

Science and Technology

Syllabus

1. Science and Technology- developments and their applications and effects in everyday life.
2. Achievements of Indians in science & technology; indigenization of technology and developing new technology.
3. Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights.

Syllabus	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
<i>Science and Technology- developments and their applications and effects in everyday life</i>	5	1			1			2	1	2		2		14
<i>Achievements of Indians in S&T; Indigenisation of technology & developing new technology</i>		1			1	1	1						1	5
<i>Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights</i>	1	1	4	2	1	1	3	1	2	1	3	2	1	23

1. Science and Technology- developments and their applications and effects in everyday life

Micro-topics	UPSC PYQs	Year	Marks
General Science	Each year a large amount of plant material, cellulose, is deposited on the surface of Planet Earth. What are the natural processes this cellulose undergoes before yielding carbon dioxide, water and other end products?	2022	10
Innovative Technologies	How does the 3D printing technology work? List out the advantages and disadvantages of the technology.	2013	5
	What is digital signature? What does its authentication mean? Give various salient built in features of a digital signature.	2013	5
Material Science and Industry Applications	What is an FRP composite material? How are they manufactured? Discuss their applications in aviation and automobile industry	2013	5
Medical and Health Technologies	What is the basic principle behind vaccine development? How do vaccines work? What approaches were adopted by the Indian vaccine manufacturers to produce COVID-19 vaccines?	2022	15
	Stem cell therapy is gaining popularity in India to treat a wide variety of medical conditions including Leukaemia, Thalassemia, damaged cornea and several burns. Describe briefly what stem cell therapy is and what advantages it has over other treatments?	2017	10
	Can overuse and the availability of antibiotics without doctor's prescription, the contributors to the emergence of drug-resistant diseases in India? What are the available mechanisms for monitoring and control? Critically discuss the various issues	2014	12.5

	involved.		
	What do you understand by fixed dose drug combinations (FDCs)? Discuss their merits and demerits.	2013	10
Technology in crisis Management	The world is facing an acute shortage of clean and safe freshwater. What are the alternative technologies which can solve this crisis? Briefly discuss any three such technologies citing their key merits and demerits.	2024	15
	COVID-19 pandemic has caused unprecedented devastation worldwide. However, technological advancements are being availed readily to win over the crisis. Give an account of how technology was sought to aid management to the pandemic.	2020	15
Technology solutions for daily challenges	What is the technology being employed for electronic toll collection on highways? What are its advantages and limitations? What are the proposed changes that will make this process seamless? Would this transition carry any potential hazards?	2024	10
	How is science interwoven deeply with our lives? What are the striking changes in agriculture triggered off by the science-based technologies?	2020	10
Nobel Prizes	The Nobel Prize in Physics of 2014 was jointly awarded to a Akasaki, Amano and Nakamura for the invention of Blue LEDs in 1990s. How has this invention impacted the everyday life of human beings?	2021	15
Sports and Technology	What do you understand by Umpire decision review in cricket? Discuss its various components. Explain how silicon tape on the edge of a bat may fool the system?	2013	10

2. Achievements of Indians in science & technology; indigenization of technology and developing new technology.

<i>Micro-topics</i>	<i>UPSC PYQs</i>	<i>Year</i>	<i>Marks</i>
Achievements of Indians in S&T	How was India benefited from the contributions of Sir M. Visvesvaraya and Dr. M. S. Swaminathan in the fields of water engineering and agricultural science respectively?	2019	10
	Discuss the work of 'Bose-Einstein Statistics' done by Prof. Satyendra Nath Bose and show how it revolutionized the field of Physics	2018	10
	Scientific research in Indian universities is declining, because a career in science is not as attractive as our business operations, engineering or administration, and the universities are becoming consumer oriented. Critically comment.	2014	12.5
Nuclear technology	The fusion energy programme in India has steadily evolved over the past few decades. Mention India's contributions to the international fusion energy project International Thermonuclear Experimental Reactor (ITER). What will be the implications of the success of this project for the future of global energy?	2025	10
	Give an account of the growth and development of nuclear science and technology in India. What is the advantage of fast breeder reactor programme in India?	2017	15

3. Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights

<i>Microtopics</i>	<i>UPSC PYQs</i>	<i>Year</i>	<i>Marks</i>
Artificial Intelligence	Introduce the concept of Artificial Intelligence (AI). How does AI help clinical diagnosis? Do you perceive any threat to privacy of the individual in the use of AI in the healthcare?	2023	10
Bio-Technology	How can India achieve energy independence through clean technology by 2047? How can biotechnology play a crucial role in this endeavour?	2025	10
	Discuss several ways in which microorganisms can help in meeting the current fuel shortage.	2023	10
	What are the research and developmental achievements in applied biotechnology? How will these achievements help to uplift the poor sections of the society?	2021	15
	How can biotechnology improve the living standards of farmers?	2019	15
	Why is there so much activity in the field of biotechnology in our country? How has this activity benefitted the field of biopharma?	2018	15
Defence Technology	How is S-400 air defence system technically superior to any other system presently available in the world?	2021	10
IT	Discuss the advantage and security implications of cloud hosting of servers vis-a-vis in-house machine-based hosting for government businesses.	2015	12.5
Space Technology	What are asteroids? How real is the threat of them causing extinction of life? What strategies have been developed to prevent such a catastrophe?	2024	15
	What is the main task of India's third moon mission which could not be achieved in its earlier mission? List the countries that have achieved this task. Introduce the subsystems in the spacecraft launched and explain the role of the 'Virtual Launch Control Centre' at the Vikram Sarabhai Space Centre which contributed to the successful launch from Sriharikota	2023	15
	Launched on 25th December, 2021, James Webb Space Telescope has been much in the news since then. What are its unique features which make it superior to its predecessor Space Telescopes? What are the key goals of this mission? What potential benefits does it hold for the human race?	2022	15
	What is India's plan to have its own space station and how will it benefit our space programme?	2019	10
	India has achieved remarkable successes in unmanned space missions including the Chandrayaan and Mars Orbiter Mission, but has not ventured into manned space mission, both in terms of technology and logistics? Explain critically.	2017	10
	Discuss India's achievements in the field of Space Science and Technology. How has the application of this technology helped India in its socio-economic development?	2016	12.5
	What do you understand by 'Standard Positioning Systems' and	2015	12.5

	'Protection Positioning Systems' in the GPS era? Discuss the advantages India perceives from its ambitious IRNSS programme employing just seven satellites.		
Nano Technology	What do you understand by nanotechnology and how is it helping in health sector?	2020	10
	Why is nanotechnology one of the key technologies of the 21st century? Describe the salient features of Indian Government's Mission on Nanoscience and Technology and the scope of its application in the development process of the country.	2016	12.5
Robotics	What are the areas of prohibitive labour that can be sustainably managed by ro-bots? Discuss the initiatives that can propel research in premier research institutes for substantive and gainful innovation.	2015	12.5
Intellectual Property Rights	What is the present world scenario of intellectual property rights with respect to life materials? Although, India is second in the world to file patents, still only a few have been commercialized. Explain the reasons behind this less commercialization.	2024	10
	How is the government of India protecting traditional knowledge of medicine from patenting by pharmaceutical companies?	2019	15
	India's Traditional Knowledge Digital Library (TKDL) which has a database containing formatted information on more than 2 million medicinal formulations is proving a powerful weapon in the country's fight against erroneous patents. Discuss the pros and cons making this database publicly available under open-source licensing	2015	12.5
	In a globalised world, intellectual property rights assume significance and are a source of litigation. Broadly distinguish between the terms – copyrights, patents and trade secrets.	2014	12.5
	Bring out the circumstances in 2005 which forced amendment to section 3(d) in the Indian Patent Law, 1970. Discuss how it has been utilized by Supreme court in its judgment rejecting Novartis patent application for "Glivec". Discuss briefly the pros and cons of the decision.	2013	10