Minerals Resources

What are Minerals?

Minerals are naturally occurring, homogeneous substances with a definite chemical composition. Based on their chemical and physical properties, minerals are broadly classified into **metallic** and **non-metallic** minerals.

Differences between Metallic and Non-metallic Minerals

Metallic Minerals	Non-metallic Minerals
Contain metals in raw form	Do not contain metals
Usually associated with igneous rocks	Mostly found in sedimentary rocks
Hard and shiny	Typically soft with no natural shine
Examples: Iron, Copper, Bauxite, Tin	Examples: Coal, Salt, Mica, Clay

Key Characteristics of Minerals

- Uneven distribution on the Earth's surface.
- Exhaustible resources that require conservation.
- Different minerals have unique chemical compositions.
- Variations in color, luster, and texture.

Minerals in India

India is rich in a wide variety of minerals due to its diverse geological structure. Common minerals found in India include coal, bauxite, mica, iron ore, and manganese.

Coal

- Found in sedimentary rocks.
- Formed from decayed plants buried in swamp forests under heat and pressure.
- Contains carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur.

Types of Coal

1. **Anthracite**:
    - Highest quality with over 90% carbon.
    - Burns slowly without smoke, leaving minimal ash.
    - High heating value.
2. **Bituminous**:
    - Contains 50%–80% carbon.
    - Hard, black, and widely used for household and industrial purposes.
    - High-grade bituminous coal is used in blast furnaces for iron smelting.
3. **Lignite**:
    - Low-grade brown coal with high moisture content.
4. **Peat**:
    - Least carbon content; represents the initial stage of coal formation.

Uses of Coal

- Generates electricity in thermal power plants.
- Used as fuel for domestic and industrial purposes.
- Essential for iron and steel production.
- By-products like ammonia and benzol are obtained during metallurgical coke production.

Distribution of Coal in India

Gondwana Coalfields (98% of total reserves): Located in Damodar, Mahanadi, and Godavari river valleys, primarily in West Bengal, Jharkhand, Odisha, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and Andhra Pradesh.

Tertiary Coalfields: Found in Assam, Arunachal Pradesh, Meghalaya, and Nagaland with high moisture content.

Petroleum

- A mixture of hydrocarbon compounds found in sedimentary rock formations like sandstone and shale.
- Refined into products such as petrol, diesel, tar, kerosene, LPG, and paraffin wax.

Uses of Petroleum

- Fuel for land, sea, and air transportation.
- Production of petrochemicals (e.g., gasoline, lubricating oil, printing ink).
- Power generation.

Major Petroleum Deposits in India

- **Mumbai High**: Offshore field in the Arabian Sea.
- **Digboi Oil Field**: Largest oil field in Assam.

- **Khambhat Basin**: Major oil reserves in Gujarat (Kalol, Ankleshwar, Kosamba, and more).

India has 21 oil refineries. Reliance Petroleum Limited's refinery in Jamnagar, Gujarat, was the first in the private sector, while Digboi Oil Refinery is the oldest.

Iron Ore

Varieties of Iron Ore and Characteristics:

- **Hematite** (Red Ore): Contains 60%–70% pure iron. Major deposits in Odisha, Jharkhand, Chhattisgarh, Karnataka, and Maharashtra.
- **Magnetite** (Black Ore): Best quality with over 70% iron and magnetic properties. Found in Tamil Nadu and Karnataka.
- **Limonite**: Lower quality with 35%–50% iron. Found in Uttarakhand, Uttar Pradesh, and Himachal Pradesh.

Major Iron Ore Deposits and Utilization

- **Chhattisgarh**: Bailadilla mines supply Bhilai Steel Plant.
- **Odisha**: Keonjhar, Mayurbhanj, and other regions supply major steel plants.
- **Karnataka**: Bababudan Hills and other areas supply Bhadravati Iron Works.
- **Other States**: Goa, Andhra Pradesh, Tamil Nadu, Maharashtra, and Rajasthan.

Manganese

- A black, hard metal primarily used for smelting iron and manufacturing ferroalloys.

Uses of Manganese

- Hardens steel and prevents rusting.
- Used in dry cell batteries, chemical industries, and glass production.

Major Deposits

Found in Andhra Pradesh, Goa, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, and Rajasthan.

Bauxite

- Primary source of aluminum.
- Used in industries such as aerospace, automobiles, and household appliances due to its lightweight and rust-resistant properties.

Major Deposits of Bauxite

Located in Goa, Odisha, Gujarat, Madhya Pradesh, Chhattisgarh, Jharkhand, Maharashtra, Karnataka, and Tamil Nadu.The largest integrated aluminum plant in India is at Renukoot, Uttar Pradesh, receiving bauxite supplies from Amarkantak Plateau and Ranchi.

Limestone

- A non-metallic mineral formed from the remains of marine organisms.

Uses of Limestone

- Used as flux in the iron and steel industry.
- Essential for cement production.
- Used in the manufacture of quicklime, slaked lime, and various chemicals.
- Prevents methane explosions in underground coal mines.