IAS WITH DR RAVI
AIM. PREPARE. ACHIEVE

Day 10 | English edition | Topics 91-100

# Study Notes and Sources

**Practice questions and explanations:**
download the separate MCQ Practice PDF.

## Topics in this booklet


| | |
|---|---|
| **91** | Akbar: conquests, Rajput policy and religious policy |
| **92** | Parliamentary privileges |
| **93** | Poverty measurement: committees, poverty lines and the MPI |
| **94** | Latitudes, longitudes and time: IST and the International Date Line |
| **95** | Tribes of Andhra Pradesh: distribution and features |
| **96** | Greenhouse effect, global warming and greenhouse gases |
| **97** | Solar technologies: photovoltaic and solar thermal |
| **98** | Statement and assumption |
| **99** | Simple interest and compound interest: the basic formulas |
| **100** | Deepavali and UNESCO intangible cultural heritage |

PART 1 · STUDY NOTES · TOPIC 91

# Akbar: conquests, Rajput policy and religious policy

History & Culture | Unit A-3

## 1. Concept in one line

Akbar came to the throne at thirteen in 1556 and, by his death in 1605, had built an empire from Kabul to Bengal by conquest, bound the Rajput chiefs to it and followed a policy of peace among religions. The examination asks for the conquests with their years and opponents, the steps of the Rajput policy and of the religious policy in order, and who was who at his court.

## 2. Revision notes

### 2.1 Accession and the regency (1556 to 1562)

- Akbar was born on 15 October 1542 at Amarkot (Topic 81). Humayun died in January 1556. Akbar was proclaimed emperor on 14 February 1556 at Kalanaur in the Punjab. He was thirteen.
- **Bairam Khan,** his tutor, was regent from 1556 to 1560 and held the title Khan-i-Khanan. In the second battle of Panipat (5 November 1556) Akbar's army, led by Bairam Khan, defeated Hemu (Topic 81).
- **Bairam Khan's fall:** Akbar dismissed him in 1560. Bairam Khan rebelled, was defeated and was pardoned. He set out for Mecca, and Afghans killed him on the way, in Gujarat (1561). His son Abdul Rahim later became Khan-i-Khanan.
- **Maham Anaga,** Akbar's former wet nurse, had urged the dismissal. After it her party in the palace had great influence. Her son **Adham Khan** commanded the Malwa expedition and misbehaved in it; later Akbar had him thrown from a terrace at Agra. By 1562 Akbar was ruling on his own.

### 2.2 The conquests in order

| Year | Region or fort | Its ruler or defender | What happened |
|---|---|---|---|
| 1561 | Malwa | Baz Bahadur, ruler of Malwa | Adham Khan led the Mughal army. Baz Bahadur was defeated and fled towards Burhanpur. Malwa was annexed |
| 1564 | Garha-Katanga, a kingdom in Gondwana (central India) | Rani Durgavati, widow of Dalpat Shah | Asaf Khan led the Mughal army. The Rani was defeated and took her own life. In 1567 Akbar gave the kingdom to Chandra Shah |
| 1567 to 1568 | Chittor, the fort of Mewar | Udai Singh, the Rana of Mewar; Jaimal and Patta held the fort | Udai Singh withdrew to the hills. The fort fell in February 1568 after a siege of about four months |
| 1572 to 1573 | Gujarat | Muzaffar Shah III, a king only in name | Akbar took Ahmedabad in 1572 and then Surat. Muzaffar Shah was captured and pensioned. A revolt broke out within six months. Akbar reached Ahmedabad again in about ten days and crushed it (2 September 1573) |
| 1574 to 1576 | Bihar and Bengal | Daud Khan Karrani, the Afghan ruler of Bengal | Patna fell in 1574. Daud was defeated at Tukaroi in 1575. He was defeated again and killed at Rajmahal in 1576. Independent rule in Bengal ended. By 1592 Raja Man Singh had brought Orissa also under Mughal rule |

| Year | Region or fort | Its ruler or defender | What happened |
|---|---|---|---|
| 18 June 1576 | Haldighati, in Rajasthan | Rana Pratap of Mewar; Hakim Khan Sur, an Afghan, led his vanguard | Raja Man Singh of Amber commanded the Mughal army, and the Mughals won. Pratap escaped and kept up the fight until his death in 1597 |
| 1581 | Kabul | Mirza Hakim, Akbar's half-brother | Rebels had proclaimed him king, and he invaded the Punjab. Akbar entered Kabul in August 1581. Kabul came under Akbar's direct rule after Hakim died in 1585 |
| 1586 | Kashmir | Yusuf Shah Chak, and then his son Yaqub | Yusuf submitted; Yaqub resisted. Kashmir was annexed in 1586 |
| 1591 | Sind: Thatta | Mirza Jani Beg, the ruler of Thatta | Abdul Rahim Khan-i-Khanan defeated him. He surrendered and became a Mughal mansabdar. Thatta was made a sarkar of the suba of Multan |
| 1595 | Kandahar | Muzaffar Husain Mirza, the governor who held it for the Safavids of Persia | He gave up the fort without a fight (18 April 1595). Baluchistan was taken about the same time |
| 1595 to 1600 | Ahmadnagar and Berar | Chand Bibi, who led the defence of Ahmadnagar | Prince Murad besieged Ahmadnagar in 1595. Chand Bibi made a treaty and gave up Berar. The fort of Ahmadnagar fell in August 1600; Chand Bibi died |
| January 1601 | Khandesh: the fort of Asirgarh | Miran Bahadur Shah, ruler of Khandesh | He refused to hand over Khandesh. The fort of Asirgarh fell on 17 January 1601 |

- **Other gains:** the fort of Chunar was taken about 1561 (one reference work gives 1562). After Chittor, Ranthambhor surrendered in 1569. Kalinjar was also taken in 1569: after a siege, its Baghela raja, Ram Chand, surrendered for lack of water. By 1570 the Rajput states of Marwar, Bikaner and Jaisalmer had submitted.
- **The last conquest in this list** is Asirgarh (January 1601). Ahmadnagar, Berar and Khandesh were then placed under Prince Daniyal.
- **Two pairs to keep apart.** Two rich kingdoms on the coast fell in the 1570s: Gujarat first, under Muzaffar Shah III, and Bengal next, under Daud Khan Karrani. Two rulers of Akbar's later years have names that begin alike: Mirza Jani Beg lost Sind (1591), and Miran Bahadur Shah lost Khandesh (1601).
- **Two women led the defence against Akbar's armies:** Rani Durgavati in Garha-Katanga (1564) and Chand Bibi at Ahmadnagar (1595).
- **The Buland Darwaza,** the great gateway at Fatehpur Sikri, is the memorial of the Gujarat campaign: NCERT says it was meant to remind visitors of the Mughal victory in Gujarat. Its details are in Topic 611.
- **Where the books differ on years:** Malwa is 1561 in Britannica; Ikram's history gives 1560, the year in which the campaign began. For Chittor, Ikram gives 1567; the fort fell in February 1568. Ranthambhor is 1569 in Britannica and 1568 in Wikipedia. Kashmir is 1586 in most books; Yaqub surrendered only in 1589. For Sind, Ikram gives 1593, the year in which Jani Beg came to the court at Lahore. For the battle of Haldighati, Badauni, who was present, gives 21 June 1576. In the examination, give the years of the table.

## 2.3 The empire in 1605

- Akbar died at Agra in October 1605. Britannica gives about 25 October; Wikipedia gives 27 October.

- **Extent:** Britannica says that at his death the empire covered the whole area north of the river Godavari, except Gondwana in central India and Assam in the north-east. So the conquest of Garha-Katanga in 1564 did not bring Gondwana as a whole into the empire: Britannica speaks only of inroads into Gondwana. Banglapedia describes it as stretching from Kabul to Bengal and from the Himalayas to Ahmadnagar. NCERT adds that he carried the frontier to the Hindukush mountains.
- **Subas (provinces):** in 1580 the empire was divided into 12 subas. They were Kabul, Lahore, Multan, Delhi, Agra, Awadh, Allahabad, Bihar, Bengal, Malwa, Ajmer and Gujarat. The Deccan conquests added Berar, Khandesh and Ahmadnagar. So there were 15 subas at his death. A suba was divided into sarkars, and a sarkar into parganas. The administration comes in Topic 101.

## 2.4 The Rajput policy

- **Aim:** to bring the Rajput states under Mughal overlordship (suzerainty), and to turn their rulers into allies and nobles of the empire.
- **Marriage alliances:** NCERT names Raja Bharmal Kachhwaha of Amber as the first Rajput chief to join the imperial service. Akbar married his daughter in 1562. The Rajput princesses whom Akbar married were not converted, and they kept their own worship in the palace. Jahangir's mother was a Kachhwaha princess of Amber.
- **High posts:** Raja Bhagwan Das and Raja Man Singh of Amber rose to high rank. Their posts are listed in Section 3. Ranks (mansabs) come in Topic 101.
- **Autonomy under Mughal overlordship:** NCERT says that a defeated chief was treated honourably and was given his lands back as an assignment. Such a homeland assignment was a watan jagir: it was hereditary and could not be transferred. The chief paid tribute (peshkash) and served the emperor.
- **Force where a chief refused:** Merta (1562), Chittor (1568) and Ranthambhor (1569) were taken by arms.
- **The exception was Mewar.** Udai Singh lost Chittor but kept western Mewar. Rana Pratap never submitted. A settlement with Mewar came only in 1615, in the time of Jahangir and of Pratap's son Amar Singh (Topic 491).
- **The first steps towards all Hindus** came in the same years: the pilgrim tax was abolished in 1563 and the jizya in 1564 (see 2.5).
- **What the policy gave the empire:** Rajput chiefs led its armies and governed its provinces, the nobility came to be drawn from many groups, and Rajasthan stayed quiet. Britannica speaks of a firm alliance of Mughals and Rajputs.
- **Not every Hindu noble was a Rajput.** Todar Mal belonged to the Khatri caste. Birbal was a Brahmin, a poet who had served at Rajput courts.

## 2.5 The religious policy in stages

| Year | Step | What to remember |
|---|---|---|
| 1562 | Marriage with the daughter of Raja Bharmal of Amber | The Rajput princesses were not converted, and they kept their own worship in the palace |
| 1563 | The pilgrim tax was abolished | This tax had been taken from Hindu pilgrims at Mathura and other sacred places |
| 1564 | The jizya was abolished | The jizya was a tax on non-Muslim subjects. Abul Fazl gives 1564; Badauni places the abolition in 1579 |
| 1575 | The Ibadat Khana (House of Worship) was built at Fatehpur Sikri | It was a hall for debates on religion. At first only Muslims took part: ulama and some courtiers |

| Year | Step | What to remember |
|---|---|---|
| 1578 | The debates were opened to Shias and to other faiths | Shias, Sufis, Brahmins, Jains, Parsis, Christians and Jews were admitted |
| 26 June 1579 | Akbar read the khutba | The khutba is the sermon at the Friday prayer. Akbar read it himself, in his own name |
| August to September 1579 | The mahzar was signed | It was a declaration signed by the leading ulama (details below) |
| 1580 | The first Jesuit mission arrived | It came from Goa to the court at Fatehpur Sikri and stayed about two years. Rudolf Aquaviva led it; Antonio Monserrate was a member |
| 1582 | The debates were closed; the Tauhid-i-Ilahi began | See 2.6 |

- Among the early measures, Akbar also forbade the conversion of prisoners of war to Islam.
- **Other visitors:** the Jain teacher Hiravijaya Suri was invited to the court, and Parsi priests (mobeds) took part in the debates. Akbar invited Dastur Meherji Rana, a Parsi priest of Navsari in Gujarat, to the court in 1577 to 1578 to explain the Parsi religion. Two more Jesuit missions came, to Lahore, in 1591 and 1595.
- **The mahzar of 1579: who and what.** Shaikh Mubarak, the father of Abul Fazl, drafted it. The leading ulama signed it, among them Abdun Nabi and Abdullah Sultanpuri. It said three things. (1) Akbar, as a just king, stood above the mujtahids, the jurists qualified to interpret the law. (2) Where the jurists disagreed, he could choose one of their opinions. (3) He could also issue an order of his own, but only if it did not go against the nass (the explicit text of the Quran or the Hadith) and was for the good of the people.
- **Why Infallibility Decree is a loose name:** older writers gave the mahzar this name. But the document only gave the emperor the last word among the jurists, and it kept his orders within the limits of the Quran.
- **Sulh-i-kul:** NCERT translates it as absolute peace; other books say peace with all, or universal peace. Abul Fazl set out this ideal and called it the cornerstone of enlightened rule. All religions and schools of thought were free to express themselves, provided they did not undermine the authority of the State or fight among themselves. The abolition of the pilgrim tax and the jizya, and a nobility drawn from many groups, put it into practice.

## 2.6 The Tauhid-i-Ilahi, the books of the reign and the nine gems

- **The name:** in Akbar's own time the order was called the Tauhid-i-Ilahi (oneness of God). Din-i-Ilahi (Divine Faith) is the name by which it is better known. It dates from 1582.
- **What it was:** historians such as S.M. Ikram and M. Athar Ali hold that it was not a new religion. It was an order of disciples who took Akbar as their spiritual guide. It had no scripture and no priests. Britannica describes it as an elite, eclectic religious movement, which in practice was a circle of personal devotion to Akbar.
- **Practices:** the disciples greeted one another with the words Allahu Akbar, and they avoided meat. Light, that is the Sun and fire, was honoured.
- **Members:** Britannica says it never had more than 19 adherents. Birbal was the only Hindu among them. Raja Bhagwan Das and Raja Man Singh made their dislike of it plain and did not join.
- **Two accounts:** Badauni, an orthodox critic, wrote so as to show that Akbar had turned away from Islam. Abul Fazl, Akbar's friend, does not describe a new religion; modern historians say that the idea of a new religion came from wrong translations of his text. The order did not outlive Akbar.
- **Translations:** Akbar had many works translated into Persian. The Mahabharata became the Razmnama (Book of Wars). Babur's memoirs were translated in 1589 (Topic 81). Literature comes in Topic 761.

- **The Ilahi era** was a solar calendar devised under Akbar for land revenue work. It was introduced in March 1584, in the 29th year of the reign, but its years were counted back from his accession in February 1556.
- **The books of the reign:**
  - The Akbarnama is by Abul Fazl. He began it in 1589 and worked on it for thirteen years. It has three books: the first two are the chronicle, and the third is the Ain-i-Akbari, which describes the administration, the army, the revenues and the geography of the empire.
  - The Muntakhab-ut-Tawarikh is by Abdul Qadir Badauni, a theologian and courtier who was critical of Akbar's policies.
  - The Tabaqat-i-Akbari is by Nizamuddin Ahmad, a scholar in Akbar's service.
- **The nine gems (navaratnas)** are a tradition. Wikipedia, following the historian G.S. Sardesai, says that the tradition has no historical basis and may have begun at a later Mughal court. The lists differ. The names that recur are Abul Fazl, Faizi, Todar Mal, Man Singh, Birbal, Tansen, Hakim Humam and Mulla Do-Piyaza; Abdul Rahim Khan-i-Khanan stands in another list.

## 3. Extra section: who was who at Akbar's court

| Person | Who he or she was | Remember for |
|---|---|---|
| Bairam Khan | Akbar's tutor; regent from 1556 to 1560; Khan-i-Khanan | The second battle of Panipat was won under him. He was dismissed in 1560 and killed in Gujarat in 1561 |
| Maham Anaga | Akbar's former wet nurse | She urged the dismissal of Bairam Khan. Her influence ended by 1562 |
| Adham Khan | Son of Maham Anaga | He led the Malwa expedition of 1561 against Baz Bahadur |
| Raja Bharmal | Kachhwaha chief of Amber | NCERT names him as the first Rajput chief to join the imperial service. Akbar married his daughter in 1562 |
| Raja Bhagwan Das | Rajput noble of Amber; some books write Bhagwant Das | He led the army into Kashmir. He made his dislike of the Tauhid-i-Ilahi plain |
| Raja Man Singh | Rajput noble of Amber | He commanded at Haldighati (1576), governed Kabul and Bihar, annexed Orissa, and was subadar (governor) of Bengal from 1594 to 1604 |
| Raja Todar Mal | A Khatri by caste; the finance (revenue) minister | He is known for the land revenue settlement (Topic 101). He also helped to put down the revolt of 1581 |
| Raja Birbal | Born Mahesh Das; a poet who had served at Rajput courts | Abul Fazl gives his rank as commander of 2,000. He was the only Hindu disciple in the Tauhid-i-Ilahi. He was killed in February 1586 in an ambush in the hills of the north-west |
| Shaikh Mubarak | A scholar; father of Faizi and Abul Fazl | He drafted the mahzar of 1579 |
| Abul Fazl | Courtier and close friend of Akbar | He wrote the Akbarnama and set out the ideal of sulh-i-kul. In 1602 he was murdered by Bir Singh Bundela, an accomplice of Prince Salim |
| Faizi | Son of Shaikh Mubarak | He is listed among the disciples of the Tauhid-i-Ilahi |

| Person | Who he or she was | Remember for |
|---|---|---|
| Abdul Rahim Khan-i-Khanan | Son of Bairam Khan | He translated Babur's memoirs into Persian (1589) and served in the Deccan campaign |

What the table shows:

- The three Rajput names of the court, Bharmal, Bhagwan Das and Man Singh, all belong to Amber.
- Shaikh Mubarak and his two sons stand behind the religious policy: the father drafted the mahzar, and Abul Fazl wrote the history of the reign.
- Bairam Khan and his son both held the title Khan-i-Khanan, at the two ends of the reign.

## 4. Three common exam traps

1. **Who was the Rana, and who commanded.** When Chittor fell (February 1568) the Rana of Mewar was Udai Singh, and the men who held the fort were Jaimal and Patta. Rana Pratap belongs to Haldighati, eight years later. At Haldighati the Mughal army was commanded by Raja Man Singh of Amber, not by Akbar in person, and the Afghan Hakim Khan Sur fought on Pratap's side. The settlement with Mewar belongs to 1615, in Jahangir's time, not to Akbar's reign.
2. **Not every Hindu noble was a Rajput, and the order of the early steps.** Todar Mal was a Khatri, and Birbal was a Brahmin poet; the Rajput chiefs of the court were Bharmal, Bhagwan Das and Man Singh. The marriage with Bharmal's daughter comes first (1562), the pilgrim tax goes next (1563) and the jizya after it (1564). The year 1564 for the jizya is Abul Fazl's; Badauni gives 1579. The Rajput brides were not converted.
3. **Three different things in three different years.** The Ibadat Khana (1575) is a building for debates. The mahzar (1579) is a document signed by ulama. The Tauhid-i-Ilahi (1582) is an order of disciples, which modern historians do not count as a new religion; Din-i-Ilahi is the name by which it is better known. Keep the books apart too: the Ain-i-Akbari is the third book of Abul Fazl's Akbarnama, the Muntakhab-ut-Tawarikh is Badauni's, and the Tabaqat-i-Akbari is Nizamuddin Ahmad's. The nine gems are a tradition with no historical basis.

PART 1 · STUDY NOTES · TOPIC 92

# Parliamentary privileges

Constitution, Polity, Social Justice & IR | Unit B-2

## 1. Concept in one line

Parliamentary privileges are the special rights and immunities that each House, its committees and its members enjoy under Article 105 (Article 194 for the State Legislatures), without which they could not discharge their functions. The examination asks for the words of these Articles, the difference between the privileges of the House and those of a member, and the leading judgments.

## 2. Revision notes

### 2.1 Meaning, and who enjoys the privileges

- **Meaning.** The Lok Sabha's Committee of Privileges, in a report of 2008, describes privileges as "certain rights and immunities enjoyed by each House of Parliament collectively, and by members of each House individually, without which they cannot discharge their functions". Their object is "to safeguard the freedom, the authority and the dignity of Parliament".

- **Not a personal status.** In State of Kerala v. K. Ajith (2021) the Supreme Court said that privileges are "not a mark of status which makes legislators stand on an unequal pedestal". A House can claim only those privileges that are essential and necessary for its functioning (Sita Soren, 2024).
- **Three holders.** Article 105 speaks of each House, the committees of each House and the members.
- **Others who speak in the House.** Article 105(4) extends the Article to persons who have, by virtue of the Constitution, the right to speak in a House. Article 88 gives this right to every Minister and to the Attorney-General of India: each may speak in, and otherwise take part in the proceedings of, either House, any joint sitting and any committee of Parliament of which he is named a member, but Article 88 gives him no vote. So a Minister is protected when he speaks in the House of which he is not a member, and the Attorney-General is protected when he speaks in either House.
- **The President.** Parliament consists of the President and the two Houses (Article 79; Topic 54). Article 105, however, does not name the President, and the guidebooks say that the privileges do not extend to him.

## 2.2 Article 105, clause by clause

| Clause | What it gives | Words to note |
|---|---|---|
| (1) | Freedom of speech in Parliament | It is "Subject to the provisions of this Constitution and to the rules and standing orders regulating the procedure of Parliament" |
| (2) | Two immunities from "any proceedings in any court": (a) for a member, in respect of anything said or any vote given by him "in Parliament or any committee thereof"; (b) for any person, in respect of the publication "by or under the authority of either House of Parliament" of any report, paper, votes or proceedings | Part (a) is for a member. Part (b) says "no person", so it covers a person who is not a member too, but it covers a publication made by or under the authority of a House and no other |
| (3) | All the other powers, privileges and immunities of each House, of its members and of its committees | They "shall be such as may from time to time be defined by Parliament by law". Until they are so defined, they are those that the House, its members and its committees had immediately before section 15 of the Constitution (Forty-fourth Amendment) Act, 1978 came into force |
| (4) | Clauses (1), (2) and (3) for persons who by virtue of the Constitution have the right to speak in, and otherwise to take part in the proceedings of, a House of Parliament or any of its committees | The clauses apply to them "as they apply in relation to members of Parliament" |

- **The House of Commons and the 44th Amendment.** As first enacted, clause (3) said that until Parliament defined them, the privileges were to be those of the House of Commons of the Parliament of the United Kingdom, and of its members and committees, at the commencement of the Constitution (26 January 1950). Section 15 of the 44th Amendment Act replaced these words with effect from 20 June 1979. Clause (3) as it stands on 11 October 2026 does not name the House of Commons.

- **The words changed, the content did not.** The privileges that a House had just before 20 June 1979 were themselves measured by those of the House of Commons in 1950. So the Lok Sabha's committee wrote in 2008 that, in the absence of a law, the privileges continue to be governed by the precedents of the British House of Commons as they stood when the Constitution came into force.
- **No law yet.** The same report records that Parliament has made no law under clause (3) to define the privileges, and the guidebooks say the same. The privileges therefore rest on five sources: the Constitution, laws made by Parliament (section 135A of the Code of Civil Procedure is one), the rules of the two Houses, parliamentary conventions and the judgments of the courts.

## 2.3 Article 194, and the Articles that stand beside these two

| Matter | Parliament | State Legislature |
|---|---|---|
| Powers, privileges and immunities of the Houses, members and committees | Article 105 | Article 194, in the same four clauses. Its clause (3) refers to section 26 of the 44th Amendment Act, also in force from 20 June 1979 |
| Persons who are not members but have the right to speak | Article 88: every Minister and the Attorney-General of India | Article 177: every Minister and the Advocate-General for the State |
| Discussion of the conduct of a Judge of the Supreme Court or of a High Court "in the discharge of his duties" | Article 121: no discussion "except upon a motion for presenting an address to the President praying for the removal of the Judge" | Article 211: no discussion. The Article has no exception |
| Courts not to inquire into the proceedings | Article 122 | Article 212, in the same words |

- **Articles 122 and 212.** (1) The validity of any proceedings in the House "shall not be called in question on the ground of any alleged irregularity of procedure". (2) An officer or member who regulates procedure or business, or maintains order, in the House is not subject to any court in the exercise of those powers.
- **Article 361A.** The 44th Amendment inserted this Article. No person is liable to any proceedings, civil or criminal, in any court for publishing in a newspaper a substantially true report of any proceedings of either House of Parliament or of a State Legislature, unless the publication is proved to have been made with malice. It does not cover a report of a secret sitting. It applies also to reports broadcast by wireless telegraphy.
- **The Parliamentary Proceedings (Protection of Publication) Act, 1977** (Act No. 15 of 1977) gives a like protection by an Act of Parliament for reports of the proceedings of either House of Parliament.

## 2.4 Collective and individual privileges

| No. | Collective privileges (of the House as a body) | Individual privileges (of a member) |
|---|---|---|
| 1 | To publish its reports, debates and proceedings, and to prohibit others from publishing them | Freedom of speech in the House (Article 105(1)) |
| 2 | To exclude strangers, that is, persons who are not members, and to hold secret sittings | Immunity from court proceedings for anything said or any vote given in the House or in its committees (Article 105(2)) |
| 3 | To regulate its own procedure and the conduct of its business (Article 118) | Freedom from arrest in civil cases during the session of the House and for 40 days before it begins and 40 days after it ends (section 135A of the Code of Civil Procedure) |

| No. | Collective privileges (of the House as a body) | Individual privileges (of a member) |
|---|---|---|
| 4 | To punish members and outsiders for breach of privilege or contempt of the House | Exemption from jury service |
| 5 | To receive immediate information of the arrest, detention or conviction of a member; and no arrest or service of legal process within the precincts of the House without the permission of the presiding officer | The member may decline to give evidence, or to appear as a witness, in a case pending in a court while the House is in session |

- **Freedom from arrest is narrow.** Its object, in the words of the Lok Sabha's committee, is "to ensure the safe arrival and regular attendance of Members of Parliament". It is available in civil cases and not in criminal cases or cases of preventive detention. In those cases the House has the right to be informed of the arrest at once, and nothing more.

