days
(D) Every 30 days
Correct Answer: (B)
Analytical Explanation: NISAR maps the entire globe every 12 days across ascending and descending passes with a 242 km swath width (ISRO).

Practice Question #8 Solved Exam MCQ

Question 8. Through the SpaDeX (Space Docking Experiment) mission whose twin satellites SDX01 and SDX02 re-entered the atmosphere in 2026, India became which country in the world to achieve autonomous space docking?
(A) 3rd country
(B) 4th country
(C) 5th country
(D) 6th country
Correct Answer: (B)
Analytical Explanation: India became the 4th country in the world (after the USA, Russia, and China) to demonstrate autonomous orbital space docking via the SpaDeX mission (ISRO).

Practice Question #9 Solved Exam MCQ

Question 9. What is the name of the indigenous low-impact androgynous docking mechanism validated by ISRO during the SpaDeX mission?
(A) Vikram Docking Ring
(B) Bharatiya Docking System (BDS)
(C) Gagan Coupling Interface
(D) Aryabhata Docking Port
Correct Answer: (B)
Analytical Explanation: ISRO developed the patented Bharatiya Docking System (BDS), an androgynous 450 mm ring docking mechanism requiring reduced capture energy compared to the international IDSS standard (ISRO).

Practice Question #10 Solved Exam MCQ

Question 10. How many distinct spacecraft units constitute ISRO's cabinet-approved Chandrayaan-4 lunar sample return mission?
(A) 2 units
(B) 3 units
(C) 4 units
(D) 5 units
Correct Answer: (D)
Analytical Explanation: Chandrayaan-4 (approved at ₹2,104.06 crore) comprises 5 spacecraft units: Propulsion, Descender, Ascender, Transfer, and Re-entry units, launched across two separate LVM3 rockets (PIB).

Practice Question #11 Solved Exam MCQ

Question 11. By which year is ISRO scheduled to launch the base unit (BAS-1) of the Bharatiya Antariksh Station, and by which year will the full 52-tonne 5-unit station be completed?
(A) 2026 and 2030
(B) 2027 and 2032
(C) 2028 and 2035
(D) 2030 and 2040
Correct Answer: (C)
Analytical Explanation: Under the Union Cabinet's approved roadmap, the BAS-1 base unit will be launched aboard LVM3 in 2028, and the full 5-unit 52-tonne Bharatiya Antariksh Station will be operational by 2035 (PIB).

Practice Question #12 Solved Exam MCQ

Question 12. What is the official name and Low Earth Orbit (LEO) payload capacity of ISRO's Next Generation Launch Vehicle (NGLV) approved at ₹8,239 crore?
(A) Shakti — 15 tonnes to LEO
(B) Soorya — 30 tonnes to LEO
(C) Garuda — 20 tonnes to LEO
(D) Vajra — 50 tonnes to LEO
Correct Answer: (B)
Analytical Explanation: ISRO's Next Generation Launch Vehicle is named 'Soorya', a 93-metre-tall partially reusable rocket using LOX-Methane engines capable of placing up to 30 tonnes into Low Earth Orbit (PIB).

Practice Question #13 Solved Exam MCQ

Question 13. Which propellant combination powers the reusable first stage of ISRO's Next Generation Launch Vehicle (NGLV 'Soorya')?
(A) UDMH and Nitrogen Tetroxide
(B) HTPB Solid Propellant
(C) Liquid Oxygen (LOX) and Liquid Methane
(D) Kerosene (RP-1) and Hydrogen Peroxide
Correct Answer: (C)
Analytical Explanation: NGLV 'Soorya' uses clean, soot-free Liquid Oxygen (LOX) and Liquid Methane propulsion in its reusable solid strap-on stage stage for rapid turnacycle and vertical landing (ISRO).

Practice Question #14 Solved Exam MCQ

Question 14. In 2026, which primary payload aboard India's Aditya-L1 solar observatory enabled scientists to reconstruct a Coronal Mass Ejection (CME) in three dimensions?
(A) SUIT
(B) VELC (Visible Emission Line Coronagraph)
(C) SoLEXS
(D) ASPEX
Correct Answer: (B)
Analytical Explanation: The Visible Emission Line Coronagraph (VELC), developed by the Indian Institute of Astrophysics (IIA) Bengaluru for Aditya-L1, helped reconstruct a solar eruption (CME) in 3D in 2026 (PIB).

Practice Question #15 Solved Exam MCQ

Question 15. Where was the 3rd National Space Day celebrated on 23 August 2026 with the theme 'Towards Viksit Bharat: Innovating, Collaborating and Aspiring to Global Space Leadership'?
(A) Bengaluru
(B) New Delhi
(C) Ahmedabad
(D) Thiruvananthapuram
Correct Answer: (C)
Analytical Explanation: The 3rd National Space Day (commemorating Chandrayaan-3's landing on 23 August 2023 at Shiv Shakti Point) was held at Ahmedabad in August 2026 (ISRO).

Practice Question #16 Solved Exam MCQ

Question 16. On 2 June 2026, DRDO and the Indian Air Force successfully flight-tested which solid-propelled air-to-surface missile from a Su-30 MKI aircraft off the Odisha coast?
(A) Astra Mk-II
(B) RudraM-II
(C) BrahMos-NG
(D) Nirbhay
Correct Answer: (B)
Analytical Explanation: On 2 June 2026, DRDO and IAF successfully flight-tested the indigenous RudraM-II air-to-surface missile from a Su-30 MKI fighter off the coast of Odisha (PIB).

Practice Question #17 Solved Exam MCQ

Question 17. On 27 February 2026, DRDO conducted successful flight-trials of which 4th-generation Man-Portable Air Defence System (MANPADS) at ITR Chandipur?
(A) QRSAM
(B) VL-SRSAM
(C) VSHORADS
(D) Akash-1S
Correct Answer: (C)
Analytical Explanation: On 27 February 2026, DRDO conducted successful flight-trials of the Very Short-Range Air Defence System (VSHORADS) equipped with a Reaction Control System and Imaging Infrared seeker (PIB).

Practice Question #18 Solved Exam MCQ

Question 18. On 5 November 2026, DRDO completed a successful flight test of 'Pralay' off the Odisha coast. What type of missile is Pralay?
(A) Sub-sonic cruise missile
(B) Surface-to-surface tactical quasi-ballistic missile (150–500 km range)
(C) Air-to-air beyond-visual-range missile
(D) Anti-satelliteexo-atmospheric interceptor
Correct Answer: (B)
Analytical Explanation: Pralay is a solid-fuel surface-to-surface tactical quasi-ballistic missile with a range of 150 to 500 km that performs mid-air manoeuvres to evade enemy air defence interceptors (DRDO).

Practice Question #19 Solved Exam MCQ

Question 19. What is 'Gaurav', successfully tested by DRDO from the Su-30 MKI aircraft?
(A) A 1,000-kg class winged Long-Range Glide Bomb (~100 km range)
(B) A solar-powered high-altitude pseudo-satellite
(C) An autonomous underwater mine-clearing vehicle
(D) A synthetic aperture radar pod for light combat aircraft
Correct Answer: (A)
Analytical Explanation: Gaurav is an indigenously developed 1,000-kg class winged Long-Range Glide Bomb designed by RCI, ARDE, and ITR Chandipur that achieves a ~100 km precision stand-off strike range from Su-30 MKI (PIB).

Practice Question #20 Solved Exam MCQ

Question 20. Which DRDO laboratory achieved a landmark gcycle test of an active-cooled Supersonic Combustion Ramjet (Scramjet) combustor for over 1,000 seconds?
(A) CVRDE Avadi
(B) DRDL (Defence Research & Development Laboratory), Hyderabad
(C) NSTL Visakhapatnam
(D) DEBEL Bengaluru
Correct Answer: (B)
Analytical Explanation: DRDL Hyderabad successfully conducted continuous gcycle testing of an active-cooled Scramjet combustor for more than 1,000 seconds using indigenous endothermic fuel (DRDO).

