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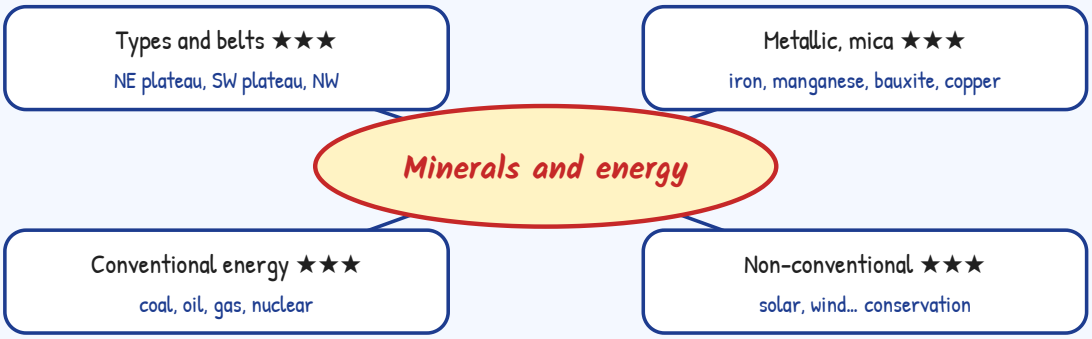
Chapter 13
Mineral and Energy Resources

Minerals and their types · characteristics · mineral belts · ferrous (iron ore, manganese) · non-ferrous (bauxite, copper) · non-metallic (mica) · conventional energy: coal, petroleum, natural gas, nuclear · non-conventional: solar, wind, tidal and wave, geothermal, bio-energy · conservation · India map items (mines and refineries)

Chapter map (★ = most important for exams)

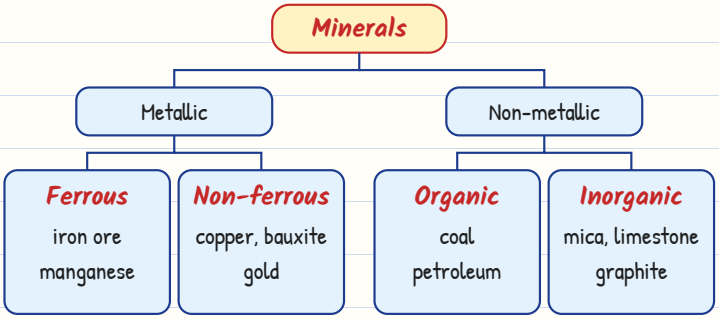


Syllabus and weightage

Part of Unit III of Book II (**10 marks**) and the **main source of India map items**: iron ore mines (Mayurbhanj, Bailadila, Ratnagiri, Ballari), manganese (Balaghat, Shivamogga), copper (Hazaribagh, Singhbhum, Khetri), bauxite (Katni, Bilaspur, Koraput), coal (Jharia, Bokaro, Raniganj, Neyveli), refineries (Mathura, Jamnagar, Barauni). Also: mineral belts, conservation, solar/nuclear energy (5 marks), quality-quantity A-R.

★ **Exam tip:** India has a rich variety of minerals due to its varied geology; most valuable minerals are **pre-Palaeozoic**, associated with **metamorphic and igneous rocks of peninsular India**; the northern alluvial plain is devoid of economic minerals. A **mineral** is a natural substance of organic or inorganic origin with definite chemical and physical properties.

13.1 Types of minerals ★★★



- **Metallic** minerals are sources of metals; **ferrous** contain iron (iron ore, manganese, chromite); **non-ferrous** do not (copper, bauxite).
- **Non-metallic: organic** — fossil (mineral) fuels from buried animal and plant life (coal, petroleum); **inorganic** — mica, limestone, graphite.

Characteristics ★★★

1. **Unevenly distributed** over space.
2. **Inverse relationship between quality and quantity**: good-quality minerals are less in quantity than low-quality ones.
3. All minerals are **exhaustible**; they take long to develop geologically and cannot be replenished at the time of need — "they do not have a second crop", so must be conserved.

13.2 Distribution of minerals ★★

- Most metallic minerals occur in the **peninsular plateau** in old crystalline rocks.
- Over **97% of coal** reserves are in the valleys of the **Damodar, Sone, Mahanadi and Godavari**.
- Petroleum in sedimentary basins of **Assam, Gujarat and Mumbai High**; new reserves in the Krishna-Godavari and Kaveri basins.
- Most major minerals lie **east of a line linking Mangaluru and Kanpur**.

13.3 Mineral belts ★★★

1. **North-Eastern Plateau Region:** Chhotanagpur (Jharkhand), Odisha plateau, West Bengal and parts of Chhattisgarh; variety of minerals — **iron ore, coal, manganese, bauxite, mica**; hence the concentration of major **iron and steel** industries here.
2. **South-Western Plateau Region:** Karnataka, Goa, contiguous Tamil Nadu uplands and Kerala; rich in **ferrous metals and bauxite**, high-grade iron ore, manganese, limestone; **lacks coal** except **Neyveli lignite**; less diversified than the NE belt; Kerala has **monazite and thorium** and bauxite clay; Goa has iron ore.
3. **North-Western Region:** along the **Aravali** in Rajasthan and part of Gujarat; minerals associated with the **Dharwar** system; **copper, zinc**; Rajasthan rich in building stones (sandstone, granite, marble), gypsum, Fuller's earth; dolomite and limestone for cement; Gujarat known for **petroleum**; Gujarat and Rajasthan rich in **salt** (Dandi March, Gujarat).
4. **Himalayan belt:** copper, lead, zinc, cobalt and tungsten in eastern and western parts; Assam valley has mineral oil; offshore oil near Mumbai (Mumbai High).

★ *Exam tip:* **Why are iron and steel plants in the NE plateau?** Iron ore and coal occur close together (with manganese, limestone), cutting transport costs; also water, labour and markets nearby.

13.4 Ferrous minerals: iron ore ★★★

- India has the **largest reserve of iron ore in Asia**; two main ores: **haematite and magnetite**; great international demand due to superior quality; mines lie close to coalfields in the NE plateau.
- About **95%** of reserves in **Odisha, Jharkhand, Chhattisgarh, Karnataka, Goa, Telangana, Andhra Pradesh and Tamil Nadu**.
- **Odisha:** hill ranges in Sundergarh, Mayurbhanj and Jhar; mines: Gurumahisani, Sulaipet, **Badampahar (Mayurbhanj)**, Kiruburu (Kendujhar), Bonai (Sundergarh).
- **Jharkhand:** some of the oldest mines; **Noamundi and Gua** in Poorbi and Pashchimi Singhbhum; the belt extends to Durg, Dantewada and **Bailadila**; **Dalli and Rajhara** in Durg (Chhattisgarh).
- **Karnataka: Sandur-Hospet (Ballari)**, Baba Budan hills and **Kudremukh** (Chikkamagaluru), parts of Shivamogga, Chitradurga, Tumakuru.
- Others: Chandrapur, Bhandara, **Ratnagiri** (Maharashtra); Karimnagar, Warangal (Telangana); Kurnool, Cuddapah, Anantapur (AP); Salem, Nilgiris (TN); **Goa** an important producer.