## 2.5 Breach of privilege, contempt of the House and punishment

- **Breach of privilege.** It takes place when any of the privileges of the House or of its members is violated.
- **Contempt of the House.** The Lok Sabha's committee defines it as "any act or omission which obstructs or impedes either House of Parliament in the performance of its functions", or which obstructs or impedes a member or officer of the House in the discharge of his duty, or which has a tendency to produce such results.
- **The difference.** A breach needs a specific privilege that has been violated. Contempt does not: it is enough that the act obstructs the House, its members or its officers. Contempt is therefore the wider term.
- **Punishments open to the Houses.** Admonition, reprimand and imprisonment; and, for members, suspension and expulsion. When imprisonment was proposed in a motion before the Lok Sabha (the motion was not adopted), it was to last "till the prorogation of the Lok Sabha", that is, till the end of the session. Members have been expelled, for example, in 1951, 1976 (from the Rajya Sabha), 1978, 2005 and 2006.
- **Who punishes.** The Committee of Privileges examines and recommends. The power to punish rests with the House alone.

| Committee of Privileges | Lok Sabha | Rajya Sabha |
|---|---|---|
| Number of members | 15 | 10 |
| Nominated by | The Speaker | The Chairman |
| Headed by | A member of the committee, named by the Speaker | The Deputy Chairman of the Rajya Sabha |

## 2.6 Leading cases

| Case | Decided | Bench | What the Supreme Court held |
|---|---|---|---|
| M.S.M. Sharma v. Sri Krishna Sinha (the Searchlight case) | 1959 | Constitution Bench; one judge dissented | The privileges of a House under Article 194(3) prevail over the freedom of speech under Article 19(1)(a) |

| Case | Decided | Bench | What the Supreme Court held |
|---|---|---|---|
| Special Reference No. 1 of 1964 (the Keshav Singh reference, also called the UP Assembly case) | 1964 | Seven judges, by a majority | The case arose when the Speaker of the Uttar Pradesh Legislative Assembly directed that two Judges of the High Court be arrested and produced before the House. Held: if the two conflict, Article 21 prevails over Articles 105(3) and 194(3). It is for the courts to decide whether a privilege that a House claims exists, and what it contains |
| P.V. Narasimha Rao v. State (the JMM bribery case) | 1998 | Five judges; three formed the majority | The majority held that members who took a bribe and then voted in the House were immune under Article 105(2). A member who took the bribe but did not vote, and the persons who gave the bribe, were not immune. This view was overruled in 2024 |
| Raja Ram Pal v. Hon'ble Speaker, Lok Sabha | 10 January 2007 | Constitution Bench, by a majority | Ten members of the Lok Sabha and one member of the Rajya Sabha were expelled on 23 December 2005 in the "cash for query" case, and they challenged the expulsion. Held by the majority: Parliament has the power to expel a member, and the power is subject to judicial review. The majority upheld the expulsions; Justice Raveendran dissented |
| State of Kerala v. K. Ajith | 28 July 2021 | Two judges | Members of the Kerala Legislative Assembly were accused of damaging property in the House on 13 March 2015, during the presentation of the budget. The Court refused to let the prosecution be withdrawn. Held: privileges and immunities are not gateways for claiming exemption from the general law of the land, such as the criminal law. A member has a right to protest in the House, but acts of vandalism are not freedom of speech |
| Sita Soren v. Union of India | 4 March 2024 | Seven judges, unanimous | A legislator who takes a bribe to vote or speak in the House has no immunity under Article 105(2) or Article 194(2). The offence of bribery is complete when the bribe is accepted; it does not matter whether the legislator then votes or speaks as agreed. The majority view of 1998 was overruled |

- **Sita Soren, the facts.** A member of a Legislative Assembly was accused of taking a bribe to vote for a particular candidate in the Rajya Sabha election of 2012.

## 3. Extra section: the path of a question of privilege in the Lok Sabha, step by step

| Step | What happens | Lok Sabha rule |
|---|---|---|
| 1 | A member gives notice of a question of privilege | Rule 223 |

| Step | What happens | Lok Sabha rule |
|---|---|---|
| 2 | The notice is tested for admissibility. The matter must be specific, of recent occurrence and such as needs the intervention of the House. The comments of the person complained against are called for | Rule 224 |
| 3 | The Speaker gives or refuses his consent. If no breach of privilege is made out, he refuses it | Rule 222 |
| 4 | The matter goes to the Committee of Privileges. The Speaker may send it on his own, or the House may send it by adopting a motion | Rule 227 for a reference by the Speaker |
| 5 | The committee examines the matter. It can call witnesses and examine documents. It decides whether a breach of privilege or a contempt is involved, and it recommends what should be done | The report is due within one month if the House fixes no time |
| 6 | The House takes up the report. It may accept, reject or modify the recommendations. The House alone awards the punishment | When the Speaker made the reference, he may pass final orders on the report or direct that it be laid on the Table |

- The Rajya Sabha follows the same path, with the Chairman in the place of the Speaker. Only the Lok Sabha's rule numbers are given here.
- Most notices of breach of privilege are rejected, and penal action is recommended in few cases.
- Remember the order of the first three rule numbers: the consent is in Rule 222, the notice in Rule 223 and the conditions of admissibility in Rule 224.

## 4. Three common exam traps

1. **"A member cannot be arrested while the House is in session."** This is too wide. The freedom from arrest covers civil cases alone, during the session and for 40 days before it begins and 40 days after it ends. It comes from section 135A of the Code of Civil Procedure, a law made by Parliament, and not from the words of Article 105. In a criminal case, or under preventive detention, the freedom is not available; the House has the right to be told of the arrest at once. Do not mix this up with the privilege of the House as a body, under which no arrest is made within its precincts without the presiding officer's permission.
2. **Articles 121 and 211 are not copies of each other.** Both bar a discussion of the conduct of a Judge of the Supreme Court or of a High Court in the discharge of his duties. Article 121 lets Parliament discuss it on a motion for an address to the President praying for the Judge's removal. Article 211 gives the State Legislature no such opening. Articles 122 and 212, on the other hand, are in the same words: the courts cannot question the proceedings on the ground of an alleged irregularity of procedure.
3. **Breach of privilege, contempt, and who punishes.** A breach of privilege needs a specific privilege that has been violated; contempt is wider and needs only an act that obstructs the House, its members or its officers. The Committee of Privileges, with 15 members in the Lok Sabha and 10 in the Rajya Sabha, examines and recommends; the House itself punishes. The House can punish outsiders as well as members. In the Rajya Sabha the Deputy Chairman heads the committee; in the Lok Sabha a member named by the Speaker heads it.

PART 1 · STUDY NOTES · TOPIC 93

# Poverty measurement: committees, poverty lines and the MPI

Indian & AP Economy and Planning | Unit C-2

## 1. Concept in one line

India measures poverty in two ways: by a poverty line of monthly consumption expenditure, and by a multidimensional poverty index (MPI) that counts deprivations in health, education and the standard of living. The examination asks which body drew which line, the lines and ratios each one gave, and how the MPI is built.

## 2. Revision notes

### 2.1 What is measured, and with what data

- **Absolute poverty** is judged against a set standard that stays the same over time and between countries: the person lacks the basic necessities for survival. **Relative poverty** is judged against the society the person lives in; the usual example is an income below 60 per cent of the median household income, the main line used in the European Union.
- **Poverty line:** the level that divides the population into poor and non-poor. **Headcount ratio (HCR):** the percentage of people below the poverty line. **Poverty gap index:** the mean distance below the poverty line, as a proportion of the line. The mean is taken over the whole population, and the non-poor are counted as having a gap of zero. The headcount ratio tells how many are poor; the poverty gap tells how far below the line they are.
- **India measures consumption, not income.** The Planning Commission defined its poverty line as a level of monthly per capita consumption expenditure (MPCE). The data came from the large-sample household consumer expenditure surveys of the National Sample Survey Office (NSSO), about once in five years. A fixed MPCE line of this kind is an absolute line.

### 2.2 The poverty line before 2009

- Before independence, Dadabhai Naoroji argued in "Poverty and Un-British Rule in India" (1901) that British rule and its high taxation had impoverished India.

| Body | Years | Basis | Line it gave (per person) | What followed |
|---|---|---|---|---|
| Working Group | 1962 | A minimum expenditure of Rs 100 a month for a household of five | Rs 20 (rural) and Rs 25 (urban) a month at 1960-61 prices | It was not an official line. It was the basis of the poverty discussion in the fifteen-year plan that the Planning Commission's Perspective Planning Division produced in 1962 |

| Body | Years | Basis | Line it gave (per person) | What followed |
|---|---|---|---|---|
| Dandekar and Rath (a study by two economists, published in the Economic and Political Weekly) | 1971 | 2,250 calories a day; NSSO household expenditure data of 1960-61 | Rs 170.80 (rural) and Rs 271.70 (urban) a year | Their estimate: 40 per cent of rural and 50 per cent of urban residents were below the line in 1960-61 |
| Task Force under Y.K. Alagh | Appointed 1977; report 1979 | 2,400 kilocalories (kcal) a day in rural areas and 2,100 kcal a day in urban areas | Rs 49.09 (rural) and Rs 56.64 (urban) a month at 1973-74 prices, applied uniformly to all the States | These lines remained the national basis until 2004-05 |
| Expert Group under D.T. Lakdawala | Constituted 1989; report 1993 | It kept the Alagh lines and 1973-74 as the base year | A separate poverty line for each State, worked out from the national lines with consumer price indices to reflect price differences between States | On this method the urban poverty ratio for 2004-05 was 25.7 per cent |

- Guidebooks often date the Alagh and Lakdawala groups by the years of their reports, 1979 and 1993; the groups were set up in 1977 and 1989.
- The Alagh lines assumed different rural and urban consumption baskets, and the Lakdawala group kept separate rural and urban national lines.
- To update the lines, the Lakdawala group recommended the consumer price index for agricultural labourers (CPI-AL) for the rural line. For the urban line the Planning Commission used the consumer price index for industrial workers (CPI-IW).

## 2.3 Tendulkar (2009) and Rangarajan (2014)

| Point | Expert Group under Suresh Tendulkar | Expert Group under C. Rangarajan |
|---|---|---|
| Years | Appointed December 2005; report 2009 | Constituted June 2012; report 30 June 2014 |
| Basket | The urban basket of 2004-05 was taken as the common basket for rural and urban areas, and priced separately for each | Separate all-India rural and urban baskets; the two lines were de-linked |
| Calorie norm | Moved away from the calorie norm; the lines were checked against spending on food, education and health | 2,155 kcal (rural) and 2,090 kcal (urban) a day, with norms for protein and fat as well |
| Consumption data | Mixed reference period | Modified mixed reference period |
| Line for 2011-12 (per person a month) | Rs 816 (rural), Rs 1,000 (urban) | Rs 972 (rural), Rs 1,407 (urban) |
| The same for a family of five | Rs 4,080 and Rs 5,000 | Rs 4,860 and Rs 7,035 |
| Poverty ratio for 2011-12 | 21.9 per cent (rural 25.7, urban 13.7) | 29.5 per cent (rural 30.9, urban 26.4) |

| Point | Expert Group under Suresh Tendulkar | Expert Group under C. Rangarajan |
|---|---|---|
| Number of poor in 2011-12 | 26.93 crore | 36.3 crore |

- **How Tendulkar fixed the line:** the group began from the urban poverty ratio of 25.7 per cent for 2004-05. The MPCE at that ratio became the new urban basket, and the rural line was worked out afresh for the same basket at rural prices. The lines for 2004-05 came to Rs 446.68 (rural) and Rs 578.80 (urban) a month, that is, about Rs 447 and Rs 579.
- Rangarajan's lines are 19 per cent (rural) and 41 per cent (urban) higher than Tendulkar's. Rangarajan used the NSSO's consumption estimates, not those of the National Accounts Statistics.

Poverty ratios on the Tendulkar method (Planning Commission press note, July 2013):

| Year | Rural (per cent) | Urban (per cent) | Total (per cent) |
|---|---|---|---|
| 1993-94 | 50.1 | 31.8 | 45.3 |
| 2004-05 | 41.8 | 25.7 | 37.2 |
| 2011-12 | 25.7 | 13.7 | 21.9 |

## 2.4 After 2014: the choice of line left open

- NITI Aayog constituted a Task Force on Elimination of Poverty in India on 16 March 2015, with Arvind Panagariya, then Vice Chairman of NITI Aayog, as its chairman. Its work came out as Occasional Paper No. 2, "Eliminating Poverty: Creating Jobs and Strengthening Social Programs", dated 21 March 2016.
- The paper listed four options: (i) continue with the Tendulkar line; (ii) switch to the Rangarajan line or another higher line; (iii) track the bottom 30 per cent of the population over time; (iv) track specific components such as nutrition, housing, drinking water, sanitation, electricity and connectivity.
- It held that options (iii) and (iv) can go along with a poverty line but cannot take its place. The choice therefore lies between (i) and (ii), and the paper left that decision to further deliberations.
- The official estimates for 1993-94, 2004-05, 2009-10 and 2011-12 use the Tendulkar line. The estimates for 2011-12 are the last official estimates on a poverty line.

## 2.5 Three reference periods

A reference period is the stretch of time for which a household is asked to report what it consumed.

- **Uniform reference period (URP):** the preceding 30 days for all items.
- **Mixed reference period (MRP):** 365 days for five low-frequency items (clothing, footwear, durables, education and institutional medical care) and 30 days for all other items.
- **Modified mixed reference period (MMRP):** 7 days for perishable items, 365 days for the five low-frequency items and 30 days for the rest.

## 2.6 Recent consumption surveys and estimates that are not official

| Household Consumption Expenditure Survey (HCES) | Average MPCE, rural | Average MPCE, urban | Urban above rural by |
|---|---|---|---|
| 2022-23 (August 2022 to July 2023) | Rs 3,773 | Rs 6,459 | 71 per cent |

| Household Consumption Expenditure Survey (HCES) | Average MPCE, rural | Average MPCE, urban | Urban above rural by |
|---|---|---|---|
| 2023-24 (August 2023 to July 2024) | Rs 4,122 | Rs 6,996 | 70 per cent |

- In 2011-12 the urban-rural gap was 84 per cent. The figures above leave out the imputed value of items received free. HCES 2022-23 collects data only on the MMRP.
- These surveys give MPCE. They do not fix a poverty line, and no official poverty ratio has been drawn from them. The estimates below are not official.
- **World Bank:** on 5 June 2025 it raised the international poverty line from 2.15 dollars a day (at 2017 purchasing power parity, PPP) to 3.00 dollars a day (at 2021 PPP). On the new line about 838 million people in the world lived in extreme poverty in 2022.
- **World Bank's figures for India, released in June 2025 and drawn from HCES 2022-23:** on the 2.15 dollar line, extreme poverty came down from 16.2 per cent in 2011-12 to 2.3 per cent in 2022-23. On the 3.00 dollar line it came down from 27.1 per cent to 5.3 per cent, that is, from 344.47 million people to about 75.2 million (as reported by Akashvani News and the Press Information Bureau, 7 June 2025).

## 2.7 The global MPI

- The Oxford Poverty and Human Development Initiative (OPHI) computes it in partnership with the Human Development Report Office of the United Nations Development Programme (UNDP). It is an annual measure of acute multidimensional poverty covering over 100 developing countries. The index was launched in 2010.
- It has three dimensions and ten indicators. Each dimension adds up to one third.

| Dimension | Indicators | Weight of each indicator |
|---|---|---|
| Health | Nutrition; child mortality | 1/6 |
| Education | Years of schooling; school attendance | 1/6 |
| Standard of living | Cooking fuel; sanitation; drinking water; electricity; housing; assets | 1/18 |

- **Who is poor:** a person who is deprived in a third or more of the weighted indicators. The method is the Alkire-Foster method.
- **MPI = H × A.** H is the incidence or headcount ratio: the share of people who are multidimensionally poor. A is the intensity: the average share of weighted deprivations among the poor.

## 2.8 The National MPI of NITI Aayog

- NITI Aayog is the nodal agency; OPHI and UNDP are its technical partners. The index is worked out from the National Family Health Survey (NFHS), not from consumption surveys.
- It keeps the three dimensions, each with a weight of one third, and the ten global indicators. It adds two: **maternal health** (under health) and **bank account** (under standard of living). That makes twelve indicators. In health it counts child and adolescent mortality.
- A household is deprived in bank account if no member has a bank account or a post office account. A person is poor if the weighted deprivation score is 33.33 per cent or more.

| Survey | Headcount ratio (H) | Intensity (A) | MPI |
|---|---|---|---|
| NFHS-3 (2005-06) | 55.34 per cent | 54.96 per cent | 0.304 |
| NFHS-4 (2015-16) | 24.85 per cent | 47.14 per cent | 0.117 |
| NFHS-5 (2019-21) | 14.96 per cent | 44.39 per cent | 0.066 |

- **Baseline Report (November 2021):** based on NFHS-4.
- **"National Multidimensional Poverty Index: A Progress Review 2023" (released on 17 July 2023):** based on NFHS-5. The headcount ratio came down from 24.85 to 14.96 per cent, a drop of 9.89 percentage points, and 13.5 crore people moved out of multidimensional poverty between 2015-16 and 2019-21. Rural poverty came down from 32.59 to 19.28 per cent and urban poverty from 8.65 to 5.27 per cent.
- **Discussion paper "Multidimensional Poverty in India since 2005-06" (released on 15 January 2024; Ramesh Chand and Yogesh Suri):** 29.17 per cent in 2013-14 and 11.28 per cent in 2022-23, a drop of 17.89 percentage points; 24.82 crore people moved out in nine years. These two years have no survey. The 2013-14 figure is an interpolation and the 2022-23 figure an extrapolation from the NFHS rounds.
- **States:** Bihar had the highest headcount ratio in 2019-21 (33.76 per cent; 51.89 in 2015-16). Kerala had the lowest (0.55 per cent; 0.70 in 2015-16). Andhra Pradesh came down from 11.77 per cent in 2015-16 to 6.06 per cent in 2019-21; the paper's estimate for it in 2022-23 is 4.19 per cent.

### 2.9 The SDG target and the global report

- **Sustainable Development Goal (SDG) target 1.2:** by 2030, to reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.
- **Global MPI report:** as on 14 October 2026 the most recent edition is the "2026 Global Multidimensional Poverty Index", a statistical update posted by UNDP on 12 October 2026. It covers 108 countries: 1.2 billion of their 6.3 billion people (18.9 per cent) live in acute multidimensional poverty. It says this number has risen for the first time since the index was launched in 2010. The edition before it was the 2025 one, "Overlapping Hardships: Poverty and Climate Hazards" (109 countries; 1.1 billion people).
- **India in the global MPI:** the figures rest on the survey of 2019-21. UNDP's Table 1 in the 2026 update gives an MPI of 0.069, with 16.4 per cent of the people poor (about 23.78 crore in 2024) and an intensity of 42.0 per cent. This 16.4 per cent is not the National MPI's 14.96 per cent: the two indices do not have the same list of indicators.

## 3. Extra section: working the MPI by hand

**Step 1: add up one person's weighted deprivations (global MPI weights).**

| Person | Deprived in | Score | Poor or not |
|---|---|---|---|
| P | Nutrition and child mortality | 1/6 + 1/6 = 1/3 | Poor: the score is exactly one third |
| Q | School attendance, cooking fuel and sanitation | 1/6 + 2/18 = 5/18, about 27.8 per cent | Not poor: the score is below one third |
| R | Years of schooling, drinking water, housing and assets | 1/6 + 3/18 = 1/3 | Poor |

| Person | Deprived in | Score | Poor or not |
|---|---|---|---|
| S | All six indicators of the standard of living, and nothing else | 6/18 = 1/3 | Poor |

- One health or education indicator (1/6) weighs as much as three indicators of the standard of living (3 × 1/18).
- No single indicator can make a person poor. It takes two indicators of 1/6 each, or one of them with three of the standard of living, or all six of the standard of living.

**Step 2: multiply the headcount ratio by the intensity.**

| Case | H | A | H × A |
|---|---|---|---|
| National MPI, 2015-16 | 0.2485 | 0.4714 | 0.117 |
| National MPI, 2019-21 | 0.1496 | 0.4439 | 0.066 |
| India in the global MPI, survey of 2019-21 | 0.164 | 0.420 | 0.069 |

- Between 2015-16 and 2019-21 both H and A came down, so the National MPI nearly halved.
- Two places can have the same H and different MPI values: where the poor are deprived in more indicators, A is higher and so is the MPI.

## 4. Three common exam traps

1. **Two lines for the same year.** For 2011-12 there are two sets of figures: Rs 816 and Rs 1,000 with 21.9 per cent, and Rs 972 and Rs 1,407 with 29.5 per cent. The official estimates are the first set. Watch 25.7 as well: it is the urban ratio for 2004-05 and also the rural ratio for 2011-12.
2. **13.5 crore and 24.82 crore.** The first is the number between two surveys, 2015-16 and 2019-21, when the ratio came down from 24.85 to 14.96 per cent. The second is for the nine years from 2013-14 to 2022-23, when it came down from 29.17 to 11.28 per cent, and both of those years are estimates, not survey years.
3. **A higher line gives a higher ratio.** For the same year, 2022-23, the World Bank's figure for India (June 2025) is 2.3 per cent on the 2.15 dollar line and 5.3 per cent on the 3.00 dollar line. Neither is an official Indian estimate, and the consumption surveys of 2022-23 and 2023-24 give average MPCE, not a poverty ratio.

PART 1 · STUDY NOTES · TOPIC 94

# Latitudes, longitudes and time: IST and the International Date Line

Geography | Unit D-1

## 1. Concept in one line

Latitude and longitude are the two angles that fix a place on the globe, and longitude also fixes its time, because the Earth turns through 15° in an hour. The examination asks for the named parallels and their values, Indian Standard Time, time calculations and the rule of the International Date Line.

## 2. Revision notes

### 2.1 Latitude and the parallels

- **Latitude** is the angular distance of a place north or south of the Equator, measured as an angle at the centre of the Earth. The Equator is 0°. The North Pole is 90° N and the South Pole is 90° S (NCERT).
- A line that joins all places of the same latitude is a **parallel of latitude**. Every parallel is a full circle, parallel to the Equator. The Equator is the largest circle; the parallels grow smaller towards the poles (NCERT).
- **Length of one degree of latitude:** about 111 km. Measured exactly, it is 110.6 km at the Equator and 111.7 km at the poles.
- **Why it is nearly constant:** latitude is measured along a meridian, all meridians are of equal length, and every degree is the same share of that length. NCERT says the distance between two latitudes remains the same everywhere. The small difference between the Equator and the poles comes from the Earth's shape: it is not a perfect sphere but an oblate spheroid.

### 2.2 The named parallels and the heat zones

| Parallel | Latitude (NCERT) | What it marks |
|---|---|---|
| Equator | 0° | The largest parallel; it divides the globe into the Northern and Southern Hemispheres |
| Tropic of Cancer | 23½° N | The northern edge of the Torrid Zone |
| Tropic of Capricorn | 23½° S | The southern edge of the Torrid Zone |
| Arctic Circle | 66½° N | The edge of the northern Frigid Zone |
| Antarctic Circle | 66½° S | The edge of the southern Frigid Zone |
| North Pole and South Pole | 90° N and 90° S | A quarter of a circle away from the Equator |

- **Why 23½° and 66½°:** the Earth's axis is tilted by about 23½°. The two tropics lie at the latitude equal to this tilt. The two polar circles lie at 90° minus the tilt: 90° - 23½° = 66½°. Reference works give today's values as 23°26′ and 66°34′; in the examination use 23½° and 66½°. How the tilt produces the seasons is a separate topic.

| Heat zone | Where it lies | Why (NCERT) |
|---|---|---|
| Torrid Zone | Between the Tropic of Cancer and the Tropic of Capricorn | The mid-day sun is exactly overhead at least once a year on every latitude here, so this area receives the maximum heat |
| Temperate Zones (two) | Between the Tropic of Cancer and the Arctic Circle in the north; between the Tropic of Capricorn and the Antarctic Circle in the south | The sun's rays fall at a lower angle, so temperatures are moderate |
| Frigid Zones (two) | Between the Arctic Circle and the North Pole; between the Antarctic Circle and the South Pole | The sun stays low in the sky and its rays are always slanting, so these zones are very cold |

## 2.3 Longitude and the meridians

- **Longitude** is the angular distance of a place east or west of the Prime Meridian. It is counted from 0° up to 180° eastward (E) and up to 180° westward (W).
- **Meridians of longitude** run from the North Pole to the South Pole. Each is a semicircle, and all are of equal length (NCERT).
- **Prime Meridian (0°):** it passes through Greenwich in London, where the British Royal Observatory stands. At the International Meridian Conference of 1884, hosted by the United States in Washington, D.C., 22 of the nations present voted for Greenwich as the zero line. NCERT's new Class 6 book adds that Greenwich was not the first prime meridian: Indian astronomers had a middle line (madhya rekha) through Ujjain.
- **180° meridian:** 180° E and 180° W are one and the same line, opposite the Prime Meridian. The Prime Meridian and the 180° meridian together divide the Earth into the Eastern and Western Hemispheres.

| Point | Parallels of latitude | Meridians of longitude |
|---|---|---|
| Shape | Full circles | Semicircles from pole to pole |
| Length | Unequal: the Equator is the longest and they shrink towards the poles | All equal |
| Counted from | The Equator (0°), up to 90° N and 90° S | The Prime Meridian (0°), up to 180° E and 180° W |
| Spacing | They never meet; one degree is about 111 km everywhere | They meet at the poles; one degree is 111.3 km at the Equator, 96.5 km at latitude 30°, 55.8 km at latitude 60° and nil at the poles |
| What they decide | The heat zones | Time |

- **Grid:** the network of parallels and meridians is the grid (on a map it is also called the graticule). A place is fixed by the point where its parallel and its meridian cross: Dhubri in Assam lies at 26° N and 90° E (NCERT).
- **Great circle:** a circle whose plane passes through the centre of the globe. The Equator is one; so is a meridian taken together with the meridian opposite it (such as 0° and 180°). The shortest course between two points on a sphere lies along a great circle, so long-distance aircraft fly great circle routes (Britannica).

