- Minerals and Their Mode of Occurrence
- Metallic and Non-Metallic Minerals and Their Conservation
- Conventional Sources of Energy
- Non-Conventional Sources of Energy
- Solved Examples
- Practice Set
- Answer Key
- Quick Reference
- Glossary
- Chronology of Key Events

Minerals and Their Mode of Occurrence

Mineral: An inorganic element or compound that occurs naturally and has certain physical, chemical and crystal properties as well as an organised internal structure is called a mineral.

Importance of Minerals:

- Everything we use, eat and drink has minerals.
- Economic development of people or nations can be vastly accelerated by the presence of valuable minerals.
- They make our life comfortable and convenient.
- They are also responsible for all the biological processes on Earth.

Mode of Occurrence of Minerals:

Minerals are usually found in **ores**. The term ore is used to describe an accumulation of any mineral mixed with other elements. Minerals generally occur in the following forms:

- In igneous and metamorphic rocks, minerals may occur in cracks, crevices, faults or joints. Examples: tin, copper, zinc, lead, etc.
- In sedimentary rocks, minerals occur in beds or layers. Examples: coal, iron ore, gypsum, potash salt and sodium salt.
- Decomposition of surface rocks and removal of soluble constituents form minerals like bauxite.
- Minerals also occur as alluvial deposits in sands of valley floors and the base of hills. Examples: gold, silver, tin, platinum.
- Ocean waters contain minerals such as common salt, magnesium and bromine.

Rocks Containing Minerals:

- Rocks are naturally formed aggregates of mineral particles.
- Minerals impart texture, colour, shape, hardness or softness to rocks. For example, limestone consists of a single mineral.
- Most rocks are combinations of different minerals.
- Over 2000 minerals have been identified; only a few are abundant.

Exam Questions

Q1: What is a mineral? Why are minerals important for economic development?

Answer: A mineral is an inorganic element or compound occurring naturally with definite physical and chemical properties. Minerals are important because they are essential for daily life, contribute to economic development, and support biological processes.

Q2: Describe the different modes of occurrence of minerals.

Answer: Minerals occur in ores, cracks and crevices of igneous and metamorphic rocks, beds of sedimentary rocks, alluvial deposits, and ocean waters.

Metallic and Non-Metallic Minerals and Their Conservation

Metallic Minerals: Divided into ferrous (contain iron) and non-ferrous (do not contain iron).

- **Ferrous Minerals:** Iron ore, manganese ore, chromite, pyrite, nickel, cobalt. They account for about three-fourths of metallic mineral production value.
- **Iron Ore:** India has abundant iron ore. Magnetite (up to 70% iron) and haematite (50-60% iron) are important types. Major belts: Odisha-Jharkhand, Durg-Bastar-Chandrapur, Bellary-Chitradurga-Chikkamagaluru-Tamkur, Maharashtra-Goa.
- **Manganese:** Used in steel manufacturing, bleaching powder, insecticides, paints. Reserves in Karnataka, Odisha, Madhya Pradesh, Andhra Pradesh, Jharkhand, Maharashtra, Goa.
- **Non-Ferrous Minerals:** Copper, bauxite, lead, zinc, gold. Used in metallurgical, engineering, electrical industries.
- **Copper:** Malleable, ductile, good conductor. Used in electrical cables, utensils, alloys. Major producers: Balaghat (MP), Khetri (Rajasthan), Singhbhum (Jharkhand).
- **Bauxite:** Ore of aluminium. Deposits in Amarkantak plateau, Maikal hills, Bilaspur-Katni plateau.

Non-Metallic Minerals:

- **Mica:** Used in electrical and electronic industries for its insulating properties. Produced in Jharkhand, Bihar, Andhra Pradesh, Rajasthan.
- **Limestone:** Composed of calcium carbonate. Used in cement, iron smelting, chemical industries. Found in MP, Chhattisgarh, Andhra Pradesh, Rajasthan, Gujarat, Karnataka, Himachal Pradesh.

Conservation of Minerals:

- Minerals are non-renewable and take thousands of years to form.
- Extraction leads to depletion; sustainable use is essential.
- Conservation methods include planned use, recycling, use of substitutes, and advanced technology for low-grade ores.

Exam Questions

Q1: Differentiate between ferrous and non-ferrous minerals with examples.

Answer: Ferrous minerals contain iron, e.g., iron ore and manganese. Non-ferrous minerals do not contain iron, e.g., copper and bauxite.

Q2: Why is conservation of minerals important? List some methods.

Answer: Minerals are non-renewable and take long to form. Conservation ensures sustainable use. Methods include planned use, recycling, using substitutes, and advanced technology.

Conventional Sources of Energy

Energy Resources: Energy is the ability to do work, measured in joules. Power is the rate of doing work, measured in watts. Energy is essential for cooking, lighting, heating, transportation, and industry.

Conventional Sources of Energy: Non-renewable sources including firewood, cattle dung cake, coal, petroleum, natural gas, and electricity.

- **Coal:** Called "Mother of Industries" or "Black Gold". Basis of Industrial Revolution. Used in iron, steel, chemical industries, and thermal power. India ranks 7th in coal reserves. Types: Anthracite (80% carbon, Jammu & Kashmir), Bituminous (60-80%), Lignite (brown coal, 60%), Peat (<50%).
- **Petroleum:** Liquid fossil fuel extracted from wells on land or offshore. Refined into gasoline and petrochemicals. Used for fuel, lubricants, plastics, chemicals. Major areas: Mumbai High, Gujarat, Assam.
- **Natural Gas:** Clean energy, environment-friendly. Used in power and fertilizer industries. Compressed Natural Gas (CNG) used in vehicles. Large reserves in Krishna-Godavari basin.

