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CUET · GEOGRAPHY · CLASS XI · CODE 313

Drainage System

CUET unit: Interior of the Earth

By **UniDrill** · NCERT-grounded study material

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📌 Snapshot

- The foundational vocabulary of drainage geography — drainage, drainage system, catchment area, river basin, watershed — underpins this topic; drainage patterns are determined by geological history, rock structure, topography, and slope.
- India's drainage is classified on three bases: orientation to sea (Arabian Sea vs. Bay of Bengal), size of watershed (major/medium/minor), and mode of origin (Himalayan vs. Peninsular) — a rich menu of factual questions for CUET.
- The Himalayan drainage evolved from the legendary Indo-Brahma river through Pleistocene upheavals into three distinct systems (Indus, Ganga, Brahmaputra) — a favourite source of assertion-reason and match-the-following questions.
- Individual river systems — Indus, Ganga, Brahmaputra and all major Peninsular rivers (Mahanadi, Godavari, Krishna, Kaveri, Narmada, Tapi, Luni) — are described with source, length, catchment area, tributaries, and mouth, providing extensive factual hooks.
- Usability of river water, inter-basin linkage schemes, and river pollution round out the topic, connecting physical geography to human geography themes tested in CUET comprehension-based questions.

📖 Detailed Notes

2.1 Core concepts

- **Drainage and drainage system:** Flow of water through well-defined channels is 'drainage'; the network of such channels is a 'drainage system'. The drainage pattern of an area is determined by geological time period, nature and structure of rocks, topography, slope, amount of water flowing, and periodicity of flow. (NCERT p. 17)
- **Four drainage patterns:** (i) Dendritic — tree-branch pattern, e.g. rivers of the northern plain; (ii) Radial — rivers flow outward from a central hill, e.g. rivers from the Amarkantak range; (iii) Trellis — primary tributaries flow parallel, secondary tributaries join at right angles; (iv) Centripetal — rivers discharge into a central lake or depression. (NCERT p. 17 box)
- **Catchment area, river basin, watershed:** A river drains water from its catchment area. The area drained by a river and its tributaries is a drainage basin. The boundary separating one basin from another is the watershed. Watersheds are small; basins

cover larger areas. River basins and watersheds are used as micro, meso, or macro planning regions. (NCERT p. 19)

