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The Quantum Leap: India's National Quantum Mission at the Halfway Mark

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The Quantum Leap: India's National Quantum Mission at the Halfway Mark

 **Science Reporter** Chapter 3 · 3 min read

Feature analysis for Science Reporter July 2026, built from verified scientific reporting.

Three years after the Union Cabinet approved the **National Quantum Mission (NQM)** in April 2023, India has crossed the **halfway mark** on the mission's targeted outcomes, with home-grown multi-qubit machines and long-distance quantum communication demonstrated on Indian soil. Quantum technology is one of the most abstract topics an aspirant meets, so this feature strips it to the ideas UPSC actually tests: what a qubit is, what the mission promises, and why nations are racing for it.

WHY IN NEWS

Quantum computing threatens to break the encryption that protects banking, defence and government data, which makes sovereign quantum capability a **strategic** and not merely scientific goal. Through 2026, Indian groups have reported working superconducting and ion-trap processors of tens of qubits, and quantum-secured communication over long fibre and free-space links, moving the mission from targets on paper to laboratory hardware. This is why NQM recurs in current-affairs and science-and-tech questions.

WHAT A QUBIT IS

A classical computer bit is either 0 or 1. A **qubit** exploits two quantum properties:

- **Superposition:** a qubit can represent a blend of 0 and 1 at once, so a register of qubits can encode many combinations simultaneously.
- **Entanglement:** two qubits can be linked so that measuring one instantly fixes the state of the other, enabling correlations no classical wire can carry.

Together these let a quantum machine explore many computational paths in parallel, which is why certain problems in chemistry, materials, optimisation and cryptography could become tractable. The catch is **decoherence**: qubits lose their fragile quantum state when disturbed by heat or noise, so they must be shielded, often near absolute zero, and protected by error correction.

THE MISSION AT A GLANCE

ELEMENT	DETAIL
Approved	April 2023, by the Union Cabinet
Duration	2023-24 to 2030-31 (eight years)
Outlay	About Rs 6,003.65 crore
Qubit target	Intermediate-scale quantum computers of 50 to 1,000 physical qubits
Platforms	Superconducting, ion-trap and photonic systems
Four verticals	Quantum Computing; Quantum Communication; Quantum Sensing and Metrology; Quantum Materials and Devices

The mission is delivered through four **Thematic Hubs (T-Hubs)** anchored at leading institutions, each owning one vertical, and it aims to build not just machines but a domestic supply chain of components, skilled researchers and start-ups. Independent tracking in 2026 indicates that more than half of the mission's targeted outcomes have already been met within three years, an unusually fast pace for a deep-tech programme.

UPSC RELEVANCE

Prelims angle: Fix the mission's numbers (2023 approval, roughly Rs 6,003.65 crore, 50 to 1,000 qubits, four verticals and four thematic hubs), and be able to define superposition, entanglement and Quantum Key Distribution, where any eavesdropping physically disturbs the quantum states and is detected.

Mains angle (GS3): NQM is a test of whether India can lead in a technology that is simultaneously scientific, economic and security-critical. **Way forward:** localise the cryogenics, lasers and control electronics that are still imported, tie the T-Hubs to industry so prototypes become products, and prepare **post-quantum cryptography** across government systems before large quantum computers can break current encryption, so that India is a rule-maker rather than a rule-taker in the quantum age.

FACTS CORNER - KNOWLEDGE PEDIA**NATIONAL QUANTUM MISSION:**

Approved April 2023; period 2023-24 to 2030-31; outlay about Rs 6,003.65 crore

Target: 50 to 1,000 physical qubits across superconducting, ion-trap and photonic platforms

Four verticals: Computing, Communication, Sensing and Metrology, Materials and Devices

CONCEPTS:

Qubit: quantum unit using superposition and entanglement

Decoherence: loss of quantum state due to noise; countered by shielding and error correction

QKD: quantum-secure key sharing where eavesdropping is detectable

Sources: Department of Science and Technology, NQM , Science Reporter / CSIR-NIScPR



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