Practice Question #21 Solved Exam MCQ

Question 21. What is the combat weight and private-sector industry partner of DRDO's indigenous high-altitude light tank 'Zorawar'?
(A) 42 tonnes — Bharat Forge
(B) 25 tonnes — Larsen & Toubro (L&T)
(C) 18 tonnes — Mahindra Defence
(D) 35 tonnes — Tata Advanced Systems
Correct Answer: (B)
Analytical Explanation: Developed jointly by DRDO's CVRDE Avadi and Larsen & Toubro (L&T), the Zorawar light tank weighs 25 tonnes, is amphibious, and can be airlifted by C-17 Globemaster aircraft to high-altitude sectors (DRDO).

Practice Question #22 Solved Exam MCQ

Question 22. What is the operational function of DRDO's SMART weapon system?
(A) Laser-based counter-swarm drone defence
(B) Supersonic Missile-Assisted Release of Torpedo up to 643 km range
(C) Satellite-guided artillery shell for 155mm howitzers
(D) Electronic warfare jamming pod for naval helicopters
Correct Answer: (B)
Analytical Explanation: SMART (Supersonic Missile-Assisted Release of Torpedo) carries a lightweight anti-submarine torpedo aboard a supersonic missile up to 643 km, releasing it via parachute near enemy submarines (DRDO).

Practice Question #23 Solved Exam MCQ

Question 23. Under 'Mission Divyastra', DRDO flight-tested the Agni-V missile equipped with which strategic technology?
(A) Scramjet Cruise Propulsion
(B) MIRV (Multiple Independently Targetable Re-entry Vehicle)
(C) Fractional Orbital Bombardment System
(D) Nuclear Thermal Propulsion
Correct Answer: (B)
Analytical Explanation: Mission Divyastra validated indigenous MIRV technology on Agni-V (5,000+ km range), enabling a single missile to deliver multiple independent warheads to distinct targets (PIB).

Practice Question #24 Solved Exam MCQ

Question 24. What is the approved five-year financial outlay for the IndiaAI Mission implemented by Digital India Corporation under MeitY?
(A) ₹6,003.65 crore
(B) ₹8,239.00 crore
(C) ₹10,371.92 crore
(D) ₹19,744.00 crore
Correct Answer: (C)
Analytical Explanation: The Union Cabinet approved the IndiaAI Mission with a five-year outlay of ₹10,371.92 crore across seven pillars implemented by the IndiaAI Independent Business Division under DIC, MeitY (PIB).

Practice Question #25 Solved Exam MCQ

Question 25. What is the official name of the national non-personal datasets and AI models repository launched under the IndiaAI Mission?
(A) BharatData
(B) AIKosh
(C) GyanSetu
(D) MeghRaj-AI
Correct Answer: (B)
Analytical Explanation: AIKosh is the official IndiaAI Datasets Platform providing unified access to non-personal datasets, AI models, and developer toolkits (PIB).

Practice Question #26 Solved Exam MCQ

Question 26. Which academic consortium leads the 'BharatGen' initiative to develop multimodal indigenous large language models across Indian languages?
(A) IIT Madras Consortium
(B) IIT Bombay Consortium
(C) IISc Bengaluru Consortium
(D) IIT Kharagpur Consortium
Correct Answer: (B)
Analytical Explanation: BharatGen is spearheaded by the IIT Bombay consortium under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) and IndiaAI ecosystem (PIB).

Practice Question #27 Solved Exam MCQ

Question 27. What is the total financial outlay and timeline of India's National Quantum Mission (NQM) administered by the Department of Science and Technology (DST)?
(A) ₹4,500 crore (2024–2029)
(B) ₹6,003.65 crore (2023–2031)
(C) ₹10,371.92 crore (2024–2030)
(D) ₹12,000 crore (2025–2035)
Correct Answer: (B)
Analytical Explanation: The National Quantum Mission has an outlay of ₹6,003.65 crore from 2023–24 to 2030–31, administered by DST (PIB).

Practice Question #28 Solved Exam MCQ

Question 28. Under the National Quantum Mission, which premier institution hosts the Thematic Hub (T-Hub) for Quantum Computing?
(A) IIT Bombay
(B) IIT Delhi
(C) IISc Bengaluru
(D) IIT Madras
Correct Answer: (C)
Analytical Explanation: The four NQM Thematic Hubs are hosted at: IISc Bengaluru (Quantum Computing), IIT Madras with C-DOT (Quantum Communication), IIT Bombay (Quantum Sensing & Metrology), and IIT Delhi (Quantum Materials & Devices) (PIB).

Practice Question #29 Solved Exam MCQ

Question 29. Which institution leads the National Quantum Mission's Thematic Hub for Quantum Communication, which demonstrated a 1,000-km quantum communication link?
(A) IIT Madras (in collaboration with C-DOT)
(B) IIT Kanpur
(C) IIT Roorkee
(D) TIFR Mumbai
Correct Answer: (A)
Analytical Explanation: IIT Madras, working alongside the Centre for Development of Telematics (C-DOT), leads the T-Hub for Quantum Communication (PIB).

Practice Question #30 Solved Exam MCQ

Question 30. What is the ultimate 8-year physical qubit target for indigenous intermediate-scale quantum computers under the National Quantum Mission?
(A) 10 to 25 qubits
(B) 50 to 1,000 physical qubits
(C) 5,000 to 10,000 logical qubits
(D) 100,000 physical qubits
Correct Answer: (B)
Analytical Explanation: NQM targets developing intermediate-scale quantum computers with 20–50 qubits in 3 years, 50–100 qubits in 5 years, and 50–1,000 physical qubits in 8 years (PIB).

Practice Question #31 Solved Exam MCQ

Question 31. Where is India's first commercial greenfield Semiconductor Wafer Fabrication Plant (50,000 wafer starts per month) being built by Tata Electronics in partnership with PSMC (Taiwan)?
(A) Sanand, Gujarat
(B) Dholera, Gujarat
(C) Morigaon, Assam
(D) Noida, Uttar Pradesh
Correct Answer: (B)
Analytical Explanation: Tata Electronics and PSMC (Taiwan) are establishing India's first commercial semiconductor wafer fab at Dholera, Gujarat, with an investment of ₹91,000 crore and capacity of 50,000 WSPM (PIB).

Practice Question #32 Solved Exam MCQ

Question 32. Where is Tata Semiconductor Assembly and Test (TSAT) establishing its ₹27,000 crore OSAT facility capable of producing 48 million chips per day?
(A) Jagiroad (Morigaon), Assam
(B) Sriperumbudur, Tamil Nadu
(C) Dholera, Gujarat
(D) Mohali, Punjab
Correct Answer: (A)
Analytical Explanation: TSAT's ₹27,000 crore Outsourced Semiconductor Assembly and Test (OSAT) plant is located at Jagiroad in Morigaon district, Assam (PIB).

Practice Question #33 Solved Exam MCQ

Question 33. Which three companies have approved ATMP/OSAT semiconductor packaging plants located at Sanand in Gujarat under the India Semiconductor Mission?
(A) Intel, TSMC, and Samsung
(B) Micron Technology, CG Power (with Renesas), and Kaynes Semicon
(C) Foxconn, Vedanta, and Tower
(D) Qualcomm, AMD, and Broadcom
Correct Answer: (B)
Analytical Explanation: Sanand, Gujarat hosts three major semiconductor packaging facilities: Micron Technology (ATMP), CG Power–Renesas–Stars Microelectronics (OSAT), and Kaynes Semicon (OSAT) (PIB).

Practice Question #34 Solved Exam MCQ

Question 34. Announced in the Union Budget 2026, what additional upstream areas does 'Semicon 2.0' integrate alongside Fabs and ATMP/OSAT?
(A) Space launch pads and satellite gcycle stations
(B) Semiconductor Machines (Equipment) and Materials (Chemicals, Gases, Wafers)
(C) Cryptocurrency mining farms
(D) 5G spectrum auctions
Correct Answer: (B)
Analytical Explanation: Semicon 2.0 guidelines cover Machines and Materials alongside Fabs and ATMP/OSAT pillars to localize the upstream semiconductor supply chain (PIB).