Manganese ★★★

- Raw material for **smelting iron ore** and making **ferro-alloys**; found in almost all formations but mainly the **Dharwar** system.
- **Madhya Pradesh and Odisha** are the leading producers. Odisha: central part of the iron ore belt – Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi, Bolangir.
- MP: belt of **Balaghat-Chhindwara-Nimar-Mandla and Jhabua**.
- Karnataka: Dharwar, Ballari, Belagavi, North Canara, Chikkamagaluru, **Shivamogga**, Chitradurga, Tumakuru.
- Maharashtra: Nagpur, Bhandara, Ratnagiri – disadvantage: **far from steel plants**. Minor: Telangana, Goa, Jharkhand.

13.5 Non-ferrous minerals ★★★

India is **poorly endowed** with non-ferrous metallic minerals except **bauxite**.

Bauxite

- The ore used for making **aluminium**; found in **tertiary deposits** associated with **laterite** rocks on plateaus and hill ranges of peninsular India and coastal tracts.
- **Odisha** is the largest producer: **Kalahandi and Sambalpur** lead; Bolangir and **Koraput** increasing.
- Patlands of **Lohardaga** (Jharkhand); Gujarat (Bhavnagar, Jamnagar); Chhattisgarh (**Amarkantak plateau**; Bilaspur); MP (**Katni-Jabalpur**, Balaghat); Maharashtra (Kolaba, Thane, Ratnagiri, Satara, Pune, Kolhapur); minor: TN, Karnataka, Goa.

Copper

- Indispensable in the **electrical industry** (wires, motors, transformers, generators); alloyable, malleable and ductile; mixed with gold to strengthen jewellery.
- Main deposits: **Singhbhum** (Jharkhand), **Balaghat** (MP), **Jhunjhunu (Khetri) and Alwar** (Rajasthan). Minor: Agnigundala (Guntur, AP), Chitradurga and Hassan (Karnataka), South Arcot (TN). (Hazaribagh, Jharkhand, is a map item.)

13.6 Non-metallic minerals: mica ★★★

- Used mainly in **electrical and electronic** industries; can be split into very thin, tough and flexible sheets. Others mined for local use: limestone, dolomite, phosphate.

- Produced in **Jharkhand, Andhra Pradesh, Telangana and Rajasthan**, then TN, WB, MP.
- Jharkhand: high-quality mica in a belt about **150 km long and 22 km wide** in the **lower Hazaribagh plateau**.
- AP: **Nellore** produces the best-quality mica.
- Rajasthan: belt of about 320 km from **Jaipur to Bhilwara** and around Udaipur. Also Mysuru, Hassan (Karnataka), Coimbatore, Tiruchirappalli, Madurai, Kanniyakumari (TN), Alleppey (Kerala), Ratnagiri (Maharashtra), Purulia and Bankura (WB).

13.7 Energy resources: conventional ★★★

Mineral fuels are essential for power for agriculture, industry and transport. Coal, petroleum, natural gas (fossil fuels) and nuclear minerals are **conventional, exhaustible** sources.

Coal ★★★

- Used in **thermal power** and **smelting iron ore**. Occurs in rocks of two ages: **Gondwana** and **tertiary**.
- About **80%** of Indian coal is **bituminous, non-coking** grade.
- **Gondwana** coal: most important fields in the **Damodar valley** (Jharkhand-Bengal belt): **Raniganj, Jharia, Bokaro, Giridih, Karanpura**; **Jharia is the largest**, followed by Raniganj. Other valleys: Godavari, Mahanadi, Sone.
- Mining centres: **Singrauli** (MP, part in UP), **Korba** (Chhattisgarh), **Talcher and Rampur** (Odisha), **Chanda-Wardha, Kamptee, Bander** (Maharashtra), **Singareni** (Telangana), Pandur (AP).
- **Tertiary** coal: Assam, Arunachal, Meghalaya, Nagaland — Darangiri, Cherrapunji, Mewlong, Langrin (Meghalaya); Makum, Jaipur, Nazira (upper Assam); Namchik-Namphuk (Arunachal); Kalakot (J&K).
- **Lignite (brown coal):** coastal Tamil Nadu (**Neyveli**), Puducherry, Gujarat, J&K.

Map item	State
Jharia, Bokaro	Jharkhand
Raniganj	West Bengal
Neyveli	Tamil Nadu

Petroleum ★★★

- Hydrocarbons of liquid and gaseous states; energy for internal combustion engines in automobiles, railways and aircraft; by-products processed in petrochemical industries (fertiliser, synthetic rubber and fibre, medicines, vaseline, lubricants, wax, soap, cosmetics). Called "**liquid gold**" for its scarcity and diverse uses.
- Occurs in **sedimentary rocks of the tertiary period**. Systematic exploration after the **ONGC** was set up in **1956**; till then **Digboi** (Assam) was the only oil region.
- **Assam:** Digboi, Naharkatiya, Moran. **Gujarat:** Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba, Lunej. **Mumbai High:** 160 km off Mumbai, discovered **1973**, production from **1976**. Oil and gas also in Krishna-Godavari and Kaveri basins.
- Crude oil must be refined. Refineries: **field-based** (e.g. **Digboi**) and **market-based** (e.g. **Barauni**). Map items: **Mathura** (UP), **Jamnagar** (Gujarat), **Barauni** (Bihar).

Natural gas ★★

Found with petroleum and released when crude is brought up. Uses: domestic and industrial fuel, power generation, heating, raw material in chemical, petrochemical and **fertiliser** industries; with city gas networks it is emerging as **CNG** (transport) and **PNG** (cooking). Major reserves: **Mumbai High** and allied west coast fields, Cambay basin; new reserves in the **Krishna-Godavari basin**. GAIL is laying cross-country pipelines ("One Nation One Grid").

Nuclear energy ★★★

- A viable source in recent times; minerals: **uranium and thorium**.

