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Introduction

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Chapter 5: Minerals and Energy Resources

Chapter 5: Minerals and Energy Resources

Introduction

Minerals have become an important part of our lives. From the smallest articles such as pins to the biggest products such as aeroplanes and railways are made of minerals. Most minerals are found in the Earth’s crust.

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Occurrence of Minerals

Minerals are naturally occurring, homogeneous substances with a definite chemical composition. Minerals occur in the following forms:

- In metamorphic and igneous rocks, minerals are obtained from cracks, faults and joints. The smaller cracks where minerals occur are called veins, while bigger fissures, crevices or joints are called lodes. When minerals in liquid and gaseous forms are forced upwards through cracks and fissures of the rocks, they cool and solidify. Examples: Copper, zinc, tin, lead.

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Occurrence of Minerals

- Minerals occur in the layers of sedimentary rocks. They are formed as a result of deposition and concentration in horizontal layers under extreme heat and pressure. Examples: Coal and iron ore. Minerals such as sodium salt and gypsum are formed as a result of evaporation in dry regions.
- When the surface of the rocks decomposes, weathered materials are left behind resulting in the formation of minerals. Example: Bauxite.

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Occurrence of Minerals

- Some minerals occur as alluvial deposits at the base of hills or on the valley floor. Examples: Gold, silver, platinum.
- Many minerals are found in the oceans. Examples: Magnesium, bromine, common salt India is rich in minerals, and varieties of minerals are found here.

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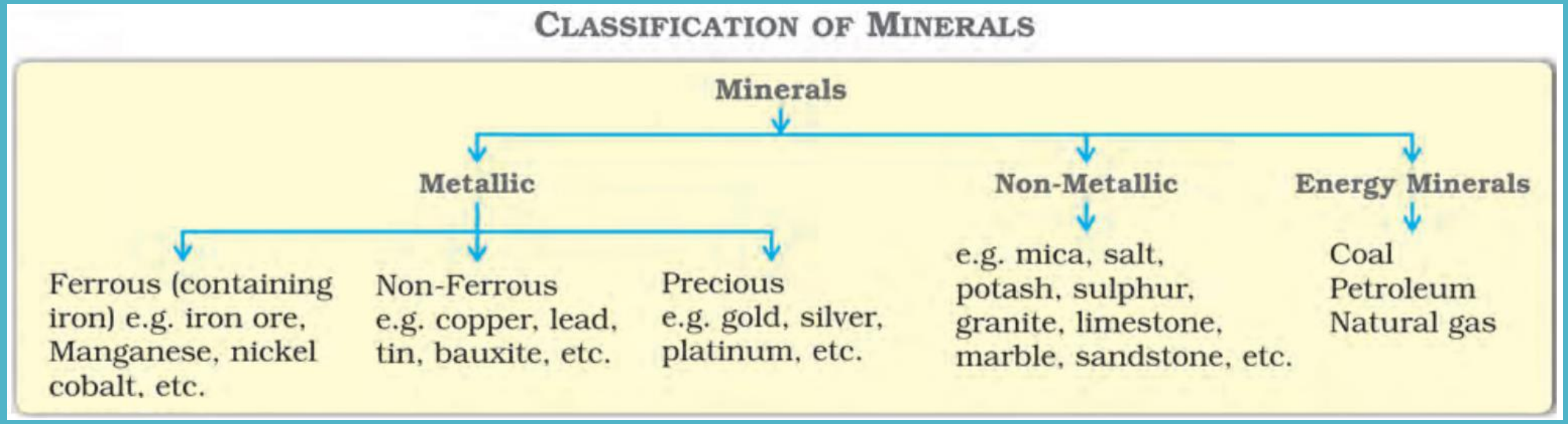
Types of Minerals:



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Types of Minerals:

There are ferrous, non-ferrous, metallic and non-metallic minerals. Ferrous minerals contain iron and have a tendency to corrode. Non-ferrous minerals do not contain iron, are not magnetic and are resistant to corrosion.

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Differences between metallic and non-metallic minerals:

Metallic Minerals	Non-metallic Minerals
Metallic minerals contain metal in raw form.	These metals are associated with sedimentary rocks.
These metals are associated with igneous rocks.	These metals are associated with sedimentary rocks.

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Differences between metallic and non-metallic minerals:

Metallic Minerals	Non-metallic Minerals
They are usually hard and have a shine of their own.	They are not usually hard and have no shine of their own.
Examples: Iron, copper, bauxite, tin.	Examples: Salt, coal, mica, clay.

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Metallic minerals:

Metallic minerals are composed of metals in their original form and possess a very crystalline atomic arrangement. Metallic minerals are composed of ferrous minerals and non-ferrous minerals.

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Metallic minerals:

Ferrous Minerals: Metallic minerals containing iron are called ferrous minerals and they are generally hard and sturdy. They are mainly found in solid form except for Hg(mercury).