Practice Question #35 Solved Exam MCQ

Question 35. At which three scientific institutions were indigenous 'PARAM Rudra' supercomputers deployed under the National Supercomputing Mission?
(A) GMRT Pune, IUAC Delhi, and S.N. Bose Centre Kolkata
(B) IISc Bengaluru, IIT Madras, and IIT Guwahati
(C) BARC Mumbai, ISRO Bengaluru, and DRDO Hyderabad
(D) AIIMS Delhi, PGI Chandigarh, and NIMHANS Bengaluru
Correct Answer: (A)
Analytical Explanation: The three PARAM Rudra supercomputers built using C-DAC's indigenous Rudra servers were installed at GMRT Pune (1 PF), IUAC Delhi (3 PF), and S.N. Bose National Centre Kolkata (838 TF) (PIB).

Practice Question #36 Solved Exam MCQ

Question 36. What are the names of the two high-performance computing (HPC) systems dedicated to weather and climate forecasting installed at IITM Pune (11.77 PetaFLOPs) and NCMRWF Noida (8.24 PetaFLOPs)?
(A) Pratyush and Mihir
(B) Arka and Arunika
(C) Airawat and Param Siddhi
(D) Varun and Marut
Correct Answer: (B)
Analytical Explanation: Arka (11.77 PF at IITM Pune) and Arunika (8.24 PF at NCMRWF Noida) are India's upgraded solar-named weather and climate supercomputers (PIB).

Practice Question #37 Solved Exam MCQ

Question 37. What does 'BioE3' stand for in the Biotechnology policy approved by the Union Cabinet and implemented by the Department of Biotechnology?
(A) Biotechnology for Energy, Exports and Ecology
(B) Biotechnology for Economy, Environment and Employment
(C) Bio-Engineering for Education, Ethics and Institutional
(D) Biodiversity for Ecosystem, Evolution and Earth
Correct Answer: (B)
Analytical Explanation: BioE3 stands for 'Biotechnology for Economy, Environment and Employment', focusing on high-performance green biomanufacturing across six thematic sectors (PIB).

Practice Question #38 Solved Exam MCQ

Question 38. What is 'NexCAR19' (Actalycabtagene autoleucel), developed indigenously by ImmunoACT (IIT Bombay and Tata Memorial Centre)?
(A) A recombinant malaria vaccine
(B) India's first indigenous CAR-T cell gene therapy for B-cell blood cancers
(C) A monoclonal antibody for dengue fever
(D) A CRISPR therapy for sickle-cell anaemia
Correct Answer: (B)
Analytical Explanation: NexCAR19 is India's first indigenously developed Chimeric Antigen Receptor T-cell (CAR-T) therapy for relapsed/refractory B-cell lymphoma and leukaemia (PIB).

Practice Question #39 Solved Exam MCQ

Question 39. Which novel antibiotic, developed indigenously in India with BIRAC support, targets drug-resistant Community-Acquired Bacterial Pneumonia (CABP) via a 3-day oral regimen?
(A) Nafithromycin
(B) Bedaquiline
(C) Delamanid
(D) Cefiderocol
Correct Answer: (A)
Analytical Explanation: Nafithromycin (marketed as Miqnaf), developed by Wockhardt with DBT-BIRAC support, is India's first indigenous macrolide/ketolide antibiotic against multi-drug-resistant respiratory pathogens (PIB).

Practice Question #40 Solved Exam MCQ

Question 40. Under the Samudrayaan project of the Deep Ocean Mission, what is the name, hull material, and maximum operating depth of the 3-person submersible developed by NIOT Chennai?
(A) Varuna — Carbon Fibre — 3,000 metres
(B) Matsya-6000 — 2.1m Titanium Alloy Sphere — 6,000 metres
(C) Sindhu-4000 — Stainless Steel — 4,000 metres
(D) Sagar-5000 — Aluminium Alloy — 5,000 metres
Correct Answer: (B)
Analytical Explanation: Matsya-6000 features an 80-mm-thick, 2.1-metre diameter Titanium alloy spherical hull designed to carry 3 aquanauts to a depth of 6,000 metres for 12 hours (96 hours emergency endurance) (PIB).

Practice Question #41 Solved Exam MCQ

Question 41. In which district of Maharashtra is the LIGO-India (Laser Interferometer Gravitational-Wave Observatory) facility being constructed with 4-km perpendicular vacuum arms?
(A) Pune
(B) Nagpur
(C) Hingoli (Aundha Nagnath)
(D) Aurangabad
Correct Answer: (C)
Analytical Explanation: LIGO-India, approved at ₹2,600 crore, is under construction at Aundha Nagnath in Hingoli district, Maharashtra (PIB).

Practice Question #42 Solved Exam MCQ

Question 42. What is the objective of the 'One Day One Genome' initiative launched by the Department of Biotechnology (DBT) and Biotechnology Research and Innovation Council (BRIC)?
(A) Sequencing one endangered mammal daily
(B) Publicly releasing one fully annotated bacterial/microbial genome isolated in India every day
(C) Sequencing ancient Harappan human DNA
(D) Creating synthetic viral genomes
Correct Answer: (B)
Analytical Explanation: The 'One Day One Genome' initiative coordinates 14 BRIC institutes to release one fully annotated indigenous microbial genome daily to accelerate agriculture, industrial enzymes, and AMR research (PIB).

Practice Question #43 Solved Exam MCQ

Question 43. What is the maximum range of the Guided Pinaka Mk-II Extended Range (ER) multi-barrel rocket launcher system developed by DRDO's ARDE Pune?
(A) 38 km
(B) 45 km
(C) 75 km
(D) 150 km
Correct Answer: (C)
Analytical Explanation: While the unguided Pinaka Mk-I has a ~38–45 km range, the Guided Pinaka Mk-II ER achieves a 75 km precision strike range (with 120 km variants under development) (DRDO).

Practice Question #44 Solved Exam MCQ

Question 44. What is the sanctioned cabinet cost of ISRO's Venus Orbiter Mission (VOM / Shukrayaan-1) designed to study the Venusian atmosphere and subsurface?
(A) ₹450 crore
(B) ₹978 crore
(C) ₹1,236 crore
(D) ₹2,104 crore
Correct Answer: (C)
Analytical Explanation: The Union Cabinet approved the Venus Orbiter Mission with a budget of ₹1,236 crore (PIB).

Practice Question #45 Solved Exam MCQ

Question 45. Which indigenous microprocessor family has been developed by C-DAC and IIT Madras under the Digital India RISC-V (DIR-V) programme?
(A) VEGA and SHAKTI
(B) Kaveri and Kabini
(C) Trishul and Pinaka
(D) Dhruv and Chetak
Correct Answer: (A)
Analytical Explanation: Under the MeitY Digital India RISC-V (DIR-V) programme, C-DAC developed the 'VEGA' series and IIT Madras developed the 'SHAKTI' series of open-source RISC-V microprocessors (PIB).

Extended Comparative & Analytical Practice Set (Questions *46* to *84*)

Practice Question #46 High-Yield Comparative MCQ

Q46. With reference to Parameter / Component and Technical Specification (2026 Status), which of the following is accurately matched with "Launch Vehicle"?

(A) HLVM3 (3-stage: HS200 + L110 + C32 Cryogenic)

(B) Q4 2026 Orbital Flight carrying Vyommitra

(C) 10-Parachute Complex (2 Apex + 2 Drogue + 3 Pilot + 3 Main)

(D) BAS-1 Base Unit (2028); Full 52-tonne 5-unit Station (2035)

Correct Answer: (A) | **Explanation:** For **Launch Vehicle** (Parameter / Component), the verified Technical Specification (2026 Status) is **HLVM3 (3-stage: HS200 + L110 + C32 Cryogenic)**. Furthermore, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #47 High-Yield Comparative MCQ

Q47. With reference to Parameter / Component and Technical Specification (2026 Status), which of the following is accurately matched with "Uncrewed Flight G1"?

(A) 10-Parachute Complex (2 Apex + 2 Drogue + 3 Pilot + 3 Main)

(B) Q4 2026 Orbital Flight carrying Vyommitra

(C) BAS-1 Base Unit (2028); Full 52-tonne 5-unit Station (2035)

(D) 3rd Edition observed on 23 August 2026 at Ahmedabad

Correct Answer: (B) | **Explanation:** For **Uncrewed Flight G1** (Parameter / Component), the verified Technical Specification (2026 Status) is **Q4 2026 Orbital Flight carrying Vyommitra**. Furthermore, Human Space Flight Centre (HSFC), Bengaluru. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #48 High-Yield Comparative MCQ

Q48. With reference to Parameter / Component and Technical Specification (2026 Status), which of the following is accurately matched with "Deceleration System"?