- **Uranium** in **Dharwar** rocks: along the **Singhbhum copper belt**; Udaipur, Alwar, Jhunjhunu (Rajasthan), Durg (Chhattisgarh), Bhandara (Maharashtra), Kullu (HP).
- **Thorium** from **monazite and ilmenite** in beach sands of Kerala and TN; world's richest monazite deposits in **Palakkad and Kollam** (Kerala), near Visakhapatnam (AP) and the Mahanadi delta (Odisha).
- **Atomic Energy Commission 1948**; Atomic Energy Institute at **Trombay (1954)**, renamed **BARC (1967)**.
- Plants: **Tarapur** (Maharashtra, the first), **Rawatbhata** near Kota (Rajasthan), **Kalpakkam** (TN), **Narora** (UP), **Kaiga** (Karnataka), **Kakrapar** (Gujarat).

13.8 Non-conventional energy ★★★

Fossil fuels and nuclear energy use exhaustible raw materials; sustainable sources are **renewable**: solar, wind, hydro-geothermal, biomass. They are **more equitably distributed, environment-friendly**, and give sustained, eco-friendly, **cheaper energy after the initial cost**.

- **Solar:** sun rays tapped in **photovoltaic cells**; also **solar thermal technology** — cost-competitive, environment-friendly, easy to construct; **7% more effective than coal/oil plants and 10% more than nuclear**; used in heaters, crop dryers, cookers; greater potential in the **west — Gujarat and Rajasthan**.
- **Wind:** absolutely pollution-free, inexhaustible; turbines convert kinetic energy to electricity; permanent winds (trades, westerlies), monsoons, local land and sea breezes; favourable in **Rajasthan, Gujarat, Maharashtra, Karnataka**.
- **Tidal and wave:** ocean currents are a store-house of infinite energy; large tidal waves along the **west coast** give great potential, not yet utilised.
- **Geothermal:** heat from magma and hot water from geysers used to generate power; India's plant at **Manikaran (HP)**; the first successful attempt (1890) at **Boise, Idaho** (USA).
- **Bio-energy:** from agricultural residues, municipal, industrial and other wastes → electricity, heat or cooking gas; processes garbage, improves rural economies, reduces pollution and pressure on fuelwood, enhances self-reliance; e.g. **Okhla** (Delhi) waste-to-energy project.

13.9 Conservation of mineral resources ★★★

1. Sustainable development integrates economic growth with environmental concerns; traditional methods generate enormous waste.
2. **Protect resources for future generations**; urgent need to conserve.
3. Develop **inexhaustible alternatives** — solar, wind, wave, geothermal — to replace exhaustible ones.
4. Use **scrap metals** for recycling, especially **copper, lead and zinc**, in which India's reserves are meagre.
5. Use **substitutes** for scarce metals.
6. Reduce **export of strategic and scarce minerals** so reserves last longer.

India map items (syllabus) ★★★

Mineral	Mine	State
Iron ore	Mayurbhanj	Odisha
	Bailadila	Chhattisgarh
	Ratnagiri	Maharashtra
	Ballari (Bellary)	Karnataka

Manganese	Balaghat	Madhya Pradesh
	Shivamogga (Shimoga)	Karnataka
Copper	Hazaribagh	Jharkhand
	Singhbhum	Jharkhand
	Khetri	Rajasthan
Bauxite	Katni	Madhya Pradesh
	Bilaspur	Chhattisgarh
	Koraput	Odisha
Coal	Jharia	Jharkhand
	Bokaro	Jharkhand
	Raniganj	West Bengal
	Neyveli (lignite)	Tamil Nadu
Oil refineries	Mathura	Uttar Pradesh
	Jamnagar	Gujarat
	Barauni	Bihar



India: iron ore (Mayurbhanj, Bailadila, Ratnagiri, Ballari), manganese (Balaghat, Shivamogga), copper (Hazaribagh, Singhbhum, Khetri) and bauxite (Katni, Bilaspur, Koraput) mines.



India: coal mines (Jharia, Bokaro, Raniganj, Neyveli) and oil refineries (Mathura, Jamnagar, Barauni).

★ **Exam tip:** **Exam pattern:** two to three of the seven India-map items each year come from this chapter (e.g. "Jharia coal mines", "an oil refinery in UP", "iron ore mines in coastal Maharashtra"). VI candidates are asked the state of each place.

NCERT exercises, solved ★★★

1. Multiple choice

(i) In which state are the major oil fields located? (a) Assam (b) Bihar (c) Rajasthan (d) Tamil Nadu 1

Ans. (a) Assam (Digboi, Naharkatiya, Moran).

(ii) Where was the first atomic power station started? (a) Kalpakkam (b) Narora (c) Rana Pratap Sagar (d) Tarapur 1

Ans. (d) Tarapur.

(iii) Which is a non-renewable source of energy? (a) hydel (b) solar (c) thermal (d) wind 1

Ans. (c) Thermal.

2. Answer in about 30 words

(i) Give an account of the distribution of mica. 2

Ans. Jharkhand (lower Hazaribagh plateau belt 150 km × 22 km, high quality), Andhra Pradesh (Nellore, best quality), Telangana, Rajasthan (Jaipur-Bhilwara belt, Udaipur), then TN, WB, MP; also Karnataka, Kerala, Maharashtra.

(ii) What is nuclear power? Mention important nuclear power stations. 2

Ans. Electricity generated from the fission of uranium and thorium. Stations: Tarapur, Rawatbhata (Kota), Kalpakkam, Narora, Kaiga, Kakrapar.

(iii) Name non-ferrous metals and their spatial distribution. 2

Ans. Bauxite (Odisha — Kalahandi, Sambalpur, Koraput; Jharkhand, Gujarat, Chhattisgarh, MP, Maharashtra) and copper (Singhbhum in Jharkhand, Balaghat in MP, Khetri/Jhunjhunu and Alwar in Rajasthan).

(iv) What are non-conventional sources of energy? 2

Ans. Renewable, inexhaustible, eco-friendly sources like solar, wind, tidal and wave, geothermal and bio-energy, which are more equitably distributed than fossil fuels.

3. Answer in about 150 words

(i) Write a detailed note on the petroleum resources of India. 5

Ans. (i) Crude petroleum consists of liquid and gaseous hydrocarbons; it fuels internal combustion engines and gives many petrochemical by-products, hence "liquid gold". (ii) It occurs in tertiary sedimentary rocks. (iii) Systematic exploration began after ONGC (1956); before that Digboi was the only oil region. (iv) **Assam**: Digboi, Naharkatiya, Moran; **Gujarat**: Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba, Lunej; **Mumbai High** (160 km offshore; discovered 1973, production 1976); new finds in Krishna-Godavari and Kaveri basins. (v) Crude is refined in field-based (Digboi) and market-based (Barauni) refineries; others include Mathura and Jamnagar. (vi) India still imports most of its crude, so conservation and alternatives are vital.