- **Classification by orientation to sea:** ~77% of India's drainage (Ganga, Brahmaputra, Mahanadi, Krishna, etc.) flows into the Bay of Bengal; ~23% (Indus, Narmada, Tapi, Mahi, Periyar) flows into the Arabian Sea. The water divide runs along the Delhi ridge, Aravalis, and Sahyadris. (NCERT p. 19)
- **Classification by watershed size:** (i) Major river basins — catchment >20,000 sq. km, 14 basins including Ganga, Brahmaputra, Krishna, Tapi, Narmada, Mahi, Pennar, Sabarmati, Barak; (ii) Medium river basins — 2,000–20,000 sq. km, 44 basins including Kalindi, Periyar, Meghna; (iii) Minor river basins — <2,000 sq. km. (NCERT p. 19)
- **Evolution of Himalayan drainage — Indo-Brahma theory:** Geologists believe a mighty river called Shiwalik or Indo-Brahma traversed the entire Himalayan length from Assam to Punjab during the Miocene period (5–24 million years ago), discharging into the Gulf of Sind. It was later dismembered into Indus (west), Ganga (central), and Brahmaputra (east) systems due to Pleistocene upheaval. The Potwar Plateau (Delhi Ridge) uplift divided Indus from Ganga drainage; downthrusting of the Malda gap diverted Ganga and Brahmaputra toward Bay of Bengal. (NCERT p. 20)
- **Himalayan rivers — general characteristics:** Fed by both snowmelt and precipitation, hence perennial. Pass through giant gorges, V-shaped valleys, rapids. In plains they form ox-bow lakes, flood plains, braided channels, meanders, and deltas. They shift course frequently (e.g. Kosi, the 'sorrow of Bihar'). (NCERT pp. 19–20)
- **The Indus System:** One of the largest river basins in the world — 11,65,000 sq. km total (321,289 sq. km in India); total length 2,880 km (1,114 km in India). Originates near Bokhar Chu (31°15'N, 81°40'E) in the Kailash range, Tibet, at 4,164 m. Known as 'Singi Khamban' (Lion's mouth) in Tibet. Flows northwest between Ladakh and Zaskar ranges, enters Pakistan near Chilas. Key Himalayan tributaries: Shyok, Gilgit, Zaskar, Hunza, Nubra, Shigar, Gasting, Dras. Receives Kabul river at Attock. Panjnad (five Punjab rivers: Satluj, Beas, Ravi, Chenab, Jhelum) joins above Mithankot. Discharges into Arabian Sea east of Karachi. (NCERT pp. 20–21)
- **Jhelum:** Rises from spring at Verinag, foot of Pir Panjal, Kashmir; flows through Srinagar and Wular lake; joins Chenab near Jhang, Pakistan. (NCERT p. 21)
- **Chenab:** Largest Indus tributary; formed by Chandra and Bhaga at Tandi near Keylong, HP; also called Chandrabhaga; 1,180 km long. (NCERT p. 21)
- **Ravi:** Rises west of Rohtang Pass, Kullu hills, HP; flows through Chamba valley; joins Chenab near Sarai Sidhu. (NCERT p. 21)
- **Beas:** Originates from Beas Kund near Rohtang Pass at 4,000 m; flows through Kullu valley; meets Satluj near Harike. (NCERT p. 21)
- **Satluj:** Originates in 'Raksas tal' near Mansarovar at 4,555 m, Tibet (called Langchen Khambab); antecedent river; passes through Shipki La; feeds Bhakra Nangal canal system. (NCERT p. 21)

- **The Ganga System:** Most important river of India. Rises in Gangotri glacier near Gaumukh, Uttarkashi, Uttarakhand, at 3,900 m (known as Bhagirathi here). Bhagirathi meets Alaknanda at Devprayag — thereafter called Ganga. Alaknanda source: Satopanth glacier above Badrinath. Length: 2,525 km; basin: ~8.6 lakh sq. km. Shared by Uttarakhand (110 km), UP (1,450 km), Bihar (445 km), West Bengal (520 km). Discharges into Bay of Bengal near Sagar Island. (NCERT pp. 21–22)
- Left bank tributaries: Ramganga, Gomati, Ghaghara, Gandak, Kosi, Mahananda.
- Right bank tributary: Son (major).
- **Yamuna:** Westernmost and longest tributary of Ganga; source in Yamunotri glacier, Banderpunch range (6,316 m); joins Ganga at Prayag (Allahabad). Right bank: Chambal, Sind, Betwa, Ken (from Peninsular plateau). (NCERT p. 22)
- **Chambal:** Rises near Mhow, Malwa plateau, MP; famous for Chambal ravines (badland topography). (NCERT p. 22)
- **Kosi:** Antecedent river; source north of Mt. Everest in Tibet; forms Sapt Kosi; known as 'sorrow of Bihar' for frequently changing course due to heavy sediment load. (NCERT pp. 20, 22)
- **Damodar:** Flows through rift valley on eastern margins of Chotanagpur Plateau; once 'sorrow of Bengal'; now managed by Damodar Valley Corporation. (NCERT p. 22)
- **The Brahmaputra System:** Originates in Chemayungdung glacier, Kailash range, near Mansarovar lake. Traverses ~1,200 km eastward in Tibet as Tsangpo ('the purifier'). Enters India west of Sadiya, Arunachal Pradesh, as Siang/Dihang. Receives Dibang/Sikang and Lohit; then called Brahmaputra. Travels 750 km through Assam valley. Enters Bangladesh near Dhubri, called Jamuna; merges with Padma into Bay of Bengal. Known for floods, channel shifting, bank erosion due to heavy sediment load. (NCERT pp. 22–23)
- **Peninsular drainage — general characteristics:** Older than Himalayan drainage. Broad, shallow, graded valleys indicate maturity. Rivers have fixed course, absence of meanders, non-perennial flow. Most flow west to east. Exceptions: Narmada and Tapi flow in rift valleys from east to west. (NCERT p. 23)
- **Evolution of Peninsular drainage — three geological events:** (i) Subsidence of western flank of Peninsula (early Tertiary) disturbed original watershed symmetry; (ii) Himalayan upheaval caused subsidence of northern Peninsular flank, creating trough faults in which Narmada and Tapi flow (hence no alluvial/deltaic deposits in these rivers); (iii) Slight tilting of Peninsular block northwest to southeast oriented drainage toward Bay of Bengal. (NCERT p. 23)
- **Major Peninsular rivers:**
- **Mahanadi:** Rises near Sihawa, Raipur district, Chhattisgarh; 851 km long; catchment 1.42 lakh sq. km; drains into Bay of Bengal through Odisha. (NCERT p. 23)

