

SURA'S
TNPSC
GROUP-I

PRELIMINARY EXAM
CCSE-I (Graduate Level)

GENERAL STUDIES
APTITUDE AND MENTAL ABILITY

V.V.K. Subburaj



SURA COLLEGE OF COMPETITION
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CONTENTS

TNPSC Group-I Original Question Paper with Explanatory Answers - 2025 1 - 84

★ PART A - GENERAL STUDIES ★

GENERAL SCIENCE (10 Questions)	1 - 160
GEOGRAPHY OF INDIA (10 Questions)	1- 144
HISTORY, CULTURE OF INDIA AND INDIAN NATIONAL MOVEMENT (25 Questions)	1 - 224
INDIAN POLITY (40 Questions).....	1 - 176
INDIAN ECONOMY AND DEVELOPMENT ADMINISTRATION IN TAMILNADU (50 Questions)	1 - 240
தமிழ்நாட்டின் வரலாறு, மரபு, பண்பாடு மற்றும் சமூக-அரசியல் இயக்கங்கள் (40 கேள்விகள்)	1 - 256

★ PART B - APTITUDE AND MENTAL ABILITY ★

APTITUDE (15 Questions)	1 - 32
REASONING (10 Questions)	33 - 112
Current Events	



TNPSC

COMBINED CIVIL SERVICES EXAMINATION-I

SCHEME OF EXAMINATION

PRELIMINARY EXAMINATION

(OBJECTIVE TYPE) (DEGREE STANDARD)

Subject	Duration	Maximum Marks	Minimum Qualifying Marks for All Communities
PRELIMINARY EXAMINATION (OBJECTIVE TYPE) GENERAL STUDIES (Degree Standard) (175 Questions)	3 hours	300	90
APTITUDE AND MENTAL ABILITY TEST (S.S.L.C. Standard) (25 Questions)			
Total - 200 Questions			

MAIN WRITTEN EXAMINATION AND ORAL TEST (DESCRIPTIVE TYPE)

Subject	Duration	Maximum Marks	Minimum Qualifying Marks for Selection	
			SCs, SC(A)s, STs, MBCs / DCs, BC(OBCM)s and BCMs	Others
Paper-I Tamil Eligibility Test (SSLC Standard) (Descriptive Type)	3 Hours	100	40	40
General Studies (Degree Standard) (Descriptive type)				
Paper-II	3 Hours	250	255	340
Paper-III	3 Hours	250		
Paper-IV	3 Hours	250		
Interview & Records		100		
	Total	850		

TNPSC GROUP – I SERVICES

Solved Original Question Paper - 2025

Duration : 3 Hours
Marks : 300

Preliminary Exam (General Studies)

Held on : 15.06.2025

1. Which of the statements are True?

- i) Octane number increases with chain length.
- ii) Cycloalkanes have higher Octane number than straight chain alkanes.
- iii) Alkenes and aromatic hydrocarbon have higher Octane number than straight chain alkanes
- iv) Branched chain alkanes have lower octane number than straight chain alkanes.

Select the correct answer :

- A) (i) and (iv) B) (i) and (ii)
C) (ii) and (iii) D) (i), (ii), (iii) and (iv)

Explanation:

Ans : (C)

i) Octane number increases with chain length.-False

In general, as the chain length of straight-chain alkanes increases, the octane number decreases. This is because longer straight-chain hydrocarbons are more prone to knocking (premature combustion in engines), which is undesirable. For example, n-heptane (C_7H_{16}) has an octane number of 0, while n-octane (C_8H_{18}) would have an even lower octane rating if it were used as a reference (but n-octane isn't a primary reference). Shorter chains or branched chains have higher octane numbers.

ii) Cycloalkanes have higher octane numbers than straight-chain alkanes.-True

Cycloalkanes (like cyclohexane) generally have higher octane numbers compared to straight-chain alkanes because their cyclic structure resists knocking better than linear chains. For example, cyclohexane has a higher octane number than n-hexane.

iii) Alkenes and aromatic hydrocarbons have higher octane numbers than straight-chain alkanes.-True

- ♦ Alkenes (like isooctane) typically have higher octane numbers than straight-chain alkanes because the double bond increases resistance to knocking.
- ♦ Aromatic hydrocarbons (like benzene, toluene) have very high octane numbers due to their stable ring structures. For example, toluene has an octane number of ~120, much higher than n-heptane (0).

iv) Branched-chain alkanes have lower octane numbers than straight-chain alkanes.-False

Branched-chain alkanes (like isooctane, the standard for 100 octane) have higher octane numbers than straight-chain alkanes. Branching reduces knocking, which is why fuels are often formulated with branched hydrocarbons.

2. Match the following hormone with the disorder caused :

- | | |
|--------------------|-----------------------|
| a) Insulin | 1. Cushing's syndrome |
| b) Thyroxine | 2. Diabetes insipidus |
| c) Glucocorticoids | 3. Acromegaly |
| d) Growth hormone | 4. Goitre |
| | 5. Diabetes Mellitus |

Codes:

- | | | | |
|------|----|----|----|
| a) | b) | c) | d) |
| A) 5 | 1 | 2 | 3 |
| B) 2 | 4 | 3 | 1 |
| C) 5 | 4 | 1 | 3 |
| D) 2 | 4 | 1 | 3 |

Explanation:

Ans : (C)

(a) Insulin

Primary disorder: Diabetes Mellitus (Type 1 or Type 2)

- ♦ Insulin is produced by the pancreas and regulates blood glucose levels. Deficiency or resistance to insulin leads to Diabetes Mellitus.

(b) Thyroxine

Primary disorder: Goitre

- ♦ Thyroxine (T4) is a thyroid hormone. Deficiency or imbalance can lead to thyroid enlargement, known as Goitre.

(c) Glucocorticoids (e.g., Cortisol)

Primary disorder: Cushing's syndrome

- ♦ Excess glucocorticoids (often due to overproduction or medication) cause Cushing's syndrome, characterized by weight gain, high blood pressure, and other symptoms.

(d) Growth Hormone (GH)

Primary disorder: Acromegaly (in adults) or Gigantism (in children)

- ♦ Overproduction of growth hormone in adults leads to Acromegaly, characterized by enlarged bones and tissues.

Incorrect Matches:

- ♦ Diabetes insipidus is caused by issues with Antidiuretic Hormone (ADH), not insulin or glucocorticoids.
- ♦ Cushing's syndrome is not linked to thyroxine or growth hormone. Cushing syndrome is a hormonal disorder caused by prolonged exposure to high levels of Cortisol, a steroid hormone produced by the adrenal glands.

3. Choose the right matches :

- | | | |
|--------------------|---|-------------------------|
| 1) Carotenoid | - | $C_{55}H_{70}O_5N_4M_g$ |
| 2) Chlorophyll 'a' | - | $C_{55}H_{72}O_5N_4M_g$ |

3) Chlorophyll 'b' - $C_{55}H_{70}O_6N_4Mg$

4) Xanthophyll - $C_{50}H_{70}O_5Mg$

Select the correct answer :

- A) (1) and (2) are correct
- B) (3) and (4) are correct
- C) (2) and (3) are correct
- D) (1) and (4) are correct

Explanation:

Ans : (C)

1. **Carotenoid** ($C_{55}H_{70}O_5N_4Mg$)

♦ **Incorrect.** Carotenoids are hydrocarbons (e.g., β -carotene, $C_{40}H_{56}$) or oxygenated derivatives (xanthophylls, e.g., $C_{40}H_{56}O_2$), but they do not contain nitrogen (N) or magnesium (Mg).

♦ The given formula resembles a chlorophyll structure, not a carotenoid.

2. **Chlorophyll 'a'** ($C_{55}H_{72}O_5N_4Mg$)

♦ **Correct.** This is the correct formula for chlorophyll a: $C_{55}H_{72}O_5N_4Mg$. Contains 4 nitrogen atoms and 1 magnesium atom in its porphyrin ring.

3. **Chlorophyll 'b'** ($C_{55}H_{70}O_6N_4Mg$)

♦ **Correct.** This is the molecular formula of chlorophyll 'b'. It differs from chlorophyll 'a' by having a formyl group ($-CHO$) instead of a methyl group ($-CH_3$), changing the formula to $C_{55}H_{70}O_6N_4Mg$.

4. **Xanthophyll** ($C_{50}H_{70}O_5Mg$)

♦ **Incorrect.** Xanthophylls are oxygenated carotenoids (e.g., lutein, $C_{40}H_{56}O_2$) and do not contain magnesium (Mg). The given formula is incorrect.

4. **The Nobel Prize in Medicine was awarded to Victor Ambros and Gary Ruvkun for their discovery of**

- A) Expression Sequence Tags
- B) Micro RNA
- C) DNA micro array
- D) SNP's

Explanation:

Ans : (B)

Victor Ambros and Gary Ruvkun were awarded the 2015 Nobel Prize in Physiology or Medicine (shared with Sydney Brenner) for their discovery of microRNAs (miRNAs) and their role in gene regulation.

