

TEST: 8

SCIENCE & TECHNOLOGY + ENVIRONMENT

16 NOVEMBER, 2019

UPSC Syllabus

- Science and Technology-developments and their applications and effects in everyday life Achievements of Indians in science & technology; indigenization of technology and developing new technology.
- Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights.
- Conservation, environmental pollution and degradation, environmental impact assessment Disaster and disaster management.

Sub-Topic Listing

SCIENCE & TECHNOLOGY

(1) Introduction

- India's Policy in the Field of the Science & Technology
- The Science & Technology Policy Resolution in 1958
- Science & Technology Policy 2013
- Institutional Structure
- New Initiatives Aligned with the National Agenda
- India & World Collaboration in Science Projects

(2) Space

- Satellite Communication in India
- INSAT Satellite Applications
- Remote Sensing Applications
- Cryogenic Rockets
- Global Positioning System
- Role of Space in Development
- ISRO as Soft Power
- Issue of Space Race
- Space Activities Bill, 2017
- Outer space treaty

(3) IT, Telcom& Electronics

- IT Industry in India
- Applications of Information Technology
- Display Technologies
- Telecommunication
- Government Initiatives
- Contemporary Debates

(4) Defence

- Missile System and their Classification
- India's Missile System
- India's Ballistic Missile Defence System
- UAVs in India
- Stealth Technology ,Chemical Weapons , Biological Weapons

(5) Nano-Science & Nano-Technology

- Nanoscience Nanotechnology and Nanomaterials
- Applications of Nanotechnology
- Health & Environmental Impacts of Nanotechnology
- Social & Ethical Impacts
- Nano-Science& Nanotechnology in India

(6) Robotics

- Robotics & Artificial Intelligence
- Applications of Robotics
- Robotics and Issues of Unemployment

(7) Nuclear Energy

- Nuclear-Power Policy of India
- Non-energy Applications of Nuclear Energy
- Impact of Radiation, Issue of Radioactive Waste
- Institutions involved in Nuclear Energy Development
- Nuclear & Radiological Disasters

(8) Biotechnology

- Application of Biotechnology
- Biotechnology Projects
- Issue of Bio-Piracy
- Bioinformatics
- Biotechnology and IPR Issue

- Ethical Dimension In Biotechnology

(9) 10 Renewable Energy

- Ocean Thermal Energy Conversion (OTEC)
- Concept of Green Building
- Tidal , Wave , Geothermal Energy , Fuel Cells

(10) 11 Achievements of Indians in science & technology

- Scientists of Ancient India
- Science and Scientists of Medieval India
- Scientists of Modern India

(11) Policies & Reports related to Science

- Technology Vision Document 2035
- National Biotechnology Development Strategy 2015-2020
- National Intellectual Property Rights Policy
- Policy on Synthetic Biology
- Law Commission Report on Human DNA Profiling

CONTEMPORARY ISSUES**(1) Space**

- OUTER SPACE TREATY
- NEUTRINO OBSERVATORY
- SOLAR MISSION- ADITYA
- Chandrayaan-2 Mission
- GRAVITATIONAL WAVES
- IMPORTANCE OF NAVIGATION SYSTEM
- Reusable Launch Vehicle
- About SN Bose
- Stephen Hawking
- Space Activities Bill, 2017
- ISRO AS SOFT POWER
- ISRO'S ROLE IN SOCIO-ECONOMIC DEVELOPMENT
- Space Debris
- GAGANYAAN
- 20 years of International Space Station

(2) Biotechnology & Health

- Tuberculosis
- Mother-to-Child Transmission of HIV
- Nipah Virus Infection

- Generic Drugs in India
- Stent Implants
- INTELLECTUAL PROPERTY RIGHTS: ISSUES & CONCERNS
- Misuse of Secondary Patent Methodology
- Digital Biopiracy
- Clinical Applications of whole Genome Sequencing
- Three-Parent Babies Permitted in UK
- Mass Embryo Transfer
- Issues Related to Gm Food
- Importance of Genetic Testing
- Health Geo-Mapping Project
- Digital Health Technology Eco-System
- Ethical Dimension In Biotechnology
- Law Commission Report on Human DNA Profiling
- Law against Genetic Discrimination
- Genome Editing: What, Why and Way Forward

