



Fundamentals of Science & Technology



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About the Tutorial

Science and Technology is one of the disciplines of modern science under which, we study about the various technologies, their applications, and the development led by these technologies.

Science and Technology also includes a wide range of topics such as Space Science Technology, Biotechnology, Nanotechnology, Defense Technology, Artificial Intelligence, Information Technology, E-infrastructure, etc.

By considering the diversity of the discipline, we have categorized this tutorial into different chapters for easy understanding.

Audience

This tutorial is designed exclusively for the students preparing for different competitive exams such as **civil services, banking, railway, eligibility test.**

Prerequisites

This tutorial is entirely based on **reliable sources including books, articles, and fact-files (taken from the official websites)** and prepared in easy and simple language.

This tutorial explains the basic concepts and elements of Science and Technology; however, prior experience of reading the basics of Science and Technology is recommended for easy understanding.

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1. Fundamentals of Science and Technology — Introduction

The evolution of science is like a boon to the world, as human beings come to know a lot about the world they are living in including the activities they indulge into. Furthermore, the development of technology along with the advancement in Science helps to bring in a revolution in various fields such as medicine, agriculture, education, information and technology, and many more.



In the present world, if we think of any sort of development, then the presence of science and technology cannot be ignored.

What is Science?

Science fundamentally is the systematic study of the structure and behavior of the natural and physical world through observations and experiments.

Study of science evolved with the civilization of human beings.

What is Technology?

Technology (which is basically derived from the Greek word '*technologia*') is an art, skill or ability, which is used to create and develop products and acquire knowledge.

Scientists used their knowledge to develop technology and then used technology to develop Science; so, because of this reason science and technology are an integrated term in today's world.

Consider the following points to understand the relationship between Science and Technology:

- Contribution of Science to Technology
-
- Contribution of Technology to Science

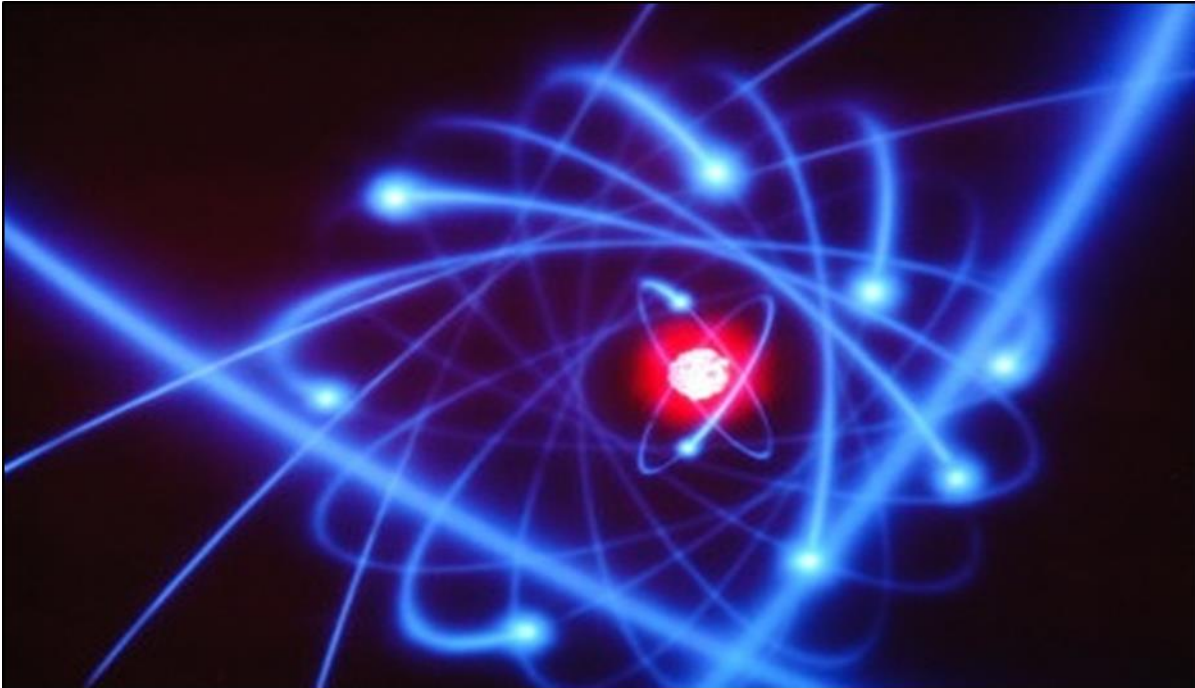
Let us discuss these points in brief.