## 2.4 Longitude and time

- **The rule:** the Earth rotates through 360° in about 24 hours. That is 15° in an hour, or 1° in 4 minutes (NCERT). So 15′ of longitude make 1 minute of time.

- **East is ahead, west is behind:** when it is 12 noon at Greenwich, it is 1 p.m. at 15° E, 11 a.m. at 15° W and midnight at 180° (NCERT). Here ahead means that the clock shows a later time, and behind means that it shows an earlier one.
- **Local time:** it is 12 noon at a place when the sun is at its highest point in the sky there. All places on one meridian have the same local time (NCERT).
- **Why a standard time:** local time changes from meridian to meridian. Dwarka in Gujarat and Dibrugarh in Assam differ by about 1 hour 45 minutes. It would be hard to prepare a timetable for trains. So a country takes the local time of one central meridian as the standard time for the whole country (NCERT).
- **Standard meridians:** there is a general understanding among countries to choose the standard meridian in multiples of 7°30′ of longitude (NCERT, Class XI). 7°30′ of longitude equals 30 minutes of time.
- **Time zones:** the Earth is divided into 24 time zones of one hour each, and each covers 15° of longitude (NCERT). On the map the zones tend to follow international borders, and a country too wide for one time keeps several.

| Country | Time zones | Note |
|---|---|---|
| France | 12 (13 with its claim in Antarctica) | Counted with its overseas territories; the highest number for any country (Wikipedia's list, citing French decrees) |
| Russia | 11 | NCERT gives the same figure |
| United States | 11 with its territories | NCERT Class XI says seven and the new NCERT Class 6 book says six; the count depends on which territories are included |
| India and China | 1 each | One standard time for the whole country |

- In the examination: 11 for Russia. For the United States, go by the book the question follows (seven in NCERT Class XI).
- **GMT and UTC:** Greenwich Mean Time (GMT) is the mean solar time of longitude 0° at the Royal Greenwich Observatory. Its present-day form is Coordinated Universal Time (UTC), which reconciles the time of atomic clocks with solar time (Britannica). Standard times are written as offsets from it; the offsets in use run from UTC-12:00 to UTC+14:00.

## 2.5 Indian Standard Time (IST)

- **Standard meridian:** 82°30′ E (82½° E). The local time on this meridian is the standard time for the whole of India (NCERT). 82°30′ is 11 times 7°30′.
- **Lead over Greenwich:** 82½ × 4 minutes = 330 minutes. So IST is 5 hours 30 minutes ahead of GMT, written UTC+5:30. Noon at Greenwich is 5:30 p.m. in India.
- **The place:** NCERT (Class IX) says the meridian passes through Mirzapur in Uttar Pradesh; a BBC report of 2001 places it near Vindhyachal in Mirzapur district. IST is described as reckoned from the clock tower of Mirzapur; the city itself lies a few minutes of arc east of the meridian. Older books name Allahabad (Prayagraj): the meridian chosen for British India in 1905 was described as the one east of Allahabad. In the examination, mark Mirzapur; mark Allahabad or Prayagraj where Mirzapur is not among the options.
- **States on the meridian:** guidebooks list five, from north to south: Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Odisha and Andhra Pradesh. The NCERT books do not give such a list. Tuni in Andhra Pradesh lies almost on the line, so the State at its southern end is Andhra Pradesh, not Telangana.

- **Why one time for the whole country:** India spans about 30° of longitude, which makes a difference of nearly two hours between its easternmost and westernmost parts. The sun rises about two hours earlier in the north-eastern States than at Jaisalmer, yet watches show the same time everywhere (NCERT, Class XI). NCERT Class IX puts the time lag from Gujarat to Arunachal Pradesh at two hours.
- **Chai bagaan time:** the tea gardens of Assam keep their clocks one hour ahead of IST. This tea garden time is also called bagan time (Hindustan Times, 2008).
- **Demand for a second time zone:** it comes mainly from the north-east; Assam's Chief Minister Tarun Gogoi campaigned for it in 2014. In the Lok Sabha on 29 July 2015 (Starred Question No. 129) the Minister of Science and Technology replied that a High Level Committee had, in January 2002, strongly rejected the idea of two time zones for India and had recommended advancing work timings by up to one hour in the eastern and north-eastern States. The reply added that there was no proposal to shift the time zone. A later reply by the same Minister, reported on 1 January 2020, said that the Committee had recommended against two time zones for strategic reasons.
- **Who keeps the time:** the National Physical Laboratory of the Council of Scientific and Industrial Research (CSIR-NPL), New Delhi, maintains IST. Its Indian Standard Time Metrology Division runs a bank of caesium atomic clocks and a hydrogen maser, which would lose or gain one second in about three lakh years.
- **The Rules of 2026:** the Department of Consumer Affairs notified the Legal Metrology (Indian Standard Time) Rules, 2026 on 27 August 2026, and they were published in the Official Gazette on 29 August 2026. They make IST the common, legally recognised time reference for legal, administrative, commercial and official purposes, under the idea of "One Nation, One Time". They come into force 180 days after publication in the Gazette, so as on 11 October 2026 they are notified but not yet in force.

## 2.6 The International Date Line

- **What it is:** an imaginary line from the North Pole to the South Pole that marks off each calendar day from the next. For most of its length it follows the 180° meridian (Britannica). The zone 12 hours ahead of Greenwich and the zone 12 hours behind it touch each other here (NCERT), so the two sides differ by a whole day.
- **Why it is not straight:** it deviates in places to avoid dividing a country into two different days (NCERT). No treaty fixes the line. Each country chooses its own standard time, and the line on the map follows those choices.

| Where | Which way the line bends | Why |
|---|---|---|
| Bering Strait | Eastward | To avoid dividing Siberia; the line passes between the two Diomede Islands |
| Aleutian Islands | Westward | To keep the Aleutian Islands with Alaska |
| South of the Equator | Eastward | So that certain island groups have the same day as New Zealand; Fiji and Tonga lie west of the line |
| Kiribati | Eastward, almost to 150° W | Kiribati lay on both sides of the line. It dropped 31 December 1994 from its calendar, and the whole country now keeps one date. Its Line Islands (UTC+14) see each new day first |
| Samoa | The line now passes east of Samoa | Samoa dropped Friday, 30 December 2011 and moved from UTC-11 to UTC+13, because Australia and New Zealand had become its biggest trading partners. American Samoa stayed on the eastern side |

| Crossing the line | What happens to the calendar | How it is described |
|---|---|---|
| Westward, from America towards Asia (east to west) | Add a day: Sunday becomes Monday, so one date is skipped | The traveller is said to lose a day |
| Eastward, from Asia towards America (west to east) | Subtract a day: Monday becomes Sunday, so one date is repeated | The traveller is said to gain a day |

- The clock is not changed at the line; only the date is.
- Rotation of the Earth and its effects, the seasons, and India's location and extent are taken up on other days.

## 3. Extra section: worked examples of time calculations

**The method in four steps**

1. Find the difference of longitude. If both places are on the same side of Greenwich (both E or both W), subtract. If they are on opposite sides, add.
2. Turn it into time: divide the degrees by 15 to get hours, or multiply them by 4 to get minutes.
3. If the place whose time is wanted lies to the east, add the time. If it lies to the west, subtract.
4. If the answer passes midnight, change the date: to the next date when adding, to the previous date when subtracting.

At the Date Line, change the date as in 2.6.

**Example 1: east of Greenwich.** It is 6:00 a.m. at Greenwich. What is the local time at 105° E?

- 105 ÷ 15 = 7 hours. The place is to the east, so add: 1:00 p.m. on the same day.

**Example 2: west of Greenwich, starting from IST.** It is 8:00 p.m. IST. What is the local time at 75° W?

- Opposite sides of Greenwich, so add: 82°30′ + 75° = 157°30′.
- 157.5 ÷ 15 = 10.5, that is, 10 hours 30 minutes. The place is to the west, so subtract: 9:30 a.m. on the same day.
- Check through Greenwich: 8:00 p.m. less 5 hours 30 minutes is 2:30 p.m. GMT. A place at 75° W is 5 hours behind: 9:30 a.m.

**Example 3: both places in east longitude.** It is 3:00 p.m. IST. What is the local time at 120° E?

- Same side, so subtract: 120° - 82°30′ = 37°30′, that is, 2 hours 30 minutes.
- 120° E is east of India, so add: 5:30 p.m.

**Example 4: across midnight.** It is 4:00 a.m. IST on a Friday. What is the local time at 22°30′ W?

- Opposite sides, so add: 82°30′ + 22°30′ = 105°, that is, 7 hours.
- West, so subtract. Going back 7 hours from 4:00 a.m. passes midnight: 9:00 p.m. on Thursday.

**Example 5: local time against standard time.** It is 12 noon IST. What is the local time at a place in India on 77° E?

- 82°30′ - 77° = 5°30′. In minutes: 5.5 × 4 = 22 minutes.
- The place is west of the standard meridian, so subtract: 11:38 a.m. The watch there shows 12 noon, but the sun reaches its highest point 22 minutes later.

**Example 6: across the Date Line.** It is 9:00 a.m. on a Tuesday at 165° E. What are the time and the day at 165° W?

- The short way, across the 180° meridian: 15° + 15° = 30°, that is, 2 hours to the east. Add: 11:00 a.m. Then cross the Date Line eastward and subtract a day: 11:00 a.m. on Monday.

- The long way, through Greenwich: 165° + 165° = 330°, that is, 22 hours to the west. 9:00 a.m. on Tuesday less 22 hours is 11:00 a.m. on Monday. Both ways agree.

## 4. Three common exam traps

1. **Adding the longitudes where they should be subtracted.** For two places on the same side of Greenwich, subtract the longitudes; for places on opposite sides, add them. 30° E and 75° E are 45° apart (3 hours); 30° E and 75° W are 105° apart (7 hours). After that, counted without crossing the Date Line, the place to the east is ahead: its clock shows the later time (and, past midnight, the later date). Across the Date Line, change the date as in 2.6 (Example 6). Do not treat IST as if it were Greenwich time: count from India's own meridian, or go through Greenwich one step at a time.
2. **Gaining and losing a day at the Date Line.** A traveller going eastward, towards America, puts the calendar back and lives one date twice: this is the gain. A traveller going westward, towards Asia, puts the calendar forward and misses one date: this is the loss. Only the date changes, not the clock. And the line is not the 180° meridian everywhere.
3. **Standard time taken for local time.** Every clock in India shows IST, which is the local time of one meridian only. The sun still rises about two hours earlier in the north-east than in the far west. Remember also the general understanding that standard meridians are chosen in multiples of 7°30′, which is 30 minutes of time, so that standard times differ by whole hours or half hours. Multiples of 15° (whole hours) are among them; India's 82°30′ is a multiple of 7°30′ but not of 15°.

PART 1 · STUDY NOTES · TOPIC 95

# Tribes of Andhra Pradesh: distribution and features

Geography | Unit D-3

## 1. Concept in one line

Andhra Pradesh has 34 Scheduled Tribes: hill tribes of the Eastern Ghats and the Nallamala, and tribes of the plains such as the Yanadi. The examination asks you to match each tribe with its area, speech and livelihood, and to know the laws, agencies and schemes meant for them.

## 2. Revision notes

### 2.1 The numbers: Census of India 2011

A Scheduled Tribe (ST) is a tribe named in the President's list for a State (2.2). Every population figure in this topic is of the Census of 2011, unless another year is given.

| Point | Undivided Andhra Pradesh (with Telangana) | Present Andhra Pradesh |
|---|---|---|
| ST population | 59.18 lakh | 27,39,919 (about 27.4 lakh) |
| Share of the State's population | About 7 per cent | 5.53 per cent |
| Number of Scheduled Tribes | 35 | 34 |
| Particularly vulnerable groups | 12 names in the Government of India's list | Ten of those names, counted as six tribes (2.5) |
| Scheduled Areas | 31,485 sq. km, about 11 per cent of the State; 5,948 villages; nine districts | Five of the nine districts: Srikakulam, Vizianagaram, Visakhapatnam, East Godavari and West Godavari, as they stood in 2011 |

| Point | Undivided Andhra Pradesh (with Telangana) | Present Andhra Pradesh |
|---|---|---|
| Integrated Tribal Development Agencies (ITDAs) in a Lok Sabha answer of 2006 | 8 | Five of those eight lie in the present State (Section 3) |

- **Sources of the two columns:** the figures of the undivided State are those of the Comptroller and Auditor General's audit of tribal welfare (2015). The figures of the present State are those given from the same Census by Prof. V. Subramanyam of Andhra University (2023).
- The other four districts with Scheduled Areas, Khammam, Warangal, Adilabad and Mahabubnagar, went to Telangana.
- **Mostly rural:** about 92 per cent of the STs of the undivided State lived in rural areas. The Scheduled Areas were the traditional home of 31 of its 35 tribes.
- **More women than men:** in the six particularly vulnerable tribes of the present State there were 2,22,390 males and 2,29,796 females, that is, about 1,033 females for every 1,000 males. The sex ratio and literacy of all the STs of the present State are taken up in Topic 595.
- **Highest share:** Alluri Sitharama Raju district. The 11 mandals of the Paderu revenue division, which alone form the district since 31 December 2025, had 6,04,047 people, of whom 5,47,951 (90.71 per cent) were STs.
- When that district was formed on 4 April 2022 it also held the Rampachodavaram division. On that larger area STs were 82.67 per cent, the sex ratio of the whole population was 1,046 and its literacy rate was 42.34 per cent.
- **A plains district:** the Nellore district website, in a table it dates to 2023, gives 2,15,452 STs, 8.72 per cent of the district's population.

## 2.2 The Constitution and the law

- **Who is a Scheduled Tribe (Article 342):** the President, "after consultation with the Governor thereof", specifies "by public notification" the tribes or tribal communities, or parts of them or groups within them, that are Scheduled Tribes in relation to a State. The notification is the Constitution (Scheduled Tribes) Order, 1950. So a community is a Scheduled Tribe State by State.
- **Changing the list:** only Parliament, by law, may include a tribe in the list or exclude one from it. Apart from that, the notification "shall not be varied by any subsequent notification".
- **Scheduled Areas (Article 244(1) and the Fifth Schedule):** the Fifth Schedule deals with the administration and control of the Scheduled Areas and the Scheduled Tribes. The President notifies the Scheduled Areas. In 2025 ten States had them, Andhra Pradesh and Telangana among them. In these areas the Governor has special responsibilities, and a Tribes Advisory Council advises the State on tribal matters. Topic 933 gives the Schedule in full; the PESA Act is Topic 504.
- **A Scheduled Area is a list of villages:** it is not every place where tribal people live. A report of Samata, a voluntary organisation, says that in the old Srikakulam district 1,250 villages were mainly tribal but only 108 were in the Scheduled Area.
- **Land Transfer Regulation:** the Andhra Pradesh Scheduled Areas Land Transfer Regulation, 1959 carried forward the Agency Tracts Act of 1917, under which land could pass only from tribal to tribal. Its amendment of 1970 is known as Regulation 1 of 70 (also written 1/70, or "One of 1970"). After it, no one may transfer land in a Scheduled Area to a non-tribal: a tribal may not, and another non-tribal may not either. The protection covers only land in villages that are inside the Scheduled Areas.
- **Samatha judgment, 1997:** it upheld the view that transferring land in a Scheduled Area to a private company goes against this Regulation.
- **Tribal Sub-Plan:** the Government of India brought in the idea in the Fifth Five Year Plan (1974-79), and the State followed it from 1974-75. The State's law on it is the Andhra Pradesh Scheduled Castes Sub-Plan and Tribal Sub-Plan (Planning, Allocation and Utilisation of Financial Resources) Act, 2013.

- **Girijan Cooperative Corporation (GCC):** under a Regulation of 1979 it is the only buyer of minor forest produce from tribals in the Scheduled Areas (35 items in a study of 2010).

## 2.3 Hill tribes: the six particularly vulnerable tribes

Districts are named as they stood in 2011. Section 3 gives their place on today's map.

| Tribe (population) | Where it lives | Speech | Livelihood | One feature |
|---|---|---|---|---|
| Chenchu (47,315) | Nallamala hills and forests; Prakasam, Guntur and Kurnool districts; many on the banks of the Krishna gorge | Telugu | By tradition food gathering and hunting; now also labour for the Forest Department | Settlements are called gudems. The tribe has a special part in the Sivaratri festival at Srisailam |
| Konda Reddi (90,937) | Hill tracts of East Godavari and West Godavari, with some in Visakhapatnam; also Khammam in Telangana | Telugu | Podu and settled cultivation; forest produce; some horticulture, such as cashew | Also called Pandava Reddis. The headman is the peddakapu; the staple food is jowar |
| Savara (1,37,613) | Hill tracts of Srikakulam and Vizianagaram, which hold 98.79 per cent of the tribe | Its own dialect, Savara; also Telugu | Konda Savara: podu, horticulture and forest produce. Kapu Savara: settled cultivation | Wall paintings; a fruit-eating festival; totemic clans taken over from the Jatapu |
| Kondh, also written Khond (1,02,378) | Hill tracts of Visakhapatnam: the eleven tribal mandals of the Paderu agency | Kui or Kuvi, Dravidian languages; many also speak a form of Odia. They call themselves Kuvinga or Kuidora | Podu; forest produce; cows, pigs and fowls | Animal sacrifice is still practised. Groups include the Dongria and the Kutia Kondh |
| Gadaba (37,798) | Forest zones of Visakhapatnam, Vizianagaram and Srikakulam; most are in Vizianagaram | Its own dialect | Podu; sheep and goats; settled cultivation in the plains | Sub-groups include the Bodo Gadaba and the Gutob Gadaba |
| Porja (36,145) | The Visakhapatnam agency, above all Munchingput mandal | Its own dialect; also Adivasi Odia and Telugu | Podu and terrace cultivation; forest produce | Clans are named after natural objects, such as Korra (sun) and Kilo (tiger) |

- **Podu** is shifting cultivation on hill slopes.
- Together the six tribes number 4,52,186, about 16.5 per cent of the State's STs. The Savara are the largest of the six and the Porja the smallest.
- **Other tribes of the Paderu hills:** the Bagata, the Valmiki, the Konda Dora, the Kotia, the Mali and the Nooka Dora are among those named for Alluri Sitharama Raju district. First languages returned in that district: Telugu 66.54 per cent, Odia 17.39 per cent, Kuvi 11.12 per cent and Konda 3.19 per cent.
- **Koya:** a tribe of the Godavari gorges, with totemic clans. In 2001 it was the second largest tribe of the undivided State.

## 2.4 Tribes of the plains

| Tribe | Where it lives | Livelihood | One feature |
|---|---|---|---|
| Yanadi | Mostly Nellore district, where 1,76,314 of the 2,15,452 STs (about 82 per cent) are Yanadi, by the district website's table of 2023. They live by river banks, lakes, tanks and canals | Fishing in inland tanks and canals; farm labour | The Nellore district website calls it the tribe with the highest population in the present State |
| Yerukula | Throughout the State, in villages shared with other communities | By tradition basket makers and pig rearers; small businesses | It had the highest literacy among the major tribes of the undivided State in 2001: 45.4 per cent |
| Sugali, also called Lambada | Mostly in Telangana; Kurnool and Prakasam are named among its districts | Once nomadic; now mostly settled cultivators who also rear cattle | Its hamlets are called tandas. It was a Scheduled Tribe in the Andhra region from 1956. The Scheduled Castes and Scheduled Tribes Orders (Amendment) Act, 1976 removed the area restriction, and from 1977 it was a Scheduled Tribe in the whole of the then State, Telangana included |
| Nakkala | Nellore district | Making small toys and selling them in towns and in other States | It is named with the Yanadi and the Yerukula among the 34 tribes |

- **Largest tribes:** in the undivided State in 2001 the order was Sugali (41.4 per cent of all STs), Koya (11.3), Yanadi (9.2), Yerukula (8.7) and Gond (5). The Sugali live mostly in Telangana, so this order does not hold for the present State.

## 2.5 Particularly vulnerable tribal groups (PVTGs): the list

- India has 75 PVTGs, in 18 States and one Union Territory. The marks of such a group are a pre-agricultural way of life, very low literacy and a population that is stagnant or falling.
- **The 12 names listed for Andhra Pradesh and Telangana together:** Chenchu, Bodo Gadaba, Gutob Gadaba, Dongria Khond, Kutia Khond, Kolam, Konda Reddi, Konda Savara, Bondo Porja, Khond Porja, Parengi Porja and Thoti.
- **In the present State:** the Andhra University study counts six tribes: Chenchu, Gadaba, Khond, Konda Reddi, Savara and Porja. They cover ten of the 12 names; Kolam and Thoti are not among the six.
- The Koya, the Yanadi, the Yerukula and the Sugali are not in the list. Topic 665 takes up the PVTGs in detail.

## 2.6 Culture and livelihood

- **Podu country:** podu is common in the hills of Visakhapatnam, East Godavari and Vizianagaram. In the undivided State, podu, settled farming and the collection of forest produce together made up 88 per cent of tribal occupations.
- **Dhimsa:** the district website calls it "the most famous cultural expression of the Araku Valley hill tribes". A group of 15 to 20 women dance; the men play the mori (a wind instrument), the thudum (a drum) and the dappu.
- **Festivals of the Paderu agency:** Itika Pongal, a hunting and harvest festival; the indigenous seed festival (Patha Vithanala Pandaga), held in April; and the Araku Chali Utsav, a three-day winter festival for visitors.
- **Araku Tribal Museum:** it shows the life of more than 17 tribal societies of the Eastern Ghats, with models of hamlets, hunting weapons, utensils and musical instruments.

- **Araku coffee:** in 1956 the Coffee Board named the GCC to promote coffee plantations through tribal farmers. Finished plantations were handed to tribal families at two acres each.
- **A name:** Alluri Sitharama Raju district is named after Alluri Sitarama Raju, a revolutionary of the freedom movement who came from this region. He led the Rampa rebellion in the hills of the Godavari Agency, from August 1922 until he was captured and killed in May 1924. A main grievance was the forest restrictions of the Madras Forest Act, 1882, which limited podu. The rebellion has its own topic.

### 2.7 Schemes, with dates

| Scheme | Date | Point to remember |
|---|---|---|
| Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM-JANMAN) | Launched on 15 November 2023, Janjatiya Gaurav Divas, at Khunti in Jharkhand | For the 75 PVTG communities in 18 States and one Union Territory; outlay Rs 24,104 crore; 11 interventions through 9 Ministries |
| Dharti Aaba Janjatiya Gram Utkarsh Abhiyan | Launched on 2 October 2024 at Hazaribagh in Jharkhand | Total outlay of over Rs 79,150 crore; it combines the efforts of 17 Ministries |
| Eklavya Model Residential Schools | Position in 2026 | 499 schools working in the country and 323 more being built |
| Forest Rights Act, 2006 (the RoFR Act) | In force since 31 December 2007 | It recognises individual and community claims to forest land. Nellore district reports 1,060 such claims and 28,099 acres distributed |

- **Janjatiya Gaurav Divas** is observed on 15 November every year, the birth anniversary of Birsa Munda.
- In June 2026, 11 museums of tribal freedom fighters stood sanctioned in 10 States. Seven were under construction, one of them in Andhra Pradesh.

## 3. Extra section: locations, from the old district map to the map of 11 October 2026

An Integrated Tribal Development Agency (ITDA) is the project office for the development of a tribal tract. A Lok Sabha answer of 22 August 2006 listed eight ITDAs in the undivided State: Seethampeta, Parvathipuram, Paderu, Rampachodavaram, K.R. Puram, Bhadrachalam, Eturunagaram and Utnoor. The last three, Bhadrachalam (Khammam), Eturunagaram (Warangal) and Utnoor (Adilabad), went to Telangana. The other five are below. A later Rajya Sabha answer dated 21 November 2019 (Question 631, Annexure II) lists eight ITDAs in post-bifurcation Andhra Pradesh: Kotaramachandrapuram, Paderu, Parvathipuram, Rampachodavaram, Seethampeta, Chinthur, Nellore and Srisailam. This is a dated 2019 official list, not a certified October 2026 directory. Nellore district's official ITDA page confirms the separate ITDA for Yanadis, established in 2002.

Andhra Pradesh had 13 districts until 4 April 2022 and 26 after that. It has 28 districts since 31 December 2025 (Topic 45).

| ITDA | District on the 13-district map | Position on 11 October 2026 | Tribes linked with it |
|---|---|---|---|
| Seethampeta | Srikakulam | The Parvathipuram Manyam district website lists Seethampeta among its tribal mandals | Savara |

| ITDA | District on the 13-district map | Position on 11 October 2026 | Tribes linked with it |
|---|---|---|---|
| Parvathipuram | Vizianagaram | Parvathipuram Manyam district, formed on 4 April 2022 with headquarters at Parvathipuram | Savara, Gadaba |
| Paderu | Visakhapatnam | Alluri Sitharama Raju district, headquarters Paderu. Since 31 December 2025 the district is the Paderu revenue division alone | Kondh, Porja, Bagata, Valmiki, Konda Dora |
| Rampachodavaram | East Godavari | Polavaram district, formed on 31 December 2025 with headquarters at Rampachodavaram. From 4 April 2022 until then it was in Alluri Sitharama Raju district | Konda Reddi |
| K.R. Puram | West Godavari | The hill tract of the old West Godavari district lies by the Godavari. Topic 45 places that stretch of the river in Eluru district | Konda Reddi |

How to hold it in memory:

- **One kind of country:** all five lie in the hills of the Eastern Ghats, from Srikakulam to the Godavari.
- **Three steps for one place:** Rampachodavaram was in East Godavari district until 2022, in Alluri Sitharama Raju district from 2022 to 2025, and is the headquarters of Polavaram district since 31 December 2025.
- **Agency:** the hilly, forested tribal tract is called the Agency. In Parvathipuram Manyam district it is made up of parts of the old Parvathipuram and Salur taluks.
- **Chintur, an ITDA after 2014:** in 2016 the State decided to set up an ITDA with its headquarters at Chintur for four mandals that came to Andhra Pradesh from Telangana after bifurcation: Bhadrachalam mandal (except the Bhadrachalam revenue village), Kunavaram, Chintur and Vara Ramachandrapuram.