(ii) Write an essay on hydel power in India. 5

Ans. Hydel power is generated by the force of falling water turning turbines; it is renewable, clean and cheap to run once dams are built. India has large potential in the **Himalayan rivers** (Indus, Ganga, Brahmaputra systems) with perennial flow and steep gradients, and in the Western Ghats and peninsular rivers. Multipurpose projects such as **Bhakra-Nangal, Damodar Valley, Hirakud, Nagarjuna Sagar, Tehri, Koyna, Sardar Sarovar** combine irrigation, flood control and power. Hydel power is concentrated in the north-east, Himalayan states (HP, Uttarakhand, J&K) and Karnataka, Kerala and Maharashtra. Problems: high initial cost, long gestation, displacement of people, siltation, seismic risk and seasonal variation of flow; much of the Brahmaputra potential is untapped. Small hydro projects help remote areas.

CBSE board questions 2024–2026, fully solved ★★★

Every question on this chapter from the 16 board papers of 2024 (64/1-5), 2025 (64/1, 2, 4-7) and 2026 (64/1-5), with complete answers based on the marking schemes and NCERT. Repeated questions are shown once with all paper codes. India map items on mines and refineries are included. "VI" marks the alternative question for visually impaired candidates.

Multiple choice questions (1 mark)

CBSE 2025 · 64/1/1 Arrange India's oil refineries from south to north: i. Mumbai ii. Kochi iii. Koyali iv. Mangaluru. (A) ii, iv, iii, i (B) ii, iv, i, iii (C) iv, ii, i, iii (D) iv, ii, iii, i 1

Ans. **(B) ii, iv, i, iii:** Kochi → Mangaluru → Mumbai → Koyali (Vadodara).

CBSE 2025 · 64/4/1 States in order of iron ore reserves (high to low): (A) Odisha, Jharkhand, Chhattisgarh (B) Maharashtra, Jharkhand, Andhra Pradesh (C) Odisha, Tamil Nadu, Telangana (D) Chhattisgarh, Karnataka, Madhya Pradesh 1

> **Ans. (A) Odisha, Jharkhand, Chhattisgarh** (as per the board key; Karnataka also has large reserves).

CBSE 2025 · 64/5/1 Arrange states from highest to lowest bauxite production: I. Odisha II. Gujarat III. Chhattisgarh IV. Madhya Pradesh. (A) III, II, I, IV (B) IV, I, III, II (C) I, II, III, IV (D) III, IV, II, I 1

> **Ans. (C) I, II, III, IV**, as per the board key: Odisha leads (Kalahandi, Koraput), followed by Gujarat, Chhattisgarh and Madhya Pradesh (as in NCERT).

CBSE 2025 · 64/7/1 Assertion (A): There is an inverse relationship between the quality and quantity of minerals. Reason (R): Good-quality minerals are less in quantity than low-quality minerals. (A) both true, R does not explain A (B) both true, R explains A (C) A correct, R incorrect (D) A incorrect, R correct 1

> **Ans. (B)** Both true and R explains A: good-quality minerals are scarce and low-quality ones abundant, hence the inverse relationship.

CBSE 2026 · 64/2/1 Arrange coal mining areas from south to north: I. Singareni II. Neyveli III. Jharia IV. Talcher. (A) II, I, III, IV (B) II, I, IV, III (C) I, II, IV, III (D) I, II, III, IV 1

> **Ans. (B) II, I, IV, III:** Neyveli (Tamil Nadu) → Singareni (Telangana) → Talcher (Odisha) → Jharia (Jharkhand).

CBSE 2026 · 64/2/1 Match minerals with mines: a. iron ore b. manganese c. bauxite d. copper — i. Katni ii. Bhilwara iii. Chandrapur iv. Sundargarh. (A) iv iii i ii (B) iii iv ii i (C) iii iv i ii (D) iv iii ii i 1

> **Ans. (C) a–iii, b–iv, c–i, d–ii**, as per the board key: iron ore – Chandrapur (Maharashtra); manganese – Sundargarh (Odisha); bauxite – Katni (MP); copper – Bhilwara (Rajasthan). (Sundargarh also has iron ore.)

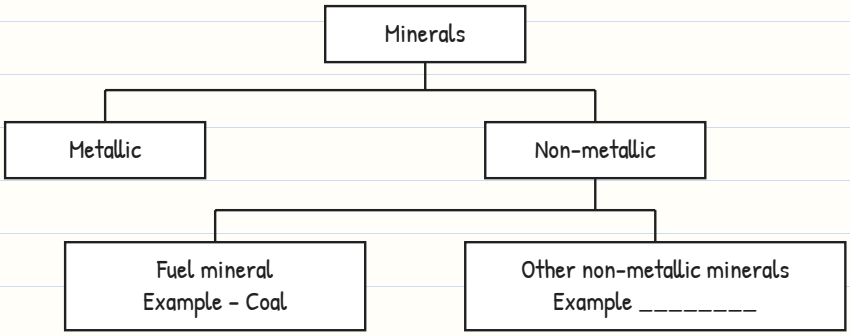
CBSE 2026 · 64/2/1 A non-ferrous ore; Odisha is the largest producer; used to make aluminium. (A) copper (B) mica (C) bauxite (D) manganese 1

> **Ans. (C) Bauxite.**

CBSE 2026 · 64/4/1 Arrange Assam's oil refineries from west to east: I. Guwahati II. Numaligarh III. Bongaigaon IV. Digboi. (A) I, III, II, IV (B) I, III, IV, II (C) III, I, IV, II (D) III, I, II, IV 1

> **Ans. (D) III, I, II, IV:** Bongaigaon → Guwahati → Numaligarh → Digboi.

CBSE 2024 · 64/2/1 Choose the correct option to fill in the blank in the flow chart (Minerals → Metallic / Non-metallic; Non-metallic → Fuel mineral, example coal / Other non-metallic minerals, example _____): (A) gold (B) bauxite (C) graphite (D) manganese



Flow chart as printed in CBSE 2024 · 64/2/1 Q10.

Ans. **(C) Graphite**: a non-metallic (inorganic) mineral, like mica, limestone and dolomite; gold, bauxite and manganese are metallic minerals. 1

CBSE 2024 · 64/5/1 Which state is the leading producer of manganese? (A) Jharkhand (B) Madhya Pradesh (C) Odisha (D) Bihar 1

Ans. **(C) Odisha** (Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi, Bolangir).