(3) DEFENCE

- India's Missile System
- Brahmos and its Significance

- India's Ballistic Missile Defence System
- Indian Submarines and Naval Ships
- Light Combat Aircraft
- UAVs in India
- Chemical Weapons
- Biological Weapons

(4) Policies Related to Science

- STI Policy 2013 of India: Analysis
- The Paradox of Innovation
- Analysis of INSPIRE Scheme
- National Biotechnology Development Strategy 2015- 2020
- Organ Donation Rules in India
- Policy on Synthetic Biology
- The DNA Technology (Use and Application) Regulation Bill, 2018
- Maharashtra's Public Cloud Policy
- National Policy on Electronics 2019
- Roadmap for Drones
- National Wind-Solar Hybrid Policy
- Draft Rules for E-Pharmacies
- National Digital Communications Policy
- Net Neutrality

(5) IT & Telecom

- Internet Of Things
- Big Data Initiative
- Supercomputer and its Applications
- Li-Fi Technology and its Application
- Use of it in Financial Inclusion
- Credit/Debit Card Crimes
- Bharatnet Project
- Wanna Cry Malware
- Concept of Cyber-Physical Systems
- Esign Electronic Signature Service: Significance & Applications
- Digital India: Achievements
- Adoption of Blockchain Technology to Stop Bank Frauds
- Artificial Intelligence and Society
- Two Authentication Procedure
- Facial Authentication Working

- Issue of Internet Governance
- Quantum computing
- National supercomputing mission
- Data Protection-B N srikrishna committee
- Data Localisation and Related Issues
- National Digital Literacy Mission and Digital NE vision
- National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)
- Bullet Train

(6) Initiatives in the Field of Science & Technology

- Technology and Food Security
- BOOSTING Horticulture through Remote Sensing
- Hyperloop Transportation Technology
- Cloud Seeding Experiment In Maharashtra
- Nano-Technology Medicines
- Hydrogen Bomb
- Ear Tagging In Cattle
- e-Cigarette
- Kudankulam Nuclear Power Plant
- Geo-Tagging The Assets In Mgnrega
- Robot Tax and its Implications
- India & World Collaboration in Science Projects

(7) Diseases in News

- Mother-to-Child Transmission of HIV
- Nipah Virus Infection
- Avian Influenza or Bird Flu
- Bovine TB
- Encephalitis
- Kyasanoor Forest Disease (Monkey Fever)
- Hospital Acquired Infection
- Rotavirus
- Middle East Respiratory Syndrome Virus
- Swine Flu
- Chikanguniya
- Tuberculosis

(8) Etc.

ENVIRONMENT

(1) ENVIRONMENT AND ECOLOGY: BASIC UNDERSTANDING

- Introduction
- Categories of Environment
- Features of Environment
- Components of Environment
- Ecology

(2) ECOSYSTEM AND ITS DYNAMICS

- Ecosystem Definitions
- Properties of Ecosystem
- Components of Ecosystem
 - ▶ Abiotic Factors
 - ▶ Biotic Factors
- Ecosystem Dynamics

(3) BIOGEOCHEMICAL CYCLES

- Gaseous Cycle
 - ▶ Carbon Cycle
- Human Impact on the Carbon Cycle
- Effects of High Concentration of Greenhouse Gases
 - ▶ Hydrological Cycle
 - ▶ Nitrogen Cycle
 - ▶ Human Impact on the Nitrogen Cycle
 - ▶ Oxygen Cycle
- Sedimentary Cycle
 - ▶ Sulphur Cycle
- Human Impact on the Sulphur Cycle
 - ▶ Phosphorus Cycle

(4) TYPES OF ECOSYSTEMS

- Terrestrial Ecosystem
- Aquatic Ecosystem
- Changes in Ecosystem
- Ecosystem Conservation
- Ecology vs. Economy

(5) POPULATION ECOLOGY

- Population Characteristics
- Population Growth Models
- Species

(6) BIOSPHERE

- Extent of the Biosphere
- Working of the Biosphere
- Importance of the Biosphere