- **Godavari:** Largest Peninsular river; called 'Dakshin Ganga'; rises in Nasik district, Maharashtra; 1,465 km long; catchment 3.13 lakh sq. km; discharges into Bay of Bengal. Tributaries: Penganga, Indravati, Pranhita, Manjra. Forms large delta after Rajamundri. (NCERT pp. 23–24)
- **Krishna:** Second largest east-flowing Peninsular river; rises near Mahabaleshwar, Sahyadri; 1,401 km long. Tributaries: Koyna, Tungabhadra, Bhima. (NCERT p. 24)
- **Kaveri:** Rises in Brahmagiri hills (1,341 m), Kodagu, Karnataka; 800 km long; catchment 81,155 sq. km. Carries water throughout the year because upper catchment receives SW monsoon (summer) and lower catchment receives NE monsoon (winter). Tributaries: Kabini, Bhavani, Amravati. (NCERT p. 24)
- **Narmada:** Originates on western flank of Amarkantak plateau at 1,057 m; flows in rift valley between Satpura (south) and Vindhyan range (north); 1,312 km long; catchment ~98,796 sq. km; forms marble rocks gorge and Dhuandhar waterfall near Jabalpur; meets Arabian Sea south of Bharuch forming a 27 km estuary. Sardar Sarovar Project on this river. (NCERT p. 24)
- **Tapi:** Originates at Multai, Betul district, MP; 724 km long; catchment 65,145 sq. km; flows westward into Arabian Sea. (NCERT p. 24)
- **Luni:** Largest river of Rajasthan west of Aravali; originates near Pushkar; ephemeral; flows into Rann of Kutch. (NCERT p. 24)
- **Usability of river water:** River water in India is unevenly distributed in time and space. Perennial rivers carry water year-round; non-perennial carry very little in dry season. Inter-basin water transfer schemes discussed include Periyar Diversion Scheme, Indira Gandhi Canal Project, Kurnool-Cuddapah Canal, Beas-Satluj Link Canal, Ganga-Kaveri Link Canal. (NCERT pp. 24–25)
- **River regimes — Himalayan vs Peninsular:** A river regime is the pattern of seasonal variation in discharge. Himalayan rivers have a dual regime — they are fed by both snowmelt (summer maximum from April–June) and the southwest monsoon (June–September), giving them perennial flow with high discharge throughout summer and early autumn. Peninsular rivers depend almost entirely on the southwest monsoon and are therefore seasonal in regime, with sharp peaks in July–September and very low flow in the dry months. The Kaveri is the major exception because its lower basin receives the retreating north-east monsoon. (NCERT pp. 19–20, 24)
- **Antecedent vs subsequent vs consequent drainage:** Drainage that pre-dates the uplift through which it now cuts is called antecedent — the Indus, Satluj, Brahmaputra and Kosi are textbook Himalayan examples that maintained their southward courses by deep down-cutting as the Himalayas rose. Consequent streams flow down the original slope of the new land surface, while subsequent streams follow weak rock structures and join the consequent at right angles, producing the trellis pattern seen in the Vindhyan country. (NCERT pp. 20–22)