Contribution of Science to Technology

Let us now understand how Science has contributed to Technology:

Science as a direct source of new technological ideas

For example, innovation and development medical instruments; nuclear technology, radar system, etc.



Science as a source of engineering

Most of the technical knowledge used in the designing and development of tools and techniques is actually an outcome of 'engineering science'.



Science has also helped in the development of human skills. This is one of the fundamental contributions of Science.

Contribution of Technology to Science

Consider the following points to understand the contribution of Technology to Science:

Technology as a source of scientific challenges

The development in the field of technology paves way for research and development in the field of Science. For example, space science is one of them. Technological development likewise indirectly stimulates basic research in the field of science.

Instrumentation and measurement techniques

Development of advanced instruments facilitated scientists to measure the distance between sun and earth, the intensity of sun's rays, the revolution of celestial bodies, internal problems of human beings, life of a bridge, etc.

2. Fundamentals of Science and Technology – Role of Science & Technology in Today’s Life

In today’s world, the role of science and technology is indispensable. We need Science and Technology in every sphere of our life like to treat diseases such as cancer or even to book a cab or train/flight ticket.

In fact, without technology (integrated with science), we cannot imagine our life *per se*.



One of the most important aspects of Science and Technology is that it has solution to the difficult of the difficult problems, the problems which have the potential to become major bottlenecks to the overall growth of the country. Some of these problems could be:

- Health aspects
- Standard of education
- Availability of healthy food and safe drinking water
- Infrastructure

On the other hand, once mitigating solutions are found for these problems, then the second major issue is the under-development in the field of scientific research and technology that directly affects the development of the country’s economy, infrastructure, higher education, and a few other fields listed below:

- Development of nuclear technology
- Defense technology

- Development of satellites
- Biotechnology
- Meteorological science
- Space technology
- Nanotechnology
- Wireless communication, etc.

All these technologies, in turn, provide favorable conditions for the country's growth and increase healthy competition nationally and also internationally.

In today's world, more often, we get to read or listen that developed countries, developing countries, underdeveloped countries, or even third-world countries, all these designate the level of development of Science and Technology in other countries, they have the influence on.

Government has also created an exclusive department to emphasize on the development of Science and Technology and a separate budget is also allocated for the same.

Nature of Science & Technology

Let us now discuss the nature of Science and Technology. There are normally two types of knowledge required for the overall development of a country:

Technical Knowledge

It can be defined in the simplest term as – '**know-how.**' It includes ranges of basic skills such as advancement in agriculture, development of chemical industries, medical technology, software engineering, etc.

Understanding of the attributes or elements

It means, knowledge and understanding of the intelligence of workers, quality of products, value of a firm, effectiveness of market, etc.



The uncompetitiveness of any of the attributes or elements leads to knowledge gap and information deficiency, which is directly related to the under-development of the respective country.

Likewise, Science and Technology is directly related to the overall development of the country. As a matter of fact, Science and Technology facilitates healthy competition between the different attributes and elements and acts like a platform for a better life.

Therefore, in order to alleviate the basic problems of food and supply, safe drinking water, health problems, education, infrastructure, etc., the emphasis and gradual development of Science and Technology is essential.

3. Fundamentals of Science and Technology – Role of Science & Technology In India

Over a period of time, India has progressively and perceptibly paved way for development in the field of Science and Technology.

The 21st century in India is apparently marked as the beginning towards an advancement in terms of technology and enrichment of knowledge base in the fields of Science.