CBSE 2024 · 64/5/1 Which is the largest coalfield in India? (A) Jharia (B) Raniganj (C) Neyveli (D) Bokaro 1

Ans. **(A) Jharia** (Damodar valley, Jharkhand), followed by Raniganj.

Questions (3 marks): short answer, passage and diagram

CBSE 2025 · 64/1/1 Why should non-conventional sources of energy be used in India for sustainable development? Explain with examples. 3

Ans. (i) Sustainable development requires integrating economic development with **environmental concerns**. (ii) **Conventional sources** (coal, petroleum, natural gas) are **exhaustible** and generate enormous waste and pollution (greenhouse gases, smoke). (iii) **Non-conventional sources** like **solar, wind, hydro, geothermal and biomass** are renewable, cleaner and more equitably distributed: e.g. solar parks in Rajasthan and Gujarat, wind farms in Tamil Nadu and Gujarat, geothermal at Manikaran (Himachal), bio-energy from waste. (iv) They reduce dependence on imports and supply power to remote areas, ensuring energy for future generations.

CBSE 2025 · 64/4/1 Distinguish between metallic and non-metallic minerals with examples. 3

Ans. (i) **Metallic minerals** contain metals and are divided into **ferrous** (containing iron: iron ore, manganese, chromite) and **non-ferrous** (copper, bauxite, lead, zinc, gold); **non-metallic minerals** do not contain metals and are divided into **organic** and **inorganic**. (ii) **Organic non-metallic** minerals are fossil fuels (coal, petroleum), derived from buried plant and animal life; **inorganic non-metallic** minerals include **mica, limestone and graphite**. (iii) Metallic minerals are generally found in igneous and metamorphic rocks and can be melted to obtain new products; non-metallic minerals are found mostly in sedimentary rocks.

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CBSE 2025 · 64/5/1 Why does solar thermal energy have a greater advantage over non-renewable energy in India? Explain. 3

Ans. (i) Sun rays tapped in photovoltaic cells and solar thermal devices produce energy; India receives abundant sunshine, especially in western India (Gujarat, Rajasthan). (ii) Solar thermal technology is more **cost-competitive** (after setup), **environment-friendly** and easy to build; it is 7% more effective than coal- or oil-based plants and 10% more effective than nuclear plants (as per NCERT). (iii) It is **renewable** and inexhaustible, unlike coal and oil, and it is commonly used in heaters, dryers, cookers; it reduces pollution and import bills.

Questions (5 marks)

CBSE 2025 · 64/2/1 (a) "Petroleum is an essential energy source with many by-products from refining." Explain with examples. OR (b) "Generation of energy through non-conventional sources is the need of the hour for sustainable development." Explain with examples. 5

Ans. **(a)** (i) Crude petroleum (hydrocarbons in liquid and gaseous form) is an essential source of energy for machines, **transport** (road, rail, air) and power generation. (ii) Its **refining** produces many by-products: petrol, diesel, kerosene, LPG, naphtha, lubricants, bitumen, and feedstock for **petrochemical industries**: fertilisers, synthetic rubber, synthetic fibres, plastics, medicines. (iii) It is called "liquid gold". (iv) Production: Assam (Digboi, Naharkatiya, Moran), Gujarat (Ankleshwar, Kalol), Mumbai High; refineries are field-based (Digboi) or market-based (Barauni, Mathura). **(b)** (i) Conventional sources (coal, petroleum, gas) are exhaustible and polluting; (ii) non-conventional sources are renewable, clean and more equitably distributed: (iii) **solar** (photovoltaic and solar thermal; Gujarat, Rajasthan solar parks); (iv) **wind** (Tamil Nadu, Gujarat, Maharashtra, Rajasthan); (v) **tidal and wave** energy along the west coast; (vi) **geothermal** (Manikaran, Puga valley); (vii) **bio-energy** from agricultural, municipal and industrial waste (e.g. Okhla, Delhi plant). They reduce emissions, support remote areas and ensure energy for the future.

CBSE 2026 · 64/1/1 (a) Explain the significance of petroleum as a major energy source and describe its distribution in India. OR (b) Explain the significance of iron ore as an industrial raw material and describe its distribution in India. 5

Ans. **(a) Significance:** (i) Crude petroleum (hydrocarbons) is an essential source of energy for machines, transport (vehicles, railways, aircraft) and generation of power. (ii) It is a raw material for many industries: **petrochemicals**, fertilisers, synthetic textiles, plastics and medicines. (iii) It is called "**liquid gold**" because of its scarcity and diverse uses. **Distribution:** (i) **Assam**: Digboi, Naharkatiya and Moran, the oldest oil-producing state. (ii) **Gujarat**: Ankleshwar, Kalol, Mehsana, Nawagam, Kosamba, Lunej. (iii) **Mumbai High**, about 160 km off Mumbai, discovered in 1973, production began in 1976; also oil and gas in the Krishna-Godavari and Kaveri basins on the east coast. Refineries are field-based (Digboi) or market-based (Barauni). **(b) Significance:** (i) Iron ore is the **basic raw material for the iron and steel industry**, the backbone of industrialisation; (ii) India has one of the largest reserves of iron ore in Asia (haematite and magnetite of high quality); it is in great demand abroad, and India exports it. **Distribution:** about 95% of reserves are in **Odisha, Jharkhand, Chhattisgarh, Karnataka, Goa, Telangana, Andhra Pradesh and Tamil Nadu**. (i) **Odisha**: Sundergarh, Mayurbhanj and Jhar (Gurumahisani, Sulaipet, Badampahar, Kiruburu, Bonai). (ii) **Jharkhand**: Noamundi and Gua in Poorbi and Pashchimi Singhbhum.

(iii) **Chhattisgarh**: Dalli and Rajhara in Durg; **Bailadila** in Dantewara. (iv) **Karnataka**: Sandur-Hospet (Ballari), Baba Budan hills and Kudremukh (Chikkamagaluru), Shivamogga; (v) **Goa**, and Maharashtra (Chandrapur, Bhandara, Ratnagiri).