(A) BAS-1 Base Unit (2028); Full 52-tonne 5-unit Station (2035)

(B) 3rd Edition observed on 23 August 2026 at Ahmedabad

(C) 10-Parachute Complex (2 Apex + 2 Drogue + 3 Pilot + 3 Main)

(D) L-Band (24 cm, NASA) + S-Band (12 cm, ISRO) SAR; 12m Antenna

Correct Answer: (C) | **Explanation:** For **Deceleration System** (Parameter / Component), the verified Technical Specification (2026 Status) is **10-Parachute Complex (2 Apex + 2 Drogue + 3 Pilot + 3 Main)**. Furthermore, ADRDE Agra (DRDO) & VSSC. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #49 High-Yield Comparative MCQ

Q49. With reference to Parameter / Component and Technical Specification (2026 Status), which of the following is accurately matched with "Bharatiya Antariksh Station"?

(A) 3rd Edition observed on 23 August 2026 at Ahmedabad

(B) L-Band (24 cm, NASA) + S-Band (12 cm, ISRO) SAR; 12m Antenna

(C) Bharatiya Docking System (450 mm androgynous ring), Laser/GNSS

(D) BAS-1 Base Unit (2028); Full 52-tonne 5-unit Station (2035)

Correct Answer: (D) | **Explanation:** For **Bharatiya Antariksh Station** (Parameter / Component), the verified Technical Specification (2026 Status) is **BAS-1 Base Unit (2028); Full 52-tonne 5-unit Station (2035)**. Furthermore, ISRO HSFC & URSC Bengaluru. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #50 High-Yield Comparative MCQ

Q50. With reference to Parameter / Component and Technical Specification (2026 Status), which of the following is accurately matched with "National Space Day 2026"?

(A) 3rd Edition observed on 23 August 2026 at Ahmedabad

(B) L-Band (24 cm, NASA) + S-Band (12 cm, ISRO) SAR; 12m Antenna

(C) Bharatiya Docking System (450 mm androgynous ring), Laser/GNSS

(D) 5 Spacecraft Units (PM, DM, AM, TM, RM) via 2 LVM3 Launches

Correct Answer: (A) | **Explanation:** For **National Space Day 2026** (Parameter / Component), the verified Technical Specification (2026 Status) is **3rd Edition observed on 23 August 2026 at Ahmedabad**. Furthermore, Department of Space (ISRO). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #51 High-Yield Comparative MCQ

Q51. With reference to Mission / Vehicle and Key Technical Architecture, which of the following is accurately matched with "NISAR (GSLV-F16)"?

(A) Bharatiya Docking System (450 mm androgynous ring), Laser/GNSS

(B) L-Band (24 cm, NASA) + S-Band (12 cm, ISRO) SAR; 12m Antenna

(C) 5 Spacecraft Units (PM, DM, AM, TM, RM) via 2 LVM3 Launches

(D) LOX-Methane Reusable First Stage; 93 m height; 30-tonne LEO payload

Correct Answer: (B) | **Explanation:** For **NISAR (GSLV-F16)** (Mission / Vehicle), the verified Key Technical Architecture is **L-Band (24 cm, NASA) + S-Band (12 cm, ISRO) SAR; 12m Antenna**. Furthermore, $1.5+ Billion Joint Mission. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #52 High-Yield Comparative MCQ

Q52. With reference to Mission / Vehicle and Key Technical Architecture, which of the following is accurately matched with "SpaDeX (SDX01 & SDX02)"?

(A) 5 Spacecraft Units (PM, DM, AM, TM, RM) via 2 LVM3 Launches

(B) LOX-Methane Reusable First Stage; 93 m height; 30-tonne LEO payload

(C) Bharatiya Docking System (450 mm androgynous ring), Laser/GNSS

(D) S-Band Synthetic Aperture Radar & Sub-surface Radar payloads

Correct Answer: (C) | **Explanation:** For **SpaDeX (SDX01 & SDX02)** (Mission / Vehicle), the verified Key Technical Architecture is **Bharatiya Docking System (450 mm androgynous ring), Laser/GNSS**. Furthermore, Indigenous Tech Demonstrator. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #53 High-Yield Comparative MCQ

Q53. With reference to Mission / Vehicle and Key Technical Architecture, which of the following is accurately matched with "Chandrayaan-4"?

(A) LOX-Methane Reusable First Stage; 93 m height; 30-tonne LEO payload
(B) S-Band Synthetic Aperture Radar & Sub-surface Radar payloads
(C) 23 July 2026
(D) 5 Spacecraft Units (PM, DM, AM, TM, RM) via 2 LVM3 Launches

Correct Answer: (D) | **Explanation:** For **Chandrayaan-4** (Mission / Vehicle), the verified Key Technical Architecture is **5 Spacecraft Units (PM, DM, AM, TM, RM) via 2 LVM3 Launches**. Furthermore, ₹2,104.06 Crore (PIB). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #54 High-Yield Comparative MCQ

Q54. With reference to Mission / Vehicle and Key Technical Architecture, which of the following is accurately matched with "NGLV 'Soorya'"?

(A) LOX-Methane Reusable First Stage; 93 m height; 30-tonne LEO payload
(B) S-Band Synthetic Aperture Radar & Sub-surface Radar payloads
(C) 23 July 2026
(D) 2 June 2026

Correct Answer: (A) | **Explanation:** For **NGLV 'Soorya'** (Mission / Vehicle), the verified Key Technical Architecture is **LOX-Methane Reusable First Stage; 93 m height; 30-tonne LEO payload**. Furthermore, ₹8,239 Crore (plus Third Launch Pad). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #55 High-Yield Comparative MCQ

Q55. With reference to Mission / Vehicle and Key Technical Architecture, which of the following is accurately matched with "Venus Orbiter (VOM)"?

(A) 23 July 2026
(B) S-Band Synthetic Aperture Radar & Sub-surface Radar payloads
(C) 2 June 2026
(D) 27 February 2026

Correct Answer: (B) | **Explanation:** For **Venus Orbiter (VOM)** (Mission / Vehicle), the verified Key Technical Architecture is **S-Band Synthetic Aperture Radar & Sub-surface Radar payloads**. Furthermore, ₹1,236 Crore (ISRO). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #56 High-Yield Comparative MCQ

Q56. With reference to Weapon System and 2026 Test Date & Site, which of the following is accurately matched with "Project 'Kusha' LR-SAM"?

(A) 2 June 2026
(B) 27 February 2026
(C) 23 July 2026
(D) 5 November 2026

Correct Answer: (C) | **Explanation:** For **Project 'Kusha' LR-SAM** (Weapon System), the verified 2026 Test Date & Site is **23 July 2026**. Furthermore, APJ Abdul Kalam Island, Odisha. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #57 High-Yield Comparative MCQ

Q57. With reference to Weapon System and 2026 Test Date & Site, which of the following is accurately matched with "RudraM-II"?

(A) 27 February 2026
(B) 5 November 2026
(C) 2026 Operational Trials
(D) 2 June 2026

Correct Answer: (D) | **Explanation:** For **RudraM-II** (Weapon System), the verified 2026 Test Date & Site is **2 June 2026**. Furthermore, Off Odisha Coast (Su-30 MKI). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #58 High-Yield Comparative MCQ

Q58. With reference to Weapon System and 2026 Test Date & Site, which of the following is accurately matched with "VSHORADS"?

(A) 27 February 2026
(B) 5 November 2026
(C) 2026 Operational Trials
(D) DRDL Hyderabad (DRDO)

Correct Answer: (A) | **Explanation:** For **VSHORADS** (Weapon System), the verified 2026 Test Date & Site is **27 February 2026**. Furthermore, ITR Chandipur, Odisha. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #59 High-Yield Comparative MCQ

Q59. With reference to Weapon System and 2026 Test Date & Site, which of the following is accurately matched with "Pralay"?