- Alpha, Beta, Gamma Diversity
- Biomes
 - ▶ Global Biomes
 - ▶ Major Biomes of the World
 - ▶ WWF Classification of Biomes
 - ▶ Terrestrial Biomes
 - ▶ Aquatic Biomes
- Indian Biomes

(7) BIODIVERSITY

- Types of Biodiversity
- Value of the Biodiversity
- Threats to Biodiversity
 - ▶ Causes of Biodiversity losses ('The Evil Quartet')
 - ▶ Invasive species
 - ▶ Effects of Loss of Bio-Diversity
- Extinction of Species
 - ▶ Types - Natural, Mass, Anthropogenic
 - ▶ Causes of Extinction
 - ▶ Consequences of Extinction of Species

(8) BIODIVERSITY CONSERVATION

- Conservation Strategies
- Conservation Tools
- IUCN
- IUCN Red List
- Ecologically Sensitive Area (ESAs)
- In-situ methods of conservation of biodiversity
 - ▶ Advantages of In-situ Conservation
 - ▶ Disadvantages of In-situ conservation
- Ex-situ Methods of Conservation of Biodiversity

(9) POLLUTION & DEGRADATION

- Land Degradation
 - ▶ Causes and Impact of Land Degradation
 - ▶ Desertification
 - ▶ Sustainable Land Management
 - ▶ Soil Erosion
 - ▶ Problems due to Excessive Irrigation
 - ▶ Soil Conservation
- Air Pollution
 - ▶ Causes of Air Pollution
 - ▶ Harmful Effects of Common Air Pollutants
 - ▶ Control of Air Pollution

- Marine Pollution
 - ▶ Effects of Marine Pollution
 - ▶ Coastal Regulation Zone Notification, 2011
- Mining & Pollution
 - ▶ Effects of Mining on Environment
 - ▶ Concept of Sustainable Mining
 - ▶ Acts to regulate the adverse effects of Mining Activities
- Other Pollution
 - ▶ Effects of Noise Pollution on Human Health
 - ▶ Harmful Effects from Biological Contaminants
 - ▶ Harmful Effects of Radioactive Pollution
 - ▶ Nuclear Accidents
- Water Degradation
 - ▶ Measurement of Water Pollution
 - ▶ Harmful Effects of Water Pollution

(10) WASTE MANAGEMENT

- Solid Waste Management
 - ▶ Salient features of SWM Rules, 2016
- e-waste Management
 - ▶ Pollutants and their Health Impacts
 - ▶ Importance of the E-Waste Management
 - ▶ E-waste (Management & Handling) Rules, 2016

- Biomedical Waste
 - ▶ Hazards Associated with Waste Management
 - ▶ Bio-Medical Waste Management Rules, 2016
- Hazardous Waste
 - ▶ Hazardous Waste Treatment
 - ▶ Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016

(11) CLIMATE CHANGE

- Factors Affecting Climate Change
- Impact of climate change & its mitigation
- Climate Change Management
 - ▶ Conventions
 - ▶ International Organisations

(12) ENVIRONMENTAL IMPACT ASSESSMENT SUSTAINABLE PRACTICES

- Impact of Agriculture on Environment
 - ▶ Sustainable Agriculture
- Sustainable Agriculture
 - ▶ Hi-tech Farming Methods
 - ▶ Rain Water Harvesting
 - ▶ Green Buildings and their Rating System in India
 - ▶ Eco-tourism-Advantages & Disadvantages of Eco-tourism

CONTEMPORARY ISSUES

(1) WILDLIFE

- Man-Animal Conflicts in India
- Poaching activities in India
- Development leads to tiger extinction
- Elephant Conservation
- International treaties for wildlife conservation Use of drones for wildlife conservation
- Urban Land Acting as Death Traps for Birds
- Eco-Bridges and Biodiversity Management
- Suderbans at risk due to Climate Change
- CRITICAL WILDLIFE HABITATS
- Declining Population of Pollinators
- International treaties for Wildlife Conservation