## 4. Three common exam traps

1. **Figures of the undivided State given as those of the present State.** 59.18 lakh, about 7 per cent and 35 tribes belong to the undivided State. 27,39,919, 5.53 per cent and 34 tribes belong to the present State. Many books still print the first set. In the same way, "the Sugali are the largest tribe" is a statement about the undivided State, and Bhadrachalam, Eturunagaram and Utnoor, three of the eight ITDAs in the Lok Sabha answer of 2006, lie in Telangana.
2. **Old district names.** Books place Paderu in Visakhapatnam district, Rampachodavaram in East Godavari district and Srisailam in Kurnool district. On 11 October 2026 they are in Alluri Sitharama Raju, Polavaram and Nandyal districts. Note also that Alluri Sitharama Raju district has not included Rampachodavaram since 31 December 2025.
3. **Three lists that are not the same.** The list of Scheduled Tribes is a list of communities. The Scheduled Areas are a list of villages: a tribal village may lie outside them, and plains tribes such as the Yanadi and the Yerukula live outside them. The PVTGs are groups chosen from inside the list of Scheduled Tribes; they are not a separate set of tribes.

PART 1 · STUDY NOTES · TOPIC 96

# Greenhouse effect, global warming and greenhouse gases

Science & Technology | Item 22

## 1. Concept in one line

The greenhouse effect is the warming of the Earth that comes about because certain gases of the atmosphere absorb the long wave radiation given out by the Earth, and global warming is the rise in the Earth's average surface temperature as human activities add to those gases. The examination asks about the gases and their warming strength, the gases listed under the Kyoto Protocol, and the dated figures of concentration and temperature.

## 2. Revision notes

### 2.1 The natural greenhouse effect

- Insolation reaches the Earth in short waves, and the atmosphere is largely transparent to it. The heated surface gives out terrestrial radiation in long waves, as infrared heat (Topic 25).
- The gases that absorb long wave radiation are called greenhouse gases (NCERT). They absorb this heat and re-radiate it, which slows the loss of heat to space (NASA). This is the greenhouse effect.
- NCERT: "Due to the presence of greenhouse gases, the atmosphere is behaving like a greenhouse." A greenhouse is the glass house of cold areas: its glass lets radiation in and stops long wave radiation going out.
- Without the greenhouse effect, the Earth's average surface temperature would be about minus 18°C. It is about 15°C. So the natural greenhouse effect keeps the Earth about 33°C warmer, and NASA calls it essential to life on Earth.
- Nitrogen, oxygen and argon make up almost all of dry air (Topic 15), yet they are not greenhouse gases: they are transparent to long wave radiation.
- **Enhanced greenhouse effect:** human action raises the concentration of greenhouse gases and so increases the natural effect. The resulting rise in the Earth's average surface temperature is **global warming**.

### 2.2 The greenhouse gases, one by one

Figures marked IPCC are from the Sixth Assessment Report (AR6, finalised in March 2023) of the Intergovernmental Panel on Climate Change (IPCC). WMO is the World Meteorological Organization. GWP (global warming potential) is explained below the table.

| Gas | Main sources and points | Lifetime in the atmosphere (IPCC) | GWP over 100 years (IPCC) |
|---|---|---|---|
| Water vapour | The most abundant greenhouse gas (NASA). Warmer oceans add more of it to the air, so it acts as a feedback and not as a forcing (2.5) | Not listed: water vapour added by human activity falls out as precipitation within weeks | Negligible, by the way GWP is defined |

| Gas | Main sources and points | Lifetime in the atmosphere (IPCC) | GWP over 100 years (IPCC) |
|---|---|---|---|
| Carbon dioxide (CO2) | Natural processes, and human activities such as burning fossil fuels and deforestation (NASA) | No single figure; its effect lasts for hundreds of years (WMO) | 1 (the reference gas) |
| Methane (CH4) | About 40% natural, such as wetlands; about 60% human: cattle, rice farming, fossil fuel exploitation, landfills, biomass burning (WMO) | 11.8 years (the WMO, October 2025: about 9 years) | 29.8 for methane of fossil origin; 27.0 for methane of non-fossil origin |
| Nitrous oxide (N2O) | Natural and human sources; human ones include biomass burning, fertiliser use and industrial processes (WMO) | 109 years | 273 |
| Ozone (O3) | Listed by NCERT among the primary greenhouse gases of concern; ozone in the troposphere is a forcing | Not given | Not given |
| Fluorinated gases: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3) | The four fluorinated entries of the Kyoto list (2.3) | HFC-134a 14 years; HFC-23 228 years; CF4, a PFC, 50,000 years | HFC-134a 1,530; CF4 7,380; HFC-23 14,600; NF3 17,400; SF6 24,300, the highest in this table |
| Chlorofluorocarbons (CFCs), for comparison | Entirely industrial; used as refrigerants, solvents and spray-can propellants (NASA) | CFC-11 52 years; CFC-12 102 years | CFC-11 6,230; CFC-12 12,500 |

- **Global warming potential (GWP):** an index of the radiative forcing (the change in the flow of energy through the climate) that follows the emission of a unit mass of a gas over a chosen period, compared with the same mass of carbon dioxide, whose GWP is 1 by definition.
- **Carbon dioxide equivalent (CO2e):** the mass of carbon dioxide that would warm the Earth as much as a given mass of another gas. One tonne of nitrous oxide counts as 273 tonnes of CO2e.
- Tonne for tonne, carbon dioxide has the lowest GWP of the gases in the table that are given a figure: it is the reference gas, with a GWP of 1. (Water vapour is given no figure; its GWP is negligible.) It leads because of the quantity emitted and its long stay in the air: in 2019, carbon dioxide from fossil fuels and industry had the largest share of the world's emissions (IPCC).
- GWP values change from one IPCC report to the next (Section 3). India's report of 2025 (2.7) uses the values of the Fifth Assessment Report: 28 for methane and 265 for nitrous oxide.

## 2.3 Which treaty counts which gas

| Group | Gases | Where they stand |
|---|---|---|
| The six gases of the Kyoto Protocol of 1997 (its Annex A) | Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride | Their emissions are added up as carbon dioxide equivalent |
| The seventh gas | Nitrogen trifluoride | Added by the Doha Amendment, adopted at Doha, Qatar, on 8 December 2012. It applies only from the beginning of the second commitment period (2013 to 2020). The Amendment entered into force on 31 December 2020 |
| Greenhouse gases kept out of the Kyoto list | Chlorofluorocarbons and hydrochlorofluorocarbons (HCFCs) | The Kyoto Protocol speaks throughout of greenhouse gases "not controlled by the Montreal Protocol". The Montreal Protocol, the treaty on the ozone layer, covers these gases (Topic 287) |

- The CFCs are greenhouse gases as well as ozone-depleting substances: see their GWPs in 2.2. HCFC-22 has a GWP of 1,960 (IPCC).
- Water vapour and ozone are not on the Kyoto list.
- **Black carbon is not a gas** and is not on the Kyoto list. It is the carbon in soot, an aerosol (fine particles in the air); soot on snow or ice adds to the warming. The IPCC counts it among the **short-lived climate forcers (SLCFs)**, reactive compounds whose lifetime in the atmosphere is typically under two decades, with methane and ozone. Its particles stay in the air for 4 to 12 days on average (Climate and Clean Air Coalition).
- The treaties themselves come in Topic 107.

## 2.4 The enhanced greenhouse effect: concentrations since 1750

The WMO Greenhouse Gas Bulletin No. 21, published on 15 October 2025, gives the global averages for 2024.

| Gas | Global average in 2024 | Change from the pre-industrial level (1750) |
|---|---|---|
| Carbon dioxide | 423.9 ppm | Up 53%, from about 278 ppm |
| Methane | 1,942 ppb | Up 166% |
| Nitrous oxide | 338.0 ppb | Up 25% |

- ppm is parts per million (Topic 15) and ppb is parts per billion. 1 ppm is 1,000 ppb.
- From 2023 to 2024 carbon dioxide rose by 3.5 ppm, the largest rise in one year since modern measurements began in 1957. The WMO's reasons: wildfire emissions, and a weaker uptake by land and ocean in 2024, a year of strong El Niño.
- IPCC: carbon dioxide at 410 ppm in 2019 was higher than at any time in at least 2 million (20 lakh) years; methane and nitrous oxide were the highest in at least 800,000 (8 lakh) years.
- These are global averages for a whole year. The figure in Topic 15 is a monthly mean at one station, Mauna Loa in Hawaii.

- **The Keeling Curve** is the graph of carbon dioxide measured at Mauna Loa since March 1958, in the programme begun by Charles David Keeling. It shows a steady rise with a yearly swing of about 6 ppm, as plants take up carbon dioxide with the seasons. (The WMO's 1957 is for modern measurements in general.)

## 2.5 Global warming so far, forcings and feedbacks

| Period | Warming above the average of 1850 to 1900 | Source |
|---|---|---|
| The decade 2011 to 2020 | 1.1°C (best estimate 1.09°C; range 0.95°C to 1.20°C) | IPCC, AR6 |
| The year 2024 | About 1.55°C (± 0.13°C); the warmest year on record | WMO |
| The year 2025 | 1.43°C (± 0.13°C) in the WMO's State of the Global Climate 2025 (March 2026); the release of 14 January 2026 had given 1.44°C. The second or third warmest year, depending on the dataset | WMO |
| The three years 2023 to 2025 | 1.48°C (± 0.13°C) on average | WMO, release of 14 January 2026 |

- As on 11 October 2026, 2025 is the latest full year. In all the 8 datasets that the WMO uses, the 11 years from 2015 to 2025 are the 11 warmest years.
- The land has warmed more (1.59°C) than the ocean (0.88°C) (IPCC, for 2011 to 2020).
- NCERT gives an older figure: by the end of the 20th century the global mean temperature had risen by about 0.6°C.
- **Cause:** the IPCC says that human activities, mainly through emissions of greenhouse gases, have "unequivocally caused global warming". Greenhouse gases added 1.0°C to 2.0°C of warming; aerosols took away 0.0°C to 0.8°C by cooling.
- **Forcing and feedback (NASA):** a forcing acts on the climate and changes how energy flows through it (for example, long-lasting heat-trapping gases). A feedback amplifies or reduces a change as time goes on.
- **Water vapour feedback:** warmer air can hold more moisture, and water vapour is itself a greenhouse gas. The IPCC counts this, taken with the lapse-rate feedback, as the largest single feedback.
- **Ice-albedo feedback:** as snow cover and sea ice shrink in the Arctic, the surface reflects less sunlight and the Arctic warms faster (albedo: Topic 25).
- **Permafrost feedback:** when permafrost, the frozen ground, thaws, it releases methane and carbon dioxide.

## 2.6 Effects in brief (detail in Topic 586)

- **Sea level:** up 0.20 m between 1901 and 2018 (IPCC). The WMO's State of the Global Climate 2025 (March 2026) gives a rise of 4.75 mm a year for 2012 to 2025, against 2.65 mm a year for 1993 to 2011. The WMO's release of November 2025 gave 4.1 mm a year for 2016 to 2025, against 2.1 mm a year for 1993 to 2002. The figure depends on the period taken; both show the rate rising.
- **Ice:** 2023-24 was the third year in a row in which every monitored glacier region lost ice (WMO). The Arctic sea-ice maximum of 2025 was the lowest in the satellite record. The WMO (November 2025) gives it as 13.8 million sq km, in March; the US National Snow and Ice Data Center (NSIDC) gives the daily maximum as 14.33 million sq km, on 22 March 2025.
- **Oceans:** over 90% of the extra energy goes into warming the ocean (WMO); the carbon dioxide they absorb makes them more acidic.

- **Extremes:** human-caused climate change already affects weather and climate extremes in every region (IPCC).

## 2.7 Who emits: the world and India

World, for 2019 (IPCC):

- Net human-caused emissions were 59 ± 6.6 gigatonnes of CO2e, about 54% more than in 1990. One gigatonne is 1 billion (100 crore) tonnes.
- About 79% came from energy, industry, transport and buildings together, and about 22% from agriculture, forestry and other land use (rounded shares).
- Per person, the world average was 6.9 tonnes of CO2e (leaving out land-use carbon dioxide); the least developed countries averaged 1.7 tonnes.

India, for 2022, from its First Biennial Transparency Report to the United Nations Framework Convention on Climate Change (UNFCCC), published by the Ministry of Environment, Forest and Climate Change in 2025. The report gives inventories for 2005, 2020, 2021 and 2022; 2022 is the latest. It prints the totals in gigagrams (1 Gg is 1,000 tonnes): 3,396,372 Gg without LULUCF, 571,823 Gg removed by LULUCF, and 2,824,549 Gg with LULUCF. The table rounds them to million tonnes.

| Item | Figure for 2022 |
|---|---|
| Total emissions, without LULUCF | 3,396 million tonnes of CO2e |
| Net removal by LULUCF | 572 million tonnes of CO2e |
| Net emissions, with LULUCF | 2,825 million tonnes of CO2e |
| Energy | 73.38% of the total without LULUCF |
| Agriculture | 15.00% |
| Industrial processes and product use | 8.86% |
| Waste | 2.76% |

- LULUCF is land use, land-use change and forestry; in India it removes more than it emits.
- The report says India's per capita emissions remain well below the global average. A Lok Sabha answer of the Ministry (13 February 2023) adds that India "has contributed only around 4 percent of global cumulative emissions from 1850 to 2019", "despite being home to around 17 percent of humanity".
- The emissions intensity of India's GDP fell by 37.38% between 2005 and 2022. The 36% of Topic 80 is for 2005 to 2020.

## 2.8 Short clarifications

| Point | Greenhouse effect and global warming | Ozone depletion |
|---|---|---|
| What happens | Greenhouse gases absorb the Earth's outgoing long wave radiation, and the Earth warms | CFCs that drift into the stratosphere destroy ozone; the fall in ozone there is called the ozone hole (NCERT) |
| Radiation concerned | The long wave (infrared) radiation of the Earth | The ultraviolet rays of the Sun, which the ozone of the stratosphere absorbs (Topic 15) |
| Treaty | The Kyoto Protocol (Topic 107) | The Montreal Protocol (Topic 287) |

- The link: the CFCs do both kinds of harm, and ozone is itself a greenhouse gas.

- **Weather and climate:** the heat of one season or one year is not, by itself, climate change. La Niña cooled 2025 for a time, and the WMO's message was that such temporary cooling does not reverse the long-term trend.
- **Carbon sinks:** a sink removes a greenhouse gas from the air. About half of the carbon dioxide emitted stays in the atmosphere; land ecosystems and the oceans absorb the rest (WMO).
- **Sequestration:** to sequester carbon is to lock it away in such stores; India's climate targets include an additional carbon sink through forest and tree cover (Topic 80). Carbon markets come in Topic 457.
- **The IPCC:** set up in 1988 by the WMO and the United Nations Environment Programme (UNEP), and endorsed by the UN General Assembly the same year, to give policymakers regular scientific assessments of climate change. Its six assessment reports are dated in Section 3. It shared the Nobel Peace Prize of 2007 with Al Gore of the United States (Topic 587).
- As on 11 October 2026 the IPCC is in its seventh assessment cycle (AR7). The cycle formally began in July 2023 with the election of a new Chair and Bureaus; its Synthesis Report is planned for release by late 2029.

## 3. Extra section: a timeline, and the same gas in three IPCC reports

| Year or date | Event |
|---|---|
| 1824 | Joseph Fourier proposes that the effect exists, without giving it this name |
| 1896 | Svante Arrhenius makes the first quantitative prediction of global warming from a doubling of carbon dioxide |
| 1901 | Nils Gustaf Ekholm first applies the term "greenhouse" to the effect |
| 1957 | Modern measurements of carbon dioxide begin |
| March 1958 | Charles David Keeling's measurements at Mauna Loa, Hawaii, begin: the Keeling Curve |
| 1988 | The IPCC is set up by the WMO and UNEP |
| 1990 | First Assessment Report; it plays a decisive role in the creation of the UNFCCC |
| 1995 | Second Assessment Report; it gives governments material ahead of the Kyoto Protocol |
| 1997 | Kyoto Protocol, with its list of six gases |
| 2001 | Third Assessment Report |
| 2005 | The Kyoto Protocol goes into effect |
| 2007 | Fourth Assessment Report; Nobel Peace Prize for the IPCC and Al Gore |
| 8 December 2012 | Doha Amendment adopted; nitrogen trifluoride becomes the seventh gas |
| 2013 to 2014 | Fifth Assessment Report finalised; it is the scientific input for the Paris Agreement |
| 31 December 2020 | The Doha Amendment enters into force |
| March 2023 | Sixth Assessment Report finalised, in time for the first global stocktake |
| July 2023 | The IPCC's seventh assessment cycle formally begins |

| Year or date | Event |
|---|---|
| 2024 | The warmest year on record: about 1.55°C above the average of 1850 to 1900 |
| 15 October 2025 | WMO Greenhouse Gas Bulletin No. 21: carbon dioxide at 423.9 ppm in 2024 |
| 14 January 2026 | The WMO puts 2025 at 1.44°C above the average of 1850 to 1900 |

The 100-year GWP of the same gas in three reports:

| Gas | Fourth Assessment Report (2007) | Fifth Assessment Report (2013 to 2014) | Sixth Assessment Report |
|---|---|---|---|
| Methane, non-fossil | 25 | 28 | 27.0 |
| Methane, fossil | Not given separately | 30 | 29.8 |
| Nitrous oxide | 298 | 265 | 273 |
| HFC-134a | 1,430 | 1,300 | 1,530 |
| Nitrogen trifluoride | 17,200 | 16,100 | 17,400 |
| Sulphur hexafluoride | 22,800 | 23,500 | 24,300 |

- The order of the gases is the same in all three reports. Only the figures move.
- Countries do not all use the same report. In 1997 the Parties asked for the values of the IPCC's Second Assessment Report, and in 2013 for those of the Fourth. So an older book can carry older figures. If a question names a report, give that report's figure.
- The IPCC's own table prints HFC-134a as 1,526 in one place and, rounded, as 1,530 in another. Both are the Sixth Assessment Report's value.

## 4. Three common exam traps

1. **"The greenhouse effect and the ozone hole are the same problem."** They are two problems. The greenhouse effect is about the Earth's long wave radiation being absorbed by gases. Ozone depletion is about the loss of ozone in the stratosphere, the ozone that absorbs the Sun's ultraviolet rays. The confusion arises because the CFCs do both kinds of harm.
2. **"Carbon dioxide is the most abundant and the most powerful greenhouse gas, and the greenhouse effect is harmful in itself."** Water vapour is the most abundant greenhouse gas, but it acts as a feedback. Tonne for tonne, carbon dioxide has the lowest GWP of the gases in the 2.2 table that are given a figure: it is the reference gas, so its GWP is fixed at 1. It leads the warming because of the quantity emitted. And the natural greenhouse effect is what keeps the Earth liveable; the trouble is the enhanced effect.
3. **Mixing up the bases and the periods.** Concentrations are compared with the level of 1750. Temperatures are compared with the average of 1850 to 1900. The IPCC's figure of warming is the average of a decade, while the WMO's yearly figure is for one year only, so the two cannot be set against each other as if they measured the same thing. A single hot year does not replace the long-term figure.

PART 1 · STUDY NOTES · TOPIC 97

# Solar technologies: photovoltaic and solar thermal

Science & Technology | Item 21

## 1. Concept in one line

Sunlight is put to use in two ways: a photovoltaic (PV) cell turns light directly into electricity, and solar thermal devices use the sun's heat, either as heat or, in concentrating solar power (CSP) plants, to run a turbine or an engine. The examination asks for the kinds of solar cell, the kinds of concentrating collector, the differences between the two routes, and India's dated figures and rules.

## 2. Revision notes

Topic 76 explained MWe (megawatts of electrical output). Below, 1 GW = 1,000 MW.

### 2.1 How a solar cell works

- A solar cell directly converts the energy of light into electrical energy through the photovoltaic effect (Britannica). It is made of a semiconductor, usually silicon: a material that conducts electricity better than an insulator but not as well as a metal.
- **The p-n junction:** a silicon wafer that is lightly doped p-type is given a thin n-type layer on its front. The boundary between the two layers is the p-n junction.
- **From photons to current:** light arrives as photons; photons with enough energy free electrons, and each freed electron leaves behind a "hole": light creates electron-hole pairs. The cell lets the freed electrons move in one direction only, so it gives direct current (DC).
- **Bandgap:** this property of a semiconductor decides which wavelengths of light it can absorb and convert.
- **Cell, module, panel, array:** cells sealed together behind glass form a module, in everyday speech a solar panel. Modules mounted together form an array.
- **Inverter:** modules give DC, but the grid and home appliances work on alternating current (AC). The inverter converts DC into AC.
- **History:** Edmond Becquerel demonstrated the photovoltaic effect in 1839. The first practical photovoltaic cell, a silicon cell, was publicly demonstrated at Bell Laboratories in 1954.

### 2.2 Kinds of solar cell

Laboratory records below use a minimum cell area of 1 $cm^2$; smaller research cells may have higher records. Figures are as given in the Photovoltaics Report of the Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE) of 14 July 2026; strengths and weaknesses are mostly from the US Department of Energy (DOE).

| Kind of cell | Material | Efficiency, as the source gives it | One strength | One weakness |
|---|---|---|---|---|
| Monocrystalline silicon | A single crystal, cut from ingots grown by the Czochralski process | Record laboratory cell: 28.1 per cent. Crystalline silicon modules on the market averaged 22.7 per cent in the last quarter of 2024 | High efficiency; modules are expected to last 25 years or more | Costlier to make than polycrystalline silicon |

| Kind of cell | Material | Efficiency, as the source gives it | One strength | One weakness |
|---|---|---|---|---|
| Polycrystalline (multicrystalline) silicon | Silicon cast in square ingots of many crystals | Less efficient than monocrystalline silicon | Less expensive | Fraunhofer ISE's table shows none of it in the world production of 2025 |
| Amorphous silicon (thin film) | Non-crystalline silicon deposited on glass | The lowest of the three forms of silicon (Britannica) | A well-developed thin-film technology | Low efficiency |
| Cadmium telluride, CdTe (thin film) | A compound of cadmium and tellurium | 21.0 per cent under Fraunhofer's minimum 1 $cm^2$ criterion; the NLR research-cell chart (17 July 2026) lists 23.1 per cent for a smaller cell; modules have risen from 15.6 to almost 20 per cent | Low-cost manufacturing; it is the second most common PV material after silicon | Needs more protection for a long outdoor life |
| Copper indium gallium diselenide, CIGS (thin film) | A compound of four elements | Record laboratory cell: 23.4 per cent | High efficiency in the laboratory | Four elements make factory production harder |
| Multi-junction cell | Stacked layers of III-V semiconductors (gallium arsenide based), each with a different bandgap | Above 45 per cent (DOE); up to 47.6 per cent under highly concentrated light | The highest efficiency: each layer absorbs a different part of the spectrum | Costly, so it is used mainly in space, as on satellites |
| Perovskite cell | A thin film named after its crystal structure | Record laboratory cell: 26.9 per cent; about 3 per cent in 2009 and over 25 per cent in 2020 | Easy to assemble | Durability: it must last about 20 years outdoors |
| Tandem cell | A cell with exactly two bandgaps, such as perovskite over silicon | Record laboratory cell (perovskite over silicon): 35.2 per cent | It beats either material used alone | Depends on the durability of the perovskite layer |
| Organic and dye-sensitised cells | Organic: carbon-rich compounds. Dye-sensitised: dye on titanium dioxide | Organic: about half that of crystalline silicon. Dye-sensitised: below the best thin-film cells | Organic cells can be put on flexible plastic | Low efficiency; shorter working life |

- **What the market uses:** silicon wafer cells made up about 98 per cent of world production in 2025, and thin film 2 to 3 per cent (Fraunhofer ISE).
- **Concentration PV (CPV):** a mirror or lens focuses sunlight on a small cell; it still makes electricity from light, not from heat.

## 2.3 Newer designs named in tenders and news

All four are crystalline silicon designs.

- **PERC (Passivated Emitter Rear Contact):** a film at the back helps the cell capture more light; made on p-type wafers.

- **TOPCon (Tunnel Oxide Passivated Contact):** adds a thin oxide layer to the PERC design; made on n-type wafers. Fraunhofer ISE calls it the dominant technology.
- **Heterojunction:** another design on n-type monocrystalline wafers. With TOPCon it is replacing PERC; n-type wafers had an 86 per cent share in 2025.
- **Bifacial module:** its transparent rear side lets it absorb light on both faces, so it gives more electricity.