CBSE 2026 · 64/3/1 (a) "Non-conventional energy sources are equitably distributed in India." Justify. OR (b) "Conventional sources of energy need to be replaced due to their exhaustibility." Justify. 5

Ans. **(a)** (i) Non-conventional sources (solar, wind, hydro, geothermal, biomass, tidal) are **renewable** and **more equitably distributed** than fossil fuels, which are concentrated in a few places. (ii) **Solar energy** is available almost everywhere, especially in western India (Gujarat, Rajasthan); (iii) **wind** in Tamil Nadu, Gujarat, Maharashtra, Rajasthan, Karnataka; (iv) **tidal and wave** along the long coastline (Gulf of Khambhat, Kachchh); (v) **geothermal** at Manikaran (Himachal) and Puga valley (Ladakh); (vi) **bio-energy** from agricultural and municipal waste in all areas. They are environment-friendly, need lower investment over time, and can provide power in remote areas. **(b)** (i) Conventional sources (coal, petroleum, natural gas, nuclear) are **exhaustible**: their reserves are limited and are being used up rapidly. (ii) They cause **pollution** (smoke, greenhouse gases, global warming) and generate large waste. (iii) Their distribution is uneven, causing import dependence (e.g. crude oil). (iv) Rising demand and costs; (v) so alternative sources like solar, wind, wave and geothermal energy, which are renewable, cleaner and more equitably distributed, should be developed.

CBSE 2024 · 64/1/1 (a) Analyse the relationship between the conservation of mineral resources and sustainable development in India. OR (b) Analyse the advantages of non-conventional energy sources, giving the example of solar energy in India. 5

Ans. **(a)** (i) Sustainable development requires **integration of economic development with environmental concerns**. (ii) Traditional methods of resource use generate enormous waste and create environmental problems. (iii) Sustainable development calls for **protection of resources for future generations**, so there is an urgent need to conserve them. (iv) **Alternative energy sources** like solar, wind, wave and geothermal energy are inexhaustible and should be developed to replace exhaustible resources. (v) For metallic minerals, the use of **scrap metals** enables recycling, especially of copper, lead and zinc, in which India's reserves are meagre. (vi) The use of **substitutes** for scarce metals reduces their consumption; **export of strategic and scarce minerals** must be reduced so that existing reserves last longer. **(b)** **Advantages:** (i) **inexhaustible** and abundantly available; (ii) more **equitably distributed**; (iii) **environment-friendly** (no pollution); (iv) provide sustained, eco-friendly and cheaper energy after the initial cost. **Solar energy:** (v) photovoltaic cells and solar thermal technology convert sunlight; it is **cost-competitive** and easy to construct; solar thermal technology is reported to be 7% more effective than coal- or oil-based plants and 10% more than nuclear plants. (vi) It is used more in appliances like **heaters, crop dryers and cookers**. (vii) The **western part of India**, like **Gujarat and Rajasthan**, has greater potential.

CBSE 2024 · 64/2/1 "Nuclear power has emerged as a viable source in recent years." Examine the statement with arguments in the context of India. 5

Ans. (i) The important minerals for nuclear energy are **uranium and thorium**; uranium deposits occur in the **Dharwar rocks**. (ii) Uranium ores occur at several locations along the **Singbhum copper belt**, and in Udaipur, Alwar and Jhunjhunu (Rajasthan), Durg (Chhattisgarh), Bhandara (Maharashtra) and Kullu

(HP). (iii) Thorium is mainly obtained from **monazite and ilmenite** in the beach sands of **Kerala and Tamil Nadu**; the world's richest monazite deposits are in **Palakkad and Kollam** (Kerala), near Visakhapatnam and in the Mahanadi delta. (iv) The **Atomic Energy Commission** was set up in 1948, but progress came after the Atomic Energy Institute at Trombay (1954), renamed the **Bhabha Atomic Research Centre** (1967). (v) Important nuclear power projects: **Tarapur** (Maharashtra), **Rawatbhata** (Kota, Rajasthan), **Kalpakkam** (TN), **Narora** (UP), **Kaiga** (Karnataka) and **Kakrapara** (Gujarat). (vi) It provides large, steady power without carbon emissions, so it is viable, though issues of safety and waste remain.

CBSE 2024 · 64/4/1 (a) Explain any five measures for the conservation of mineral resources in India. OR (b) Explain the importance of solar energy in the Indian context. 5

Ans. **(a)** (i) Sustainable development calls for **protection of resources for future generations**. (ii) Develop **alternative energy sources** (solar, wind, wave, geothermal) — inexhaustible — to replace exhaustible ones. (iii) Use **scrap metals** for recycling, especially copper, lead and zinc, in which India's reserves are meagre. (iv) Use **substitutes** for scarce metals. (v) Reduce the **export of strategic and scarce minerals** so existing reserves last longer; adopt improved mining technology that reduces waste. **(b)** (i) Sun rays tapped in **photovoltaic cells** are converted into energy; solar thermal technology is another method. (ii) It has relative advantages over non-renewable sources: **cost-competitive, environment-friendly and easy to construct**. (iii) Solar energy is 7% more effective than coal- or oil-based plants and 10% more than nuclear plants. (iv) Used in **heaters, crop dryers and cookers**. (v) The **western part of India** (Gujarat, Rajasthan) has great potential; India gets abundant sunshine for most of the year, so it reduces dependence on fossil fuels and imports.

Map questions

CBSE 2025 · 64/1/1 India map: a copper mining centre in Jharkhand. 1

Ans. **Singhbhum** or **Hazaribagh**: the board's answer map marks both and accepts either one.

CBSE 2025 · 64/1/1 India map: a manganese mining centre in Madhya Pradesh. 1

Ans. **Balaghat.**

CBSE 2025 · 64/1/1 India map: an iron ore mining centre in Maharashtra. 1

Ans. **Ratnagiri** or **Chandrapur**: the board's answer map marks both and accepts either one.



Answer map, CBSE 2025 · 64/1/1 (Q30): 30.4, 30.5, 30.6, as located on the board's answer map.

CBSE 2025 · 64/2/1; CBSE 2025 · 64/4/1 India map: important iron ore mines in Odisha. 1

Ans. **Mayurbhanj** or **Kendujhar**: the board's answer map marks both and accepts either one (CBSE 2025 · 64/4/1 marks Mayurbhanj).

CBSE 2025 · 64/2/1 India map: a copper mine in Rajasthan. 1

Ans. **Khetri** (Jhunjhunu district), as marked on the board's answer map. The VI key also accepts Bhilwara or Udaipur.

CBSE 2025 · 64/2/1; CBSE 2025 · 64/4/1; CBSE 2026 · 64/2/1; CBSE 2026 · 64/3/1; CBSE 2026 · 64/4/1; CBSE 2026 · 64/5/1

India map: an oil refinery in Bihar. 1

Ans. **Barauni.**



Answer map, CBSE 2025 · 64/2/1 (Q30): 30.1, 30.3, 30.4, as located on the board's answer map.

