

## Science & Technology + Environment

Group 2 Mains · Paper II · Section B · 75 marks — the official syllabus, then our 2-Paksham segregation into **22 chapters**, sequenced the way a beginner is taught (the tangible first, policy & theory last).

### How to read this

Paper → Section → Paksham → Chapter → its sub-topics

పక్షం a wing of a bird — a friendly signpost; read the English name, skip the rest

sub-topic what sits inside a chapter — your actual study units

3d

just a label tying a chapter to the official syllabus line — ignore if new

Woven

AP

Woven = India+AP taught together; AP = Andhra-specific

✓ Every chapter here is placed by hand against the official syllabus — nothing auto-sorted, nothing dropped.

### How to use this to study — the method

1. **Read the chapters in order** — Ch 1 onward is built to take a complete beginner from the ground up.
2. **Learn a chapter, then its sub-topics** — the chips are your checklist; cover every one.
3. **Write ONE answer cold** after each chapter — the only proof you've actually learnt it.
4. **Plan in days, write the date** — the **Days** column is a suggested pace (heavier chapters get more). Write the date you **Studied** a chapter, then revise it after **+7 days (R1)**, **+30 days (R2)** and in the **final run-up (R3)** — write the actual date in each box. Circle **Weak/OK/Strong** so revision hits the shaky chapters first.

### The official syllabus — word for word

Paper II · Section B · Science & Technology (75M) · reproduced exactly from APPSC Notification 11/2023.

1. **Technology Missions, Policies & Applications:** National S&T / STI Policy, Strategies & Missions, Emerging Frontiers · Space — Launch Vehicles, Satellites & Applications, Space Science Missions · Defence — DRDO, IGMDP · ICT — National IT Policy, Digital India, E-Governance, Cyber Security & Policy · Nuclear — Reactors, Power Plants, Radioisotopes, Nuclear Programme.
2. **Energy Management — Policy & Projections:** Installed Capacities & Demand · National Energy Policy · National Policy on Biofuels · Bharat Stage Norms · Non-Renewable & Renewable Energy — Sources & Capacities · New Initiatives in Renewable Energy.
3. **Ecosystem & Biodiversity:** Ecology & Ecosystem — concepts, components, types · Biodiversity — meaning, hotspots, loss · Conservation — methods, conventions, protocols · Wildlife — CITES, Endangered Species · Biosphere Reserves · Indian Wildlife Conservation efforts.
4. **Waste Management & Pollution Control:** Solid Waste — classification, disposal, management · Environmental Pollution — types, sources, impacts · Pollution Control, Regulation & Alternatives · Transgenics & Regulation · Eco-Friendly Technologies · Bioremediation.
5. **Environment & Health:** Global Warming, Climate Change, Acid Rain, Ozone Depletion, Ocean Acidification · International Initiatives & India's Role · Sustainable Development · Health Issues — disease burden, epidemics/pandemics · Public Health Initiatives.

### How we divide it

2 Pakshas · 22 chapters

This subject is two wings of one bird — the **technology** wing that lifts a society forward, the **environment** wing that keeps it alive. So we read it as **2 పక్షాలు (Pakshas)** — two wings. Inside each wing the chapters run in **learning order**: we start with the most tangible thing (rockets, forests) and leave the dry policy and frameworks for last, once you can see why they matter.

| PAKSHAM      | ENGLISH          | THREE-WORD TAG          | OFFICIAL  | CH |
|--------------|------------------|-------------------------|-----------|----|
| విజ్ఞానపక్షం | The Frontier     | రాకెట్ · సంకేతం · అణువు | Units 1–2 | 10 |
| ప్రకృతిపక్షం | The Living World | అడవి · పొగ · మందు       | Units 3–5 | 12 |

### PYQ analysis — what the examiner actually asks

38 past Group 2 Mains MCQs (cycles 2016 & 2023) map to these chapters. ★ marks the high-yield chapters — study these first.

**Hottest:** Ch 4 Energy Management (8); Ch 17 Climate Change, Ozone & Ocean Acidification (6); Ch 5 ICT & Digital India (4); Ch 21 Health, Disease & Public Health (3); Ch 15 Environmental Pollution (3).

**Cold (0 PYQ, but still in syllabus — don't skip):** Ch 7, Ch 8, Ch 9, Ch 12, Ch 18, Ch 19, Ch 20, Ch 22.

Counts are single-pass topic-tagging of the official question bank — directional (hot/cold), not exact. Only two cycles available.