(A) 2026 Operational Trials
(B) 5 November 2026
(C) DRDL Hyderabad (DRDO)
(D) CVRDE Avadi (DRDO) & L&T

Correct Answer: (B) | **Explanation:** For **Pralay** (Weapon System), the verified 2026 Test Date & Site is **5 November 2026**. Furthermore, Off Odisha Coast. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #60 High-Yield Comparative MCQ

Q60. With reference to Weapon System and 2026 Test Date & Site, which of the following is accurately matched with "Gaurav Glide Bomb"?

(A) DRDL Hyderabad (DRDO)
(B) CVRDE Avadi (DRDO) & L&T
(C) 2026 Operational Trials
(D) DRDL, RCI Hyderabad & NSTL Visakhapatnam

Correct Answer: (C) | **Explanation:** For **Gaurav Glide Bomb** (Weapon System), the verified 2026 Test Date & Site is **2026 Operational Trials**. Furthermore, ITR Chandipur (Su-30 MKI). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #61 High-Yield Comparative MCQ

Q61. With reference to Indigenous Defence System and Developing DRDO Lab / Partner, which of the following is accurately matched with "Long-Range Hypersonic Missile"?

(A) CVRDE Avadi (DRDO) & L&T
(B) DRDL, RCI Hyderabad & NSTL Visakhapatnam
(C) ASL & DRDL Hyderabad
(D) DRDL Hyderabad (DRDO)

Correct Answer: (D) | **Explanation:** For **Long-Range Hypersonic Missile** (Indigenous Defence System), the verified Developing DRDO Lab / Partner is **DRDL Hyderabad (DRDO)**. Furthermore, >1,500 km range. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #62 High-Yield Comparative MCQ

Q62. With reference to Indigenous Defence System and Developing DRDO Lab / Partner, which of the following is accurately matched with "Zorawar Light Tank"?

(A) CVRDE Avadi (DRDO) & L&T
(B) DRDL, RCI Hyderabad & NSTL Visakhapatnam
(C) ASL & DRDL Hyderabad
(D) ARDE Pune & HEMRL Pune

Correct Answer: (A) | **Explanation:** For **Zorawar Light Tank** (Indigenous Defence System), the verified Developing DRDO Lab / Partner is **CVRDE Avadi (DRDO) & L&T**. Furthermore, 25 Tonnes. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #63 High-Yield Comparative MCQ

Q63. With reference to Indigenous Defence System and Developing DRDO Lab / Partner, which of the following is accurately matched with "SMART System"?

(A) ASL & DRDL Hyderabad
(B) DRDL, RCI Hyderabad & NSTL Visakhapatnam
(C) ARDE Pune & HEMRL Pune
(D) ₹10,371.92 Crore (5-Year Outlay)

Correct Answer: (B) | **Explanation:** For **SMART System** (Indigenous Defence System), the verified Developing DRDO Lab / Partner is **DRDL, RCI Hyderabad & NSTL Visakhapatnam**. Furthermore, 643 km Range. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #64 High-Yield Comparative MCQ

Q64. With reference to Indigenous Defence System and Developing DRDO Lab / Partner, which of the following is accurately matched with "Agni-V (Mission Divyastra)"?

(A) ARDE Pune & HEMRL Pune
(B) ₹10,371.92 Crore (5-Year Outlay)
(C) ASL & DRDL Hyderabad
(D) 45,000+ GPUs (as of June 2026)

Correct Answer: (C) | **Explanation:** For **Agni-V (Mission Divyastra)** (Indigenous Defence System), the verified Developing DRDO Lab / Partner is **ASL & DRDL Hyderabad**. Furthermore, 5,000+ km Range. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #65 High-Yield Comparative MCQ

Q65. With reference to Indigenous Defence System and Developing DRDO Lab / Partner, which of the following is accurately matched with "Guided Pinaka Mk-II ER"?

(A) ₹10,371.92 Crore (5-Year Outlay)
(B) 45,000+ GPUs (as of June 2026)
(C) 13 Responsible AI Projects approved (July 2026)
(D) ARDE Pune & HEMRL Pune

Correct Answer: (D) | **Explanation:** For **Guided Pinaka Mk-II ER** (Indigenous Defence System), the verified Developing DRDO Lab / Partner is **ARDE Pune & HEMRL Pune**. Furthermore, 75 km Extended Range (44 sec for 12 rockets). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #66 High-Yield Comparative MCQ

Q66. With reference to IndiaAI Mission Pillar / Metric and Verified 2026 Official Figure / Status, which of the following is accurately matched with "Total Financial Outlay"?

(A) ₹10,371.92 Crore (5-Year Outlay)
(B) 45,000+ GPUs (as of June 2026)
(C) 13 Responsible AI Projects approved (July 2026)
(D) BharatGen, Sarvam AI, Soket AI, Gnani.ai

Correct Answer: (A) | **Explanation:** For **Total Financial Outlay** (IndiaAI Mission Pillar / Metric), the verified Verified 2026 Official Figure / Status is **₹10,371.92 Crore (5-Year Outlay)**. Furthermore, MeitY / Digital India Corporation (IndiaAI IBD). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #67 High-Yield Comparative MCQ

Q67. With reference to IndiaAI Mission Pillar / Metric and Verified 2026 Official Figure / Status, which of the following is accurately matched with "Shared AI Compute Capacity"?

(A) 13 Responsible AI Projects approved (July 2026)
(B) 45,000+ GPUs (as of June 2026)
(C) BharatGen, Sarvam AI, Soket AI, Gnani.ai
(D) National Datasets & Model Repository

Correct Answer: (B) | **Explanation:** For **Shared AI Compute Capacity** (IndiaAI Mission Pillar / Metric), the verified Verified 2026 Official Figure / Status is **45,000+ GPUs (as of June 2026)**. Furthermore, Empanelled Cloud & Data Centre Providers. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #68 High-Yield Comparative MCQ

Q68. With reference to IndiaAI Mission Pillar / Metric and Verified 2026 Official Figure / Status, which of the following is accurately matched with "Safe & Trusted AI Projects"?

(A) BharatGen, Sarvam AI, Soket AI, Gnani.ai
(B) National Datasets & Model Repository
(C) 13 Responsible AI Projects approved (July 2026)
(D) Indian Institute of Science (IISc), Bengaluru

Correct Answer: (C) | **Explanation:** For **Safe & Trusted AI Projects** (IndiaAI Mission Pillar / Metric), the verified Verified 2026 Official Figure / Status is **13 Responsible AI Projects approved (July 2026)**. Furthermore, IITs, IIITs, and Academic Consortia. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #69 High-Yield Comparative MCQ

Q69. With reference to IndiaAI Mission Pillar / Metric and Verified 2026 Official Figure / Status, which of the following is accurately matched with "Indigenous Foundation Models"?

(A) National Datasets & Model Repository
(B) Indian Institute of Science (IISc), Bengaluru
(C) IIT Madras (with C-DOT)
(D) BharatGen, Sarvam AI, Soket AI, Gnani.ai

Correct Answer: (D) | **Explanation:** For **Indigenous Foundation Models** (IndiaAI Mission Pillar / Metric), the verified Verified 2026 Official Figure / Status is **BharatGen, Sarvam AI, Soket AI, Gnani.ai**. Furthermore, IndiaAI Innovation Centre & IIT Bombay Consortium. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #70 High-Yield Comparative MCQ

Q70. With reference to IndiaAI Mission Pillar / Metric and Verified 2026 Official Figure / Status, which of the following is accurately matched with "AIKosh Platform"?

(A) National Datasets & Model Repository
(B) Indian Institute of Science (IISc), Bengaluru
(C) IIT Madras (with C-DOT)
(D) IIT Bombay

Correct Answer: (A) | **Explanation:** For **AIKosh Platform** (IndiaAI Mission Pillar / Metric), the verified Verified 2026 Official Figure / Status is **National Datasets & Model Repository**. Furthermore, IndiaAI IBD & Line Ministries. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #71 High-Yield Comparative MCQ

Q71. With reference to Thematic Hub (T-Hub) Domain and Lead Host Institution, which of the following is accurately matched with "Quantum Computing"?