Key Contribution:

♦ Ambros and Ruvkun identified small non-coding RNA molecules (miRNAs) that regulate gene expression by binding to messenger RNA (mRNA), leading to gene silencing.

♦ Their work revolutionized understanding of genetic regulation and opened new fields in RNA biology.

MicroRNAs (miRNAs) are:

- ♦ Short RNA molecules (about 21–23 nucleotides long)
- ♦ Non-coding: they do not code for proteins
- ♦ Involved in post-transcriptional regulation of gene expression

They function by:

1. Binding to complementary sequences on target mRNAs (usually in the 3' untranslated region)
2. Leading to either:
 - mRNA degradation, or
 - Repression of translation

This process reduces the amount of protein that get produced from that mRNA.

Before this discovery, it was believed that gene regulation was mostly controlled by proteins (transcription factors, repressors, etc.). But miRNAs revealed a whole new layer of RNA-based gene regulation.

Key impacts:

Developmental Biology

- miRNAs regulate key genes involved in timing of cell differentiation and organ development

Cancer

- Many miRNAs are found to be abnormally expressed in tumors
- miRNAs regulate key genes involved in timing of cell differentiation and organ development

Neurological Disorders

- Linked to diseases like Alzheimer's, Parkinson's, and autism

Therapeutics

- Targeting miRNAs is now a promising strategy for drug development
- miRNA mimics or inhibitors are in clinical trials

5. **Which of the following statements are true about crew selection and training for "Gaganyaan Mission"?**

- i) Crews are selected after clinical, psychological and aeromedical examination.
- ii) Mission-specific training will be conducted at ISRO, Trivandrum.
- iii) Selected astronauts will undergo their generic spaceflight training in Yuri Gagarin Cosmonaut training centre, Russia.

Select the correct answer :

- A) (i) and (ii) only
- B) (ii) and (iii) only
- C) (iii) only
- D) (i) and (iii) only

Explanation:

Ans : (D)

The correct statements regarding crew selection and training for the Gaganyaan Mission are:

(i) Crews are selected after clinical, psychological and aeromedical examination.

♦ The selection process, led by the Institute of Aerospace Medicine (IAM) in collaboration with ISRO, includes physical fitness tests, lab and radiological investigations, and evaluations of psychological and aeromedical fitness

(ii) (Mission-specific training will be conducted at ISRO, Trivandrum.

◆ Mission-specific training takes place at the Astronaut Training Facility in Bengaluru, not at Trivandrum

(iii) Selected astronauts will undergo their generic spaceflight training in Yuri Gagarin Cosmonaut Training Centre, Russia.

True

◆ The four selected astronauts (Group Captains Prasanth Balakrishnan Nair, Angad Pratap, Ajit Krishnan, and Wing Commander Shubhanshu Shukla) underwent generic spaceflight training at the Yuri Gagarin Cosmonaut Training Centre in Russia (2020-2021).

The Gaganyaan Mission is India's first human spaceflight mission, developed by the Indian Space Research Organisation (ISRO). Announced in 2018 by Prime Minister Narendra Modi, the mission aims to send a crew of three Indian astronauts into low Earth orbit (LEO) at an altitude of around 400 kilometers, where they will spend approximately three days in space before returning safely to Earth. The spacecraft will be launched using the human-rated LVM3 rocket (a modified version of the GSLV Mk III), from the Satish Dhawan Space Centre in Sriharikota, Andhra Pradesh.

The crew selection process involves rigorous clinical, psychological, and aeromedical evaluations, conducted in collaboration with the Institute of Aerospace Medicine in Bengaluru. Four Indian Air Force pilots were chosen and sent to the Yuri Gagarin Cosmonaut Training Centre in Russia for generic spaceflight training. They are now undergoing mission-specific training in India, where ISRO has set up advanced astronaut training facilities in Bengaluru.

The spacecraft consists of a crew module, which houses the astronauts and life-support systems, and a service module, which provides power and propulsion. Multiple uncrewed test flights, including abort tests like TV-D1, are being conducted to ensure crew safety. The first human flight is expected to take place in 2025.

Once completed, Gaganyaan will mark India's entry into the elite group of nations capable of sending humans into space independently, joining the ranks of the United States, Russia, and China. The mission is a major milestone for India's space program and a testament to its growing technological capabilities.

6. Which of the following statements are correct about PFAS?

- i) PFAS is per and poly fluoro alkyl substances.
- ii) It is used in paint industries.
- iii) PFAS are endocrine disrupters.

Select the correct answer :

- A) (i) and (ii) are correct
- B) (ii) and (iii) are correct
- C) (i) and (iii) are correct
- D) (i) only correct

Explanation:

Ans : (*)

PFAS (Per- and Polyfluoroalkyl Substances) are a large group of human-made chemicals used since the 1940s in various industrial and consumer products. They are known for their water-, grease-, and stain-resistant properties, which make them useful in products like non-stick cookware (e.g., Teflon), waterproof clothing, firefighting foam, food packaging, and more.

PFAS are often called "forever chemicals" because they are extremely persistent in the environment and human body, meaning they do not break down easily. Exposure to PFAS has been linked to various health risks, including hormonal (endocrine) disruption, liver damage, decreased fertility, immune system effects, and certain cancers.

Due to their persistence and potential harm, PFAS are now a major environmental and public health concern, with many countries working to regulate and reduce their use.

(i) PFAS is per and poly fluoro alkyl substances.

Correct

PFAS stands for Per- and Polyfluoroalkyl Substances. These are a large group of synthetic chemicals known for their strong carbon-fluorine bonds, making them highly resistant to degradation.

(ii) It is used in paint industries.

Correct

PFAS are added to paints and coatings for their:

- ◆ Water repellency
- ◆ Stain resistance
- ◆ Chemical resistance
- ◆ Smooth spreading & leveling properties and Durability and weather resistance

(iii) PFAS are endocrine disrupters.

Correct

Some PFAS compounds are known to interfere with the endocrine system, affecting hormonal balance and potentially leading to health issues like reproductive disorders, developmental problems, and even cancer.

All the statements are correct.

7. The biological oxygen demand is the amount of dissolved oxygen required by in water.

- A) Microbes
- B) Plants
- C) Animals
- D) Seaweeds

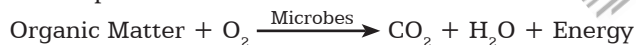
Explanation:

Ans : (A)

Biological Oxygen Demand (BOD) is a key indicator of water quality that measures the amount of **dissolved oxygen** required by **microorganisms** (mainly aerobic bacteria) to decompose organic matter present in a water sample. When organic waste such as plant debris, sewage, or industrial effluents enters a water body, microbes begin breaking it down. During this process, they consume oxygen. The greater the amount of organic matter, the more oxygen is needed for its decomposition.

BOD is usually measured over a **period of five days at 20°C**, and it reflects the level of organic pollution in the water. A **high BOD indicates a high level of biodegradable material**, which means more oxygen is being consumed by microbes, potentially leading to oxygen depletion. This can harm aquatic life such as fish, which rely on dissolved oxygen to survive. On the other hand, low BOD levels suggest that the water is relatively clean and contains less organic waste.

- ◆ Microbes (Option A) are the primary agents of organic decomposition.
- ◆ They metabolize organic pollutants, consuming oxygen in the process:



- ◆ Plants (B), Animals (C), and Seaweeds (D) respire but do not significantly contribute to BOD because they do not decompose organic waste.

Significance of BOD:

- ◆ High BOD = High organic pollution (e.g., sewage discharge, agricultural runoff).
- ◆ Low BOD = Cleaner water (e.g., mountain streams).
- ◆ BOD levels > 5 mg/L indicate polluted water unsuitable for aquatic life.

8. Which of the following is the first Indian Geo-Stationary Satellite?

- A) INSAT 3D
- B) LANDSAT 8
- C) IKONOS 1
- D) QUICK BIRD

Explanation:

Ans : (A)

The first Indian geostationary satellite is INSAT-3D, a part of the Indian National Satellite System (INSAT) developed and operated by the Indian Space Research Organisation (ISRO). Launched on July 26, 2013, from French Guiana using an Ariane 5 launch vehicle, INSAT-3D is designed specifically for meteorological observations and weather forecasting. It carries advanced payloads such as a 6-channel imager and a 19-channel sounder, along with instruments for data relay and search and rescue operations.

INSAT-3D operates in a geostationary orbit, meaning it remains fixed over a specific point on the Earth's equator (Orbits Earth at ~35,786 km altitude, matching Earth's rotation (24-hour period), allowing continuous observation of the Indian subcontinent. This capability is crucial for real-time weather monitoring, cyclone tracking, cloud pattern observation, and atmospheric studies.