## 2.4 Efficiency and what limits it

- **Efficiency** is the percentage of the solar energy shining on a PV device that is converted into usable electricity.
- **Reflection:** untreated silicon reflects more than 30 per cent of the light; anti-reflection coatings and textured surfaces cut this.
- **Recombination:** a freed electron may recombine with a hole inside the cell and is lost to the current, a fundamental limit (DOE).
- **Temperature:** solar cells generally work best at low temperatures. When a cell gets hotter, its current rises slightly but its voltage falls much more, so its output drops.
- **Dust (soiling):** dirt on the modules cuts the light that reaches the cells. The world's annual energy loss from soiling in 2018 was estimated at no less than 3 to 4 per cent.
- **Shockley-Queisser limit (1961):** theory limits a cell with a single p-n junction to about 33 per cent. Multi-junction and tandem cells go beyond it.
- **Watt-peak (Wp):** rated power, measured under a standard level of light at a constant cell temperature. World production in 2025 is estimated at 706 GWp.

## 2.5 Systems and where the modules are placed

- **Grid-connected and off-grid:** a grid-connected system feeds the grid through its inverter; an off-grid system, such as a stand-alone solar pump, is not joined to the grid. Batteries store solar energy for night or poor weather.
- **Net metering:** a billing arrangement in which one meter measures the current flowing both ways, so a consumer can use self-generated electricity at any time.
- **Solar trackers:** one-axis trackers follow the sun from east to west; two-axis trackers keep the modules pointed directly at it. They give more energy but cost more.
- **Building-integrated photovoltaics (BIPV):** the modules are built into roofing, windows or facades.
- **Agrivoltaics:** the same land is used both for solar energy and for farming.
- **Floating solar:** the modules float on a reservoir. On 4 January 2025 the Press Information Bureau (PIB) described the Omkareshwar Floating Solar Park in Khandwa district, Madhya Pradesh, as the largest floating solar park in India; 278 MW of its planned 600 MW had then been commissioned. The cooling effect of the water improves the performance of the panels.

## 2.6 Solar thermal: using the heat directly

- **Flat-plate collector:** the common collector for hot water. It loses heat through its glass cover, so it suits low-temperature uses such as hot water.
- **Evacuated tube collector:** a vacuum between two concentric tubes, as in a vacuum flask, cuts heat loss. A flat plate is generally more efficient in full sunshine; the evacuated tube, in cloudy or extremely cold weather.
- **Solar cookers:** a box cooker typically reaches 50 to 100 °C and works even under partly overcast skies; Horace de Saussure built the first one in 1767. Concentrating cookers reach up to 350 °C but need direct sunlight. A system built in 1999 at Abu Road in Rajasthan can cook up to 35,000 meals a day.
- **Solar dryers and stills:** solar heat dries wood, fruits, grains and fish. In a solar still the sun's heat evaporates water, which condenses under a glass cover and is collected as drinking water.

- **Solar pond:** a pool of salt water that stores solar heat. Low-salinity water floats on high-salinity water and the heated bottom layer does not mix readily with it, so the bottom can reach up to 90 °C while the top stays at 30 °C. One was built at Bhuj in Gujarat.

## 2.7 Concentrating solar power (CSP)

Mirrors concentrate sunlight on a receiver. A heat-transfer fluid carries the heat, which drives a turbine or an engine.

| System | Mirrors | Where the light is concentrated | Heat-transfer fluid | Note |
|---|---|---|---|---|
| Parabolic trough | Parabola-shaped mirrors in rows, turning on one axis from east to west | On a receiver tube along the focal line; the tube is fixed to the mirror structure and moves with it | Synthetic oil, molten salt or pressurised steam | The most common CSP system in the United States |
| Linear Fresnel reflector | Flat or slightly curved mirrors on trackers mounted on the ground | On a receiver tube that stays fixed in space above the mirrors | A fluid in the tube; steam can also be raised directly in the solar field | Cheaper than the trough; few plants use it |
| Solar tower (central receiver) | A large number of flat, sun-tracking mirrors called heliostats | On one receiver at the top of a tall tower | Water turned to steam in some towers; molten salt in others | Ivanpah in California: 392 MW, 173,500 heliostats, three towers |
| Parabolic dish with a Stirling engine | A dish of mirrors that tracks the sun continuously | On a thermal receiver at the focus of the dish | Usually hydrogen or helium, which is both the heat-transfer medium and the working fluid of the engine | Small: typically 3 to 25 kW per dish |

- **Line focus and point focus:** the trough and the Fresnel reflector concentrate light along a line (a tube). The tower and the dish concentrate it on a point.
- **From heat to electricity:** trough, Fresnel and tower systems raise steam for a turbine; in the dish the heated gas moves the pistons of a Stirling engine.
- **Thermal storage in molten salt:** salt heated in sunlight hours is kept in insulated tanks and later raises steam, so the plant can generate in cloudy weather or at night. Plants are now offered with 3 to 12 hours of storage.

## 2.8 Photovoltaic and CSP compared

| Point | Photovoltaic (PV) | Concentrating solar power (CSP) |
|---|---|---|
| Sunlight it can use | Needs no focusing; a bifacial module also uses light reaching its rear | Direct sunlight: mirrors must track and focus the sun's beam, so the best sites have high direct radiation |
| Storage | Batteries store electricity for use without sunlight. A direct-use off-grid pump can operate without batteries; a grid-connected plant need not include them | Heat stored in molten salt, for generation after sunset |

| Point | Photovoltaic (PV) | Concentrating solar power (CSP) |
|---|---|---|
| Water | No steam cycle | Wet cooling uses about 3.1 to 3.4 cubic metres per MWh, more than coal or nuclear plants; dry cooling cuts this by 91 to 95 per cent |
| Scale and cost | An estimated 706 GWp of modules were made in 2025 alone | Under 10 GW installed worldwide in 2023; around 2020 the cheapest CSP power cost about five times utility-scale PV power |

## 2.9 India: capacity, resource and rules

Installed solar capacity as on 30 September 2026 (Ministry of New and Renewable Energy, MNRE):

| Category | Capacity (GW) | Share of solar (per cent) |
|---|---|---|
| Ground-mounted | 125.65 | 73.5 |
| Grid-connected rooftop | 33.41 | 19.5 |
| Hybrid projects (solar component) | 5.36 | 3.1 |
| Off-grid solar | 6.63 | 3.9 |
| Total solar | 171.05 | 100 |

- Solar is the largest renewable source: 171.05 GW out of 299.25 GW of renewable capacity (large hydro included), about 57 per cent. From April to September 2026, 20.79 GW of solar capacity was added.
- **Leading States** (solar capacity as on 30 September 2026, in MNRE's State-wise table): Rajasthan 45.12 GW, Gujarat 36.23 GW, Maharashtra 20.40 GW, Tamil Nadu 14.35 GW and Karnataka 12.35 GW. Andhra Pradesh comes sixth with 8.41 GW.
- **Resource:** about 5,000 trillion kWh of solar energy falls on India's land area a year; most parts receive 4 to 7 kWh per square metre per day. The National Institute of Solar Energy (NISE) has assessed the potential at about 748 GW, assuming 3 per cent of the waste land is covered with PV modules.
- **Manufacturing chain:** polysilicon, ingot, wafer, cell, module. The Standing Committee on Energy (report presented on 8 December 2025) recorded, as of June 2025, 91 GW a year of module capacity but only 2 GW of ingot and wafer capacity and none for polysilicon; India imports polysilicon, ingots and wafers.
- **Approved List of Models and Manufacturers (ALMM):** set up by an MNRE Order of 2 January 2019; List-I (modules) was first issued on 10 March 2021 and List-II (cells) on 31 July 2025. Government and government-assisted projects, scheme projects, and open access and net-metering projects may use only List-I modules.
- **Production Linked Incentive (PLI):** the National Programme on High Efficiency Solar PV Modules has an outlay of ₹24,000 crore. The Union Cabinet approved Tranche I (₹4,500 crore) on 7 April 2021 and Tranche II (₹19,500 crore) on 21 September 2022. Capacity awarded: 8,737 MW to three bidders and 39,600 MW to 11 bidders. The incentive is paid for five years after commissioning.
- **Old panels:** the E-Waste (Management) Rules, 2022, notified on 2 November 2022, cover solar photovoltaic modules, panels and cells in Chapter V. Manufacturers and producers must register on the portal, store the waste generated up to 2034-35 as the Central Pollution Control Board (CPCB) lays down, and file annual returns; recyclers must recover the materials the CPCB specifies.
- Other topics: National Solar Mission (117), rooftop solar and PM-KUSUM (537), Andhra Pradesh (657), energy storage (976).

## 3. Extra section: chronology, 1767 to 2026

| Date | Event |
|---|---|
| 1767 | Horace de Saussure builds the first box cooker |
| 1839 | Edmond Becquerel, aged 19, demonstrates the photovoltaic effect |
| 1883 | Charles Fritts coats selenium with a thin layer of gold; his cell is only about 1 per cent efficient |
| 1954 | The first practical photovoltaic cell is publicly demonstrated at Bell Laboratories |
| 1958 | Solar cells fly on the satellite Vanguard 1 |
| 1961 | The Shockley-Queisser limit is stated |
| 1999 | The solar steam cooking system at Abu Road, Rajasthan, is built |
| 2009 | Perovskite cells are first used; efficiency is about 3 per cent |
| 2 January 2019 | MNRE issues the Order that sets up the ALMM |
| 10 March 2021 | ALMM List-I (modules) is first issued |
| 7 April 2021 | The Union Cabinet approves Tranche I of the PLI for solar modules |
| 21 September 2022 | The Union Cabinet approves Tranche II of the PLI |
| 2 November 2022 | The E-Waste (Management) Rules, 2022 are notified |
| 4 January 2025 | The PIB reports 278 MW commissioned at the Omkareshwar Floating Solar Park |
| 31 July 2025 | ALMM List-II (cells) is first issued |
| 30 September 2026 | India's installed solar capacity stands at 171.05 GW |

How to read the table:

- The science came in this order: the effect (1839), a weak selenium cell (1883), a practical silicon cell (1954), use in space (1958), the theoretical limit (1961), perovskite (2009).
- India's instruments came in this order: the ALMM Order (2019), List-I for modules (2021), the PLI in two tranches (2021 and 2022), the rules on solar waste (2022), List-II for cells (2025).
- A cooker that uses the sun's heat (1767) is older than any solar cell.

## 4. Three common exam traps

1. **Taking the most efficient cell for the most used cell.** The record belongs to multi-junction cells, but they are costly and go mainly into space. The market is crystalline silicon; all thin film together is only 2 to 3 per cent of production. A laboratory record is also not what a module on sale gives: for crystalline silicon the record cell stands at 28.1 per cent, while modules on the market averaged 22.7 per cent.
2. **Taking every solar power plant for a photovoltaic plant.** A CSP plant has no solar cells: its mirrors make heat, and the heat makes electricity. That is why it stores energy as heat in molten salt, while PV stores electricity in batteries, and only where storage is needed: a direct-use off-grid pump can work without

batteries; a grid-connected plant need not include them. Concentration PV sounds like CSP but is photovoltaic. And much of solar thermal makes no electricity at all: water heaters, cookers, dryers and stills.

3. **Mixing up India's figures and instruments.** The 171.05 GW of 30 September 2026 is installed capacity of every kind, rooftop and off-grid included, not only the large ground-mounted plants. The 748 GW of NISE is an assessed potential that rests on an assumption about waste land; it is not a target. The ALMM is a list of what may be used; the PLI is money paid for making modules. Solar waste comes under the E-Waste (Management) Rules, 2022, not under a separate solar law.

PART 1 · STUDY NOTES · TOPIC 98

# Statement and assumption

General Mental Ability: Reasoning & Psychological | Item 1

## 1. Concept in one line

An assumption is something the speaker takes for granted without saying it, and without which the statement would lose its point. The exam gives a statement followed by two or three assumptions and asks which of them are implicit, that is, hidden in the statement.

## 2. Revision notes

### 2.1 What an assumption is

- The statement in this topic is something a person or an office says or writes for a purpose: a notice, an advertisement, a piece of advice, an order, an appeal, an explanation, a prediction. Take it as given. You are not asked whether it is true or wise.
- An assumption is an idea that the speaker takes to be true but does not state. The statement rests on it. If the idea were false, the speaker would have no reason to make the statement.
- "Implicit" means present in the statement without being said. An assumption that passes the tests in 2.3 "is implicit"; one that fails "is not implicit".
- Example. A mother tells her son: "Take a sweater with you; you will reach the hill station only at night." She does not say that it may be cold there at night, or that a sweater keeps out the cold. But she takes both for granted. Without them her advice has no point.
- Question format: a statement, then assumptions numbered I and II (sometimes I, II and III). The usual options are "Only assumption I is implicit", "Only assumption II is implicit", "Both I and II are implicit" and "Neither I nor II is implicit". Many papers add a fifth option, "Either I or II is implicit" (see 2.8).

### 2.2 Assumption, conclusion and restatement

Statement: a conductor tells a passenger, "The 7 a.m. bus is cancelled today; take the 8 a.m. bus."

| Point | Restatement | Assumption | Conclusion (inference) |
|---|---|---|---|
| Where it stands | Inside the statement | Before the statement: the ground on which the statement rests | After the statement: what is drawn from the statement |
| Said or not | Said, in other words | Not said; hidden | Not said; worked out |
| Question to ask | Does it only repeat the statement? | Must the speaker believe this in order to say it? | If the statement is true, does this follow from it? |

| Point | Restatement | Assumption | Conclusion (inference) |
|---|---|---|---|
| In the example | "The 7 a.m. bus will not run today." | "The 8 a.m. bus will run today." "The 8 a.m. bus goes to the place the passenger wants to reach." | "A passenger who takes this advice will start one hour later than by the 7 a.m. bus." |
| In an assumption question | Not implicit | Implicit | Not implicit |

- Memory line: an assumption comes before the statement; a conclusion comes after it. (Statement and conclusion is a separate topic on another day.)

## 2.3 The two working tests

### Test 1: the negation test

1. Read the statement and ask what the speaker wants to achieve by it.
2. Deny the assumption, that is, write the sentence that says the opposite. Deny it exactly. The denial of "some people will come" is "nobody will come". The denial of "all people will come" is only "at least one person will not come". (As in the syllogism topic of Day 2, "some" means "at least one".)
3. Put the denial beside the statement. If the statement falls apart or loses its purpose, the assumption is implicit. If the statement still makes sense, the assumption is not implicit.

Example. A coaching centre advertises: "Join our evening batch; classes begin after office hours."

| Assumption | Its denial | Does the advertisement still make sense? | Result |
|---|---|---|---|
| Some people who have jobs want coaching | No person who has a job wants coaching | No: a batch that begins after office hours is meant for such people | Implicit |
| All people who have jobs want coaching | At least one person who has a job does not want coaching | Yes: the others may still join | Not implicit |

### Test 2: "Must the speaker believe this?"

Put the assumption into one of three boxes:

- The speaker must believe it; otherwise the speaker would not say this: implicit.
- It may be true, but the speaker need not believe it: not implicit. An example for the same advertisement: "The morning batches of the centre are full." Perhaps they are; but the advertisement makes sense even if they are not.
- It has nothing to do with the statement, or it goes against the statement: not implicit.

The two tests give the same result. Use Test 2 for speed, and Test 1 to confirm a doubtful case.

## 2.4 The standard patterns in one table

| Pattern | What the speaker assumes | What the speaker does not assume |
|---|---|---|
| Advertisement or notice | People will read it; some of them want what is offered and may respond | Everybody will respond; the thing offered is the best; the rivals are bad |

| Pattern | What the speaker assumes | What the speaker does not assume |
|---|---|---|
| Advice or suggestion | It is practicable; the person may act on it; it will help | It is the only way; the person will definitely follow it |
| Order, rule or policy | The problem it is meant for exists; it can be carried out; it will serve its purpose, at least in part | The problem will be solved fully; everybody will welcome it |
| Cause stated for an effect | The cause named can produce that effect | It is the only cause; the effect will continue in future |
| Comparison or claim of improvement | The old state existed and was not as good | The old state was bad in every way; nothing better is possible |
| Request or appeal | What is asked for is not happening by itself, or not enough; some people may respond | Everybody will respond; a penalty would not work |
| Prediction | The ground it rests on leads to the result; conditions will not change so much as to defeat the result | The result is certain; nothing else affects the result |

- These patterns are a guide, not a rule. Confirm each assumption with the tests in 2.3.

## 2.5 A worked example of each pattern

1. **Advertisement or notice.** A travel agency advertises: "Sleeper bus from Vijayawada to Tirupati every night at 9." Implicit: "Some people want to travel on this route at night." Deny it and the advertisement is wasted. Not implicit: "This is the best bus on the route." The agency may think so, but the advertisement works without it.
2. **Advice or suggestion.** A teacher tells a student: "Solve one previous question paper every Sunday; your speed will improve." Implicit: "The student can get previous question papers." "A better speed is of some use to the student." Without these the advice is useless. ("Solving question papers improves speed" is not one of them: the teacher has said it.) Not implicit: "Solving question papers is the only way to improve speed."
3. **Order, rule or policy.** A Collector orders: "Every fair price shop shall write its stock position on a board each morning." Implicit: "An ordinary dealer is able to put up such a board." "A board will help cardholders to know the stock." Not implicit: "All dealers cheat the cardholders." The order needs only that cardholders do not always know the stock; it does not need every dealer to be dishonest.
4. **A cause stated for an effect.** "Accidents on the ghat road came down this year because crash barriers were put up." Implicit: "Crash barriers can prevent some accidents." Not implicit: "Nothing else changed on that road this year." The speaker says that the barriers brought the accidents down; the speaker need not hold that nothing else helped.
5. **Comparison or claim of improvement.** A minister says: "With the new bridge, the journey between the two towns now takes only one hour." Implicit: "Before the bridge was built, the journey took more than one hour." If it did not, there is nothing to claim. Not implicit: "The old road has been closed."
6. **Request or appeal.** A blood bank appeals: "Our stock of blood is low. Donors should come forward this week." Implicit: "Some people who see the appeal are able to give blood and may do so." Deny it and the appeal is of no use. Not implicit: "All the people who see the appeal will give blood."
7. **Prediction.** A farmer says: "The canal water came on time, so the paddy crop will be good this year." Implicit: "Timely water helps the paddy crop." "The farmer does not expect anything to damage the crop in the rest of the season." Not implicit: "Water is the only thing that a paddy crop needs."

### 2.6 Strong words and modest words

| Kind of word | Examples | Usual result | Why |
|---|---|---|---|
| Strong | only, all, every, always, never, definitely, the best | Not implicit | The denial of a strong sentence is mild ("not all", "not always"), so the statement survives the denial |
| Modest | some, may, likely, at least a few, to some extent | Implicit, if it is tied to the statement | The denial of a modest sentence is sweeping ("none", "cannot"), so the statement falls |

- This is a guide, not a rule. Confirm with the negation test every time.
- A strong assumption can be implicit when the statement itself is that strong. Order: "Every vehicle that enters the campus shall be checked at the gate." The assumption "The gate staff are able to check all the vehicles that enter" is implicit, although it has the word "all".
- A modest assumption is not implicit when it has nothing to do with the statement. For the same order, "Some staff members may come on foot" is modest, but it is beside the point.

### 2.7 Assumptions that fail

- **Too far from the statement.** They need a chain of extra steps. For the fair price shop order: "Cardholders will stop buying from private shops."
- **New facts.** They bring in a reason, a past record or a cost that the statement does not need. For the bus advertisement: "Train tickets on this route are hard to get."
- **Repeats.** They say what the statement has already said. For the bridge claim: "By the new bridge, the journey between the two towns takes one hour." But what words such as "now", "as well" or "come down" take for granted about the earlier state is not a repeat: it is not said, it is assumed. So for the same claim, "Before the bridge was built, the journey took more than one hour" is implicit (2.5, item 5).
- **Likely results.** They come after the statement, not before it (see Section 4).

### 2.8 How "both", "either" and "neither" work

- Judge each assumption by itself. Do not let your verdict on I change your verdict on II.
- If both pass, the answer is "Both I and II are implicit". If both fail, it is "Neither I nor II is implicit". With three assumptions, judge all three and then pick the option that lists exactly the ones that passed.
- A guide, not a rule: take "Either I or II is implicit" as the answer only when three things are true together: I and II are opposites, so both cannot hold; between them they cover every case; and the statement needs one of them but does not show which.
- Example. An officer adds up the marks on an answer script once again and writes: "The total written here is 62; this is not the correct total. Write the correct total." I. The correct total is more than 62. II. The correct total is less than 62. The officer has the correct total in hand, and it is not 62, so the officer believes exactly one of the two. Deny I alone and the note still stands, because II may be the case. Deny II alone and it still stands. Deny both and the correct total becomes 62: the note falls. So the answer is "Either I or II is implicit".
- Two assumptions that only point in different directions are not such a pair. If the speaker can do without both of them, the answer is "neither".

Other days cover statement and conclusion, statement and argument, statement and course of action, cause and effect, and strengthening and weakening an argument.

## 3. Extra section: a drill of eight statements with answers

Cover the answer line, decide by the two tests, and then check.

**1. Notice.** A primary health centre puts up this notice: "Free eye check-up for persons above 60 years on the first Monday of every month."

- I. Some persons above 60 years may come for the check-up.
- II. Persons below 60 years do not have eye problems.
- Answer: only I is implicit. Deny I ("no person above 60 years will come") and the notice has no purpose. Deny II ("some persons below 60 years have eye problems") and the notice still stands: the centre has only chosen whom to serve free.

**2. Advice.** A coach tells a runner: "Sleep for eight hours every night in the week before the race; you will run better."

- I. Sleep is the only thing that improves running.
- II. The runner is able to sleep for eight hours a night.
- Answer: only II is implicit. Deny II ("the runner is not able to sleep for eight hours a night") and the advice cannot be followed, so it has no point. "Only" makes I too strong: the coach need not believe it.

**3. Order.** A municipal commissioner orders: "From 1 January every shop shall keep separate bins for wet waste and dry waste."

- I. Keeping two bins is within the means of an ordinary shop.
- II. Keeping wet waste and dry waste apart is of some use.
- Answer: both I and II are implicit. Deny I ("keeping two bins is beyond the means of an ordinary shop") and the order cannot be obeyed. Deny II ("keeping the two kinds apart is of no use at all") and the order has no purpose.

**4. Cause stated for an effect.** A headmaster says: "Attendance has risen this term because the school bus now goes up to the hill hamlets."

- I. A bus up to the hamlets makes it easier for some children to come to school.
- II. Attendance will rise again next term.
- Answer: only I is implicit. Deny I and the bus cannot be the cause of the rise. II is a forecast about the future; it comes after the statement.

**5. Claim of improvement.** A district library puts up this notice: "The reading room is now open on Sundays as well."

- I. Most readers are free only on Sundays.
- II. The reading room was not open on Sundays earlier.
- Answer: only II is implicit. "Now" and "as well" announce a change, so the old state must have been different. I may be true, but the notice makes sense even if only a few readers come on Sundays.

**6. Prediction.** An engineer says: "Once the flyover opens, traffic jams at the junction will come down."

- I. There are traffic jams at the junction at present.
- II. The flyover will end all the traffic problems of the city.
- Answer: only I is implicit. Jams can "come down" only if there are jams now. II goes far beyond the junction, and "all" makes it too strong.

**7. Advertisement.** A transport corporation advertises: "Book your bus ticket on our mobile application and avoid the queue at the counter."

- I. Every passenger has a mobile phone.
- II. The corporation is going to close its ticket counters.
- Answer: neither I nor II is implicit. Deny I ("at least one passenger has no mobile phone") and the advertisement still works for the others. II is a new fact; the advertisement itself speaks of a counter that is working.

**8. Request.** A principal puts up this notice: "Students are requested to switch off the fans and lights when they leave the classroom."

- I. Some students leave the classroom without switching off the fans and lights.
- II. Some students may act on the request.
- Answer: both I and II are implicit. Deny I and there is nothing to ask for. Deny II and there is no use in asking.

## 4. Three common exam traps

1. **Using outside knowledge.** Work only from what the speaker says. A father tells his son, "Wear a helmet every time you ride." You know that riders without helmets are fined. But "The police fine riders who do not wear helmets" is not implicit: the father's point may simply be safety, and his advice stands even if there is no fine. In the same way, do not reject an assumption because you do not agree with the statement.
2. **Treating a likely result as an assumption.** A transport corporation decides to give students half-fare passes on city buses. "City buses will become more crowded" may well happen, but it comes after the decision. The corporation need not believe it in order to decide. What the corporation must believe comes before the decision: "Some students travel, or may travel, by city bus."
3. **Rejecting a modest assumption because it is obvious.** "Passers-by may read this board" and "The listener is able to do what is advised" sound too plain to be the answer. Yet these are exactly the things that a speaker takes for granted. Obvious does not mean stated. Reject an assumption if it is too strong, unconnected with the statement or a repeat of the statement; never reject it for being plain.

PART 1 · STUDY NOTES · TOPIC 99

# Simple interest and compound interest: the basic formulas

General Mental Ability: Quantitative & Data | Item 10

## 1. Concept in one line

Interest is the extra money paid for the use of a sum: simple interest is reckoned on the original principal only, so it is the same every year, while compound interest is reckoned on the principal together with the interest already earned, so it grows every year. The exam asks for the interest or for the amount (principal plus interest), and tests whether you keep the rate and the time in the same unit and keep the two kinds of interest apart.

## 2. Revision notes

### 2.1 The terms

- **Principal (P):** the money lent, borrowed or deposited. Questions also call it "the sum".
- **Interest (I):** the extra money paid for the use of the principal.
- **Rate (R):** the interest on every ₹100 for one year, written "R per cent per annum" (p.a.). 10% p.a. means ₹10 on every ₹100 for one year. The base of this percentage (Topic 29) is the principal.
- **Time (T):** the period for which the money is used. In the compound interest formula a whole number of years is written n.
- **Amount (A):** principal + interest, that is, what is paid back or received at the end. A = P + I.
- A rate is per annum unless the question says otherwise.