(A) IIT Madras (with C-DOT)
(B) Indian Institute of Science (IISc), Bengaluru
(C) IIT Bombay
(D) IIT Delhi

Correct Answer: (B) | **Explanation:** For **Quantum Computing** (Thematic Hub (T-Hub) Domain), the verified Lead Host Institution is **Indian Institute of Science (IISc), Bengaluru**. Furthermore, 20–50 to 1,000 physical qubits (Superconducting & Photonic). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #72 High-Yield Comparative MCQ

Q72. With reference to Thematic Hub (T-Hub) Domain and Lead Host Institution, which of the following is accurately matched with "Quantum Communication"?

(A) IIT Bombay
(B) IIT Delhi
(C) IIT Madras (with C-DOT)
(D) Dholera, Gujarat

Correct Answer: (C) | **Explanation:** For **Quantum Communication** (Thematic Hub (T-Hub) Domain), the verified Lead Host Institution is **IIT Madras (with C-DOT)**. Furthermore, 1,000-km fibre QKD & satellite-based free-space quantum link. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #73 High-Yield Comparative MCQ

Q73. With reference to Thematic Hub (T-Hub) Domain and Lead Host Institution, which of the following is accurately matched with "Quantum Sensing & Metrology"?

(A) IIT Delhi
(B) Dholera, Gujarat
(C) Morigaon (Jagiroad), Assam
(D) IIT Bombay

Correct Answer: (D) | **Explanation:** For **Quantum Sensing & Metrology** (Thematic Hub (T-Hub) Domain), the verified Lead Host Institution is **IIT Bombay**. Furthermore, Atomic clocks, NV-diamond magnetometers, quantum gravimeters. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #74 High-Yield Comparative MCQ

Q74. With reference to Thematic Hub (T-Hub) Domain and Lead Host Institution, which of the following is accurately matched with "Quantum Materials & Devices"?

(A) IIT Delhi
(B) Dholera, Gujarat
(C) Morigaon (Jagiroad), Assam
(D) Sanand, Gujarat

Correct Answer: (A) | **Explanation:** For **Quantum Materials & Devices** (Thematic Hub (T-Hub) Domain), the verified Lead Host Institution is **IIT Delhi**. Furthermore, Superconducting resonators, single-photon detectors, topological materials. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #75 High-Yield Comparative MCQ

Q75. With reference to Project & Consortium and Location (City & State), which of the following is accurately matched with "Tata Electronics + PSMC (Taiwan)"?

(A) Morigaon (Jagiroad), Assam
(B) Dholera, Gujarat
(C) Sanand, Gujarat
(D) MeitY & DST (C-DAC Indigenous Rudra Server)

Correct Answer: (B) | **Explanation:** For **Tata Electronics + PSMC (Taiwan)** (Project & Consortium), the verified Location (City & State) is **Dholera, Gujarat**. Furthermore, Commercial Wafer Fab. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #76 High-Yield Comparative MCQ

Q76. With reference to Project & Consortium and Location (City & State), which of the following is accurately matched with "Tata Semiconductor Assembly & Test (TSAT)"?

(A) Sanand, Gujarat
(B) MeitY & DST (C-DAC Indigenous Rudra Server)
(C) Morigaon (Jagiroad), Assam
(D) Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)

Correct Answer: (C) | **Explanation:** For **Tata Semiconductor Assembly & Test (TSAT)** (Project & Consortium), the verified Location (City & State) is **Morigaon (Jagiroad), Assam**. Furthermore, OSAT / Advanced Packaging. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #77 High-Yield Comparative MCQ

Q77. With reference to Project & Consortium and Location (City & State), which of the following is accurately matched with "Micron Technology"?

(A) MeitY & DST (C-DAC Indigenous Rudra Server)
(B) Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)
(C) Department of Biotechnology (DBT)
(D) Sanand, Gujarat

Correct Answer: (D) | **Explanation:** For **Micron Technology** (Project & Consortium), the verified Location (City & State) is **Sanand, Gujarat**. Furthermore, ATMP Memory Facility. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #78 High-Yield Comparative MCQ

Q78. With reference to Project & Consortium and Location (City & State), which of the following is accurately matched with "CG Power + Renesas (Japan) + Stars (Thailand)"?

(A) Sanand, Gujarat
(B) MeitY & DST (C-DAC Indigenous Rudra Server)
(C) Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)
(D) Department of Biotechnology (DBT)

Correct Answer: (A) | **Explanation:** For **CG Power + Renesas (Japan) + Stars (Thailand)** (Project & Consortium), the verified Location (City & State) is **Sanand, Gujarat**. Furthermore, OSAT Facility. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #79 High-Yield Comparative MCQ

Q79. With reference to Project & Consortium and Location (City & State), which of the following is accurately matched with "Kaynes Semicon"?

(A) MeitY & DST (C-DAC Indigenous Rudra Server)
(B) Sanand, Gujarat
(C) Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)
(D) Department of Biotechnology (DBT)

Correct Answer: (B) | **Explanation:** For **Kaynes Semicon** (Project & Consortium), the verified Location (City & State) is **Sanand, Gujarat**. Furthermore, OSAT Facility. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #80 High-Yield Comparative MCQ

Q80. With reference to 2026 Science & Tech Initiative and Nodal Ministry / Institute, which of the following is accurately matched with "PARAM Rudra Supercomputers"?

(A) Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)
(B) Department of Biotechnology (DBT)
(C) MeitY & DST (C-DAC Indigenous Rudra Server)
(D) IIT Bombay/TMC (ImmunoACT) & Wockhardt/BIRAC

Correct Answer: (C) | **Explanation:** For **PARAM Rudra Supercomputers** (2026 Science & Tech Initiative), the verified Nodal Ministry / Institute is **MeitY & DST (C-DAC Indigenous Rudra Server)**. Furthermore, Deployed at GMRT Pune (1 PF), IUAC Delhi (3 PF), SNBNCBS Kolkata. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #81 High-Yield Comparative MCQ

Q81. With reference to 2026 Science & Tech Initiative and Nodal Ministry / Institute, which of the following is accurately matched with "Arka & Arunika HPC Systems"?

(A) Department of Biotechnology (DBT)

(B) IIT Bombay/TMC (ImmunoACT) & Wockhardt/BIRAC

(C) Ministry of Earth Sciences (NIOT Chennai)

(D) Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)

Correct Answer: (D) | **Explanation:** For **Arka & Arunika HPC Systems** (2026 Science & Tech Initiative), the verified Nodal Ministry / Institute is **Ministry of Earth Sciences (IITM Pune & NCMRWF Noida)**. Furthermore, Arka: 11.77 PetaFLOPs (Pune). (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #82 High-Yield Comparative MCQ

Q82. With reference to 2026 Science & Tech Initiative and Nodal Ministry / Institute, which of the following is accurately matched with "BioE3 Policy"?

(A) Department of Biotechnology (DBT)

(B) IIT Bombay/TMC (ImmunoACT) & Wockhardt/BIRAC

(C) Ministry of Earth Sciences (NIOT Chennai)

(D) HLVM3 (3-stage: HS200 + L110 + C32 Cryogenic)

Correct Answer: (A) | **Explanation:** For **BioE3 Policy** (2026 Science & Tech Initiative), the verified Nodal Ministry / Institute is **Department of Biotechnology (DBT)**. Furthermore, 6 Thematic Biomanufacturing Sectors + Bio-AI Hubs & Biofoundries. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #83 High-Yield Comparative MCQ

Q83. With reference to 2026 Science & Tech Initiative and Nodal Ministry / Institute, which of the following is accurately matched with "NexCAR19 & Nafithromycin"?

(A) Ministry of Earth Sciences (NIOT Chennai)

(B) IIT Bombay/TMC (ImmunoACT) & Wockhardt/BIRAC

(C) HLVM3 (3-stage: HS200 + L110 + C32 Cryogenic)

(D) Q4 2026 Orbital Flight carrying Vyommitra

Correct Answer: (B) | **Explanation:** For **NexCAR19 & Nafithromycin** (2026 Science & Tech Initiative), the verified Nodal Ministry / Institute is **IIT Bombay/TMC (ImmunoACT) & Wockhardt/BIRAC**. Furthermore, Indigenous CD19 CAR-T Therapy & Novel Ketolide Antibiotic. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

Practice Question #84 High-Yield Comparative MCQ

Q84. With reference to 2026 Science & Tech Initiative and Nodal Ministry / Institute, which of the following is accurately matched with "Samudrayaan (Matsya-6000)"?