LANDSAT 8 is a U.S. satellite launched by NASA and USGS for Earth observation.

IKONOS 1 and QUICKBIRD are commercial Earth imaging satellites operated by American companies.

9. Who among the following tribes act as cattle keepers?

- A) Dhimor
- B) Kewats
- C) Rawats
- D) Bhils

Explanation:

Ans : (C)

The Rawat tribe is a prominent Adivasi (tribal) community mainly found in Chhattisgarh, Rajasthan, Uttar Pradesh, and parts of Uttarakhand. Traditionally, the Rawats have been associated with pastoralism and cattle herding, earning them the identity of cattle keepers in their regions.

Their name itself is believed to be derived from "Raut" or "Rautar," meaning protector of cattle or cowherd, which reflects their close connection with livestock, especially cows and buffaloes. In many rural societies of central India, the Rawats are known for their expertise in animal husbandry, and they often supply milk and dairy products to nearby villages and towns.

Cattle are not just an economic asset for them, but also hold cultural and religious significance. During local festivals and rituals, cattle—especially bulls and cows—are decorated and worshipped by the community. This deep-rooted tradition highlights the Rawats' identity as custodians of cattle wealth in tribal India.

- ◆ **A) Dhimor:** This community is traditionally linked with water-related occupations such as fishing, boating, and irrigation works, especially in eastern and central India.
- ◆ **B) Kewats:** Similar to the Dhimors, the Kewats are also associated with river-based livelihoods. They work as boatmen, fishermen, and sometimes as agricultural laborers in riverine areas.
- ◆ **D) Bhils:** One of the largest tribal groups in India, the Bhils are mainly engaged in shifting agriculture, hunting, and forest-based activities. Though some Bhils may keep livestock, cattle rearing is not their traditional or primary occupation.

10. Reason and Assertion type:

Assertion [A] : Development of a nation depends on infrastructure facilities.

Reason [R] : Transport and communication are the back bone of economic development.

Select the correct answer :

- A) [A] and [R] is true and [R] is correct explanation for [A]
- B) [A] is true but [R] is false
- C) [A], [R] is true but [R] is not the correct explanation of [A]
- D) Both [A] and [R] are not correct

Explanation:

Ans : (A)

Assertion [A]:

"Development of a nation depends on infrastructure facilities."

This statement is true. The level of a country's development is strongly linked to the availability and quality of its

HISTORY, CULTURE OF INDIA, AND INDIAN NATIONAL MOVEMENT

- ♠ From the Beginnings to Indus Valley Civilisation
- ♠ Chalcolithic, Megalithic, Iron Age and Vedic Cultures
- ♠ Rise of Territorial Kingdoms and New Religious Sects
- ♠ Emergence of State and Empire
- ♠ Early Tamil Society and Culture
- ♠ Ancient Cities of Tamilagam
- ♠ Post-Mauryan India
- ♠ The Guptas
- ♠ Harsha and the Rise of Regional Kingdoms
- ♠ South Indian Kingdoms
- ♠ Advent of Arabs & Turks and Kingdoms in North India
- ♠ Sources of Medieval India
- ♠ Emergence of New Kingdoms in South India : Later Cholas and Pandyas
- ♠ Other South Indian Kingdoms
- ♠ Bahmani and Vijayanagar Kingdoms
- ♠ The Mughal Empire
- ♠ The Rise of Marathas
- ♠ New Religious Ideas and Movements
- ♠ Art and Architecture of Tamil Nadu
- ♠ Arrival of Europeans
- ♠ Expansion of British Rule
- ♠ Early Uprisings against British Rule
- ♠ Effects of British Rule
- ♠ Socio-Religious Movements
- ♠ Indian National Movement
- ♠ Role of Tamil Nadu in Freedom Struggle
- ♠ Tamil Renaissance
- ♠ Development of Education
- ♠ Status of Women in India Through the Ages
- ♠ Unity and Diversity
- ♠ National Symbols

PRACTICE QUESTIONS

FROM THE BEGINNINGS TO INDUS VALLEY CIVILISATION

The transition from the beginnings of human existence to the rise of the Indus Valley Civilization represents one of the most significant phases in the evolution of Indian history. According to historians, early human societies in the Indian subcontinent passed through various stages of cultural and technological development. During the Paleolithic Age, humans survived as nomadic hunter-gatherers and used crude stone tools made of quartzite and flint. Archaeological sites like Bhimbetka, Hunsgi, and Kurnool caves provide evidence of early human habitation and rock art.

The Mesolithic Age witnessed climatic changes after the Ice Age, leading to the use of microlithic tools, semi-settled life, and the beginning of animal domestication. In the Neolithic period, humans gradually shifted towards food production, agriculture, and permanent settlements. Important Neolithic sites such as Mehrgarh, Burzahom, Chirand, and Paiyampalli reveal developments in farming, pottery, weaving, and social life. Historians regard Mehrgarh as one of the earliest agricultural settlements in South Asia, showing continuity towards urban civilization.

The Chalcolithic phase marked the use of copper along with stone tools and saw the emergence of village cultures, trade networks, craft specialization, and social differentiation. These gradual economic and technological advancements laid the foundation for urbanization. Around 2600 BCE, the Indus Valley Civilization, also called the Harappan Civilization, emerged as the first urban civilization of the Indian subcontinent. Spread across present-day India and Pakistan, it covered major sites such as Harappa, Mohenjo-daro, Dholavira, Lothal, Kalibangan, and Rakhigarhi.

The civilization is noted for its remarkable urban planning, grid-pattern streets, sophisticated drainage system, standardized weights and measures, granaries, dockyards, and extensive trade relations with Mesopotamia and the Persian Gulf. Scholars like Mortimer Wheeler and Stuart Piggott emphasized its urban character, while recent archaeological studies highlight regional diversity within Harappan culture. Although the script remains undeciphered, seals, terracotta figurines, beads, and pottery reflect a highly organized socio-economic and cultural life. Thus, the journey from prehistoric societies to the Indus Valley Civilization demonstrates the gradual transformation of human communities from primitive survival to complex urban civilization in ancient India.

The sources for the history of this are archaeological sites, geological sediments, animal bones and fossils, stone tools, bone tools, rock paintings and artefacts. There is no written evidence for this period. Although the Harappans used a script, it is yet to be deciphered.

The pre-historic period witnessed no development of scripts. It is referred to as Stone Age.

It is believed that human ancestors might have first evolved in Africa and later migrated to different parts of the world. The migrants were known as 'Homo erectus'.

Recent researches have revealed that humans lived in India between 2 million and 1 million years ago.

The period before invention of script is divided into Stone Age, Bronze Age and Iron Age. The names have been assigned depending upon the metals they used.

The earliest age in history is called old Stone Age or Paleolithic. This period is divided into (1) Lower Paleolithic Culture (2) Middle Paleolithic Culture and (3) Upper Paleolithic Culture.

Some of the famous sites of Old Stone Age in India are:

- The Soan valley and Potwar Plateau on the northwest India.
- The Siwalik hills on the north India.
- Bhimbetka in Madhya Pradesh.
- Adamgarh hill in Narmada valley.
- Kurnool in Andhra Pradesh and
- Attirampakkam near Chennai.

The period after Stone Age is Mesolithic Age next is Neolithic Age. In the Neolithic Age only, animal and plant domestication developed leading to food production.

During the Lower Paleolithic Period, human ancestor species of Homo erectus is believed to have lived in India.

The first Paleolithic tools were identified at the site of Pallavaram near Chennai by Robert Bruce Foote in 1863.

Pre-historic study mainly depends on tools they used. They used the tools mainly for hunting, butchering and skinning the animals.

The industries of Paleolithic cultures are divided into the Early, Middle and Late Acheulian Industries. The early Acheulian tools include polyhedrons, spheroids, hand axes, cleavers and flake tools.

The Acheulian tradition is absent in the Western Ghats, coastal areas and north-eastern India. Heavy rainfall is attributed to its absence.

Lower paleolithic tools are found in Athirampakkam, Pallavaram and Gudiyam near Chennai, Hunsgi valley and Isampur in Karnataka, and Bhimbetka in Madhya Pradesh are some important Paleolithic sites where the Acheulian tools are found.

Researchers have concluded that Paleolithic age was around two million years ago. This culture continued upto 60,000 years ago.

Evidence of hominin (immediate ancestors of Homo Sapiens) fossil is rare in India. The only rare hominin fossil was found in Hoshangabad in M.P. A fossil was discovered in Athirampakkam. But now not available.

A hominid Skull cap was found in a basal conglomerate deposit in 1982. It is considered to represent the Archaic Homo Sapiens.