- **Deltas vs estuaries — Peninsular contrast:** Mahanadi, Godavari, Krishna and Kaveri build extensive deltas in the Bay of Bengal because the eastern coast is emergent, gradient is gentle, and sediment load is high. Narmada and Tapi, in contrast, flow through structural rift valleys with steep gradients into the submerged western coast; they cannot drop their load and instead form long estuaries — Narmada's 27 km estuary south of Bharuch is the standard example. (NCERT pp. 23–24)
- **River pollution and inter-basin transfer:** NCERT notes that the increasing demand of water for irrigation, industry and domestic use creates the twin challenges of pollution from untreated effluents and over-extraction. Inter-basin transfer schemes (Periyar Diversion to Tamil Nadu; Indira Gandhi Canal carrying Beas–Satluj water into the Thar desert) attempt to redistribute the surplus of perennial Himalayan and west-flowing rivers to deficit Peninsular basins. The Ganga Action Plan and Namami Gange are policy responses to pollution in the Ganga basin. (NCERT p. 25)
- **Hierarchical drainage classification (Strahler order conceptual):** A first-order stream has no tributaries; two first-order streams join to form a second-order stream; the Ganga at its mouth is approximately a tenth-order trunk stream. NCERT does not present the Strahler scheme directly but uses an equivalent hierarchical idea while describing major/medium/minor basins (>20,000 / 2,000–20,000 / <2,000 sq km).

2.2 Definitions to memorise

Term	Definition	Page
Drainage	Flow of water through well-defined channels	17
Drainage system	Network of drainage channels in an area	17
Catchment area	Specific area from which a river collects its water	17
Drainage basin	Area drained by a river and all its tributaries	19
Watershed	Boundary line separating one drainage basin from another	19
Dendritic pattern	Drainage resembling tree branches; e.g. northern plains rivers	17
Radial pattern	Rivers flow outward in all directions from a central hill	17
Trellis pattern	Primary tributaries parallel; secondary join at right angles	17
Centripetal pattern	Rivers discharge from all directions into a lake/depression	17
Perennial river	River that carries water throughout the year	17
Ephemeral river	River with water only during rainy season; dry otherwise	17
Antecedent river	River that predates the uplift of the mountains it crosses (e.g. Satluj, Kosi, Subansiri)	21, 22, 23

Term	Definition	Page
Panjnad	Collective name for the five Punjab rivers (Satluj, Beas, Ravi, Chenab, Jhelum) joining the Indus	20
Tsangpo	Name of the Brahmaputra in Tibet; means 'the purifier'	22
Indo-Brahma	Hypothetical ancient river traversing the entire Himalayan length; ancestral to Indus, Ganga, Brahmaputra	20
Dakshin Ganga	Another name for the Godavari river	23
Trough fault	Structural depression through which Narmada and Tapi flow	23
Estuary	Funnel-shaped river mouth where tidal action is significant; e.g. Narmada's 27 km estuary	24
River regime	The seasonal pattern of variation in a river's discharge through the year	19
Subsequent river	Stream that develops along structurally weak lines (faults, joints) and joins consequent rivers at right angles	17
Consequent river	River whose course follows the original slope of the new land surface	17
Rejuvenation	Renewal of erosive activity by a river after uplift or fall of base level	23
Sapta Kosi	Combined name for the seven head-streams of the Kosi in eastern Nepal	22
Bhakra Nangal	Multi-purpose project on the Satluj river that supplies water and power to Punjab and Haryana	21
Damodar Valley Corporation (DVC)	Inter-state river-valley authority set up in 1948 to tame the Damodar — once the 'sorrow of Bengal'	22