(A) HLVM3 (3-stage: HS200 + L110 + C32 Cryogenic)

(B) Q4 2026 Orbital Flight carrying Vyommitra

(C) Ministry of Earth Sciences (NIOT Chennai)

(D) 10-Parachute Complex (2 Apex + 2 Drogue + 3 Pilot + 3 Main)

Correct Answer: (C) | **Explanation:** For **Samudrayaan (Matsya-6000)** (2026 Science & Tech Initiative), the verified Nodal Ministry / Institute is **Ministry of Earth Sciences (NIOT Chennai)**. Furthermore, 2.1m Titanium Sphere (80mm thick); 3 crew; 6,000m depth; 12h normal / 96h emergency. (Source: इसरो आधिकारिक पोर्टल & IUC Academy).

BOOK CA*11* — *65* Rapid-Fire Revision Points

1. **Gaganyaan-1 (G1)**: First uncrewed orbital flight of ISRO's Gaganyaan programme scheduled for Q4 2026 aboard **HLVM3** carrying humanoid robot **Vyommitra** (ISRO).

2. **HLVM3 Rocket Stages**: Two **HS200** solid strap-ons + **L110** liquid core stage (twin Vikas engines) + **C32** cryogenic upper stage (CE-20 engine).

3. **Vyommitra**: Indigenous half-humanoid female robot developed by **ISRO Inertial Systems Unit (IISU), Thiruvananthapuram** to test ECLSS and panel operations on G1.

4. **Gaganyaan Astronaut-Designates**: Group Captains **Prashanth Balakrishnan Nair, Ajit Krishnan, Angad Pratap, and Shubhanshu Shukla** (PIB).

5. **Bharatiya Antariksh Station (BAS)**: Base unit **BAS-1 (~10 tonnes)** to be launched on LVM3 by **2028**; full 5-unit **52-tonne** space station by **2035**.

6. **Revised Gaganyaan & BAS Outlay**: Union Cabinet expanded total programme funding to **₹20,193 crore** (adding ₹11,170 crore) covering 8 total missions through 2028 (PIB).

7. **3rd National Space Day (23 August 2026)**: Hosted at **Ahmedabad** with theme '*Towards Viksit Bharat: Innovating, Collaborating and Aspiring to Global Space Leadership*'.

8. **NISAR Satellite**: Joint **NASA–ISRO Synthetic Aperture Radar** launched on **GSLV-F16** into a **747 km** Sun-Synchronous Orbit ($1.5+ billion mission) (ISRO).

9. **NISAR Dual Frequencies**: World's first satellite combining **L-band SAR (24 cm, NASA)** and **S-band SAR (12 cm, ISRO)** on a single platform with a **12-metre** gold-mesh reflector.

10. **NISAR Global Repeat Cycle**: Maps the entire Earth's land and ice surfaces every **12 days** using the **SweepSAR** technique across a 242 km swath.

11. **SpaDeX Mission**: Launched on **PSLV-C60** with twin 220-kg satellites (**SDX01 Chaser & SDX02 Target**); made India the **4th country** in the world to achieve autonomous space docking.

12. **SpaDeX 2026 Conclusion**: Both SpaDeX satellites completed controlled atmospheric re-entry in 2026 (~7 hours apart) after nearly 21 months in orbit (ISRO).

13. **Bharatiya Docking System (BDS)**: Patented indigenous androgynous docking system (450 mm diameter) validated on SpaDeX for future use in Chandrayaan-4 and BAS.

14. **Chandrayaan-4 Outlay & Architecture**: Approved at **₹2,104.06 crore**; comprises **5 spacecraft units** (Propulsion, Descender, Ascender, Transfer, Re-entry) launched via **two LVM3 rockets**.

15. **NGLV 'Soorya'**: Next Generation Launch Vehicle approved at **₹8,239 crore**; 93-metre reusable heavy-lift rocket using **LOX-Methane** engines with **30-tonne LEO** payload capacity.

16. **Venus Orbiter Mission (VOM / Shukrayaan-1)**: Cabinet-approved **₹1,236 crore** mission carrying S-band SAR and subsurface radar to study Venusian atmosphere and geology (PIB).

17. **Aditya-L1 2026 Scientific Breakthrough**: **VELC** (Visible Emission Line Coronagraph) instrument reconstructed a solar Coronal Mass Ejection (CME) in 3D from Lagrange Point L1.

18. **PSLV-C62 (12 January 2026)**: Experienced a third-stage anomaly studied by ISRO's Failure Analysis Committee for propulsion reliability upgrades.

19. **Third Launch Pad (TLP)**: Approved at **SDSC-SHAR, Sriharikota** to support NGLV 'Soorya' and horizontal/vertical integration of future human spaceflight missions.

20. **Kulasekarapattinam Spaceport**: ISRO's second spaceport under construction in **Thoothukudi district, Tamil Nadu**, dedicated to polar **SSLV** launches without dog-leg manoeuvres.

21. **Project 'Kusha' LR-SAM (23 July 2026)**: DRDO successfully conducted the maiden flight-test of the indigenous **Kusha Long-Range Surface-to-Air Missile** from APJ Abdul Kalam Island, Odisha (**PIB**).

22. **Kusha Air Defence Envelope**: Three-tier indigenous air defence system (150 km, 250 km, and 350+ km intercept tiers) designed to neutralise stealth fighters, AWACS, and cruise missiles.

23. **RudraM-II Flight-Test (2 June 2026)**: Successfully flight-tested by DRDO and IAF from a **Su-30 MKI** aircraft off the Odisha coast (**PIB**).

24. **RudraM-II Specifications**: Solid-propelled air-to-surface/anti-radiation missile with **~300 km range**, Mach 5.5 speed, Passive Homing Head (PHH), and Imaging Infrared (IIR) seeker.

25. **VSHORADS Flight-Trials (27 February 2026)**: DRDO revalidated the 4th-generation Man-Portable Air Defence System (**VSHORADS**, 6 km range, Reaction Control System) at ITR Chandipur (**PIB**).

26. **Pralay Missile Flight-Test (5 November 2026)**: Surface-to-surface tactical **quasi-ballistic missile** (150–500 km range, 350–700 kg warhead) completed user-readiness flight testing off Odisha.

27. **Gaurav Long-Range Glide Bomb**: Indigenous **1,000-kg class winged glide bomb** (~100 km precision range) tested from **Su-30 MKI**, developed by RCI, ARDE, and ITR Chandipur (**DRDO**).

28. **Long-Range Hypersonic Missile**: Tested from APJ Abdul Kalam Island; **>1,500 km range**, terminal speed **>Mach 6**, designed for anti-ship and land-attack strike roles.

29. **DRDL Scramjet Milestone**: DRDO's Defence Research & Development Laboratory (Hyderabad) gcycle-tested an active-cooled **Scramjet combustor for >1,000 seconds** using endothermic fuel.

30. **Zorawar Light Tank**: Indigenous **25-tonne** amphibious high-altitude light tank developed by **DRDO (CVRDE Avadi) and L&T**; armed with a 105 mm gun and ATGM firing capability.

31. **Mission Divyastra (Agni-V MIRV)**: Validated indigenous **Multiple Independently Targetable Re-entry Vehicle (MIRV)** technology on the 5,000+ km range three-stage solid-fuel Agni-V missile.

32. **Agni-Prime (Agni-P)**: Canisterised new-generation medium-range ballistic missile (**1,000–2,000 km** range) featuring composite motor casings and manoeuvrable re-entry vehicle.

33. **SMART System**: **Supersonic Missile-Assisted Release of Torpedo** developed by DRDO with a **643 km** stand-off anti-submarine engagement range.

34. **Guided Pinaka Mk-II ER**: Extended-range multi-barrel rocket launcher system with **75 km precision range** using INS/NavIC guidance; exported to Armenia.

35. **Astra Mk-I & Mk-II**: Indigenous Beyond-Visual-Range Air-to-Air Missile (**BVRAAM**) family (Astra Mk-I: 110 km; Astra Mk-II with dual-pulse solid motor: 160+ km).

36. **VL-SRSAM**: Vertical Launch Short-Range Surface-to-Air Missile (50–80 km range) developed by DRDO for Indian Navy warships to replace Barak-1.