In Narmada Valley, animal fossils of pre-historic elephant skull was discovered. Skulls of wild cattle and of great horse-like animal were also found. The teeth of horses or asses and of water buffalo were found. 17 animal hoof prints have been uncovered at Athirampakkam.

The people of Lower Paleolithic age lived in caves near river valleys as seen from evidence in Bhimbetka (M.P).

They belonged to the species of 'homo erectus' who had no complex languages. They expressed a few sounds and signs. They were intelligent enough to use stone tools.

About 4,00,000 years from now, changes took place in lithic technology and the species of human ancestors diverged. Anatomically, modern humans are said to have emerged around 3,00,000 years ago. The middle Paleolithic period of Athirampakkam is dated to be around 3.85 to 1.72 lakh years from now.

The tool types of the Middle Paleolithic period are hand axes, cleavers, choppers, chopping tools, scrapers, borers and points, projectile points or shouldered points and knives on flakes. Flake industry was predominant in the Middle Paleolithic period and tools such as scrapers, points and borers were made. Scrapers were used for wood and skin working.

The middle Paleolithic culture in India is dated between 3,85,000 and 40,000 BCE.

The Middle Paleolithic sites are found in Narmada, Godavari, Krishna, Yamuna and other river valleys.

The main features of the Indian Middle Palaeolithic period include the following :

1. The tools became smaller.
2. The decrease in the use of hand axes in relation to other tools.
3. Use of core preparation techniques in stone tool production.
4. Use of chert, jasper, chalcedony and quartz as raw materials.

The period of upper Paleolithic culture is marked by innovation in tool technology and increased cognitive capability of humans.

The modern humans evolved first in Sub-Saharan area about 3,00,000 years ago. They migrated and occupied various areas of Asia around 60,000 years ago.

Their tool technology improved to blades and bone tools. Many tools made of Silica - rich raw materials were used.

Bone tools and faunal remains are found in Kurnool caves of Andhra Pradesh.

The upper Paleolithic culture is represented in India between 40,000 and 10,000 years from now.

The people of this period used caves as well as the open air space for living. Meralbhavi in Karnataka, Kurnool caves and Godavarikhani in Telangana, Baghor I and Baghor III of Son Valley in Madhya Pradesh and Patne in Maharashtra are some of the Upper Palaeolithic sites of India.

Sri Lanka has evidence of microliths and hominin fossils. Incised ostrich eggshell, and shell and stone beads have been found at Jwalapuram in Andhra Pradesh, Patne in Maharashtra and Batadomba-Lena and Fa Hien Cave in Sri Lanka.

Evidences of art in the forms of paintings, beads and ornaments of this period have been found.

Some of the green colour paintings of Bhimbetka belong to this period according to archaeological evidence.

Mesolithic Culture

Mesolithic culture can be found along the length and breadth of India. In the following places, the Mesolithic sites have been discovered.

Mesolithic remains are found in Langhanj in Gujarat, Adamgarh in Madhya Pradesh and also in some places of Rajasthan, Uttar Pradesh.

Mesolithic sites in India are found in Paisra (Bihar), Baghor II, Chopani Mando, Sarai Nahar Rai, Mahadaha and Damdama (all in Uttar Pradesh), Sankanakallu and Kibbanahalli (Karnataka). Rock shelter sites are found in Lekhakia, Baghai Khor, Adamgarh and Bhimbetka.

Coastal sites are seen at Mumbai,teri sites of Thoothukudy in Tamil Nadu and Vishakapatnam, which have microlithic evidence.

The change of climate triggered migration of people to various eco-zones. Monsoon pattern had also developed.

Even in today's deserts of Rajasthan also, there were fresh water lakes between 10,000 and 3500 B.P.

The date of Mesolithic culture differs from place to place.

In eastern Mediterranean (Levant) it dated between 20,000 and 9500 BCE, In Tamil Nadu and Kerala, it continued upto 1000 BCE. In Srilanka, microlithics appeared about 28,500 years BP.

Economy

- ★ Hunting was the main Occupation, Agriculture was not practised. Domestication of animals paved the way for neo-lithic age. The rock paintings of central India depict hunting, trapping, fishing etc.
- ★ The faunal evidence from this period shows that people belonging to this period hunted cattle, gaur, buffalo, barasingha, porcupines, sambar, chital, gazelle, hog deer, nilgai, jackal, turtle, fish, wild hare, lizard, fox and monitor lizard. Bones of rhinoceros and elephant have also been found. They used spears, bow and arrow and traps. The paintings of Bhimbetka show that various animals were hunted and for this men and women went together.
- ★ The people used fire and perhaps roasted food. Domestic animal bones of cattle, sheep, goats, pig and dog have been found at Kanewal, Loteshwar and Ratanpur, and from Adamgarh and Bhimbetka in Madhya Pradesh sites. Camel bones have been found from Kanewal.
- ★ The Mesolithic people were highly mobile. They made temporary hunts with perishable materials. They moved mainly in search of food.

GEOGRAPHY OF INDIA

- ◇ **INDIA - GEOGRAPHICAL LOCATION, PHYSICAL UNITS**
- ◇ **RIVER SYSTEM**
- ◇ **CLIMATE**
- ◇ **SOIL AND AGRICULTURE**
- ◇ **NATURAL VEGETATION**
- ◇ **MINERALS**
- ◇ **INDUSTRIES**
- ◇ **TRANSPORT**
- ◇ **ENVIRONMENTAL ISSUES**
- ◇ **ECOSYSTEM**
- ◇ **BIODIVERSITY AND CONSERVATION**
- ◇ **SUSTAINABLE DEVELOPMENT GOALS**
- ◇ **CLIMATE CHANGE**
- ◇ **DISASTER MANAGEMENT**
- ◇ **POPULATION DENSITY AND DISTRIBUTION**
- ◇ **CULTURAL GEOGRAPHY**
- ◇ **GEOGRAPHICAL LANDMARKS**

PRACTICE QUESTIONS

INDIA - GEOGRAPHICAL LOCATION, PHYSICAL UNITS

India is the seventh largest country in the world and second largest country in Asia. It forms a part of south Asia and is separated by the Himalayas from the rest of the continent. India accounts for about 2.4 % of the total area of the world with an area of 32,87,263 sq.km. Many of the Indian states are larger in size than several countries of the world.

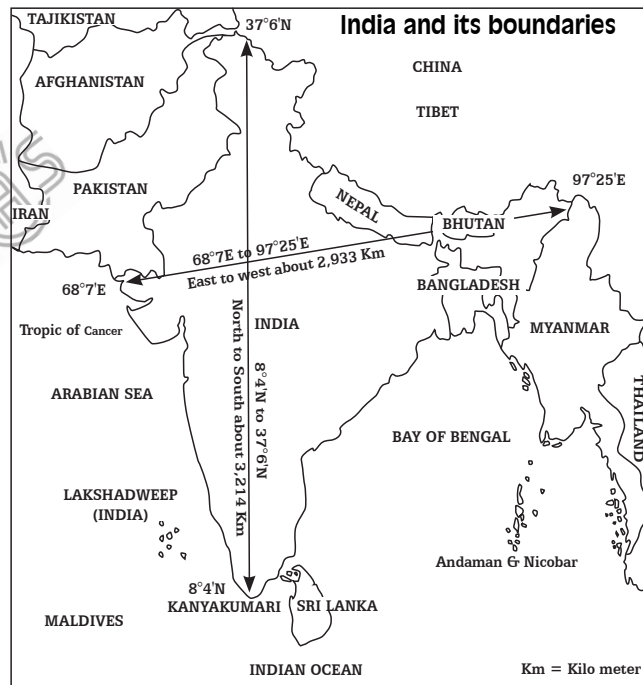
India's Land and Water Frontiers

- India shares its 15,200 km long land frontier with Pakistan in the west, Afghanistan in the north-west, China, Nepal and Bhutan in the north and Bangladesh and Myanmar in the east. India shares longest border with Bangladesh (4156 km) as Bangladesh is totally encircled by Indian states, while the shortest border with Afghanistan (106 km). About 6,100 km long coastline of India is washed on three sides of the country by the Indian Ocean and its two arms namely the Arabian sea in the west and the Bay of Bengal in the east. The total length of the coast line of India including the islands is 7,516.6 km. India and Sri Lanka are separated by a narrow stretch of water called Palk Strait.
- India is located between the East and West Asia. India along with the countries of Myanmar, Bangladesh, Pakistan, Nepal, Bhutan and Sri Lanka is called a subcontinent. This region is separated from the rest of Asia by a chain of mountains in the northwest, north and northeast and by seas in the south. This region also possesses a distinct continental characteristics in physiography, climate, natural vegetation, minerals, human resources etc. Hence India is known as '**subcontinent**'. As India is surrounded on three sides by sea, it is called as 'Peninsula' also.