CBSE 2025 · 64/4/1; CBSE 2026 · 64/2/1 India map: important coal mines in West Bengal. 1

Ans. Raniganj.

CBSE 2025 · 64/4/1 India map: important manganese mines in Karnataka. 1

Ans. Shivamogga (Shimoga), as marked on the board's answer map (the VI key also accepts Chitradurga or Tumakuru).



Answer map, CBSE 2025 · 64/4/1 (Q30): 30.2, 30.4, 30.5, 30.6, as located on the board's answer map.

CBSE 2025 · 64/5/1; CBSE 2025 · 64/7/1; CBSE 2026 · 64/1/1; CBSE 2024 · 64/1/1; CBSE 2024 · 64/5/1 India map: an oil refinery in Uttar Pradesh. 1

Ans. Mathura.

CBSE 2025 · 64/5/1 India map: important bauxite mines in southern Odisha. 1

Ans. Koraput.

CBSE 2025 · 64/5/1 India map: important iron ore mines in southern Chhattisgarh. 1

Ans. Bailadila.

CBSE 2025 · 64/5/1 India map: important copper mines in southern Rajasthan. 1

Ans. Udaipur (southern Rajasthan). The board's answer map marks Udaipur and Khetri and accepts either one.



Answer map, CBSE 2025 · 64/5/1 (Q30): 30.2, 30.4, 30.6, 30.7, as located on the board's answer map.

CBSE 2025 · 64/6/1 India map: iron ore mines in southern Chhattisgarh. 1

Ans. Bailadila.

CBSE 2025 · 64/6/1 India map: copper mines in northern Jharkhand. 1

Ans. Hazaribagh.



Answer map, CBSE 2025 · 64/6/1 (Q30): 30.2, 30.3, as located on the board's answer map.

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CBSE 2025 · 64/7/1; CBSE 2026 · 64/2/1 India map: important iron ore mines in coastal Maharashtra. 1

Ans. Ratnagiri.

CBSE 2025 · 64/7/1 India map: important coal mines in Tamil Nadu. 1

Ans. Neyveli.



Answer map, CBSE 2025 · 64/7/1 (Q30): 30.3, 30.4, 30.7, as located on the board's answer map.

CBSE 2026 · 64/1/1 India map: an iron ore mining area in southern Chhattisgarh. 1

Ans. Bailadila (Dantewada district), as marked on the board's answer map (the VI key also accepts Durg / Dalli-Rajhara).

CBSE 2026 · 64/1/1 India map: a major area of bauxite mining in Odisha. 1

Ans. Koraput, as marked on the board's answer map (the VI key also accepts Kalahandi, Sambalpur or Bolangir).



Answer map, CBSE 2026 · 64/1/1 (Q30): 30.3, 30.4, 30.5, as located on the board's answer map.

CBSE 2026 · 64/2/1 India map: important manganese mines in Madhya Pradesh. 1

Ans. Balaghat.



Answer map, CBSE 2026 · 64/2/1 (Q30): 30.2, 30.3, 30.4, 30.5, as located on the board's answer map.

CBSE 2026 · 64/3/1 India map: the easternmost iron ore mining area in Odisha. 1

Ans. Mayurbhanj.

CBSE 2026 · 64/3/1 India map: a coal mining area in Tamil Nadu. 1

Ans. Neyveli (lignite).



Answer map, CBSE 2026 · 64/3/1 (Q30): 30.3, 30.4, 30.5, as located on the board's answer map.

CBSE 2026 · 64/4/1 India map: the iron ore mines in coastal Maharashtra. 1

Ans. Ratnagiri.

CBSE 2026 · 64/4/1 India map: the coal mines in West Bengal. 1

Ans. Raniganj.



Answer map, CBSE 2026 · 64/4/1 (Q30): 30.2, 30.3, 30.4, as located on the board's answer map.

CBSE 2026 · 64/5/1 India map: iron ore mines in western Maharashtra. 1

Ans. Ratnagiri.

CBSE 2026 · 64/5/1 India map: bauxite mines in Madhya Pradesh. 1

Ans. Katni, as marked on the board's answer map (the VI key also accepts Balaghat).



Answer map, CBSE 2026 · 64/5/1 (Q30): 30.3, 30.4, 30.5, as located on the board's answer map.

CBSE 2024 · 64/1/1 India map: Khetri – copper mines. [VI: name its state] 1

Ans. Khetri, **Rajasthan** (Jhunjhunu district).

CBSE 2024 · 64/1/1 India map: Jharia – coal mines. [VI: name its state] 1

Ans. Jharia, **Jharkhand**.



Answer map, CBSE 2024 · 64/1/1 (Q30): 30.2, 30.6, 30.7, as located on the board's answer map.

CBSE 2024 · 64/2/1 India map: major iron ore mines of Maharashtra. 1

Ans. Ratnagiri.

CBSE 2024 · 64/2/1 India map: an oil refinery of Uttar Pradesh. [VI: the state of the Jamnagar refinery] 1

Ans. Mathura (VI: Gujarat).



Answer map, CBSE 2024 · 64/2/1 (Q30): 30.4, 30.5, as located on the board's answer map.

CBSE 2024 · 64/3/1 India map: Katni – major bauxite mines. [VI: name its state] 1

Ans. Katni, **Madhya Pradesh**.

CBSE 2024 · 64/3/1 India map: Barauni – oil refinery. [VI: name its state] 1

Ans. Barauni, **Bihar**.



Answer map, CBSE 2024 · 64/3/1 (Q30): 30.4, 30.5, as located on the board's answer map.

CBSE 2024 · 64/4/1 India map: Hazaribagh – copper mines. [VI: name its state] 1

Ans. Hazaribagh, **Jharkhand**.

CBSE 2024 · 64/4/1 India map: Neyveli – coal mines. [VI: name its state] 1

Ans. Neyveli, **Tamil Nadu** (lignite).

CBSE 2024 · 64/4/1 India map: Ratnagiri – iron ore mines. [VI: name its state] 1

Ans. Ratnagiri, **Maharashtra**.



Answer map, CBSE 2024 · 64/4/1 (Q30): 30.3, 30.4, 30.5, as located on the board's answer map.

CBSE 2024 · 64/5/1 India map: an important coal mining area in West Bengal. 1

Ans. **Raniganj**.

CBSE 2024 · 64/5/1 India map: an iron ore mining area in Chhattisgarh. 1

Ans. **Bailadila** (Dantewada district), as marked on the board's answer map (the VI key also accepts Durg).



Answer map, CBSE 2024 · 64/5/1 (Q30): 30.2, 30.3, 30.7, as located on the board's answer map.