- **Electricity:** Generated by hydro turbines (renewable) and thermal power plants (non-renewable). Major projects: Bhakra Nangal, Damodar Valley Corporation, Kopili Hydel Project.

Exam Questions

Q1: What are conventional sources of energy? Give examples.

Answer: Conventional sources are non-renewable energy sources like coal, petroleum, natural gas, firewood, and electricity.

Q2: Describe the importance of coal as an energy source.

Answer: Coal is a prime energy source, basis of industrial revolution, used in steel and chemical industries, and for thermal power generation.

Non-Conventional Sources of Energy

Non-Conventional Sources of Energy: Renewable energy sources with large potential, including solar, wind, biomass, geothermal, tidal, and hydro power.

- **Solar Energy:** Converts sunlight to electricity using photovoltaic technology. Used for cooking, pumping, heating, lighting.
- **Wind Energy:** India has 20,000 MW potential. Important wind farms in Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra, Lakshadweep.
- **Biogas:** Produced from shrubs, farm, animal and human wastes. Used in rural domestic consumption.
- **Other Sources:** Geothermal, tidal, and wave energy.

Conservation of Energy Resources:

- Energy is essential for economic development.
- Most energy resources are limited and consumption is rising due to industrialisation and urbanisation.
- Conservation methods include sustainable development, judicious use, minimising wastage, advanced technology, minimising exports, using substitutes, and recycling.

Exam Questions

Q1: List the main non-conventional sources of energy.

Answer: Solar energy, wind energy, biomass energy, geothermal energy, tidal energy, and hydro power.

Q2: Why is conservation of energy resources important? How can it be done?

Answer: Energy resources are limited and consumption is increasing. Conservation ensures sustainable use through planned development, reducing wastage, using technology, recycling, and using substitutes.

Solved Examples

1. **Example:** Explain the difference between ferrous and non-ferrous minerals.

   Solution: Ferrous minerals contain iron, such as iron ore and manganese. Non-ferrous minerals do not contain iron, such as copper and bauxite.

2. **Example:** Name two conventional and two non-conventional sources of energy.

   Solution: Conventional: Coal, petroleum. Non-conventional: Solar energy, wind energy.

Practice Set

Easy

1. What is a mineral?
2. Name two ferrous minerals.
3. What is coal mainly used for?

Moderate

1. Describe the mode of occurrence of minerals in sedimentary rocks.
2. List three uses of copper.
3. What are the main types of coal?

Challenging

1. Explain the importance of conserving minerals and energy resources.
2. Compare conventional and non-conventional sources of energy with examples.
3. Describe the major iron ore belts in India.

Answer Key

Easy

1. A naturally occurring inorganic element or compound with definite properties.
2. Iron ore, manganese ore.
3. Used mainly for thermal power and industrial fuel.

Moderate

1. Minerals occur in beds or layers in sedimentary rocks, e.g., coal, iron ore.
2. Electrical cables, utensils, alloys.

3. Anthracite, bituminous, lignite, peat.

Challenging

1. Minerals and energy resources are limited; conservation ensures sustainable use and future availability.
2. Conventional sources are non-renewable like coal and petroleum; non-conventional are renewable like solar and wind energy.
3. Odisha-Jharkhand, Durg-Bastar-Chandrapur, Bellary-Chitradurga-Chikkamagaluru-Tamkur, Maharashtra-Goa belts.

Quick Reference

- **Minerals:** Naturally occurring inorganic substances with definite properties.
- **Ores:** Minerals from which metals can be profitably extracted.
- **Ferrous Minerals:** Contain iron, e.g., iron ore, manganese.
- **Non-Ferrous Minerals:** Do not contain iron, e.g., copper, bauxite.
- **Conventional Energy:** Non-renewable sources like coal, petroleum.
- **Non-Conventional Energy:** Renewable sources like solar, wind.
- **Conservation:** Sustainable use, recycling, technology advancement.

Glossary

- **Ore:** A mineral or rock from which a valuable substance can be extracted profitably.
- **Crevices:** Narrow openings or fissures in rocks.
- **Alluvial Deposits:** Materials like silt, sand, clay deposited by rivers.
- **Bromine:** A non-metallic element extracted from ocean water.
- **Malleable:** Ability of a metal to be hammered or rolled into sheets.
- **Dielectric Strength:** Ability of a material to withstand high voltage without breaking down.
- **Thermal Power:** Electricity generated by converting heat energy.
- **Crude Oil:** Unrefined petroleum.
- **Hydro Electricity:** Electricity generated by water flow.
- **Renewable Resources:** Resources that can be replenished naturally.

- **Tidal Energy:** Power generated from the rise and fall of tides.

Chronology of Key Events

Time Period / Year	Event / Change	Importance
Industrial Revolution	Use of coal as prime energy source	Foundation for modern industries
Discovery of Petroleum Fields (20th Century)	Major petroleum production in Mumbai High, Gujarat, Assam	Boosted fuel and chemical industries
Development of Hydroelectric Projects	Bhakra Nangal, Damodar Valley Corporation	Renewable electricity generation
Recent Decades	Growth of non-conventional energy sources	Promotion of sustainable energy use