Location and Extent

- India extends from **8°4' N** to **37°6' N** latitudes and **68°7' E** to **97°25' E** longitudes. Hence India is located in the north Eastern hemisphere. India lies totally to the north of Equator.
- The southernmost point of the country is Pygmalion Point or Indira Point (6°45'N latitude) located in the Andaman and Nicobar Islands. The southernmost point of main land of India is **Cape Comorin** (Kanyakumari). The north-south extent of India is **3214 km** and it extends from **Indira Col** in Jammu and Kashmir in the north to Kanyakumari in the south. The east-west extension is **2933 km** and it stretches from Rann of Kutch (Gujarat) in the west to Arunachal Pradesh in the east. The Tropic of Cancer (23°30' N) passes through the middle of the country dividing it into two halves as northern temperate and southern tropical lands. India has been politically divided into 28 states and 8 union territories for administrative convenience.

Indian Standard Time (IST)



- The longitudinal difference between Gujarat in the west and Arunachal Pradesh in the east is about 30°. The Earth rotates through its axis around 360° in 24 hours. Thus, a difference of 1° longitude will make a difference of 4 minutes in time. The difference in longitude between Gujarat (68°7' E) and Arunachal Pradesh (97°25' E) is 29°18'. Hence the difference in local time between these two places is $29^{\circ}18' \times 4'$ (minutes) = 1 hour 57 minutes 12 seconds (approximately 2 hours). Hence Arunachal Pradesh will have sunrise about two hours earlier than the Gujarat which is in the west.
- To offset these differences, India has set a standard time. The local time of the central meridian of India is the standard time of India. **India's central meridian is 82°30' E longitude.** It passes through Mirzapur and roughly bisects the country in terms of longitude. The IST is 5.30 hrs ahead of Greenwich Mean Time (GMT).

Major Physiographic Divisions of India

As India possesses varied landmass, it is conveniently divided into six physiographic divisions.

- The Himalayan Mountains
- The Great Northern Plains
- The Peninsular Plateau
- The Indian Desert
- The Coastal Plains
- The Islands

Himalayan Mountains

- They are young folded mountains formed few million years ago by tectonic activity. It stretches for a distance of 2500 kms from east to west. It serves as the strong northern boundary of India. The width varies between 500 kms in Kashmir and 200 kms in Arunachal Pradesh. 'The Pamirs' or the 'Pamir Knot' popularly known as the 'Roof of the world' is the link between the Himalayas and high ranges of central Asia.
- The term "Himalaya" is derived from Sanskrit. It means "**The Abode of Snow**". The Himalayan Mountains that function as a great wall is grouped into three divisions. 1) **The Trans-Himalayas**, 2) **Himalayas**, 3) **Eastern or Purvanchal hills**.

Aravalli range is the oldest fold mountain range in India.

The Trans Himalayas

- Trans Himalayan range which lies in the west (it is also known as western himalayas) and it is north to the Great Himalayan range that lies in Jammu & Kashmir and Tiban Plateau. This part is known as Tibetan Himalayas, as more extent of this lies in Tibet. The Trans-Himalayan range has 40 km width in its eastern and western extremities and about 225 km width in its central part. They contain **Tethys** sediments.
- The rocks of this region contain fossils bearing marine sediments which are underlain by 'Tertiary granite'. It has partly metamorphosed sediments and constitutes the core of the Himalayan axis. The prominent ranges of Trans Himalayas are Zaskar, Ladakh, Kailash, and Karakoram.

The Himalayas

It forms the core of the Himalayan range. It was formed by the movement of Angara land mass in the north and Gondwana land mass in the south. The Tethys sea found between these two land masses was uplifted by the compression and the resultant landform was the Himalayas. It consists of many ranges. The main divisions of the Himalayas are the (A) **Greater Himalayas**, (B) **the Lesser Himalayas** and (C) **the Siwaliks**

Important Peaks in the Himalayas

Peak	Country	Height in metres
Mt. Everest	Nepal	8848
Mt.K2 or Godwin Austen	India	8611
Kanchenjunga	India	8598
Makalu	Nepal	8481
Dhaulagiri	Nepal	8172
Nanga Parbat	India	8126
Annapurna	Nepal	8078

Peak	Country	Height in metres
Nanda Devi	India	7817
Kamet	India	7756
Namcha Barwa	India	7756
Gurla Mandhata	Nepal	7728

A. The Greater Himalayas or the Himadri

They are 25 km wide and has average height of 6000 mts. The greater Himalayas receive lesser rainfall than lesser Himalayas and the Siwaliks. Physical weathering is less effective over the greater Himalayas. Most of the lofty peaks lie in this range. The notable ones are Mt. Everest (8,848 m) and Kanchenjunga (8,586 m). Mt. Everest is located in Nepal and Kanchenjunga is located between Nepal and Sikkim. This range is the most continuous of all ranges. It is the region of permanent snow cover. So, it has many glaciers. **Gangothri, Yamunothri and Siachen** are some of them.

Himalaya is the home to several high peaks. It holds the record of having the maximum number of highest peaks among any mountain range in the world. Out of 14 high peaks in the world, Himalayas holds 9.

B. The Lesser Himalayas or The Himachal

It is the middle range. The height varies between 3700 and 4500 mts and width upto 80 kms.

The major passes in the Himalayas are Karakoram pass (Jammu and Kashmir), Zojila pass, Shipkila pass (Himachal Pradesh), Bomdila pass (Arunachal Pradesh), Nathala pass (Sikkim) and Jhelepla pass (Sikkim). The Khyber pass which connects Pakistan and Afghanistan, and Bolan pass in Pakistan are important passes of the Indian subcontinent.

C. The Siwaliks or Outer Himalayas

- This range is formed partly by debris brought by the Himalayan rivers. The width of Siwaliks varies between 10 km and 50 km and height varies between 900-1100 mts. The elevation is 1300 mtr. This range is disconnected and a number of longitudinal valleys are found.
- The longitudinal valleys found between the siwaliks and the lesser himalayas are called Duns in the west and Duars in the east. These are considered as ideal sites for settlement.

Purvanchal Hills

- The eastern offshoot of Himalayas are Purvanchal Hills.
- Most of these hills are located along the border of India and Myanmar while others are inside India. Daffla Hills, Abor Hills, Mishmi Hills, Patkai Bum Hills, Naga Hills, Manipur Hills, Mizo Hills, Tripura Hills, Mikir Hills, Garo Hills, Khasi Hills and Jaintia Hills are the hills which are collectively known as **Purvanchal Hills**.

INDIAN POLITY

- ▲ **Constitution of India**
- ▲ **Preamble**
- ▲ **Salient Features of Indian Constitution**
- ▲ **Union and its Territories**
- ▲ **Citizenship**
- ▲ **Fundamental Rights**
- ▲ **Directive Principles of State Policy**
- ▲ **Fundamental Duties**
- ▲ **Union Executive**
- ▲ **Legislature**
- ▲ **Centre-State Relations**
- ▲ **Judiciary in India**
- ▲ **Local Governments**
- ▲ **Elections and Representation**

- ▲ **Political Parties and Political System**
- ▲ **Other Constitutional Bodies**
- ▲ **Official Language**
- ▲ **Emergency Provisions**
- ▲ **Non-Constitutional Bodies**
- ▲ **Anti-Corruption Measures**
- ▲ **Co-Operative Societies**
- ▲ **Women Empowerment**
- ▲ **Human Rights Charter**
- ▲ **Landmark Supreme Court Judgements**
- ▲ **Political Thoughts**
- ▲ **Some Important Constitutional Amendments**

PRACTICE QUESTIONS

CONSTITUTION OF INDIA

CONSTITUTIONAL DEVELOPMENT IN INDIA

- ★ The constitution consists of a set of fundamental principles based on which the state organisation is governed. It is the supreme law of the land.
- ★ The need for the constitution came along with the dawn of independence. For this purpose the Constituent Assembly was formed in 1946 and on January 26, 1950 the Constitution came into force.
- ★ The idea of Constituent Assembly for India was put forward for the first time by M.N. Roy in 1934. M.N. Roy was a pioneer of Communist movement in India.

Prem Behari Narain Raizada was the calligrapher of the Indian Constitution. The original constitution was handwritten by him in a flowing italic style.

BACKGROUND:

The company rule (1773-1857)

There are certain Acts that had been formulated by the British Government to regulate and control the affairs of East India Company in British India. They formed the basis for our constitution.

Regulating Act of 1773

- ★ It designated the Governor of Bengal as the Governor General of Bengal. The first Governor-General was Lord Warren Hastings.
- ★ It established a Supreme Court in Calcutta (1774) which comprised a Chief Justice and three other judges.
- ★ It laid the foundation for Central administration in India.

Amending act of 1781 : (Act of settlement)

- ★ To rectify the defects of the Regulating Act of 1773, the British Parliament passed the Amending Act of 1781. It is also known as Act of Settlement.