Practice set

1. Why do minerals "not have a second crop"?
2. Name the line east of which most minerals lie.
3. Which mineral belt lacks coal except Neyveli lignite?
4. Name two iron ore mines of Jharkhand.
5. Why are Maharashtra's manganese mines at a disadvantage?
6. Which district gives the best mica?
7. What share of Indian coal is bituminous non-coking?
8. Name a field-based and a market-based refinery.

Answers

Ans. 1. They are exhaustible and cannot be replenished quickly.

2. Mangaluru–Kanpur line.
3. South-Western Plateau region.
4. Noamundi, Gua.
5. They are far from steel plants.
6. Nellore (Andhra Pradesh).
7. About 80%.
8. Digboi; Barauni.

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Multiple choice: 20 MCQs

1. Most valuable Indian minerals are of:
   (a) quaternary age (b) tertiary age (c) pre-Palaeozoic age (d) Mesozoic age
2. An inorganic non-metallic mineral:
   (a) mica (b) coal (c) petroleum (d) bauxite
3. Over 97% of coal reserves are in the valleys of:
   (a) Ganga, Yamuna (b) Narmada, Tapi (c) Kaveri, Krishna (d) Damodar, Sone, Mahanadi, Godavari
4. Kerala has deposits of:
   (a) coal (b) monazite and thorium (c) petroleum (d) copper
5. Copper and zinc are major minerals of the:
   (a) NE plateau (b) North-Western region (c) SW plateau (d) Himalayan belt
6. India has the largest reserve in Asia of:
   (a) coal (b) petroleum (c) copper (d) iron ore
7. Kudremukh iron ore is in:
   (a) Karnataka (b) Goa (c) Odisha (d) Chhattisgarh
8. Dalli and Rajhara are in:
   (a) Bastar (b) Bilaspur (c) Durg (d) Raipur
9. Manganese is mainly associated with the:
   (a) alluvium (b) Gondwana system (c) tertiary rocks (d) Dharwar system
10. The largest producer of bauxite:
    (a) Gujarat (b) Odisha (c) Jharkhand (d) MP
11. Bauxite is associated with:
    (a) granite (b) alluvium (c) laterite (d) black soil
12. Copper is indispensable in the ___ industry:
    (a) electrical (b) cement (c) textile (d) paper
13. The largest coalfield of India:
    (a) Raniganj (b) Jharia (c) Singrauli (d) Korba
14. Tertiary coal is found in:
    (a) Jharkhand (b) Odisha (c) Meghalaya (d) Telangana
15. Mumbai High production commenced in:
    (a) 1956 (b) 1973 (c) 1986 (d) 1976
16. Monazite is richest in:
    (a) Palakkad and Kollam (b) Nellore (c) Singhbhum (d) Udaipur
17. BARC got its name in:
    (a) 1967 (b) 1954 (c) 1948 (d) 1974
18. Solar energy has greater potential in:
    (a) Kerala, Assam (b) Punjab, HP (c) Bihar, WB (d) Gujarat, Rajasthan
19. India's geothermal plant is at:
    (a) Puga (b) Manikaran (c) Kaiga (d) Okhla
20. Okhla in Delhi is a ___ project:
    (a) solar (b) wind (c) waste-to-energy (d) tidal

1 (c) · 2 (a) · 3 (d) · 4 (b) · 5 (b) · 6 (d) · 7 (a) · 8 (c) · 9 (d) · 10 (b) · 11 (c) · 12 (a) · 13 (b) · 14 (c) · 15 (d) · 16 (a) · 17 (a) · 18 (d) · 19 (b) · 20 (c)

Assertion–Reason (6)

(a) Both A and R true, R explains A. (b) Both true, R does not explain A. (c) A true, R false. (d) A false, R true.

1. A: There is an inverse relationship between quality and quantity of minerals. R: Good-quality minerals are less in quantity than low-quality ones.
2. A: Major iron and steel plants are in the NE plateau. R: Iron ore and coal occur close together there.
3. A: The northern plains are rich in minerals. R: They are made of alluvium.
4. A: Use of scrap is important for copper, lead and zinc. R: India's reserves of these are meagre.
5. A: Petroleum is called liquid gold. R: It is scarce and has diversified uses.
6. A: Non-conventional energy is more equitably distributed. R: It is exhaustible.

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Key: 1 (a) · 2 (a) · 3 (d) · 4 (a) · 5 (a) · 6 (c)

- **Last-night summary:** pre-Palaeozoic, peninsular igneous-metamorphic; plains barren. Types: metallic (ferrous, non-ferrous), non-metallic (organic fuels, inorganic mica/limestone/graphite). Characteristics: uneven, inverse quality-quantity, exhaustible. Coal 97% in Damodar, Sone, Mahanadi, Godavari; oil in Assam, Gujarat, Mumbai High; east of Mangaluru-Kanpur. Belts: NE plateau (iron, coal, Mn, bauxite, mica → steel), SW plateau (iron, bauxite; Neyveli only coal; monazite), NW Aravali (copper, zinc, stones, salt, Gujarat oil), Himalayan.
- Iron: largest in Asia; haematite, magnetite; 95% in 8 states; Badampahar, Gurumahisani, Kiruburu, Bonai (Odisha); Noamundi, Gua (Jharkhand); Bailadila, Dalli-Rajhara (Chhattisgarh); Sandur-Hospet, Kudremukh (Karnataka); Ratnagiri; Goa. Mn: smelting, ferro-alloys; MP and Odisha lead; Balaghat, Shivamogga. Bauxite: laterite; Odisha (Kalahandi, Sambalpur, Koraput); Katni; Amarkantak/Bilaspur. Copper: Singhbhum, Balaghat, Khetri. Mica: Hazaribagh belt, Nellore best, Jaipur-Bhilwara.
- Coal: Gondwana (Jharia largest, Raniganj, Bokaro…), tertiary (NE), lignite (Neyveli); 80% bituminous. Oil: ONGC 1956; Digboi; Ankaleshwar; Mumbai High 1973/76; field (Digboi) vs market (Barauni) refineries; Mathura, Jamnagar. Gas: CNG, PNG; KG basin. Nuclear: uranium (Dharwar, Singhbhum), thorium (monazite, Palakkad, Kollam); AEC 1948, BARC 1967; Tarapur, Rawatbhata, Kalpakkam, Narora, Kaiga, Kakrapar. Non-conventional: solar (7%/10%), wind, tidal, geothermal (Manikaran), bio-energy (Okhla). Conservation: alternatives, scrap, substitutes, cut exports.