

National Mission on Quantum Technologies & Applications (NM-QTA)

The National Mission on Quantum Technologies & Applications (NM-QTA) was announced by the Finance Minister in the Union Budget 2020. Government schemes are important for the [UPSC exam](#) and in this article, you can read all about the NM-QTA, its impact, objectives and significance.

National Quantum Mission

The NM-QTA, also called the National Quantum Mission, was announced with an outlay of Rs.8000 crore for five years in the [Budget 2020](#).

- The scheme is implemented by the Department of Science and Technology (DST) under the Ministry of Science and Technology.
- The focus areas for the mission will be addressing national priorities through:
 - Fundamental science
 - Translation
 - Technology development
- The mission is expected to address the ever-increasing technological demands of society and also take into account the international achievements and trends in this domain.
- It is also expected to benefit in preparing the next generation skilled manpower, encourage translational research, and promote entrepreneurship and develop an ecosystem for start-ups.
- Quantum principles will be used to engineer solutions to problems in the field of communications, computing, chemistry, sensing, cryptography, mechanics, imaging among others.
- **Applications** of quantum computing and technology include those in the domains of aerospace engineering, simulations, weather prediction, cybersecurity, securing communications and financial transactions, education, health, agriculture, advanced manufacturing, etc.
- It is believed that countries with an edge in quantum technology will be able to showcase better economic growth and play a dominant leadership role.
- Quantum technology is a fast-growing industry and it has the potential to usher in many disruptive innovations. It also has applications across a wide spectrum of industries and strategic areas.

Quantum Technology Applications



secure communications
research in fundamental physics
disaster management
pharmaceuticals
industrial revolution 4.0
weather prediction
securing financial transactions
aerospace engineering
cybersecurity
advanced manufacturing

NM-QTA Significance

A government thrust in this field will go a long way towards helping India become a lead player in this field and experience multi-dimensional growth. It is also expected to spur job creation. The government's organizational and financial support will also ensure that both public and private sectors will benefit. The mission will establish standards to be applied to all research and help stimulate a pipeline to support research and applications well into the future.

What is Quantum Mechanics?

Quantum mechanics is a branch of physics that was developed in the early 20th century.

- It is a fundamental branch of science that describes the physical properties of nature at the atomic and subatomic scale.
- It has offered the foundation for our understanding of the physical world, the interaction between light and matter, etc.
- At the microscopic scale, the laws and equations of classical physics fail to explain the movement of particles. In classical mechanics, objects (of everyday sizes and speeds) exist at a specific time and at a specific location. However, at the quantum level, objects exist in a haze of probability.
- Quantum physics has led to the invention of such useful technologies as semiconductor transistors and lasers.

Quantum Technology

Quantum technology is based on the principles of quantum physics/mechanics. It concerns the manipulation and control of quantum systems, which will help achieve information processing that goes beyond the limits of the classical world. Quantum technology exploits some of the properties of quantum mechanics – such as quantum entanglement, superposition and tunnelling – in developing practical applications like computing and cryptography.

Quantum Computing

Quantum computing is basically harnessing the laws of quantum mechanics to process information. A conventional computer processes in bits (0s and 1s), while a quantum computer uses qubits or quantum bits. A qubit is a quantum system that encodes the zero and the one into two distinguishable quantum states. Capitalising on the phenomenon of superposition and entanglement, quantum computers can mimic several traditional computers in parallel. This can exponentially increase the processing power and speed of computers.