Pitt's India Act of 1784

- ★ It established a system of dual government.
- ★ It established a new body called 'Board of control' to manage the political affairs of the company and the existing court of directors to manage the commercial affairs.

Charter Act of 1813

- ★ The Company's entire commercial trade monopoly ended, except the tea trade and the trade with China.
- ★ Allotted ₹ 1 lakh to promote education in India.

Charter Act of 1833

- ★ The Charter Act of 1833 attempted to introduce a system of open competition for selection of civil servants, and stated that the Indians should not be debarred from holding any place, office and employment under the Company. However, this provision was negated after opposition from the Court of Directors.

- ★ This act was final step towards centralisation.
- ★ It made Governor-General of Bengal as the Governor General of India and vested in him all civil and military powers.
- ★ Lord William Bentick was the first Governor-General of India.
- ★ It ended the activities of East India company as a commercial body and changed it into a purely administrative body.
- ★ A Law commission under Lord Macaulay was formed to codify the laws.

Charter Act of 1853

- ★ It established a separate Governor-General's Legislative Council which came to be known as Indian Legislative Council.
- ★ It introduced the local representation in the Indian Legislative Council.
- ★ It introduced an open competition system of selection and recruitment of civil servants. The covenanted civil service was thus thrown open to the Indians also. Accordingly, the Macaulay Committee (the Committee on the Indian Civil Service) was appointed in 1854.

The Crown Rule (1858-1947)

The Revolt of 1857 brought about important changes in the British administration in India. The rule of the East India Company came to an end. The administration of India came under the direct control of the British Crown. These changes were announced in the Government of India Act of 1858. The 'Proclamation of Queen Victoria' assured the Indians a benevolent administration. Thereafter, important developments had taken place in constitutional history of India as a result of the Indian National Movement.

Government of India Act of 1858

The Government of India Act of 1858 was passed by the Parliament of England and received royal assent on 2nd August 1858. Following are the main provisions of the Act :

- ★ East India Company's rule came to an end and the Indian administration came under the direct control of the Crown.
- ★ In England, the Court of Directors and Board of Control were abolished. In their place the Secretary of State for India and India Council were established. The Secretary of State would be a member of the British cabinet. Sir Charles Wood was made the first Secretary of State for India. The Council consisting of 15 members would assist him.
- ★ The Governor General of India was also made the Viceroy of India. The first Viceroy of India was Lord Canning.
- ★ All the previous treaties were accepted and honoured by the Act.

Queen Victoria's Proclamation

On 1 November 1858 the Proclamation of Queen Victoria was unveiled by Lord Canning at Allahabad. This royal Proclamation was translated into Indian languages and publicly read in many important places. It announced the end of Company's rule in India and the Queen's assumption of the Government of India. It endorsed the treaty made by the Company with Indian princes and promised to respect their rights, dignity and honour. It assured the Indian people equal and impartial protection of law and freedom of religion and social practices. The Proclamation of Queen Victoria gave a practical shape to the Act of 1858.

Indian Councils Act of 1861

- ★ The Indian Councils Act of 1861 increased the number of members in the Governor-General's executive Council from 4 to 5. Further the Governor-General's Executive Council was enlarged into a Central Legislative Council. Six to twelve "additional members" were to be nominated by the Governor-General. Not less than half of these members were to be non-officials. Thus a provision was made for the inclusion of Indians in the Legislative Council. The functions of these members were strictly limited to making legislation and they were forbidden from interfering in the matters of the Executive Council. They did not possess powers of administration and finance.
- ★ Legislative Councils were also established in the provinces. The number of additional members in the provinces was fixed between four and eight. So, this Act was an important constitutional development and the people of India came to be involved in the law making process. The mechanism of Indian legislation developed slowly and was reinforced further by the Acts of 1892 and 1909.

Indian Councils Act of 1892

The Indian Councils Act of 1892 was the first achievement of the Indian National Congress. It had increased the number of "additional members" in the Central Legislative Council. They were to be not less than 10 and not more than 16. It had also increased the proportion of non-officials – 6 officials and 10 non-officials. The members were allowed to discuss the budget and criticize the financial policy of the government. In the provinces the number of additional members also was increased with additional powers.

Indian Councils Act of 1909

This Act is also known as Morley-Minto Reforms (Lord Morley was the then Secretary of State for India and Lord Minto was the then Viceroy of India).

The features of this Act were as follows:

- ★ It considerably increased the size of the legislative councils, both Central and provincial. The number of members in the Central legislative council was raised from 16 to 60. The number of members in the provincial legislative councils was not uniform.

- ★ It retained official majority in the Central legislative council, but allowed the provincial legislative councils to have nonofficial majority.
- ★ It enlarged the deliberative functions of the legislative councils at both the levels. For example, members were allowed to ask supplementary questions, move resolutions on the budget and so on.
- ★ It provided (for the first time) for the association of Indians with the executive councils of the Viceroy and Governors. Satyendra Prasad Sinha became the first Indian to join the Viceroy's executive council. He was appointed as the Law Member.
- ★ It introduced a system of communal representation for Muslims by accepting the concept of 'separate electorate'. Under this, the Muslim members were to be elected only by Muslim voters. Thus, the Act 'legalised communalism' and Lord Minto came to be known as the Father of Communal Electorate.
- ★ It also provided for the separate representation of presidency corporations, chambers of commerce, universities and zamindars.

Government of India Act of 1919

On August 20, 1917, the British Government declared, for the first time, that its objective was the gradual introduction of responsible Government in India.

The Government of India Act of 1919 was thus enacted, which came into force in 1921. This Act is also known as Montagu-Chelmsford Reforms (Montagu was the Secretary of State for India and Lord Chelmsford was the Viceroy of India).

The features of this Act were as follows:

- ★ It relaxed the central control over the provinces by demarcating and separating the central and provincial subjects. The central and provincial legislatures were authorised to make laws on their respective list of subjects. However, the structure of government continued to be centralised and unitary.
- ★ It further divided the provincial subjects into two parts—transferred and reserved. The transferred subjects were to be administered by the Governor with the aid of Ministers responsible to the legislative council. The reserved subjects, on the other hand, were to be administered by the Governor and his executive council without being responsible to the legislative council. This dual scheme of governance was known as 'dyarchy'—a term derived from the Greek word diarche which means double rule. However, this experiment was largely unsuccessful.
- ★ It introduced, for the first time, bicameralism and direct elections in the country. Thus, the Indian legislative council was replaced by a bicameral legislature consisting of an Upper House (Council of State) and a Lower House (Legislative Assembly). The majority of members of both the Houses were chosen by direct election.
- ★ It required that the three of the six members of the Viceroy's executive Council (other than the Commander-in-Chief) were to be Indian.

INDIAN ECONOMY AND DEVELOPMENT ADMINISTRATION IN TAMIL NADU

- ☞ Nature of Indian Economy
 - ☞ Five-Year Plan Models - An Assessment
 - ☞ Planning Commission and Niti Aayog
 - ☞ Fiscal Policy
 - ☞ Banking
 - ☞ Monetary Economics
 - ☞ Finance Commission
 - ☞ Land Reforms and Agriculture
 - ☞ Application of Science and Technology in Agriculture
 - ☞ Modern Farming Techniques and Marketing
 - ☞ Agricultural Price Policy
 - ☞ Labour and Employment
 - ☞ Industrial Growth
 - ☞ Rural Development and Welfare
 - ☞ Recent Social Welfare Schemes
 - ☞ Administration of States
 - ☞ Role and Impact of Social Welfare Schemes
 - ☞ Evolution of 19th and 20th Century Socio-Political Movements in Tamil Nadu
 - ☞ Tamil Nadu Political Thought
 - ☞ Tamil Renaissance
 - ☞ Economy of Tamil Nadu
 - ☞ Education and Health Systems in Tamil Nadu
 - ☞ Geography of Tamil Nadu and its Impact on Economic Growth
 - ☞ E-Governance in Tamil Nadu
 - ☞ Some Important Policies and Programmes of Tamil Nadu
 - ☞ Some Important State Government Schemes
- PRACTICE QUESTIONS**

NATURE OF INDIAN ECONOMY

Nature of Indian Economy

Indian economy is the fourth largest economy in the world (nominal GDP). Being one of the top listed countries, in terms of industrialization and economic growth, India's national GDP has witnessed a growth rate of 7.6% in the 2025–2026 financial year. Nominal GDP is estimated to grow at 8.0% in FY 2025-26. Even though the rate of growth has been sustainable and comparatively stable, there are still signs of backwardness.