(2) COMBATING POLLUTION

- Indoor Air Pollution and its impact

- Impact of Particulate Matter
- Smog and its impact
- Aerosol shrinking India's Monsoon
- Stubble Burning
- Mobile radiation Impact on Health
- Heavy water Pollution
- Plastic Pollution
- Light Immersion Pollution
- Idol Pollution
- Oil Spill
- Garbage Dumping and its Environment
- E-waste Management Rules 2016
- Groundwater contamination (Arsenic, Uranium)
- Bharat Stage Norm
- What is Polluters Pay Model?
- LANCET Study REPORT : Most Pollution linked deaths occur in India

- Beach (Coastal) Pollution
- Nitrogen Pollution
- Hazardous Waste (Management & Transboundary Movement) Rules, 2016

(3) CLIMATE CHANGE

- Conference of Parties (COP-24) at Katowice
- Marrakech Climate Change Conference
- Paris Agreement
- US moved out of Paris agreement
- Kigali Agreement
- Kyoto Protocol (2nd Commitment)
- IPCC Report 2018
- International Solar Alliance
- Concept of Green Bond
- Green Climate Fund
- Carbon Tax Feasibility in India
- Concept of Green Building
- Concept of Carbon Credit
- Climate Change and Cities
- Climate change and its impact on Health
- Climate Change and Agriculture
- Climate Change and sea level Rise
- Ocean Warming
- Melting of Gangotri Glacier
- Programmes and Policies Initiated for Mitigating Climate Change
- International Collaboration for Mitigating Climate Change
- Ethical issue involved in climate change
- Third Pole and Climate Change
- UNCCD 2018-2030 Strategic Framework
- REGULATORY INDICATORS FOR SUSTAINABLE ENERGY (RISE) 2018 – WB
- ACCOUNTING METHODS OF CLIMATE FUND QUESTIONED
- Tackling climate change from a security perspective
- EFFECTS OF GLOBAL WARMING ON EL NIÑO IN THE 21ST CENTURY
- INDIA TO EXPAND POLAR RESEARCH TO ARCTIC
- BENGAL TIGERS MAY NOT SURVIVE CLIMATE CHANGE
- SCIENTISTS MULL STRATOSPHERIC BARRIER TO CURB GLOBAL WARMING

(4) RENEWABLE ENERGY

- Biogas
- National Solar Mission

- Status of Hydro Power energy in India
- Alternative fuels in India
- Draft Energy Policy
- National Energy Storage Mission
- Indian Renewable Energy Development Agency
- National Wind-solar Hybrid Policy
- Photo-voltaic industry and CPSU scheme

(5) INITIATIVES FOR ENVIRONMENTAL CONSERVATION

- Compensatory Afforestation Fund Act
- Draft National Wildlife Action Plan
- Wetland Management Rules, 2017
- Initiatives to enhance green cover
- Policy on Promotion of City Compost
- Ancient Bawadis and Water Management
- Living status to Rivers
- Ganga River Pollution
- Environment Impact Assessment
- Environmental Compliance and Enforcement in India
- Public Participation for Environmental conservation
- Western Ghats biodiversity conservation
- The 25 Year Environment Plan
- India's National Redd+ Strategy
- EnviStats-India 2019
- Indian Forest Act amendment
- Sustainable India Finance Facility (SIFF)
- Sustainable Development in Indian Himalayan Region
- Global Carbon Project (GCP)
- Naturalized species
- Resource Efficiency Cell
- India Cooling Action Plan (ICAP), Global Cooling Coalition
- Island protection zone (IPZ) 2019 for Andaman and Nicobar
- Plan to save Himalayan springs

(6) ENVIRONMENTAL INSTITUTIONS

- Pollution Control Board: Analysis
- National Green Tribunal: Analysis
- Forest Survey of India and India State of Forest Report, 2017
- Genetic Engineering Appraisal Committee
- Traditional Knowledge Digital Library

(7) MISCELLANEOUS ISSUES

- Impacts of Dam and fishing
 - Issue of Land Degradation
 - Sand Mining
 - Algal bloom Issue
 - Melting of Antarctica and its impact
 - River linking project and its impact
 - Bottom Trawling to Deep Sea fishing
 - Mass Coral Bleaching – Threats to coral reefs
 - Forest Fires
- (8) Etc.**