2.3 Diagrams / processes to remember

- **Figure 3.1 (p. 17):** A river in the mountainous region — visualise gorges, V-shaped valleys, rapids characteristic of Himalayan upper course.
- **Figure 3.2 (p. 18):** Map of Major Rivers of India — must-memorise for location-based MCQs: note water divide (line separating Arabian Sea from Bay of Bengal drainage), positions of Indus, Ganga, Brahmaputra (north) and Mahanadi, Godavari, Krishna, Kaveri, Narmada, Tapi (Peninsula).
- **Figure 3.3 (p. 19):** Rapids — characteristic feature of Himalayan rivers in their upper course where gradient is steep.
- **Confluence points of Ganga tributaries (p. 21):** Vishnu Prayag (Dhauli + Vishnu Ganga = Alaknanda), Karna Prayag (Pindar + Alaknanda), Rudra Prayag (Mandakini + Alaknanda), Devprayag (Bhagirathi + Alaknanda = Ganga) — these are repeatedly tested.

- **Rift valley rivers (p. 23–24):** Narmada and Tapi both flow in rift valleys between parallel ranges — Satpura + Vindhyas for Narmada; no alluvial/deltaic deposits hence estuaries not deltas.

2.5 Key data table (NCERT figures to memorise)

#	River	Length	Catchment (sq km)	Source	Mouth	NCERT page
1	Indus	2,880 km (1,114 in India)	11,65,000 (3,21,289 in India)	Bokhar Chu, Kailash, Tibet	Arabian Sea	20–21
2	Ganga	2,525 km	8,60,000 (approx.)	Gangotri glacier, Uttarakhand	Bay of Bengal	21
3	Yamuna	1,376 km	3,66,000	Yamunotri glacier, Banderpunch	Confluence at Allahabad	22
4	Brahmaputra	~2,900 km (~750 in Assam)	5,80,000	Chemayungdung, Tibet	Bay of Bengal (via Bangladesh)	22
5	Mahanadi	851 km	1,42,000	Sihawa, Chhattisgarh	Bay of Bengal	23
6	Godavari	1,465 km	3,13,000	Nasik, Maharashtra	Bay of Bengal	23
7	Krishna	1,401 km	2,58,000	Mahabaleshwar, Maharashtra	Bay of Bengal	24
8	Kaveri	800 km	81,155	Brahmagiri Hills, Karnataka	Bay of Bengal	24
9	Narmada	1,312 km	98,796	Amarkantak plateau (1,057 m)	Arabian Sea (Gulf of Khambhat)	24
10	Tapi	724 km	65,145	Multai, Betul, MP	Arabian Sea	24
11	Chenab (Indus tributary)	1,180 km	—	Confluence of Chandra + Bhaga at Tandi	Joins Indus near Mithankot	21
12	Satluj	—	—	Raksas tal, Mansarovar (4,555 m)	Indus near Mithankot	21
13	Luni	—	—	Pushkar, Rajasthan	Rann of Kachchh (inland)	24

#	River	Length	Catchment (sq km)	Source	Mouth	NCERT page
14	Major basins (>20,000 sq km)	14 basins	—	—	—	19
15	Drainage to Bay of Bengal vs Arabian Sea	~77% : ~23%	—	—	—	19