## 2.2 Simple interest

- Under simple interest (SI) the interest of every year is reckoned on the original principal only. The principal does not change, so the interest is the same every year.
- Interest for one year = P × R/100. For T years it is T times as much: **SI = P × R × T/100 = PRT/100.**
- **A = P + SI = P(1 + RT/100).**
- Example: ₹6,000 at 7% p.a. for 4 years. One year's interest = 7% of 6,000 = ₹420. SI = 420 × 4 = ₹1,680. A = 6,000 + 1,680 = ₹7,680.
- On ₹100 the interest is simply R × T rupees: at 18% for 3 years it is 18 + 18 + 18 = ₹54. So simple interest is "R × T per cent" of the principal.

## 2.3 Time in months or days, and a rate per month

- In PRT/100 the rate is per annum, so the time must be in years.
- Months are divided by 12 and days by 365 (a year is taken as 365 days).

| Period | Part of a year |
|---|---|
| 1 month | 1/12 |
| 3 months | 1/4 |
| 4 months | 1/3 |
| 6 months | 1/2 |
| 8 months | 2/3 |
| 9 months | 3/4 |
| 73 days | 1/5 |
| 146 days | 2/5 |
| 219 days | 3/5 |
| 292 days | 4/5 |

- Years and months together: 1 year 6 months = 1 6/12 = 1 1/2 years. Write 1.5, not 1.6.
- **A rate per month.** The rate and the time must be in the same unit. Keep both in months, or multiply the monthly rate by 12 to get the rate per annum and put the time in years. ₹8,000 at 1 1/2% per month for 10 months: 8,000 × 1.5 × 10/100 = ₹1,200. The other way: 18% p.a. for 10/12 year also gives ₹1,200. Multiplying a monthly rate by 12 is right for simple interest only.

## 2.4 Compound interest, built up year by year

- Under compound interest (CI) the interest of each year is added to the principal at the end of that year, and the next year's interest is reckoned on this larger sum. So interest is earned on the principal and also on the interest already earned.
- When the interest is added once a year, it is said to be compounded yearly (or annually). Half-yearly and quarterly compounding come in Topic 529.
- ₹10,000 at 10% p.a., compounded yearly:

| Year | Principal for the year | Interest for the year | Amount at the end of the year |
|---|---|---|---|
| 1 | ₹10,000 | ₹1,000 | ₹11,000 |
| 2 | ₹11,000 | ₹1,100 | ₹12,100 |

| Year | Principal for the year | Interest for the year | Amount at the end of the year |
|---|---|---|---|
| 3 | ₹12,100 | ₹1,210 | ₹13,310 |

- **How the formula arises.** After 1 year: A = P + PR/100 = P(1 + R/100). In the second year this amount is the principal, so after 2 years A = P(1 + R/100) × (1 + R/100) = P(1 + R/100)$^2$. After 3 years A = P(1 + R/100)$^3$. Every year multiplies the sum by (1 + R/100) once more. So after n years:
- **A = P(1 + R/100)$^n$ and CI = A - P.**
- The formula gives the amount. For the interest, subtract the principal: in the table, CI for 3 years = 13,310 - 10,000 = ₹3,310.

## 2.5 Growth factors and the fraction form

- (1 + R/100) is the growth factor for one year: the number by which the sum is multiplied every year. At 10% it is 1.1. For n years the factor is its nth power.
- Factors worth remembering:

| Rate p.a. | Rate as a fraction | Factor for 1 year | Factor for 2 years | Factor for 3 years |
|---|---|---|---|---|
| 5% | 1/20 | 1.05 = 21/20 | 1.1025 = 441/400 | 1.157625 = 9,261/8,000 |
| 10% | 1/10 | 1.1 = 11/10 | 1.21 = 121/100 | 1.331 = 1,331/1,000 |
| 12 1/2% | 1/8 | 1.125 = 9/8 | 81/64 | 729/512 |
| 20% | 1/5 | 1.2 = 6/5 | 1.44 = 36/25 | 1.728 = 216/125 |

- The factor less 1 is the interest on ₹1. At 10% for 3 years the factor is 1.331, so CI is 33.1% of the principal. Simple interest for the same period is 30%.
- **Fraction form.** 12 1/2% = 1/8 (Topic 29), so every year the sum becomes 9/8 of itself. ₹6,400 at 12 1/2% for 2 years: 6,400 × 81/64 = ₹8,100, and CI = ₹1,700. This form is quick when the principal can be divided exactly by the denominator of the factor.
- The fraction form helps in simple interest too: at 12 1/2% the interest of one year is 1/8 of the principal.

## 2.6 Simple and compound interest side by side

₹10,000 at 10% p.a. for 3 years, under both kinds of interest:

| Year | SI for the year | SI up to that year | Amount under SI | CI for the year | CI up to that year | Amount under CI |
|---|---|---|---|---|---|---|
| 1 | ₹1,000 | ₹1,000 | ₹11,000 | ₹1,000 | ₹1,000 | ₹11,000 |
| 2 | ₹1,000 | ₹2,000 | ₹12,000 | ₹1,100 | ₹2,100 | ₹12,100 |
| 3 | ₹1,000 | ₹3,000 | ₹13,000 | ₹1,210 | ₹3,310 | ₹13,310 |

- In the first year the two are equal.
- From the second year compound interest is ahead, because interest is now earned on the earlier interest. The extra ₹100 of the second year is 10% of the first year's interest of ₹1,000.
- A formula for the gap between the two is taken up in Topic 669.

## 2.7 Different rates in successive years

- Multiply the growth factors, one for each year. ₹10,000 at 10% in the first year and 20% in the second: 10,000 × 1.1 × 1.2 = ₹13,200.

- Adding the rates (30%) gives ₹13,000, which is the simple interest answer and is wrong here. The order of the rates does not change the result. Successive percentage changes are treated in full in Topic 159.

### 2.8 How a sum grows

| Feature | Simple interest | Compound interest |
|---|---|---|
| Interest is reckoned on | The original principal only | The principal and the interest already earned |
| Interest of each year | The same every year | Larger every year |
| Amount after the period | $P(1 + RT/100)$ | $P(1 + R/100)^n$ |
| What happens every year | The same sum, PR/100, is added | The sum is multiplied by the same factor, (1 + R/100) |
| First year | Equal to compound interest | Equal to simple interest |

- Under simple interest the amount rises by equal steps. Plotted year by year, the amounts lie on a straight line.
- Under compound interest every step is bigger than the one before, so the line bends upwards and the sum grows faster each year.
- **"A sum doubles itself" under simple interest.** The interest must equal the principal: PRT/100 = P, so R × T = 100. At 10% a sum doubles in 10 years; at 12 1/2% in 8 years; at 8% in 12 1/2 years.
- **Rule of 72 for compound interest.** The number of years in which a sum doubles is roughly 72 ÷ R. It is a rough guide only, fairly close for rates of about 6% to 10%. Never use it where an exact answer is asked.

| Rate p.a. | Simple interest: years to double (100 ÷ R, exact) | Compound interest: rule of 72 (rough) | Compound interest: years to double, to two decimal places |
|---|---|---|---|
| 6% | 16 2/3 | 12 | 11.90 |
| 8% | 12 1/2 | 9 | 9.01 |
| 10% | 10 | 7.2 | 7.27 |
| 12% | 8 1/3 | 6 | 6.12 |

Other days cover finding the rate, the time and the principal under simple interest (Topic 389), compound interest reckoned half-yearly and quarterly (Topic 529), the difference between compound and simple interest (Topic 669), instalments (Topic 809), and population growth and depreciation (Topic 869).

## 3. Extra section: worked examples

### A. Simple interest

1. **Whole years.** ₹7,500 at 6% p.a. for 4 years. One year's interest = 6% of 7,500 = ₹450. SI = 450 × 4 = ₹1,800. Amount = 7,500 + 1,800 = ₹9,300.
2. **Time in months.** ₹12,000 at 9% p.a. for 8 months. 8 months = 8/12 = 2/3 year. One year's interest is ₹1,080, so SI = 1,080 × 2/3 = ₹720.
3. **Years and months, amount asked.** ₹20,000 at 7 1/2% p.a. for 3 years 4 months. Time = 3 4/12 = 3 1/3 = 10/3 years. One year's interest is ₹1,500, so SI = 1,500 × 10/3 = ₹5,000. Amount = 20,000 + 5,000 = ₹25,000.
4. **Time in days.** ₹7,300 at 10% p.a. for 146 days. 146/365 = 2/5 year. One year's interest is ₹730, so SI = 730 × 2/5 = ₹292.

5. **Rate per month.** ₹15,000 at 2% per month for 1 year 3 months. Time = 15 months. SI = 15,000 × 2 × 15/100 = ₹4,500. Check: 24% p.a. for 1 1/4 years gives 15,000 × 24 × 5/4 ÷ 100 = ₹4,500.
6. **Fraction form.** ₹9,600 at 12 1/2% p.a. for 5 years. One year's interest = 1/8 of 9,600 = ₹1,200. SI = 1,200 × 5 = ₹6,000.

### B. Compound interest, compounded yearly

1. **Two years.** ₹8,000 at 5% p.a. for 2 years. Amount = 8,000 × 1.1025 = ₹8,820. CI = 8,820 - 8,000 = ₹820. Year by year: ₹400 in the first year and ₹420 in the second.
2. **Three years.** ₹15,000 at 20% p.a. for 3 years. Amount = 15,000 × 1.728 = ₹25,920. CI = 25,920 - 15,000 = ₹10,920.
3. **Fraction form.** ₹5,120 at 12 1/2% p.a. for 3 years. Amount = 5,120 × 729/512 = 10 × 729 = ₹7,290. CI = 7,290 - 5,120 = ₹2,170.
4. **Different rates.** ₹20,000 at 5% in the first year, 10% in the second and 20% in the third. Factor = 1.05 × 1.1 × 1.2 = 1.386. Amount = 20,000 × 1.386 = ₹27,720. CI = ₹7,720. Adding the rates (35%) would give ₹7,000, which is wrong.

### C. Both kinds on the same sum

1. ₹50,000 at 20% p.a. for 3 years. SI = 10,000 × 3 = ₹30,000. CI = 50,000 × (1.728 - 1) = 50,000 × 0.728 = ₹36,400. Year by year the compound interest is ₹10,000, then ₹12,000, then ₹14,400. In the first year the two are equal.

### D. Doubling

1. At 12 1/2% p.a. simple interest, one year's interest is 1/8 of the sum, so the interest equals the sum in 8 years: the sum doubles in exactly 8 years. Under compound interest at the same rate the rule of 72 gives 72 ÷ 12.5 = 5.76, that is, about 6 years. In fact the factor for 6 years, $(9/8)^6$, is about 2.03.

## 4. Three common exam traps

1. **Interest or amount?** Read the last line of the question. PRT/100 gives the interest, and the principal has still to be added if the amount is asked. $P(1 + R/100)^n$ gives the amount, and the principal has still to be subtracted if the interest is asked. On ₹6,000 at 7% p.a. simple interest for 4 years the interest is ₹1,680 and the amount is ₹7,680. A question that asks for one of them may carry the other among its options.
2. **Rate and time in different units.** With a rate per annum the time must be in years: 8 months is 8/12 = 2/3 year, and 1 year 6 months is 1.5 years, not 1.6. With a rate per month the time must be in months: 2% per month for 15 months is 30% of the principal.
3. **Treating compound interest as simple interest.** PRT/100 does not give compound interest for more than one year. At 20% p.a. for 3 years, compound interest is 72.8% of the principal, not 60%. In the same way, rates of successive years are not added: 5% in one year and 20% in the next raise a sum by 26%, not by 25%, because the factors are multiplied (1.05 × 1.2 = 1.26).

PART 1 · STUDY NOTES · TOPIC 100

# Deepavali and UNESCO intangible cultural heritage

Current Affairs | CA-PER

Scheduled topic: Current affairs: Deepavali on UNESCO's list of intangible cultural heritage (December 2025)

## 1. Concept in one line

In December 2025 the Intergovernmental Committee of the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage, a Convention of the United Nations Educational, Scientific and Cultural Organization (UNESCO), met in New Delhi and inscribed Deepavali on the Representative List of the Intangible Cultural Heritage of Humanity. The examination asks about the inscription and the session, India's elements on that List with their years, and how the 2003 Convention, its three instruments and its Committee differ from the World Heritage Convention of 1972.

## 2. Revision notes

### 2.1 The inscription of Deepavali

- **The decision:** By Decision 20.COM 7.b.24 the Committee "Decides to inscribe Deepavali on the Representative List of the Intangible Cultural Heritage of Humanity". The nominating State is India. The nomination file is No. 02312.
- **The name:** The element is inscribed as "Deepavali". UNESCO's page adds that it is also known as Diwali.
- **When:** The note of the Press Information Bureau (PIB) that reports the inscription is dated 10 December 2025, the third day of the session. UNESCO shows 2025 as the year of inscription.
- **Who prepared the file:** The Sangeet Natak Akademi (SNA), New Delhi, a body under the Ministry of Culture, coordinated the nomination. It formed a committee of experts and practitioners from different regions. India nominated Deepavali for the 2024-25 cycle.
- **Domain:** UNESCO's page places Deepavali in one domain of the Convention: social practices, rituals and festive events.
- **The count:** In the words of the PIB note, "It is the 16th Indian element on this list."

### 2.2 What UNESCO's page and the decision say about the festival

- **What it is:** UNESCO describes Deepavali as "a light festival celebrated annually by diverse individuals and communities across India". It follows the lunar calendar, falls on the new moon in October or November and lasts several days. It marks the last harvest of the year and the start of a new year and a new season.
- **What it stands for:** In the words of the decision, it "symbolizes the victory of light over darkness and good over evil".
- **Practices:** People clean and decorate homes and public spaces, light lamps and candles, set off fireworks and pray for prosperity and new beginnings. Families exchange gifts and sweets, share meals, and celebrate with music, dance and rituals.
- **How it is handed down:** It is "passed on informally within families and communities". Elders teach children through stories and by taking part together. Temples, schools, cultural organisations and digital platforms also help.
- **Who takes part:** People of all ages, genders and backgrounds. The decision names indigenous communities, senior citizens, children, men, women, transgender communities and people with special needs. The decision also records the involvement of people from other religions, "both believers and non-believers".
- **The five days, as the PIB note lists them:** Dhanteras, Naraka Chaturdashi, Lakshmi-Ganesha Puja on the third day, a day of visiting and exchanging gifts, and Bhai Dooj.

- **Safeguarding recorded in the decision:** the festival is designated a public holiday, the government supports logistics and security, and artisans are supported. For the future the file gives priority to green and inclusive practices and to natural and sustainable materials.

## 2.3 The twentieth session of the Committee

| Point | Detail |
|---|---|
| Body | The Intergovernmental Committee for the Safeguarding of the Intangible Cultural Heritage, twentieth session, written 20.COM |
| Place | New Delhi. The venue was the Red Fort complex, which the PIB note calls a UNESCO World Heritage Site |
| Dates | UNESCO's page: "from Monday 8 to Friday 12 December 2025 in New Delhi, India". The PIB note of 7 December 2025, issued before the session, gave 8 to 13 December 2025. Both begin on 8 December. In the exam, follow the source that the question names |
| Chairperson | H.E. Mr Vishal V. Sharma, Ambassador and Permanent Delegate of India to UNESCO |
| Host | India. The PIB note of 7 December 2025 says it was the first time that India hosted a session of this Committee |
| Files before the Committee | 11 nominations for the Urgent Safeguarding List, 54 nominations for the Representative List, 2 requests for transfer between lists, and 1 proposal for the Register of Good Safeguarding Practices. These are the files placed before the Committee, not the number inscribed |
| Two other inscriptions of 2025 | Italy: "Italian cooking, between sustainability and biocultural diversity", on the Representative List. Pakistan: "Boreendo, Bhorindo: ancient dying folk musical instrument, its melodies, knowledge, and skills", on the Urgent Safeguarding List |
| Next session | The twenty-first session: "from Monday 30 November to Saturday 5 December 2026 in Xiamen, China", to be chaired by H.E. Mr Gao Zheng, Vice-Minister of Culture and Tourism of China. Any Indian element inscribed there must be added to the table in 2.4 |

## 2.4 India's elements on the Representative List

UNESCO's page on India, as seen on 11 October 2026, shows 16 inscribed elements. Every one of them is on the Representative List.

| No. | Year | Element, as UNESCO names it | Short name |
|---|---|---|---|
| 1 | 2008 | Tradition of Vedic chanting | Vedic chanting |
| 2 | 2008 | Kutiyattam, Sanskrit theatre | Kutiyattam |
| 3 | 2008 | Ramlila, the traditional performance of the Ramayana | Ramlila |

| No. | Year | Element, as UNESCO names it | Short name |
|---|---|---|---|
| 4 | 2009 | Ramman, religious festival and ritual theatre of the Garhwal Himalayas, India | Ramman |
| 5 | 2010 | Chhau dance | Chhau |
| 6 | 2010 | Kalbelia folk songs and dances of Rajasthan | Kalbelia |
| 7 | 2010 | Mudiyettu, ritual theatre and dance drama of Kerala | Mudiyettu |
| 8 | 2012 | Buddhist chanting of Ladakh: recitation of sacred Buddhist texts in the trans-Himalayan Ladakh region, Jammu and Kashmir, India | Buddhist chanting of Ladakh |
| 9 | 2013 | Sankirtana, ritual singing, drumming and dancing of Manipur | Sankirtana of Manipur |
| 10 | 2014 | Traditional brass and copper craft of utensil making among the Thatheras of Jandiala Guru, Punjab, India | Thatheras' metal craft |
| 11 | 2016 | Yoga | Yoga |
| 12 | 2017 | Kumbh Mela | Kumbh Mela |
| 13 | 2021 | Durga Puja in Kolkata | Durga Puja |
| 14 | 2023 | Garba of Gujarat | Garba |
| 15 | 2024 | Nawrouz, Novruz, Nowrouz, Nowrouz, Nawrouz, Nauryz, Nooruz, Nowruz, Navruz, Nevruz, Nowruz, Navruz | Nowruz (multinational) |
| 16 | 2025 | Deepavali | Deepavali |

- **The pattern of years:** three elements in 2008, one in 2009, three in 2010, and after that one in each of these years: 2012, 2013, 2014, 2016, 2017, 2021, 2023, 2024 and 2025. No Indian element carries 2011, 2015, 2018, 2019, 2020 or 2022.
- **Why 2008:** Before the Convention came into force, UNESCO proclaimed 90 "Masterpieces of the Oral and Intangible Heritage of Humanity" in 2001, 2003 and 2005. Article 31 of the Convention provides for their incorporation in the Representative List, and UNESCO's page on them says they were "incorporated into the Representative List on 4 November 2008". India's three oldest entries carry 2008. If a book gives an earlier year for one of them, that is not its year on the Representative List.
- **Neighbouring years that get exchanged:** Buddhist chanting of Ladakh (2012), Sankirtana of Manipur (2013) and the Thatheras' metal craft (2014) came in three consecutive years. Yoga (2016) came one year before Kumbh Mela (2017). Durga Puja (2021) and Garba (2023) are two years apart.

- **Nowruz:** It is a multinational element. Its page lists 13 countries: Afghanistan, Azerbaijan, India, Iran, Iraq, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Türkiye, Turkmenistan and Uzbekistan. UNESCO shows it as inscribed in 2024, at the nineteenth session, and the page points back to an earlier decision of the Committee's eleventh session. So India's count of 16 includes one element shared with 12 other countries.
- **Two ways of counting Nowruz:** That earlier decision, 11.COM 10.B.1 (Addis Ababa, 2016), inscribed Nowruz for 12 States, India among them, and replaced an inscription of 2009; the decision of 2024 extended the file to 13 countries. Books that count Nowruz under 2016 make Garba (2023) India's 15th element; UNESCO's page counts it under 2024, the year of the latest extension, as the table above does, and Garba is then the 14th. In both counts Deepavali is the 16th.
- **What may come next:** UNESCO's page on India shows one nomination under process for 2026: "Henna: rituals, aesthetic and social practices", for the Representative List. PIB notes of 27 October 2025 and 7 December 2025 say that India has nominated Chhath Mahaparva. Nothing is counted until the Committee inscribes it.

## 2.5 The Convention of 2003

- **Name and adoption:** The Convention for the Safeguarding of the Intangible Cultural Heritage was adopted on 17 October 2003 by the General Conference of UNESCO at its 32nd session in Paris.
- **In force:** 20 April 2006, three months after the thirtieth instrument of ratification was deposited.
- **India:** ratified on 9 September 2005.
- **Meaning (Article 2):** intangible cultural heritage means "the practices, representations, expressions, knowledge, skills" that communities, groups and, in some cases, individuals recognise as part of their cultural heritage.
- **The five domains (Article 2):** (a) "oral traditions and expressions, including language as a vehicle of the intangible cultural heritage"; (b) "performing arts"; (c) "social practices, rituals and festive events"; (d) "knowledge and practices concerning nature and the universe"; (e) "traditional craftsmanship".
- **Safeguarding (Article 2):** "measures aimed at ensuring the viability of the intangible cultural heritage", such as identification, documentation, transmission and revitalisation. Under Articles 11 and 12 each State Party draws up one or more inventories of the heritage in its territory and updates them regularly.
- **India's inventory:** The decision records that Deepavali was entered in 2023 in the Intangible Cultural Heritage of India National Inventory. The SNA maintains it and updates it every year. In a Lok Sabha answer of 4 August 2025 the Ministry of Culture calls it the "National Inventory of ICH" and says it has designated the SNA as the nodal agency for India's nominations to UNESCO's lists. The PIB note of 7 December 2025 names the Ministry of Culture and its autonomous body, the SNA, as the nodal agencies for hosting the twentieth session, and says the Ministry runs the "Scheme for Safeguarding the Intangible Heritage and Diverse Cultural Traditions of India".

The Convention has three instruments. They are not three ranks.

| Instrument | Article | What goes into it | Example from these notes |
|---|---|---|---|
| Representative List of the Intangible Cultural Heritage of Humanity | 16 | Elements inscribed "to ensure better visibility of the intangible cultural heritage and awareness of its significance" | Deepavali, and each of India's other 15 elements |

| Instrument | Article | What goes into it | Example from these notes |
|---|---|---|---|
| List of Intangible Cultural Heritage in Need of Urgent Safeguarding (the Urgent Safeguarding List) | 17 | Heritage that needs urgent safeguarding, inscribed at the request of the State Party concerned | Pakistan's Boreendo, 2025 |
| Register of Good Safeguarding Practices | 18 | Programmes, projects and activities that "best reflect the principles and objectives of this Convention" | One proposal was before the twentieth session |

## 2.6 The two organs, and the route of a nomination

- **General Assembly of the States Parties (Article 4):** "the sovereign body of this Convention". It meets in ordinary session every two years and elects the Committee. Its eleventh session was held at UNESCO Headquarters, Paris, on 17 and 18 June 2026, with the election of new Committee members on its agenda. UNESCO's page on that session speaks of "the 185 States Parties".
- **The Committee (Articles 5 to 7):** It began with 18 States Members, and the number rose to 24 once the Convention had 50 States Parties. Members are elected for four years, with equitable geographical representation and rotation. Half the members are renewed every two years. A member "may not be elected for two consecutive terms". It promotes the objectives of the Convention, gives guidance on best practices, examines reports and requests, and decides on inscriptions.
- **India on the Committee:** three terms, 2006 to 2010, 2014 to 2018 and 2022 to 2026. India hosted and chaired the twentieth session during the third term. As on 11 October 2026 UNESCO's list of the 24 members, whose terms run from 2024 to 2028 or from 2026 to 2030, does not include India.
- **Route of a nomination:**
  - Step 1: The State Party sends the file, prepared with the free, prior and informed consent of the community. It must reach the Secretariat by 31 March of the first year. The PIB note says, "Each country can nominate one element every two years."
  - Step 2: The Secretariat registers the file and asks for anything missing. The Evaluation Body studies the files from December of the first year and finishes its report by September of the second year.
  - Step 3: The Committee examines the files and decides in November or December of the second year.

## 2.7 Not the same as World Heritage

| Point | Convention of 2003 | Convention of 1972 |
|---|---|---|
| Full name | Convention for the Safeguarding of the Intangible Cultural Heritage | Convention concerning the Protection of the World Cultural and Natural Heritage |
| Adopted by the General Conference of UNESCO | 17 October 2003 | 16 November 1972 |
| In force | 20 April 2006 | 1975 |
| India ratified | 9 September 2005 | 14 November 1977 |
| What it covers | Living practices, expressions, knowledge and skills of communities | Natural or cultural sites |

| Point | Convention of 2003 | Convention of 1972 |
|---|---|---|
| Where an entry goes | Representative List, Urgent Safeguarding List, or Register of Good Safeguarding Practices | World Heritage List |
| India, as on 11 October 2026 | 16 elements | 45 properties: 37 cultural, 7 natural and 1 mixed. The most recent is the Ancient Buddhist Site of Sarnath (2026) |
| Example | Deepavali | The Red Fort complex, where the Committee met |

UNESCO as a specialised agency, festivals and performing arts in detail, and the World Heritage sites belong to other days' topics.