37. **DURGA-II & KALI**: DRDO's indigenous **Directed Energy Weapon (DEW)** programmes utilizing high-energy solid-state lasers and gigawatt electron-beam pulses for counter-drone warfare.

38. **IndiaAI Mission Outlay**: Approved at **₹10,371.92 crore** over 5 years, implemented by the **IndiaAI Independent Business Division (IBD)** under Digital India Corporation, MeitY (**PIB**).

39. **IndiaAI 2026 GPU Milestone**: Shared AI compute capacity expanded to **45,000+ GPUs as of June 2026** (surpassing the initial 10,000 GPU target by more than 4.5 times) (**PIB**).

40. **IndiaAI Compute Utilisation (August 2026)**: **237 research and startup projects** accessed subsidised AI computing covering **93.18 lakh GPU hours** (**PIB**).

41. **Safe & Trusted AI Pillar (July 2026)**: Government approved **13 Responsible AI projects** across IITs/IIITs focusing on machine unlearning, deepfake watermarking, and bias mitigation (**PIB**).

42. **AIKosh**: Official **IndiaAI Datasets Platform** hosting thousands of non-personal datasets and AI models for researchers and startups.

43. **Sovereign Indian AI Models**: **BharatGen** (IIT Bombay consortium), **Sarvam AI**, **Soket AI Labs**, and **Gnani.ai** selected to build foundational multimodal models across 22 scheduled languages.

44. **National Quantum Mission (NQM)**: **₹6,003.65 crore** outlay (2023–2031) administered by the **Department of Science and Technology (DST)** (**PIB**).

45. **NQM Thematic Hub — Quantum Computing**: Hosted at **Indian Institute of Science (IISc), Bengaluru** (targeting 50 to 1,000 physical qubits by 2031).

46. **NQM Thematic Hub — Quantum Communication**: Hosted at **IIT Madras** in collaboration with **C-DOT**; demonstrated a **1,000-km quantum communication link** in 2026.

47. **NQM Thematic Hub — Quantum Sensing & Metrology**: Hosted at **IIT Bombay** (developing atomic clocks, NV-diamond magnetometers, and quantum gravimeters).

48. **NQM Thematic Hub — Quantum Materials & Devices**: Hosted at **IIT Delhi** (developing superconducting resonators, single-photon sources, and topological materials).

49. **Semicon 2.0 (Union Budget 2026)**: Expanded the India Semiconductor Mission to support **Machines and Materials** alongside Wafer Fabs and ATMP/OSAT packaging (**PIB**).

50. **12 Approved Semiconductor Projects**: As of 2026, India has approved **12 semiconductor manufacturing/packaging projects** under the India Semiconductor Mission with 50% central fiscal support.

51. **Dholera Semiconductor Wafer Fab**: **Tata Electronics + PSMC (Taiwan)** building India's first commercial wafer fab at **Dholera, Gujarat** (₹91,000 crore, **50,000 wafers/month**).

52. **Morigaon (Assam) OSAT Plant**: **Tata Semiconductor Assembly and Test (TSAT)** establishing a ₹27,000 crore facility at Jagiroad, Morigaon producing **48 million chips/day**.

53. **Sanand (Gujarat) Packaging Hub**: Hosts three major plants—**Micron Technology** (ATMP, ₹22,516 Cr), **CG Power–Renesas–Stars** (OSAT, ₹7,600 Cr), and **Kaynes Semicon** (OSAT, ₹3,307 Cr).

54. **DIR-V Programme**: Digital India RISC-V initiative advancing indigenous **VEGA (C-DAC)** and **SHAKTI (IIT Madras)** open-source microprocessors.

55. **PARAM Rudra Supercomputers**: Built on C-DAC's indigenous **Rudra server board** and deployed at **GMRT Pune (1 PF), IUAC Delhi (3 PF), and S.N. Bose Centre Kolkata (838 TF)** (**PIB**).

56. **Arka & Arunika Weather HPCs**: Installed at **IITM Pune (Arka — 11.77 PetaFLOPs)** and **NCMRWF Noida (Arunika — 8.24 PetaFLOPs)** under the Ministry of Earth Sciences.

57. **BioE3 Policy**: *Biotechnology for Economy, Environment and Employment* policy by **DBT** establishing Bio-AI Hubs and Biofoundries across 6 thematic sectors.

58. **GenomeIndia & One Day One Genome**: Completion of **10,000 human whole-genome sequences** under GenomeIndia, followed by DBT-BRIC's **One Day One Genome** microbial annotation mission.

59. **NexCAR19**: India's first indigenous **CAR-T cell therapy** developed by **ImmunoACT (IIT Bombay & Tata Memorial Centre)** for B-cell blood cancers at ~1/10th global cost.

60. **Nafithromycin (Miqnaf)**: India's first indigenous ketolide/macrolide antibiotic developed by **Wockhardt with BIRAC support** for drug-resistant Community-Acquired Bacterial Pneumonia.

61. **Samudrayaan (Matsya-6000)**: Indigenous 3-person deep-ocean submersible with a **2.1-metre Titanium alloy spherical hull (80 mm thick)** built by **NIOT Chennai** for **6,000-metre** dives.

62. **LIGO-India**: Third global gravitational-wave laser interferometer observatory (₹2,600 crore) under construction at **Aundha Nagnath in Hingoli district, Maharashtra**.

63. **Square Kilometre Array Observatory (SKAO)**: India approved **₹1,250 crore** as a full member of the international SKAO radio telescope project (low-frequency array in Australia, mid-frequency in South Africa).

64. **Hanle MACE Telescope**: **Major Atmospheric Cherenkov Experiment (MACE)** inaugurated at **Hanle, Ladakh (4,300 m altitude)** by BARC—Asia's largest and the world's highest imaging atmospheric Cherenkov gamma-ray telescope.

65. **INS Arighat**: India's second indigenous nuclear-powered ballistic missile submarine (**SSBN** of the Arihant class) commissioned into the Indian Navy at Visakhapatnam, armed with K-15/K-4 SLBMs (**PIB**).

IUC Academy *1-3-7-21* Day Spaced-Revision & Self-Assessment Tracker (www.iucacademy.com)

Chapter / Study Section	Day 1 (First Read)	Day 3 (Active Recall)	Day 7 (MCQ Drill)	Day 21 (Exam Ready)
1. Executive Thematic Overview	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
2. Chapter 1: ISRO Human Spaceflight & Orbital Architecture 2026: Gaganyaan-1 (G1), Vyommitra & Bharatiya Antariksh Station	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
3. Chapter 2: ISRO Exploration, Earth Observation & Heavy-Lift Propulsion 2026: NISAR, SpaDeX, Chandrayaan-4 & NGLV Soorya	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
4. Chapter 3: DRDO Strategic & Tactical Missiles 2026: Project Kusha LR-SAM, RudraM-II, VSHORADS & Pralay	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
5. Chapter 4: DRDO Hypersonic Technology, Naval Weapons, Armoured Platforms & Directed Energy Systems 2026	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
6. Chapter 5: IndiaAI Mission 2026: 45,000+ GPU Sovereign Compute, AIKosh, BharatGen & Safe and Trusted AI	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
7. Chapter 6: National Quantum Mission (NQM) 2026: Four Thematic Hubs, 1,000-km QKD & Indigenous Qubit Roadmaps	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
8. Chapter 7: India Semiconductor Mission (ISM) & Semicon 2.0 in 2026: Commercial Fabs, ATMP/OSAT & DLI Ecosystem	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
9. Chapter 8: Biotechnology, BioE3 Policy, Supercomputing (PARAM Rudra & Arka/Arunika) & Deep-Ocean Mission 2026	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
10. BOOK CA11 — 45 Solved 4-Option Multiple-Choice Questions (MCQs)	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**
11. Extended Comparative & Analytical Practice Set (Questions 46–85)	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**

Chapter / Study Section	Day 1 (First Read)	Day 3 (Active Recall)	Day 7 (MCQ Drill)	Day 21 (Exam Ready)
12. BOOK CA11 — 65 Rapid-Fire Revision Points	☐ Completed (100% Concept Clarity)	☐ Flowchart & Tables Revised	☐ 75+ MCQs Solved (>85% Accuracy)	☐ **Final Rapid Recall Ready**