2.4 Common confusions / NTA trap points

- **'Sorrow of Bihar' vs. 'Sorrow of Bengal':** Kosi = sorrow of Bihar (changes course due to sediment); Damodar = sorrow of Bengal (floods; now managed by DVC). NTA frequently swaps these.
- **Indus tributaries vs. Ganga tributaries:** Panjnad rivers (Satluj, Beas, Ravi, Chenab, Jhelum) are all Indus tributaries, NOT Ganga tributaries. Yamuna, Ghaghara, Gandak, Kosi are Ganga tributaries. Students often confuse Chambal — it joins Yamuna (a Ganga tributary) not the Indus.
- **Narmada and Tapi flow west, not east:** Almost all Peninsular rivers flow west to east into Bay of Bengal. Narmada and Tapi are the major exceptions flowing into Arabian Sea. Luni is ephemeral and flows into Rann of Kutch — neither Bay of Bengal nor Arabian Sea proper.
- **Devprayag vs. Vishnu Prayag:** Devprayag is where Bhagirathi meets Alaknanda (river becomes 'Ganga'). Vishnu Prayag is where Dhauli and Vishnu Ganga meet to form Alaknanda. NTA uses these as distractors for each other.
- **Kaveri's year-round flow:** Unlike other Peninsular rivers, Kaveri does not dry up because its upper catchment receives SW monsoon and lower catchment receives NE monsoon — a standard 'reason'-type question. Students often attribute this only to snowmelt (which is incorrect for Peninsular rivers).
- **Indo-Brahma vs Indo-Gangetic — different concepts:** Indo-Brahma is the hypothetical Miocene mega-river that allegedly traversed the entire Himalayan length; Indo-Gangetic refers to the modern plain or geological trough between the Himalayas and the Peninsula. NTA may swap the labels to test reading carefulness.
- **Source of Ganga at Devprayag, not Gangotri:** The river officially named "Ganga" begins only at Devprayag where the Bhagirathi (from Gangotri) meets the Alaknanda (from Satopanth above Badrinath). Upstream of Devprayag, the headstream is the Bhagirathi, not the Ganga. NTA exploits this in source-identification questions.
- **Yamuna ≠ a Peninsular tributary:** Yamuna is a Himalayan tributary of the Ganga (source Yamunotri glacier). However, its own right-bank tributaries — Chambal, Sind, Betwa, Ken — are Peninsular. NTA mixes these in match-the-following.

- **Tsangpo is Brahmaputra in Tibet, not Indus:** Indus in Tibet is "Singi Khamban"; Brahmaputra in Tibet is "Tsangpo"; Satluj in Tibet is "Langchen Khambab". Swapping these Tibetan names is a high-frequency trap.
- **Drainage pattern in northern plains:** The Ganga and its tributaries in the northern plain exhibit a dendritic (tree-branch) pattern. The trellis pattern appears in the Vindhyan country, the radial pattern around Amarkantak, and the centripetal pattern around inland-drainage basins like Sambhar Lake.

🎯 Practice MCQs

📊 PYQ Alignment

This chapter contributes consistently to CUET Geography papers, with questions focused on naming tributaries of major rivers, identifying drainage patterns, distinguishing Himalayan from Peninsular rivers, and locating river sources — typically 2–3 direct factual questions and 1–2 statement-based or match-the-following questions per year. The 'sorrow of Bihar/Bengal' pair, Panjnad rivers, Devprayag confluence, and Narmada–Tapi rift valley are among the most frequently recycled test points. For the full solved CUET PYQ set on drainage, see `/pyq/geography` .

Drainage System appears in CUET (UG) Geography across 3 cycle(s). The questions below were extracted from official CUET (UG) papers and matched to this chapter by topic — see `/pyq/geography` for the full PYQ archive.

CUET 2023 — Actual PYQs from this chapter

Q.33 (CUET 2023) Arrange the following river basins according to their area in descending order: A. Mahanadi basin B. Tapi basin C. Ganga basin D. Godavari basin Options:

- A) C, D, B, A
- B) C, D, A, B
- C) C, A, D, B
- D) C, A, B, D

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

Q.24 (CUET 2023) In which of the following river basins is the replenishable utilisation of water highest?

- A) Tapi
- B) Narmada
- C) Krishna

- D) Mahanadi

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

CUET 2024 — Actual PYQs from this chapter

Q.49 (CUET 2024) The city of _____ is located on the river Hooghly.

- A) Madurai
- B) Hyderabad
- C) Kolkata
- D) Delhi

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key

CUET 2025 — Actual PYQs from this chapter

Q.30 (CUET 2025) Arrange the following river basins in descending order according to size: (A) Mahanadi (B) Godavari (C) Ganga (D) Pennar Options:

- A) (D), (B), (C), (A)
- B) (B), (C), (A), (D)
- C) (C), (B), (A), (D)
- D) (C), (B), (D), (A)

Tests: aligns with chapter content Answer: Not in extracted key — verify against official NTA key