## 3. Extra section: timeline, and what the Committee recorded on Deepavali under each criterion

| Date | Event |
|---|---|
| 16 November 1972 | The World Heritage Convention is adopted |
| 17 October 2003 | The Convention for the Safeguarding of the Intangible Cultural Heritage is adopted in Paris |
| 9 September 2005 | India ratifies the 2003 Convention |
| 20 April 2006 | The 2003 Convention comes into force |
| 4 November 2008 | The 90 Masterpieces are incorporated into the Representative List |
| 2023 | Deepavali is entered in India's national inventory |
| 2024-25 cycle | India nominates Deepavali |
| 8 December 2025 | The twentieth session of the Committee opens in New Delhi |
| 10 December 2025 | Date of the PIB note that reports the inscription of Deepavali |
| 30 November to 5 December 2026 | Dates announced for the twenty-first session at Xiamen, China |

A nomination to the Representative List is examined under five criteria, numbered R.1 to R.5. The decision on Deepavali records the following under each.

| Criterion | What the Committee recorded for Deepavali |
|---|---|
| R.1 | The festival brings families and communities together for gifts, sweets, meals, music, dance and rituals. Elders pass it on informally to children. Temples, schools, cultural groups and digital platforms also hand it down |
| R.2 | It supports social cohesion, well-being and inclusion. Sharing meals and sweets and giving food to those in need are part of it |

| Criterion | What the Committee recorded for Deepavali |
|---|---|
| R.3 | Millions of people practise it. The safeguarding measures are designation as a public holiday, government support for logistics and security, and support for artisans. Green and inclusive practices and natural and sustainable materials are among the priorities ahead |
| R.4 | The SNA coordinated the nomination with a committee of experts and practitioners from several regions. The file shows the free, prior and informed consent of a wide range of people |
| R.5 | The element was entered in 2023 in the Intangible Cultural Heritage of India National Inventory, which the SNA maintains and updates every year with communities, groups and non-governmental organisations |

## 4. Three common exam traps

1. **Intangible heritage is not World Heritage.** Deepavali is on a list kept under the Convention of 2003. The World Heritage List belongs to the Convention of 1972 and holds sites. A festival, a dance or a craft is never a "World Heritage Site". The Red Fort complex, where the Committee met, is one. Both lists carry UNESCO's name, so read which Convention the question is about.
2. **Three instruments, one Convention.** The Representative List is not a list of heritage in danger. Heritage that needs urgent safeguarding goes to the Urgent Safeguarding List. The Register holds programmes, projects and activities, not festivals. Every Indian element is on the Representative List. At the same session at which Deepavali was inscribed, an element of a neighbouring country went to the Urgent Safeguarding List.
3. **The count, its date and the shared element.** India's count is 16 as on 11 October 2026, and it includes Nowruz, which India shares with 12 other countries. UNESCO shows Nowruz under the year of the latest decision on it (2024), not under 2016, the year of the inscription in which India is one of 12 States; counted under 2016, Garba becomes the 15th element, but Deepavali is the 16th either way. The count before Deepavali was 15, and that figure is still found in material printed in December 2025. The count can change at the Committee's next session, so read the date in the question.

REFERENCE APPENDIX

# Sources and references

Source identifiers restart at S1 within each topic. Source titles and links are listed here. Complete usage notes and additional verification details are in the shared companion, Day 10 Detailed Sources and Verification.

## Topic 91 · Akbar: conquests, Rajput policy and religious policy

**S1 · NCERT, Our Pasts II (Class VII history), Chapter 4, "The Mughals (16th to 17th Century)".** https://ncert.nic.in/textbook/pdf/gess104.pdf

**S2 · NCERT, Themes in Indian History Part II (Class XII), Theme Nine, "Kings and Chronicles: The Mughal Courts".** https://ncert.nic.in/ncerts/l/lehs205.pdf

**S3 · Encyclopaedia Britannica, "India", section "The reign of Akbar the Great".** https://www.britannica.com/place/India/The-reign-of-Akbar-the-Great

**S4 · Encyclopaedia Britannica, "Akbar" (biography; summary and facts panel).** https://www.britannica.com/biography/Akbar

**S5 · Encyclopaedia Britannica, "Din-i Ilahi".** https://www.britannica.com/topic/Din-i-Ilahi

**S6 · Encyclopaedia Britannica, "Ilahi era".** https://www.britannica.com/topic/Ilahi-era

**S7 · National Institute of Open Schooling (NIOS), Senior Secondary History (315), Lesson 10, "Establishment of the Mughal Rule".** https://www.nios.ac.in/media/documents/SrSec315NEW/315_History_Eng/315_History_Eng_Lesson10.pdf

**S8 · S.M. Ikram, Muslim Civilization in India (Columbia University Press, 1964), Chapter XI, "The Age of Akbar", web edition on the site of Professor Frances Pritchett.** https://franpritchett.com/00islamlinks/ikram/part2_11.html

**S9 · S.M. Ikram, Muslim Civilization in India (Columbia University Press, 1964), Chapter XII, "Religion at Akbar's Court", web edition on the site of Professor Frances Pritchett.** https://franpritchett.com/00islamlinks/ikram/part2_12.html

**S10 · Encyclopaedia Iranica, "AKBAR I", entry by Fritz Lehmann (Vol. I, Fasc. 7, 1984).** https://www.iranicaonline.org/articles/akbar-i-mughal-india

**S11 · Banglapedia: National Encyclopedia of Bangladesh (Asiatic Society of Bangladesh), "Akbar", entry by KM Karim.** https://en.banglapedia.org/index.php/Akbar

**S12 · Wikipedia, "Akbar".** https://en.wikipedia.org/wiki/Akbar

**S13 · Wikipedia, "Din-i Ilahi" (citing Makhanlal Roychoudhury, The Din-i-Ilahi, 1941; M. Athar Ali, Mughal India, 2006, pp. 163 to 164; Corinne Lefèvre in the Encyclopaedia of Islam, 2015; Mubarak Ali).** https://en.wikipedia.org/wiki/Din-i_Ilahi

**S14 · Wikipedia, "Ibadat Khana" (citing Sailendra Nath Sen, 2013, p. 171; Vincent Smith in the Journal of the Royal Asiatic Society, 1917).** https://en.wikipedia.org/wiki/Ibadat_Khana

**S15 · Wikipedia, "Battle of Haldighati" (citing Jadunath Sarkar, Military History of India, 1960; Badauni; Rima Hooja, A History of Rajasthan, 2006; Satish Chandra).** https://en.wikipedia.org/wiki/Battle_of_Haldighati

**S16 · Wikipedia, "Navaratnas" (citing Govind Sakharam Sardesai, 1943; Makhanlal Roychoudhury, 1941).** https://en.wikipedia.org/wiki/Navaratnas

**S17 · Wikipedia, "Subah" (citing V.D. Mahajan, History of Medieval India, Part II, 1991).** https://en.wikipedia.org/wiki/Subah

**S18 · Wikipedia, "Birbal" (citing P.P. Sinha, Raja Birbal: Life and Times, 1980; Beatrice K. Otto, 2001; R.S. Chaurasia, 2002; J.F. Richards, 1995).** https://en.wikipedia.org/wiki/Birbal

**S19 · Selfstudyhistory.com, "Akbar: conquest and consolidation of the empire and Rajput policy" (28 January 2015), a study compilation that follows the standard textbook account.** https://selfstudyhistory.com/2015/01/28/akbar-conquest-and-consolidation-of-the-empire-and-rajput-policy/

**S20 · Selfstudyhistory.com, "Akbar: evolution of religious and social outlook, theory of Sulh-i-kul and religious policy, Part I" (29 September 2020), a study compilation that follows the standard textbook account.** https://selfstudyhistory.com/2020/09/29/akbar-evolution-of-religious-and-social-outlook-theory-of-sulh-i-kul-and-religious-policy-part-i/

**S21 · Wikipedia, "Kalinjar Fort" (citing Syed Ali Nadeem Rezavi, "The Medieval Fort of Kalinjar and Its History", Proceedings of the Indian History Congress 63, 2002, p. 1244).** https://en.wikipedia.org/wiki/Kalinjar_Fort

**S22 · Wikipedia, "Meherji Rana".** https://en.wikipedia.org/wiki/Meherji_Rana

**S23 · Banglapedia: National Encyclopedia of Bangladesh (Asiatic Society of Bangladesh), "Bangabda", entry by Syed Ashraf Ali.** https://en.banglapedia.org/index.php/Bangabda

**S24 · Encyclopaedia Iranica, "PARSI COMMUNITIES i. Early History", entry by John R. Hinnells (2008).** https://www.iranicaonline.org/articles/parsi-communities-i-early-history

**S25 · Government of Sindh, Culture, Tourism, Antiquities and Archives Department, "Tomb of Mirza Jani and Mirza Ghazi Baig".** https://antiquities.sindhculture.gov.pk/tour/tomb-of-mirza-jani-mirza-ghazi-baig/

**S26 · Wikipedia, "Mirza Jani Beg Tarkhan" (citing Suhail Zaheer Lari, A History of Sindh, Oxford University Press, 1994; the Tabaqat-i-Akbari; Farid Bhakkari, Dhakhirat al-Khawanin).** https://en.wikipedia.org/wiki/Mirza_Jani_Beg_Tarkhan

**S27 · Encyclopaedia Britannica, "Birbal".** https://www.britannica.com/biography/Birbal

## Topic 92 · Parliamentary privileges

**S1 · Government of India, The Constitution of India, Part V, "The Union" (text with footnotes, copy hosted by the Ministry of External Affairs; an older print).** https://www.mea.gov.in/Images/pdf1/Part5.pdf

**S2 · Government of India, The Constitution of India, Part VI, "The States" (text with footnotes, copy hosted by the Ministry of External Affairs; an older print).** https://www.mea.gov.in/Images/pdf1/Part6.pdf

**S3 · Lok Sabha Secretariat, Committee of Privileges (Fourteenth Lok Sabha), Eleventh Report, "Parliamentary Privileges: Codification and Related Matters", presented to the Speaker on 31 March 2008, published April 2008 (copy in the Parliament Digital Library).** https://eparlib.sansad.in/bitstream/123456789/63246/1/14_Privileges_11.pdf

**S4 · Supreme Court of India, Sita Soren v. Union of India, judgment of 4 March 2024, 2024 INSC 161 (text on Indian Kanoon; judgment of D.Y. Chandrachud, Chief Justice; the page shows the judgment up to paragraph 86).** https://indiankanoon.org/doc/193599726/

**S5 · Supreme Court Observer, "Legislative Immunity for Lawmakers: Case Explainer" (Sita Soren v. Union of India).** https://www.scobserver.in/journal/legislative-immunity-for-lawmakers-case-explainer/

**S6 · Supreme Court of India, State of Kerala v. K. Ajith, Criminal Appeal Nos. 697 and 698 of 2021, judgment of 28 July 2021 (Supreme Court website; judgment of D.Y. Chandrachud, J.; text read up to paragraph 55).** https://api.sci.gov.in/supremecourt/2021/11510/11510_2021_35_1501_28812_Judgement_28-Jul-2021.pdf

**S7 · LiveLaw, "Legislative Privileges, Immunities Not Gateways To Claim Exemption From Criminal Law: Supreme Court In Kerala Assembly Case", 28 July 2021.** https://www.livelaw.in/amp/top-stories/legislative-privileges-immunities-not-gateways-to-claim-exemption-from-criminal-law-supreme-court-in-kerala-assembly-case-178332

**S8 · Supreme Court of India, Raja Ram Pal v. Hon'ble Speaker, Lok Sabha, judgment of 10 January 2007 (text on Indian Kanoon; opinion of Y.K. Sabharwal, Chief Justice; the first 100,000 characters of the page).** https://indiankanoon.org/doc/20615895/

**S9 · Wikipedia, "Forty-fourth Amendment of the Constitution of India" (citing the text of the Act and the Gazette of India).** https://en.wikipedia.org/wiki/Forty-fourth_Amendment_of_the_Constitution_of_India

**S10 · Vajiram and Ravi, "What is the Committee of Privileges in Parliament?", 21 February 2023 (updated 26 March 2025).** https://vajiramandravi.com/current-affairs/what-is-the-committee-of-privileges-in-parliament/

**S11 · Drishti IAS, "Lok Sabha Committee of Privileges", 6 March 2026.** https://www.drishtiias.com/daily-updates/daily-news-analysis/lok-sabha-committee-of-privileges/print_manually

**S12 · Shankar IAS Parliament, "Parliamentary Privilege and Privilege Committees", 5 March 2026.** https://www.shankariasparliament.com/current-affairs/gs-ii/parliament-and-state-legislatures/parliamentary-privilege-privilege-committees

**S13 · IAS Gyan, "Parliamentary Privileges" (a restatement of the standard guidebook account; no date shown).** https://www.iasgyan.in/daily-current-affairs/parliamentary-privileges

**S14 · Wikipedia, "Operation Duryodhana" (citing DNA India and The Times of India).** https://en.wikipedia.org/wiki/Operation_Duryodhana

**S15 · Wikipedia, "Raja Ram Pal" (citing Cobrapost, The Indian Express and the Parliament of India biography).** https://en.wikipedia.org/wiki/Raja_Ram_Pal

**S16 · Earlier topics of this programme, read for consistency: Topic 54, "Lok Sabha: composition, term and Speaker", and Topic 82, "Rajya Sabha: composition, Chairman and special powers" (their sources include** https://www.mea.gov.in/Images/pdf1/Part5.pdf **and** https://sansad.in/rs/about/introduction **)**

**S17 · The Parliamentary Proceedings (Protection of Publication) Act, 1977 (Act No. 15 of 1977), bare text (copy on the Indian Railways website, Railway Protection Force bare Acts).** https://indianrailways.gov.in/railwayboard/uploads/directorate/security/rpf/Files/law/BareActs/parlpoceedingsact1977act.html **; India Code entry:** https://www.indiacode.nic.in/handle/123456789/2442

**S18 · Shubhankar Dam, "Parliamentary Privileges as Façade: Political Reforms and the Indian Supreme Court", Singapore Journal of Legal Studies, 2007, pp. 162 to 183.** https://law.nus.edu.sg/sjls/wp-content/uploads/sites/14/2024/07/1933-2007-sjls-jul-162.pdf

**S19 · Constitution of India text of Article 361A and Article 105 (Constitution of India project, constitutionofindia.net).** https://constitutionofindia.net/articles/article-361a **and** https://constitutionofindia.net/articles/article-105

**S20 · Supreme Court of India, Sita Soren v. Union of India, judgment of 4 March 2024 (Supreme Court website; the text read up to paragraph 100).** https://api.sci.gov.in/supremecourt/2014/10177/10177_2014_1_1501_51211_Judgement_04-Mar-2024.pdf

**S21 · Verdictum, "Supreme Court: Sita Soren v. Union of India: Bribery is not protected by parliamentary privilege", 4 March 2024.** https://www.verdictum.in/court-updates/supreme-court/supreme-court-sita-soren-v-union-of-india-bribery-is-not-protected-by-parliamentary-privilege-1523716

**S22 · The Code of Civil Procedure, 1908, section 135A, bare text (copy on devgan.in).** https://mail.devgan.in/cpc/chapter_11.php

**S23 · Governance Now, "What is common between Vijay Mallya and Subramanian Swamy".** https://www.governancenow.com/news/regular-story/what-common-vijay-mallya-subramanian-swamy

Additional primary references: https://sansad.in/uploads/CHAPTER_25_52_a244798c73.pdf

# Topic 93 · Poverty measurement: committees, poverty lines and the MPI

**S1 · Press Information Bureau (Planning Commission), "Rangarajan Report on Poverty", 7 August 2014 (written reply in the Rajya Sabha).** https://pib.gov.in/newsite/PrintRelease.aspx?relid=108291

**S2 · Press Information Bureau (Planning Commission), press note on poverty estimates for 2011-12, 23 July 2013.** https://pib.gov.in/newsite/PrintRelease.aspx?relid=97365

**S3 · NITI Aayog, Occasional Paper No. 2, "Eliminating Poverty: Creating Jobs and Strengthening Social Programs", 21 March 2016.** https://niti.gov.in/sites/default/files/2018-12/OccasionalPaper_No2_Poverty.pdf

**S4 · Press Information Bureau (NITI Aayog), "24.82 crore Indians escape Multidimensional Poverty in last 9 years", 15 January 2024.** https://www.pib.gov.in/PressReleasePage.aspx?PRID=1996271

**S5 · Press Information Bureau (NITI Aayog), "13.5 crore Indians escape Multidimensional Poverty in 5 years", 17 July 2023.** https://www.pib.gov.in/PressReleasePage.aspx?PRID=1940125

**S6 · NITI Aayog discussion paper, Ramesh Chand and Yogesh Suri, "Multidimensional Poverty in India since 2005-06", January 2024.** https://www.niti.gov.in/sites/default/files/2024-01/MPI-22_NITI-Aayog20254.pdf

**S7 · NITI Aayog, "National Multidimensional Poverty Index: A Progress Review 2023".** https://www.niti.gov.in/sites/default/files/2023-08/India-National-Multidimentional-Poverty-Index-2023.pdf

**S8 · UNDP, Human Development Reports, "2025 Global Multidimensional Poverty Index (MPI)" (posted 17 October 2025; opened 11 October 2026).** https://hdr.undp.org/content/2025-global-multidimensional-poverty-index-mpi

**S9 · Oxford Poverty and Human Development Initiative, "Global MPI" (opened 11 October 2026).** https://ophi.org.uk/global-mpi

**S10 · UNDP, "Global Multidimensional Poverty Index 2026-Statistical Update", briefing note for India (October 2026; opened 14 October 2026).** https://www.hdr.undp.org/sites/default/files/Country-Profiles/MPI2026/IND.pdf

**S11 · Press Information Bureau (Ministry of Statistics and Programme Implementation), "Household Consumption Expenditure Survey: 2023-24", 27 December 2024.** https://www.pib.gov.in/PressReleasePage.aspx?PRID=2088390

**S12 · World Bank, factsheet "June 2025 Update to Global Poverty Lines", 5 June 2025.** https://www.worldbank.org/en/news/factsheet/2025/06/05/june-2025-update-to-global-poverty-lines

**S13 · G.C. Manna, "Contentious Methodological Issues in the Official Estimates of Poverty Line and Head Count Ratios", Special Proceedings of the 19th Annual Conference of the Society of Statistics, Computer and Applications, Jammu, 2017, pp. 39-48.** https://www.ssca.org.in/media/5._GC_Manna_Paper_Jammu_Conference.pdf

**S14 · Lok Sabha, Unstarred Question No. 3500, answered on 24 August 2011 by the Minister of State for Planning.** https://eparlib.nic.in/bitstream/123456789/605146/1/107592.pdf

**S15 · Wikipedia, "Poverty in India" (citing Dandekar and Rath, "Poverty in India", Economic and Political Weekly, 6(2), 9 January 1971; the World Bank's Spring 2025 Poverty and Equity Brief).** https://en.wikipedia.org/wiki/Poverty_in_India

**S16 · Wikipedia, "Measuring poverty" (citing the European Anti-Poverty Network; the ILO Poverty Manual, chapter 4; Haughton and Khandker, Handbook on Poverty and Inequality, World Bank, 2009).** https://en.wikipedia.org/wiki/Measuring_poverty

**S17 · Akashvani News (News On AIR), "Nearly 27 crore people lifted out of extreme poverty in India over 11 years, says World Bank report", 7 June 2025.** https://www.newsonair.gov.in/indias-extreme-poverty-falls-to-5-3-in-2022-2023-says-world-bank

**S18 · UNDP, Human Development Reports, "2026 Global Multidimensional Poverty Index", Statistical Update (posted 12 October 2026; opened 14 October 2026).** https://hdr.undp.org/content/2026-global-multidimensional-poverty-index

**S19 · Lok Sabha, Unstarred Question No. 828, "Poverty in India", answered on 24 July 2015 (Ministry of Planning).** https://eparlib.sansad.in/bitstream/123456789/665239/1/19495.pdf

**S20 · Encyclopaedia Britannica, "Dadabhai Naoroji".** https://www.britannica.com/biography/Dadabhai-Naoroji

**S21 · Government of NCT of Delhi, Economic Survey of Delhi 2003-04, chapter 21, "Poverty Line in Delhi".** https://delhiplanning.delhi.gov.in/sites/default/files/Planning/economic-survey-2003-04/ch21.pdf

**S22 · Press Information Bureau, factsheet "India's Poverty Story Transformed", 7 June 2025 (citing the World Bank's Poverty and Inequality Platform).** https://www.pib.gov.in/FactsheetDetails.aspx?Id=149221&reg=48&lang=2

Additional primary references: https://hdr.undp.org/sites/default/files/publications/additional-files/2026-10/2026_gMPI_Table1and2.pdf

# Topic 94 · Latitudes, longitudes and time: IST and the International Date Line

**S1 · NCERT, The Earth: Our Habitat (Class VI Geography), Chapter 2, "Globe: Latitudes and Longitudes" (pages marked 2022-23).** https://ncert.nic.in/textbook/pdf/fess202.pdf

**S2 · NCERT, Exploring Society: India and Beyond (Class 6 Social Science), Chapter 1, "Locating Places on the Earth".** https://ncert.nic.in/textbook/pdf/fees101.pdf

**S3 · NCERT, India: Physical Environment (Class XI), Chapter 1, "India: Location" (pages marked 2026-27).** https://ncert.nic.in/textbook/pdf/kegy101.pdf

**S4 · Encyclopaedia Britannica, "International Date Line" (page updated 9 October 2026).** https://www.britannica.com/topic/International-Date-Line

**S5 · Encyclopaedia Britannica, "Greenwich Mean Time" (page updated 2 October 2026).** https://www.britannica.com/science/Greenwich-Mean-Time

**S6 · Encyclopaedia Britannica, "great circle route".** https://www.britannica.com/technology/great-circle-route

**S7 · Encyclopaedia Britannica, "latitude and longitude" (summary and diagram captions).** https://www.britannica.com/science/latitude

**S8 · Wikipedia, "Latitude" (citing Osborne, The Mercator Projections, 2013, and Rapp, Geometric Geodesy, 1991, for the meridian arc figures).** https://en.wikipedia.org/wiki/Latitude

**S9 · Wikipedia, "Geographic coordinate system".** https://en.wikipedia.org/wiki/Geographic_coordinate_system

**S10 · Wikipedia, "List of time zones by country" (citing French Decree no. 2017-292 of 6 March 2017 and Decree no. 79-896 of 17 October 1979 for France).** https://en.wikipedia.org/wiki/List_of_time_zones_by_country

**S11 · Wikipedia, "Indian Standard Time" (citing BBC News, "India investigates different time zones", 21 August 2001; Hindustan Times, "Change clock to bagantime", 13 April 2008; Times of India, 2 January 2014; Times Now on the choice of 1905).** https://en.wikipedia.org/wiki/Indian_Standard_Time

**S12 · Wikipedia, "Mirzapur" (citing Firstpost, "Turning the Clock Back: How Indian Standard Time came into existence 75 years ago", 1 September 2022, and BBC News, 21 August 2001).** https://en.wikipedia.org/wiki/Mirzapur

**S13 · Wikipedia, "International Date Line" (citing BBC, 2011, for Samoa; Ariel and Berger, Plotting the Globe, 2005, for Kiribati; The New York Times, 2024, for the line's status).** https://en.wikipedia.org/wiki/International_Date_Line

**S14 · Lok Sabha, Starred Question No. 129, "Different Time Zone", answered on 29 July 2015 by the Minister of Science and Technology (Parliament Digital Library).** https://eparlib.nic.in/bitstream/123456789/666148/1/20327.pdf

**S15 · CSIR-National Physical Laboratory, "Indian Standard Time Metrology Division" (page read on 11 October 2026).** https://www.nplindia.in/index.php/science-technology/indian-standard-time-metrology-division/

**S16 · News On AIR (Akashvani), "Dept of Consumer Affairs notifies Legal Metrology (Indian Standard Time) Rules, 2026", 30 August 2026, and "Government notifies rules mandating Indian Standard Time", 3 September 2026.** https://newsonair.gov.in/dept-of-consumer-affairs-notifies-legal-metrology-indian-standard-time-rules-2026/ **;** https://newsonair.gov.in/government-notifies-rules-mandating-indian-standard-time/

**S17 · Vajiram and Ravi, practice question "The Indian Standard Meridian passes through 5 States" (page updated October 2026).** https://vajiramandravi.com/upsc-exam/the-indian-standard-meridian-passes-through-5-states-which-of-these-states-is-not-among-the-five/

**S18 · NCERT, Contemporary India I (Class IX Geography), Chapter 1, "India: Size and Location", as reproduced on the SATHEE portal of IIT Kanpur.** https://sathee.iitk.ac.in/ncert-books/class-09/social-science/contemporary-india-01/chapter-01-india-size-and-location

**S19 · Press Information Bureau, Ministry of Consumer Affairs, Food and Public Distribution, "Department of Consumer Affairs Notifies Legal Metrology (Indian Standard Time) Rules, 2026", 30 August 2026.** https://www.pib.gov.in/PressReleasePage.aspx?PRID=2304613&reg=3&lang=1

**S20 · Encyclopaedia Britannica, "International Date Line" (re-opened).** https://www.britannica.com/topic/International-Date-Line

**S21 · Wikipedia, "Longitude" (table of the length of a degree on the WGS84 ellipsoid).** https://en.wikipedia.org/wiki/Longitude

**S22 · Wikipedia, "International Meridian Conference" (citing Howse, Greenwich Time and the Longitude, 1997, for the vote).** https://en.wikipedia.org/wiki/International_Meridian_Conference **; Organiser (India Science Wire), "Strategic reasons do not allow dual time zones in India", 1 January 2020.** https://organiser.org/2020/01/01/126009/bharat/strategic-reasons-do-not-allow-dual-time-zones-in-india/