Study & spaced-revision tracker — all 22 chapters

Every chapter, in order. **Qs** = times asked (2016+2023); ★ = high-yield. **Days** is a suggested pace. Write the **date** you study a chapter and each revision date; circle **W/O/S** for confidence.

| CHAPTER                                                    | QS | DAYS | STUDIED<br>DATE                                                                | WROTE<br>DATE | R1<br>+7 DAYS | R2<br>+30 DAYS | R3<br>FINAL | CONFIDENCE |
|------------------------------------------------------------|----|------|--------------------------------------------------------------------------------|---------------|---------------|----------------|-------------|------------|
| విజ్ఞానపక్షం · The Frontier                                |    |      |                                                                                |               |               |                |             |            |
| Ch 1 — Space Technology                                    | 2  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 2 — Defence Technology                                  | 1  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 3 — Nuclear Technology                                  | 1  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| ★ Ch 4 — Energy Management                                 | 8  | 3    |                                                                                |               |               |                |             | W · 0 · S  |
| ★ Ch 5 — ICT & Digital India                               | 4  | 3    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 6 — Cyber Security & Data Protection                    | 1  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 7 — Computing & Emerging Technologies                   | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 8 — Biotechnology & Genetic Engineering                 | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 9 — Nanotechnology & Advanced Materials                 | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 10 — S&T Policy, Institutions, Scientists & IPR         | 1  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| ప్రకృతిపక్షం · The Living World                            |    |      |                                                                                |               |               |                |             |            |
| Ch 11 — Ecology & Ecosystem Fundamentals                   | 1  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 12 — Terrestrial, Aquatic & Coastal Ecosystems          | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 13 — Biodiversity — Concepts, Flora, Fauna & Marine     | 3  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 14 — Wildlife Conservation — Protected Areas & Projects | 2  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 15 — Environmental Pollution                            | 3  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 16 — Waste Management & Green Technology                | 2  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| ★ Ch 17 — Climate Change, Ozone & Ocean Acidification      | 6  | 3    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 18 — Environmental Governance, Law & Institutions       | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 19 — Disaster Management                                | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 20 — Sustainable Development & SDGs                     | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 21 — Health, Disease & Public Health                    | 3  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| Ch 22 — Contemporary Environmental Issues                  | ·  | 2    |                                                                                |               |               |                |             | W · 0 · S  |
| TOTAL — all 22 chapters                                    |    | 47   | suggested study days — add a final revision run-up. Fill your own dates above. |               |               |                |             |            |

Every chapter, opened into its sub-topics

విజ్ఞానపక్షం · The Frontier రాకెట్ · సంకేతం · అణువు

Technology — what a society builds · Units 1–2

Ch 1 Space Technology 1b 2 Qs

- Why a rocket needs stages
- PSLV · GSLV · LVM3
- Cryogenic engine & the tech-denial story
- Satellites & their uses (remote sensing, NavIC)
- Chandrayaan · Mangalyaan · Aditya-L1 · Gaganyaan
- Sarabhai & Thumba — the origin
- Sriharikota (AP)

Ch 2 Defence Technology 1c 1 Qs

- DRDO — structure, vision, labs
- IGMDP — the missile family
- Agni · BrahMos · Divyastra (MIRV)
- Ballistic Missile Defence · hypersonics · Mission Shakti (ASAT)
- Tejas · AMCA · Arjun · Pinaka
- Atmanirbhar (DAP 2020, indigenisation)
- Vizag Eastern Naval Command (AP)

Ch 3 Nuclear Technology 1h 1 Qs

- Fission, plainly
- The three-stage programme & the thorium logic
- Reactor types · PFBR Kalpakkam · Kakrapar
- DAE · BARC · NPCIL · AERB
- Radioisotope applications
- Doctrine (No-First-Use, Pokhran)
- Tummalapalle uranium (AP)

Ch 4 ★ Energy Management 2a · 2b · 2c · 2d · 2e · 2f 8 Qs

- Energy mix & installed capacity
- National Energy Policy
- Renewables — solar · wind · hydro · bio (500 GW target)
- Schemes (Solar Mission · ISA · PM-KUSUM · Surya Ghar · Green Hydrogen)
- Biofuels · E20 · Bharat Stage norms
- Efficiency (BEE · PAT · UJALA)
- Rayalaseema solar/wind parks (AP)

Ch 5 ★ ICT & Digital India 1d·1e·1f 4 Qs

National IT Policy & IT Act 2000 Digital India — the 9 pillars India Stack (Aadhaar · UPI · DBT-JAM · DigiLocker · ONDC)

E-governance models · NeGP · CSCs 5G · BharatNet The digital divide e-Pragati · AP Fibre Grid · MeeSeva (AP)