Features of a Developed Economy :

1. High National Income, 2. High Per Capita Income, 3. High Standard of Living, 4. Full Employment of Resources, 5. Dominance of Industrial Sector, 6. High Level of Technology, 7. High Industrialization, 8. High Consumption Level, 9. High Level of Urbanisation, 10. Smooth Economic Growth, 11. Social Equity, Gender Equality and Low Levels of Poverty, 12. Political Stability and Good Governance

Features of Indian Economy

India has a mixed economy	Indian economy is a typical example of mixed economy. This means both private and public sectors co-exist and function smoothly. On one side, some of the fundamental and heavy industrial units are being operated under the public sector, while, due to the liberalization of the economy, the private sector has gained importance. This makes it a perfect model for public – private partnership.
An emerging market	India has emerged as vibrant economy sustaining stable GDP growth rate even in the midst of global downtrend. This has attracted significant foreign capital through FDI and FII. India has a high potential for prospective growth. This also makes it an emerging market for the world.
Agriculture plays the key role	Agriculture being the maximum pursued occupation in India, it plays an important role in economy as well. Around 50% of the people in India depend upon agriculture for their livelihood. In fact, approx. 18% of our GDP today is contributed by the agricultural sector. Green revolution, ever green revolution and inventions in bio-technology have made India as a self sufficient and also surplus production country. The export of agricultural products such as fruits, vegetables, spices, vegetable oils, tobacco, animal skin, etc. also added to forex earning through international trading.
Emerging Economy	Emerging as a top economic giant among the world economy, India bags the fifth position in terms of nominal Gross Domestic Product (GDP) and third in terms of Purchasing Power Parity (PPP). As a result of rapid economic growth Indian economy has a place among the G20 countries.
Fast Growing Economy	India, the world's fourth-largest economy, has emerged as the fastest-growing major economy and is on track to become the world's third-largest economy with a projected GDP of \$7.3 trillion by 2030. India is projected to be world's fastest growing major economy (6.3% to 6.8% in 2025-26).
Fast growing Service Sector	The service sector, contributes a lion's share to the GDP of India. There has been a high rise growth in the technical sectors like Information Technology, BPO etc. These sectors have contributed immensely to the growth of the economy. These emerging service sectors have helped the country go global and helped in spreading its branches around the world.
Large Domestic Consumption	With the faster growth rate in the economy the standard of living has improved a lot. This in turn has resulted in rapid increase in domestic consumption in the country. The standard of living has considerably improved and life style has changed.
Rapid growth of Urban areas	Urbanization is a key ingredient of the growth of any economy. There has been a rapid growth of urban areas in India after independence. Improved connectivity in transport and communication, education and health have speeded up the pace of urbanization.
Stable macro economy	The Indian economy has been projected and considered as one of the most stable economies of the world. The 2014-15 Economic survey represents the Indian economy to be a "heaven of macroeconomic stability, resilience and optimism.
Demographic dividend	The human capital of India is young. This means that India is a pride owner of the maximum percentage of youth. The young population is not only motivated but skilled and trained enough to maximize the growth. Thus human capital plays a key role in maximizing the growth prospects in the country. Also, this has invited foreign investments to the country and outsourcing opportunities too.

Weakness of Indian Economy

Large Population	India stands second in terms of size of population next to China and our country is likely to overtake china in near future. Population growth rate of India is very high and this is always a hurdle to sustainable growth rate. The population growth rate in India is as high as 1.7 per thousand.
Inequality and poverty	There exists a huge economic disparity in the Indian economy. The proportion of income and assets owned by top 10% of Indians goes on increasing. This has led to an increase in the poverty level in the society and still a higher percentage of individuals are living Below Poverty Line (BPL). As a result of unequal distribution of income, the rich becomes richer and poor becomes poorer.
Increasing Prices of Essential Goods	Even though there has been a constant growth in the GDP and growth opportunities in the Indian economy, there have been steady increase in the price of essential goods. The continuous rise in prices erodes the purchasing power and adversely affects the poor people, whose income is not protected.
Weak Infrastructure	Even though there has been a gradual improvement in the infrastructural development in the past few decades, there is still a scarcity of the basic infrastructure like power, transport, storage etc.
Inadequate Employment generation	With growing youth population, there is a huge need of the employment opportunities. The growth in production is not accompanied by creation of job. Sometimes, the Indian economy is characterized by 'jobless growth'.
Outdated technology	The level of technology in agriculture and small scale industries is still outdated and obsolete.

Demographic trends in India

Scientific study of the characteristics of population is known as Demography. The various aspects of demographic trends in India are :

1. Size of population
2. Rate of growth
3. Birth and death rates
4. Density of population
5. Sex-ratio
6. Life-expectancy at birth
7. Literacy ratio

a. Size of Population

Census Year	Population (in crores)	Average annual growth rate
1901	23.84	—
1911	25.21	0.56
1921	25.13	– 0.03
1931	27.90	1.04
1941	31.87	1.33
1951	36.11	1.25
1961	43.92	1.96
1971	54.81	2.20
1981	68.33	2.22

Census Year	Population (in crores)	Average annual growth rate
1991	84.33	2.16
2001	102.70	1.97
2011	121.02	1.66

- ❖ As per the United Nation database, India's current 1.41 billion population surpassed China in 2023. It is also expected to hit 1.5 billion by 2030 and 1.78 billion by 2050.
- ❖ India has only about 2.4% of the world's geographical area and contributes less than 1.2% of the world's income, but accommodates about 17.5% of the world's population. In other words, every 6th person in the world is an Indian. Infact, the combined population of just two states namely, Uttarpradesh and Maharashtra is more than the population of United States of America, the third most populous country of the world. Some of the states in India have larger population than many countries in the world.
- ❖ The negative growth during 1911-21 was due to rapid and frequent occurrence of epidemics like cholera, plague and influenza and also famines. The year 1921 is known as the '**Year of Great Divide**' for India's population as population starts increasing.

GENERAL SCIENCE

Scientific Knowledge and Scientific Temper

Power of Reasoning

Rote Learning vs Conceptual Learning

Science as a Tool to Understand the Past, Present, and Future

PHYSICS

- ❖ Nature of Universe
- ❖ Measurement of Physical Quantities
- ❖ General Scientific Laws
- ❖ Everyday Application of the Science
- ❖ Nuclear Physics in our Daily Life

CHEMISTRY

- ❖ Elements and Compounds
- ❖ Acids, Bases and Salts
- ❖ Periodic Classification of Elements
- ❖ Carbon and its Compounds

❖ Chemistry in Everyday Life

❖ Food Adulteration

❖ Metallurgy

BIOLOGY

- ❖ Main Concepts of Life Science
- ❖ Classification of Living Organisms
- ❖ Evolution
- ❖ Genetics and Heredity
- ❖ Physiology
- ❖ Nutrition, Health and Human Diseases
- ❖ Environmental Science

PRACTICE QUESTIONS

GENERAL SCIENCE

Scientific Knowledge and Scientific Temper

Introduction

- **Scientific Knowledge:** Refers to the systematic understanding of the natural and social world through observation, experimentation, and logical reasoning. It is based on empirical evidence and is constantly evolving.
- **Scientific Temper:** A mindset or attitude that emphasizes rationality, logic, and evidence-based thinking. It involves questioning, critical thinking, and a willingness to change beliefs based on new evidence.

Scientific Knowledge

- **Definition:** The body of knowledge obtained through scientific methods, which includes facts, theories, laws, and principles.
- **Characteristics:**
 - **Empirical:** Based on observable and measurable evidence.
 - **Systematic:** Follows a structured and methodical approach.
 - **Objective:** Aims to be free from personal biases.
 - **Cumulative:** Builds upon previous knowledge.
 - **Falsifiable:** Can be tested and potentially disproven.
- **Components:**
 - **Facts:** Observable phenomena.
 - **Hypotheses:** Proposed explanations for phenomena.
 - **Theories:** Well-substantiated explanations of aspects of the natural world.
 - **Laws:** Statements that describe consistent patterns in nature.

The Scientific Method

Scientific knowledge is obtained through a structured approach known as the scientific method, which consists of:

1. Observation – Identifying a phenomenon or problem.
2. Formulating a Question – Asking "why" or "how" the phenomenon occurs.
3. Developing a Hypothesis – Making an educated guess based on existing knowledge.
4. Conducting Experiments – Testing the hypothesis through controlled experiments.
5. Analyzing Data – Interpreting experimental results.
6. Drawing Conclusions – Confirming or rejecting the hypothesis.
7. Formulating Theories or Laws – Establishing principles that explain the phenomenon.

Examples of Scientific Knowledge

- The Law of Gravitation by Newton explains how objects attract each other.

- The Germ Theory of Disease by Pasteur and Koch describes how microorganisms cause diseases.
- The Theory of Evolution by Darwin explains the process of natural selection.
- The Periodic Table classifies chemical elements based on properties.