# Topic 95 · Tribes of Andhra Pradesh: distribution and features

**S1 · V. Subramanyam (Senior Fellow, ICSSR, Department of Anthropology, Andhra University), "Social Exclusion and Vulnerability of Particularly Vulnerable Tribal Groups in Andhra Pradesh: Future Strategic Plan of Action for its Inclusive Growth and Development", We the People: DSNLU Journal of Social Sciences, Vol. 1, Issue 1, 2023, pp. 158-185.** https://dsnlu.ac.in/storage/2023/02/14-Social-Exclusion-and-Vulnerability-of-Particularly-Vulnerable-Tribal-Groups-in-Andhra-Pradesh.pdf

**S2 · Comptroller and Auditor General of India, audit report on Andhra Pradesh, Report 3 of 2015, Chapter 3 (performance audit on tribal welfare).** https://cag.gov.in/uploads/download_audit_report/2015/Andhra_Pradesh_Report_3_2015_Chap_3.pdf

**S3 · Government of India, The Constitution of India, Part XVI, "Special Provisions relating to Certain Classes" (text with footnotes, copy hosted by the Ministry of External Affairs).** https://www.mea.gov.in/Images/pdf1/Part16.pdf

**S4 · M. Gopinath Reddy and K. Anil Kumar, Political Economy of Tribal Development: A Case Study of Andhra Pradesh, Working Paper No. 85, Centre for Economic and Social Studies, Hyderabad, February 2010.** https://cess.ac.in/wp-content/uploads/2023/12/CESS-Working-Paper-No.85.pdf

**S5 · Wikipedia, "Scheduled Areas" (citing Ministry of Panchayati Raj, "State wise details of notified Fifth Schedule Areas").** https://en.wikipedia.org/wiki/Scheduled_Areas

**S6 · Samata, Hyderabad, "Problems Related to Tribal People in Andhra Pradesh: A Report to the Scheduled Areas and the Scheduled Tribes Commission" (undated).** https://samataindia.org.in/data/documents/triballandproblems.PDF

**S7 · Government of Andhra Pradesh, Sri Potti Sriramulu Nellore district website, "Tribal Welfare".** https://spsnellore.ap.gov.in/tribal-welfare/

**S8 · Wikipedia, "Alluri Sitharama Raju district".** https://en.wikipedia.org/wiki/Alluri_Sitharama_Raju_district

**S9 · Wikipedia, "Particularly vulnerable tribal group" (citing Press Information Bureau, "Welfare of particularly vulnerable Tribal groups").** https://en.wikipedia.org/wiki/Particularly_vulnerable_tribal_group

**S10 · Government of Andhra Pradesh, Alluri Sitharama Raju district website, "About District".** https://allurisitharamaraju.ap.gov.in/about-district/

**S11 · Government of Andhra Pradesh, Alluri Sitharama Raju district website, "Cultural Tourism".** https://allurisitharamaraju.ap.gov.in/cultural-tourism/

**S12 · Press Information Bureau, backgrounder "Antyodaya in Action: Ensuring Dignity, Opportunity, and Growth for All", 12 June 2026.** https://static.pib.gov.in/WriteReadData/specificdocs/documents/2026/jun/doc2026612890901.pdf

**S13 · Government of Andhra Pradesh, Parvathipuram Manyam district website, "About District".** https://parvathipurammanyam.ap.gov.in/about-district/

**S14 · Earlier topic of this programme, read for consistency: Topic 45, "Rivers of Andhra Pradesh" (its sources include Wikipedia, "List of districts of Andhra Pradesh",** https://en.wikipedia.org/wiki/List_of_districts_of_Andhra_Pradesh **, the Nandyal district website,** https://nandyal.ap.gov.in/about-district/ **, and Wikipedia, "Polavaram district",** https://en.wikipedia.org/wiki/Polavaram_district **)**

**S15 · Prime Minister's Office (pmindia.gov.in), "Launches 'Viksit Bharat Sankalp Yatra' to ensure saturation of flagship government schemes", 15 November 2023.** https://pmindia.gov.in/?p=16319616

**S16 · All India Radio News (newsonair.gov.in), "PM Modi to launch and inaugurate projects worth over Rs 83,300 crore during Hazaribagh visit", 2 October 2024.** https://www.newsonair.gov.in/pm-modi-to-launch-and-inaugurate-projects-worth-over-%E2%82%B983300-crore-during-hazaribagh-visit/

**S17 · Wikipedia, "Rampa Rebellion of 1922" (citing David Arnold, "Disease, Resistance and India's Ecological Frontier, 1770-1947" (2000), for the dates, and Atlury Murali, "Tribal Armed Rebellion of 1922-1924 in the Madras Presidency" (2017), for the forest grievance).** https://en.wikipedia.org/wiki/Rampa_Rebellion_of_1922

**S18 · Sakshi Post, "AP CM to commission ITDA at Chintur", 12 April 2016.** https://www.sakshipost.com/ap-cm-to-commission-itda-at-chintur

**S19 · Ministry of Tribal Affairs, Annual Report 2023-24, Annexure 5B, "State / UT wise list of Scheduled Tribes in India" (copy hosted by IIIT Lucknow).** https://iiitl.ac.in/wp-content/uploads/2024/08/07014a84-st-list-as-per-annual-report_-2023-24.pdf

**S20 · Lok Sabha, Unstarred Question No. 3620, "Welfare to Particularly Vulnerable Tribal Groups (PVTGs)", answered by the Ministry of Tribal Affairs on 15 July 2019.** https://eparlib.nic.in/bitstream/123456789/953713/1/AU3620.pdf

**S21 · Lok Sabha, Starred Question No. 384, answered by the Ministry of Tribal Affairs on 22 August 2006, annexure "List of ITDAs Andhra Pradesh".** https://eparlib.sansad.in/bitstream/123456789/531440/1/31843.pdf

**S22 · Encyclopaedia Britannica, "Kui language".** https://www.britannica.com/topic/Kui-language

**S23 · Palla Trinadha Rao, "Can the decades-old constitutional dispute over Lambadas' Scheduled Tribe status in Telangana be resolved?", Down To Earth, 20 January 2026.** https://www.downtoearth.org.in/amp/story/governance/can-the-decades-old-constitutional-dispute-over-lambadas-scheduled-tribe-status-in-telangana-be-resolved

Additional primary references: https://www.sansad.in/getFile/annex/250/AU631.pdf?source=pqars ; https://spsnellore.ap.gov.in/integrated-tribal-development-agency-itda-yanadis/ ; https://ncst.gov.in/page/forest-rights-act-2006 ; https://nhrc.nic.in/assets/uploads/publication/NHRCJournal2002.pdf

# Topic 96 · Greenhouse effect, global warming and greenhouse gases

**S1 · NCERT, Fundamentals of Physical Geography (Class XI), Chapter 11, "World Climate and Climate Change", reprint 2026-27.** https://ncert.nic.in/textbook/pdf/kegy211.pdf

**S2 · NASA Science, "The Causes of Climate Change" (page last updated 1 October 2026).** https://science.nasa.gov/climate-change/causes/

**S3 · Wikipedia, "Greenhouse effect" (citing Columbia University, "Solar Radiation and the Earth's Energy Balance", and Le Treut et al., 2007, "Historical Overview of Climate Change Science", IPCC Fourth Assessment Report, for minus 18°C; IPCC AR6 Working Group I, Annex VII, Glossary, for nitrogen, oxygen and argon and for the enhanced greenhouse effect; Fourier, 1824; Held and Soden, 2000, for Arrhenius; Ekholm, 1901; University of Georgia Extension and IPCC Fourth Assessment Report, Working Group I, Chapter 1, for real greenhouses).** https://en.wikipedia.org/wiki/Greenhouse_effect

**S4 · Encyclopaedia Britannica, "global warming", section "Causes of global warming" (page updated 31 July 2026).** https://www.britannica.com/science/global-warming/Causes-of-global-warming

**S5 · IPCC, Sixth Assessment Report, Working Group I, Chapter 7, Supplementary Material, Table 7.SM.7.** https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

**S6 · Greenhouse Gas Protocol, "IPCC Global Warming Potential Values", version 2.0, 7 August 2024 (a table adapted from the IPCC's Fourth, Fifth and Sixth Assessment Reports; for the Sixth it points to Chapter 7 of Working Group I, Tables 7.15 and 7.SM.6).** https://ghgprotocol.org/sites/default/files/2024-08/Global-Warming-Potential-Values%20%28August%202024%29.pdf

**S7 · Wikipedia, "Global warming potential" (citing the IPCC AR6 Working Group I Glossary for the definition, and Table 7.15 of Chapter 7 for methane; decisions 2/CP.3 and 24/CP.19 of the UNFCCC).** https://en.wikipedia.org/wiki/Global_warming_potential

**S8 · IPCC, Sixth Assessment Report, Working Group I, Chapter 7, "The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity".** https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-7/

**S9 · Kyoto Protocol to the United Nations Framework Convention on Climate Change, text.** https://unfccc.int/resource/docs/convkp/kpeng.html

**S10 · Doha Amendment to the Kyoto Protocol, text.** https://unfccc.int/files/kyoto_protocol/application/pdf/kp_doha_amendment_english.pdf

**S11 · UN Climate Change, "The Doha Amendment".** https://unfccc.int/process/the-kyoto-protocol/the-doha-amendment

**S12 · World Meteorological Organization, "Greenhouse Gas Bulletin - No. 21", 15 October 2025.** https://wmo.int/media/41825

**S13 · World Meteorological Organization, press release "Carbon dioxide levels increase by record amount to new highs in 2024", 15 October 2025.** https://wmo.int/news/media-centre/carbon-dioxide-levels-increase-record-amount-new-highs-2024

**S14 · World Meteorological Organization, "2025 set to be second or third warmest year on record, continuing exceptionally high warming trend", 6 November 2025.** https://wmo.int/node/32986

**S15 · World Meteorological Organization, press release "WMO confirms 2025 was one of warmest years on record", 14 January 2026.** https://wmo.int/news/media-centre/wmo-confirms-2025-was-one-of-warmest-years-record

**S16 · IPCC, Sixth Assessment Report, Synthesis Report, Summary for Policymakers, paragraphs A.1 to A.2.1.** https://www.ipcc.ch/report/ar6/syr/summary-for-policymakers/

**S17 · Government of India, Ministry of Environment, Forest and Climate Change, "India: First Biennial Transparency Report to the United Nations Framework Convention on Climate Change", 2025.** https://unfccc.int/sites/default/files/resource/BTR1_INDIA.pdf

**S18 · Wikipedia, "Climate change" (citing USGCRP, 2017, Chapter 2, for the water vapour feedback; Turetsky et al., 2019, for permafrost).** https://en.wikipedia.org/wiki/Climate_change

**S19 · IPCC, "History of the IPCC".** https://www.ipcc.ch/about/history/

**S20 · Wikipedia, "Keeling Curve" (citing Harris, D.C., 2010, "Charles David Keeling and the Story of Atmospheric CO2 Measurements", Analytical Chemistry, for the start in March 1958; Keeling, C.D., 1960, and Keeling et al., 1976, Tellus, for the seasonal swing).** https://en.wikipedia.org/wiki/Keeling_Curve

**S21 · IPCC, "Seventh Assessment Report (AR7)".** https://www.ipcc.ch/assessment-report/ar7/

**S22 · IPCC, Sixth Assessment Report, Working Group I, Chapter 6, "Short-lived Climate Forcers", Section 6.1.** https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-6/

**S23 · Climate and Clean Air Coalition, "Black carbon".** https://www.ccacoalition.org/short-lived-climate-pollutants/black-carbon

**S24 · NOAA Global Monitoring Laboratory, "Trends in Atmospheric Carbon Dioxide", Mauna Loa.** https://gml.noaa.gov/ccgg/trends/

**S25 · IPCC, Sixth Assessment Report, Working Group III, Summary for Policymakers, paragraphs B.1.1 and B.2.1.** https://www.ipcc.ch/report/ar6/wg3/chapter/summary-for-policymakers/

**S26 · World Meteorological Organization, "State of the Global Climate 2025", one-page summary, March 2026.** https://wmo.int/sites/default/files/2026-03/State%20of%20the%20Climate%202025_1%20pager_final.pdf

**S27 · National Snow and Ice Data Center (NSIDC), "Arctic sea ice sets record-low maximum in 2025", 27 March 2025.** https://nsidc.org/sea-ice-today/analyses/arctic-sea-ice-sets-record-low-maximum-2025

**S28 · Lok Sabha, Unstarred Question No. 1698, answered by the Ministry of Environment, Forest and Climate Change, 13 February 2023.** https://eparlib.nic.in/bitstream/123456789/1469390/1/AU1698.pdf

# Topic 97 · Solar technologies: photovoltaic and solar thermal

**S1 · Ministry of New and Renewable Energy (MNRE), "Physical Progress" (page updated 8 October 2026; seen on 11 October 2026).** https://mnre.gov.in/en/physical-progress/

**S2 · MNRE, "Solar Overview".** https://mnre.gov.in/en/solar-overview/

**S3 · US Department of Energy, "Solar Photovoltaic Cell Basics".** https://www.energy.gov/eere/solar/solar-photovoltaic-cell-basics

**S4 · US Department of Energy, "Solar Performance and Efficiency".** https://www.energy.gov/cmei/systems/solar-performance-and-efficiency

**S5 · US Department of Energy, "Solar Photovoltaic System Design Basics".** https://www.energy.gov/cmei/systems/solar-photovoltaic-system-design-basics

**S6 · Fraunhofer Institute for Solar Energy Systems ISE, with PSE Projects GmbH, "Photovoltaics Report" (updated 14 July 2026).** https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf

**S7 · US National Renewable Energy Laboratory (NREL), "Best Research-Cell Efficiency Chart".** https://www.nrel.gov/pv/cell-efficiency.html

**S8 · Wikipedia, "Solar cell" (citing, for the Shockley-Queisser limit, W. Shockley and H. J. Queisser, 1961; the article's notes 27 and 28 for Bell Laboratories and its inventors, note 19 for Fritts, note 29 for Vanguard 1, note 79 for monocrystalline and polycrystalline silicon, note 118 for bifacial cells, notes 175 to 177 for PERC and TOPCon).** https://en.wikipedia.org/wiki/Solar_cell

**S9 · Encyclopaedia Britannica, "solar cell".** https://www.britannica.com/technology/solar-cell

**S10 · US Department of Energy, "Concentrating Solar-Thermal Power Basics".** https://www.energy.gov/eere/solar/concentrating-solar-thermal-power-basics

**S11 · US Department of Energy, "Linear Concentrator System Concentrating Solar-Thermal Power Basics".** https://www.energy.gov/cmei/systems/linear-concentrator-system-concentrating-solar-thermal-power-basics

**S12 · US Department of Energy, "Power Tower System Concentrating Solar-Thermal Power Basics".** https://www.energy.gov/cmei/systems/power-tower-system-concentrating-solar-thermal-power-basics

**S13 · US Department of Energy, "Dish/Engine System Concentrating Solar-Thermal Power Basics".** https://www.energy.gov/cmei/systems/dishengine-system-concentrating-solar-thermal-power-basics

**S14 · Wikipedia, "Solar thermal energy" (citing the US Energy Information Administration for the classes of collector; the article's notes 29 to 33 for cookers, notes 23, 24 and 28 for drying and stills).** https://en.wikipedia.org/wiki/Solar_thermal_energy

**S15 · Wikipedia, "Concentrated solar power" (its water figures are from a study of 2013; its capacity table cites REN21 reports).** https://en.wikipedia.org/wiki/Concentrated_solar_power

**S16 · MNRE, "Approved List of Models and Manufacturers (ALMM)" (seen on 11 October 2026).** https://mnre.gov.in/en/approved-list-of-models-and-manufacturers-almm/

**S17 · MNRE, "Production Linked Incentive (PLI) Scheme: National Programme on High Efficiency Solar PV Modules" (page last updated 8 August 2023).** https://mnre.gov.in/en/production-linked-incentive-pli/

**S18 · Press Information Bureau, "Solar Waste Treatment under E-Waste (Management) Rules, 2022" (Ministry of New and Renewable Energy, reply in the Rajya Sabha, 14 March 2023).** https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1906920

**S19 · Press Information Bureau, "Omkareshwar Floating Solar Park showcases scale and ambition of India's clean energy goals: Union Minister Pralhad Joshi" (4 January 2025).** https://www.pib.gov.in/PressReleasePage.aspx?PRID=2090177

**S20 · PRS Legislative Research, summary of the report of the Standing Committee on Energy, "Performance Evaluation of Solar Power Projects in the Country" (report presented on 8 December 2025).** https://prsindia.org/policy/report-summaries/performance-evaluation-of-solar-power-projects

**S21 · Wikipedia, "Solar water heating" (citing C. Marken, "Solar collectors: Behind the glass", HomePower 133, 2009, for the reduced heat loss and the better performance in cloudy or cold weather; Kim and Seo, 2007, for the vacuum; Shi and Yang, 1999, for the absorber coating; Trinkl and others, 2005, for flat plates in full sunshine).** https://en.wikipedia.org/wiki/Solar_water_heating

**S22 · Wikipedia, "Solar pond" (citing G. Boyle, Renewable Energy: Power for a Sustainable Future, 2nd edition, Oxford University Press, 2004, for the mixing and the temperatures; TERI pages for Bhuj).** https://en.wikipedia.org/wiki/Solar_pond

**S23 · Wikipedia, "Agrivoltaics" (citing Dinesh and Pearce, "The potential of agrivoltaic systems", Renewable and Sustainable Energy Reviews, 2016, for the definition).** https://en.wikipedia.org/wiki/Agrivoltaics

**S24 · Wikipedia, "Net metering" (citing Energy Informative, "What's the Difference Between Net Metering and Feed-In Tariffs?", 28 February 2023, for the bi-directional meter).** https://en.wikipedia.org/wiki/Net_metering

**S25 · Wikipedia, "Photovoltaic system" (its reference 51, by Ilse and others, for the 2018 loss estimate).** https://en.wikipedia.org/wiki/Photovoltaic_system

**S26 · MNRE, "State-wise (Location based) installed capacity of Renewable Power as on 30.09.2026" (PDF linked from the Physical Progress page).** https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2026/10/20261008207003538.pdf

**S27 · Ministry of Environment, Forest and Climate Change, E-Waste (Management) Amendment Rules, 2023, G.S.R. 61(E) of 30 January 2023 (copy on the Tamil Nadu Pollution Control Board site).** https://tnpcb.gov.in/pdf_2024/EwasteRules2022_AmendJan23.pdf

Additional primary references: https://www.nlr.gov/docs/libraries/pv/cell-pv-eff.pdf ; https://www.energy.gov/sites/default/files/2025-01/DOE%20SETO%20CdTe%20Photovoltaics%20Perspective%20Paper.pdf ; https://www1.eere.energy.gov/femp/pdfs/FTA_pv.pdf ; https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2026/10/20261008207003538.pdf

## Topic 98 · Statement and assumption

**S1 · Wikipedia, "Tacit assumption" (citing Edgar H. Schein, Organizational Culture and Leadership, Jossey-Bass, 2004).** https://en.wikipedia.org/wiki/Tacit_assumption

**S2 · Wikipedia, "Presupposition" (citing Stephen C. Levinson, Pragmatics, Cambridge University Press, 1983, pp. 181 to 184).** https://en.wikipedia.org/wiki/Presupposition

**S3 · Varsity Tutors, LSAT Logical Reasoning, lesson on necessary assumptions.** https://www.varsitytutors.com/practice/subjects/lsat-logical-reasoning/lessons/necessary-assumption

**S4 · SATHEE SSC portal of IIT Kanpur, preparation guide for reasoning, page on statement and assumptions.** https://sathee.iitk.ac.in/sathee-ssc/student-corner/preparation-guide/reasoning/statement-and-assumptions

**S5 · IndiaBIX, Logical Reasoning, section on statement and assumption (directions to the exercise).** https://www.indiabix.com/logical-reasoning/statement-and-assumption/

**S6 · Testbook, Telugu-language practice page of questions on statements and assumptions.** https://testbook.com/objective-questions/te/mcq-on-statements-and-assumptions--5eea6a1539140f30f369f440

## Topic 99 · Simple interest and compound interest: the basic formulas

**S1 · NCERT, Mathematics, Class VII, chapter "Comparing Quantities" (the textbook used before Ganita Prakash), Sections 7.4 "Charge Given on Borrowed Money or Simple Interest" and 7.4.1 "Interest for Multiple Years", read on the SATHEE portal of IIT Kanpur.** https://sathee.iitk.ac.in/ncert-books/class-07/mathematics/chapter-7-comparing-quantities

**S2 · National Institute of Open Schooling (NIOS), Secondary Course Mathematics (211), Lesson 8 "Percentage and Its Applications", Sections 8.5.3 (simple interest), 8.5.4 (compound interest) and 8.5.5 (growth and depreciation), Examples 8.29, 8.34, 8.36, 8.37 and 8.46.** https://digital.nios.ac.in/content/211en/Chapter-8.pdf

**S3 · Handout "Deducing a Formula for Compound Interest", Class 8 Mathematics, chapter "Comparing Quantities", Module 3/3, on the website of the Atomic Energy Education Society.** https://www.aees.gov.in/htmldocs/downloads/Econtent_aug2020/VIII_MAT_L08_M03_COMPARING_QUANTITIES_HANDOUT.pdf

**S4 · SATHEE portal (IIT Kanpur), bank examinations study material, "Simple Interest - Theory & Concepts".** https://ibps.iitk.ac.in/sathee-bank-exam/bank-exams/ibps-po/study-materials/memory-based-questions/simple-interest/theory

**S5 · Wikipedia, "Rule of 72" (its references include Slavin, All the Math You'll Ever Need, 1989, pp. 153-154, and Gould and Weil, "The Rule of 69", Journal of Business, 1974).** https://en.wikipedia.org/wiki/Rule_of_72

## Topic 100 · Deepavali and UNESCO intangible cultural heritage

**S1 · UNESCO, Intangible Cultural Heritage, country page "India".** https://ich.unesco.org/en/state/india-IN

**S2 · UNESCO, element page "Deepavali", nomination file No. 02312.** https://ich.unesco.org/en/RL/02312

**S3 · UNESCO, Decision of the Intergovernmental Committee 20.COM 7.b.24, "Deepavali".** https://ich.unesco.org/en/decisions/20.COM/7.B.24

**S4 · UNESCO, page of the twentieth session of the Committee (20.COM).** https://ich.unesco.org/en/20com

**S5 · Press Information Bureau (PIB Research), "A Glowing Recognition: Deepavali Added to UNESCO's Intangible Cultural Heritage List", 10 December 2025,** https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/dec/doc20251210726801.pdf **; the same note under the title "Diwali Added …",** https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/dec/doc20251210725901.pdf

**S6 · Press Information Bureau, "India Hosts UNESCO's 20th ICH Session", 7 December 2025.** https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/dec/doc2025127721401.pdf

**S7 · UNESCO, text of the Convention for the Safeguarding of the Intangible Cultural Heritage (2003).** https://ich.unesco.org/en/convention

**S8 · UNESCO, "The States Parties to the Convention for the Safeguarding of the Intangible Cultural Heritage (2003)".** https://ich.unesco.org/en/states-parties-00024

**S9 · UNESCO, Legal Affairs, "Convention for the Safeguarding of the Intangible Cultural Heritage".** https://www.unesco.org/en/legal-affairs/convention-safeguarding-intangible-cultural-heritage

**S10 · UNESCO, "Members of the Intergovernmental Committee".** https://ich.unesco.org/en/members-00028

**S11 · UNESCO, page of the twenty-first session of the Committee (21.COM).** https://ich.unesco.org/en/21com

**S12 · UNESCO, element page of Nowruz, nomination file No. 02097.** https://ich.unesco.org/en/RL/02097

**S13 · UNESCO, "Proclamation of the Masterpieces of the Oral and Intangible Heritage of Humanity (2001-2005)".** https://ich.unesco.org/en/proclamation-of-masterpieces-00103

**S14 · UNESCO, "Procedure of inscription of elements on the Lists and of selection of Good Safeguarding Practices".** https://ich.unesco.org/en/procedure-of-inscription-00809

**S15 · UNESCO, Intangible Cultural Heritage, country page "Italy".** https://ich.unesco.org/en/state/italy-IT

**S16 · UNESCO, Intangible Cultural Heritage, country page "Pakistan".** https://ich.unesco.org/en/state/pakistan-PK

**S17 · UNESCO World Heritage Centre, States Parties, "India".** https://whc.unesco.org/en/statesparties/in

**S18 · UNESCO World Heritage Centre, "The World Heritage Convention".** https://whc.unesco.org/en/convention/

**S19 · Press Information Bureau, "Chhath Mahaparva: From Riverbanks to World Heritage Status", 27 October 2025.** https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/oct/doc20251027678001.pdf

**S20 · High Commission of India, Port of Spain, "High Commissioner's Remarks on Inscription of Diwali on UNESCO's Representative List of Intangible Heritage of Humanity", 10 December 2025.** https://www.hcipos.gov.in/section/remarks-and-speeches/high-commissioners-remarks-on-inscription-of-diwali-on-unescos-representative-list-of-intangible-heritage-of-humanity-10-12-2025/

**S21 · The institute's current affairs files: Insights "Current Affairs 30" (CA-30), December 2025, page 130; ForumIAS "Factly Compilation", December 2025**

**S22 · UNESCO, page of the eleventh session of the General Assembly of the States Parties (11.GA).** https://ich.unesco.org/en/11ga

**S23 · Lok Sabha, Unstarred Question No. 2375, answered on 4 August 2025 by the Ministry of Culture (Lai Haraoba).** https://eparlib.sansad.in/bitstream/123456789/2994121/1/AU2375_zPpg3m.pdf

**S24 · UNESCO, Decision of the Intergovernmental Committee 11.COM 10.B.1 (Addis Ababa, 2016), Nowruz.** https://ich.unesco.org/en/decisions/11.COM/10.B.1