Ch 6 Cyber Security & Data Protection 1g 1 Qs

The CIA triad (confidentiality, integrity, availability) Threats — ransomware · phishing · deepfake · digital-arrest Critical Information Infrastructure

CERT-In · NCIIPC · I4C · helpline 1930 National Cyber Security Policy DPDP Act 2023 & the Puttaswamy privacy right

Ch 7 Computing & Emerging Technologies 1a

How AI works — generative models & LLMs IndiaAI Mission · Bhashini · AI4Bharat Quantum — National Quantum Mission

Semiconductors — India Semiconductor Mission (Micron, Tata) Supercomputing (PARAM) · 5G/6G Blockchain · robotics · drones · IoT

Ch 8 Biotechnology & Genetic Engineering 1a

What biotechnology is Tools — restriction enzymes · vectors · PCR Recombinant DNA, step by step GM crops (Bt cotton · GM mustard · GEAC)

CRISPR · gene therapy · stem cells DNA fingerprinting · tissue culture BioE3 Policy · Genome Valley · Bharat Biotech (AP)

Ch 9 Nanotechnology & Advanced Materials 1a

The nanoscale (1–100 nm) — why properties change Nanomaterials — nanotubes · graphene · quantum dots Top-down vs bottom-up

Nano Mission & institutions Applications (nano-urea · Tata Swach · medicine · energy) Nanotoxicity & regulation

Ch 10 S&T Policy, Institutions, Scientists & IPR 1a 1 Qs

STI Policy — evolution & aims The institutional map (CSIR · DST · DBT) Great Indian scientists IPR — patents · TRIPS · traditional knowledge

R&D spending & the ecosystem Emerging-tech governance

ప్రకృతిపక్షం · The Living World అడవి · పొగ · మందు

Environment — what we must protect · Units 3–5

Ch 11 Ecology & Ecosystem Fundamentals 3a 1 Qs

What ecology is Biotic & abiotic components Food chains, webs & energy flow Ecological pyramids Nutrient (biogeochemical) cycles

Ecological succession

Ch 12 Terrestrial, Aquatic & Coastal Ecosystems 3a

Forest · grassland · desert Freshwater & marine Wetlands & mangroves Coastal & estuarine systems Ecosystem services

Ch 13 Biodiversity — Concepts, Flora, Fauna & Marine 3b 3 Qs

Genetic · species · ecosystem levels India's four hotspots Endemic flora & fauna Marine biodiversity Causes of loss IUCN Red List

Ch 14 Wildlife Conservation — Protected Areas & Projects 3c·3d·3e·3f 2 Qs

In-situ & ex-situ conservation National parks · sanctuaries · biosphere reserves Project Tiger / Elephant CITES & endangered species

Wildlife Protection Act 1972 Post-2020 Global Biodiversity Framework

Ch 15 Environmental Pollution 4c 3 Qs

Air · water · soil · noise Sources & major pollutants Impacts on health & ecology The Air Quality Index Bioaccumulation

Ch 16 Waste Management & Green Technology 4a·4b·4d·4e 2 Qs

Solid waste & its classification Disposal methods & the rules Swachh Bharat · waste-to-energy Transgenics & their regulation

Bioremediation & eco-friendly tech

Ch 17 ★ Climate Change, Ozone & Ocean Acidification 5a 6 Qs

The greenhouse effect & global warming Acid rain Ozone depletion Ocean acidification The IPCC Impacts on India

Ch 18 Environmental Governance, Law & Institutions 5b

EPA 1986 · Air & Water Acts CPCB · SPCB · NGT · MoEFCC Environmental Impact Assessment Forest Conservation Act

Conventions (UNFCCC · Kyoto · Paris · Montreal · CBD)

Ch 19 Disaster Management 5b

Hazard vs disaster Types — natural & man-made DM Act 2005 · NDMA · SDMA Cyclones · floods · droughts (AP-prone) Sendai Framework

Early-warning systems

Ch 20 Sustainable Development & SDGs 5b

What sustainability means Brundtland & the 17 SDGs India — NDCs · ISA · Mission LIFE Circular economy Green finance

Ch 21 **Health, Disease & Public Health** 5c·5d 3 Qs

- Disease-burden trends
- Communicable vs non-communicable
- Epidemics & pandemics
- Healthcare delivery
- Ayushman Bharat · National Health Mission
- AP health schemes

Ch 22 **Contemporary Environmental Issues** 5b

- Current flashpoints & recent summits
- Latest reports & indices
- Emerging pollutants (microplastics)
- Environment vs development conflicts
- Recent Supreme Court / NGT judgments