Importance of Scientific Knowledge

Scientific knowledge has transformed society in multiple ways:

- **Technological Advancement** – Innovations like electricity, the internet, and artificial intelligence.
- **Medical Breakthroughs** – Vaccines, antibiotics, and surgical techniques save lives.
- **Environmental Conservation** – Understanding climate change, renewable energy, and biodiversity.
- **Space Exploration** – Discoveries about planets, black holes, and space travel.
- **Economic Growth** – Science-based industries such as pharmaceuticals, IT, and agriculture boost economies.

Scientific Temper

Definition

Scientific temper refers to a rational mindset that promotes questioning, reasoning, and evidence-based decision-making. It discourages superstition, blind faith, and irrational beliefs.

The term Scientific Temper was first introduced by Jawaharlal Nehru in his book "The Discovery of India", where he emphasized the role of science in shaping modern India.

Characteristics of Scientific Temper

- **Rational Thinking** – Accepting ideas based on logic, not myths.
- **Curiosity** – A continuous desire to learn and explore.
- **Skepticism** – Not believing in claims without sufficient evidence.
- **Open-Mindedness** – Willingness to accept new facts and ideas.
- **Questioning Attitude** – Challenging traditional beliefs that lack scientific proof.
- **Ethical and Objective Approach** – Making decisions based on facts rather than emotions.

Role of Scientific Temper in Society

- **Eliminates Superstitions** – Encourages people to question myths and blind faith.
- **Encourages Logical Thinking** – Helps in making informed decisions in daily life.
- **Promotes Social Reform** – Challenges social evils like caste discrimination and gender bias.
- **Strengthens Democracy** – Helps citizens make rational choices in elections and governance.
- **Aids in Economic and Technological Development** – Leads to innovation and progress.

Examples of Scientific Temper in Daily Life

- Choosing modern medicine over faith healing or black magic.
- Using fact-checking to verify information before sharing it on social media.
- Relying on scientific farming methods rather than astrological predictions for agriculture.
- Understanding that eclipses are celestial events and not bad omens.

Constitutional and Legal Provisions for Scientific Temper in India

1. Article 51A(h) of the Indian Constitution – It is a Fundamental Duty of every citizen to develop scientific temper, humanism, and the spirit of inquiry.
2. Right to Education (Article 21A) – Provides access to scientific education for all children.
3. Drugs and Magic Remedies Act (1954) – Bans misleading advertisements promoting magical cures.
4. Consumer Protection Act (2019) – Protects consumers from fraudulent claims in medicine and technology.
5. National Science and Technology Policy – Encourages research and technological innovation in India.

Relationship Between Scientific Knowledge and Scientific Temper

- **Interdependence:** Scientific temper is essential for the development of scientific knowledge, and scientific knowledge reinforces scientific temper.
- **Mutual Reinforcement:** Scientific temper drives the pursuit of scientific knowledge, and the acquisition of scientific knowledge enhances scientific temper.
- **Role in Society:** Together, they contribute to the progress of society by promoting rational thinking, technological advancement, and evidence-based policies.

Challenges to Scientific Temper in India

Despite constitutional provisions, scientific temper faces several challenges:

1. Superstitions and Blind Beliefs – Practices like astrology, black magic, and miracle cures persist.
2. Misinformation and Fake News – Social media spreads unverified and false information.
3. Lack of Awareness and Education – Many people do not receive proper science education.
4. Reluctance to Change – Traditional beliefs and customs prevent the acceptance of scientific ideas.
5. Political and Religious Influence – Some groups promote anti-scientific narratives for personal gain.

Ways to Promote Scientific Temper

- Strengthening Science Education – Making science education more practical and interactive in schools.
- Encouraging Critical Thinking – Teaching students how to analyze and question information.
- Media Awareness – Promoting responsible journalism that highlights scientific facts.
- Government Initiatives – Organizing science fairs, research programs, and public awareness campaigns.
- Involvement of Scientists – Encouraging scientists to engage with the public and explain complex concepts.

Scientific knowledge and scientific temper are the backbones of a progressive, rational, and developed society. While scientific knowledge provides facts and innovations, scientific temper ensures that these advancements are applied logically and ethically.

Encouraging scientific temper will help India eliminate superstitions, adopt modern technologies, and ensure sustainable development. Thus, developing a scientifically aware and rational society is essential for India's future.

Power of Reasoning**Introduction**

The Power of Reasoning refers to the ability to think logically, analyze situations, and draw conclusions based on facts and evidence rather than emotions or blind faith. It is an essential cognitive skill that helps individuals make rational decisions, solve problems, and understand complex concepts.

Reasoning plays a crucial role in science, philosophy, law, and daily life by enabling people to distinguish between truth and falsehood, detect fallacies, and develop critical thinking.

Meaning and Definition of Reasoning

- Reasoning is the mental process of drawing conclusions from premises or facts using logic.
- It involves evaluating evidence, identifying patterns, and applying logical principles.
- Example: If all humans are mortal and Socrates is a human, then Socrates is mortal (a logical deduction).

Definitions by Scholars

- Aristotle – "Reasoning is an instrument of knowledge that helps in discovering truth."
- John Dewey – "Reasoning is the process of thinking in which thought proceeds in a linear, logical manner."

Types of Reasoning**1. Deductive Reasoning**

- Involves drawing specific conclusions from general principles.
- Example:
 - Premise 1: All mammals have lungs.
 - Premise 2: A whale is a mammal.
 - Conclusion: A whale has lungs.

Characteristics:

- Moves from general to specific.
- If the premises are true, the conclusion must be true.

2. Inductive Reasoning

- Involves drawing general conclusions from specific observations.
- Example:
 - Observation: The sun has risen in the east every day.
 - Conclusion: The sun always rises in the east.

Characteristics:

- Moves from specific to general.
- The conclusion is probable but not always certain.

3. Abductive Reasoning

- Involves making the best possible explanation based on incomplete evidence.
- Example: If a person is sneezing, coughing, and has a fever, we may infer they have the flu.

Characteristics:

- Commonly used in detective work and medical diagnosis.
- Based on inference and probability.

4. Analogical Reasoning

- Comparing two different things based on similarities.
- Example: The structure of an atom is like a solar system (electrons revolve around the nucleus like planets orbit the sun).

Characteristics:

- Helps in understanding complex ideas.
- Used in legal arguments and scientific models.

5. Logical Reasoning

- The process of using formal rules of logic to reach conclusions.
- Example:
 - Statement: If it rains, the ground will be wet.
 - Observation: It rained.
 - Conclusion: The ground is wet.

Components of Reasoning

- **Logic:** The framework for constructing valid arguments.
 - **Propositional Logic:** Deals with simple declarative propositions.
 - **Predicate Logic:** Involves predicates and quantifiers.
- **Critical Thinking:** The objective analysis and evaluation of facts to form a judgment.
 - **Skills:** Analysis, interpretation, inference, explanation, evaluation.
- **Problem-Solving:** The process of finding solutions to difficult or complex issues.
 - **Steps:** Identify the problem, generate possible solutions, evaluate and select the best solution, implement and assess the solution.

Cognitive Processes Involved in Reasoning

- **Perception:** The process of recognizing and interpreting sensory information.
- **Memory:** The retention and recall of information.
- **Attention:** The focus of cognitive resources on specific stimuli.
- **Language:** The use of symbols and rules to communicate and reason.

Factors Affecting Reasoning

- **Cognitive Biases:** Systematic patterns of deviation from norm or rationality in judgment.
 - **Examples:** Confirmation bias, availability heuristic, anchoring bias.
- **Emotions:** Can both positively and negatively influence reasoning.
- **Knowledge and Experience:** Greater knowledge and experience can enhance reasoning abilities.
- **Cultural Influences:** Cultural background can shape reasoning styles and preferences.

Importance of Reasoning**1. Enhances Critical Thinking**

- Helps individuals analyze information logically rather than accepting things blindly.
- Encourages questioning and skepticism.

2. Aids in Decision-Making

- Enables people to weigh pros and cons before making choices.
- Used in business, law, politics, and everyday life.

3. Essential for Scientific Discovery

- Scientists use reasoning to form hypotheses, conduct experiments, and validate theories.
- Example: Isaac Newton reasoned that an invisible force (gravity) causes apples to fall.

4. Strengthens Problem-Solving Skills

- Helps in solving puzzles, mathematical problems, and strategic challenges.
- Used in programming, engineering, and artificial intelligence.

5. Helps in Legal and Ethical Judgments

- Courts use logical reasoning to interpret laws and deliver justice.
- Ethical reasoning helps in moral decision-making.

Applications of Reasoning in Daily Life

1. Medical Diagnosis – Doctors use reasoning to identify diseases based on symptoms.
2. Crime Investigation – Detectives use logical reasoning to solve cases.
3. Education – Helps students understand subjects like mathematics, science, and philosophy.
4. Politics – Used to form policies and arguments in debates.
5. Technology Development – Engineers use reasoning to innovate new technologies.