At present, India holds a strong position in terms of advanced technology. India also serves as a knowledge warehouse with the existence of its many institutions catering to Science and Technology which come with qualified and trained manpower.



Areas of Development

Let us now discuss the different areas which undergo development with the advancement in Science and Technology:

- Higher education
- Scientific research and development
- Technological development
- Advancement of agricultural system
- Development of space science and technology

- Development of medical science and technology
- Development of infrastructure
- Information and communication technology
- Development of various fields of engineering (including software, chemical, mechanical, civil, electrical, electronic, etc.)

Likewise, India has strong scientific and technological base that spreads across the country in the form of academic institutions, research and development laboratories, advanced medical center (with research facilities), experimental centers, and different advanced industries.



Because of the development in all spheres of Science and technology, today, India is unquestionably a leading developing country in the world.

Science & Technology and Industry in India

Over the recent past, Science and Technology has made tremendous contribution towards the settlement of industries in India.

Starting from the micro level to the macro level, research and development in the field of technology has created an ideal niche for the overall growth of the economic condition of the country. The perceptible examples are the development of Atomic Energy, Space Science, dozens of successful satellite systems, advanced medical technologies, etc.

After the independence, it was not possible for India to depend on other countries for various aspects of development; therefore, the development of indigenous technology was indispensable for the overall development of a country.

Thankfully, today, Indian technologies and companies are as competent as in other developed countries. India is also a lead in various fields, and is a tough competitor for other countries.

If we discuss about the skilled human resources, many Indians are at top-notch positions in leading companies.

Indian industries started flourishing post 1990, i.e., the landmark era. Globalization, liberalization, and privatization, facilitated this growth. The industries catering to Information & Technology, Atomic Energy, Automotive, Biotechnology, Nanotechnology, Pharmaceutical, Petroleum, etc. have increased at global level.

On the other hand, the Government of India has also made sizable investment in the field of research and development to encourage the advancement of Indian economy.

For consistent and efficient growth, various initiatives have been taken by establishing the following organizations:

- Council of Scientific and Industrial Research (CSIR) center
- Department of Science and Technology (DST)
- All India Institute of Medical Sciences (AIIMA)
- Aryabhata Research Institute of Observational Sciences (ARIES)
- Central Drug Research Institute
- Centre for the Study of Developing Societies
- Central Electronics Engineering Research Institute
- Central Food Technological Research Institute
- Central Glass and Ceramic Research Institute (CGCRI)
- Central Institute of Agricultural Engineering
- Central Institute of Brackish Water Aquaculture
- Central Soil Salinity Research Institute
- Indian Institute of Engineering Science and Technology (IEST)
- Indira Gandhi Centre for Atomic Research (IGCAR)
- Institute of Economic Growth
- Institute of Genomics and Integrative Biology (IGIB)
- National Institute of Electronics & Information Technology (NIELIT)
- National Institute of Pharmaceutical Education and Research
- National Institute of Oceanography (NIO)

Likewise, there are dozens of other such scientific research centers, which have been set up for the overall economic growth of the country.

Science & Technology and Society in India

The growth, peace, and security of a society is directly related to the development of the technology; as Science and Technology in a way influences the development as well as security of the society.



Consider the following points to understand how the security of a society is directly related to the development of the technology:

- CCTV Camera at various locations (especially at public places) is one of the best examples of keeping crime under surveillance and it also provides a sense of security to the people.
- Because of the advancement in technology, today, there is a reduce in communication gap; people have the information of where their near and dear ones are and are just a phone call away at times of need.
- The job of the police has become easier, as police can trace criminals easily.
- Besides, because of the advancement of technology, today, most of the villages in India have electricity, road, and can avail for essential facilities.
- People, who are residing in even very remote part of the country, have the benefit of entertaining themselves and upgrading their knowledge through the different programmes broadcast on television (with dozens of channels).
- Telecommunications network towers have been set up at the remotest of the remote regions too.



Therefore, Science and Technology is like a boon for the overall scientific and economic development of the country.

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