Non-Ferrous Minerals: These minerals, which include copper, bauxite, lead, zinc and gold play a vital role in a number of metallurgical, engineering and electrical industries. Let us study the distribution of copper and bauxite.

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Non-Metallic minerals:

Nonmetallic minerals are a special group of chemical elements from which no new product can be generated if they are melted. Nonmetallic minerals are, for example, sand, gravel, limestone, clay, and marble.

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Major Minerals and their Occurrence in India:

Names of Minerals	Properties	Importance	Occurrence
Iron Ore	Ferrous, heavy metal	Magnetite is of the finest quality. It is used in electrical industries. Hematite ore is the most important industrial iron ore.	Odisha–Jharkhand Belt • Durg–Bastar–Chandrapur belt in Chhattisgarh and Maharashtra • Bellary–Chitradurga–Chikmaglur–Tumkur

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Major Minerals and their Occurrence in India:

Names of Minerals	Properties	Importance	Occurrence
Manganese	Ferrous mineral	It is used in the manufacturing of steel and ferro-manganese alloy. It is also used in the manufacturing of bleaching powder, insecticides and paints.	Odisha is the largest producer of manganese ore in India.

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Major Minerals and their Occurrence in India:

Names of Minerals	Properties	Importance	Occurrence
Copper	Non-ferrous mineral, ductile and good conductor of electricity	It is used in electrical cables, electronics and chemical industries.	Balaghat mines in Madhya Pradesh, Khetri Mines in Rajasthan and Singbhum district of Jharkhand.

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Major Minerals and their Occurrence in India:

Names of Minerals	Properties	Importance	Occurrence
Bauxite	Non-ferrous mineral; aluminium is obtained from it.	Aluminium obtained from bauxite is used largely in the aviation industry and automobile industry	Odisha is the largest producer of bauxite in India. Panchpatmali deposits are the most important bauxite deposits in the state.

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Major Minerals and their Occurrence in India:

Names of Minerals	Properties	Importance	Occurrence
Mica	Non-metallic mineral; resistant to high voltage.	It is used in the electric and electronic industry.	Koderma–Gaya–Hazaribagh belt of Jharkhand, Northern Chota Nagpur Plateau, areas around Ajmer, Nellore in Andhra Pradesh

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Energy Resources - Conventional and Non-Conventional:

Conventional Energy Resources: Conventional sources of energy are the natural energy resources which are present in a limited quantity and are being used for a long time. They are called non-renewable sources as once they are depleted, they cannot be generated at the speed which can sustain its consumption rate.

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Major conventional sources of energy:

Coal

- Coal is a major source of energy in India. It is formed as a result of compression of plant material over millions of years.
- Anthracite is the finest quality of coal. Bituminous coal is used for commercial purposes. High-quality bituminous coal is used in blast furnaces for smelting iron. Lignite is an inferior quality of coal which has high moisture content.

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Major conventional sources of energy:

- In India, coal occurs in the Damodar Valley in West Bengal and Jharkhand, Jharia, Raniganj and Bokaro. Godavari, Mahanadi, Son and Wardha valleys also contain coal deposits. Because coal loses weight, heavy industries and thermal power stations are located close to coal fields.

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Major conventional sources of energy:

Petroleum

- It is another major source of energy in India. It is used for heat and lighting, lubricants for machinery and as raw material for many manufacturing industries.
- Petroleum is found in the fault traps between porous and non-porous rocks. Gas occurs above the oil.
- Mumbai High, Gujarat and Assam are important petroleum-producing regions in the country. Ankleshwar in Gujarat, and Digboi and Naharkatiya are important oil fields in Assam.

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Major conventional sources of energy:

Natural Gas

- It is an environment-friendly source as it emits carbon dioxide in low quantities. It may occur with or without petroleum. It is used as raw material in petrochemical industries and as a source of energy.
- The Krishna-Godavari Basin has large reserves of natural gas. Mumbai High, Gulf of Khambhat and the Andaman and Nicobar Islands also have large reserves of natural gas.

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Major conventional sources of energy:

Electricity produced by using coal, petroleum and natural gas is known as thermal electricity. Electricity produced by using fast-flowing water is known as hydroelectricity.

Chapter 5: Minerals and Energy Resources

Non-Conventional Energy Resources:

Renewable energy sources, often known as non-conventional energy, are sources that are renewed by natural processes on a continual basis.

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Non-Conventional Energy Resources:

Nuclear Energy

- It is produced by altering the atoms in an atomic reactor.
- Uranium and thorium used for the production of nuclear energy are found in Jharkhand, Aravalli ranges of Rajasthan and Monazite sands of Kerala.

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Non-Conventional Energy Resources:

- Nuclear energy comes from splitting atoms in a reactor to heat water into steam, turn a turbine and generate electricity. 93 nuclear reactors in 28 states generate nearly 20 percent of the nation's electricity, all without carbon emissions because reactors use uranium, not fossil fuels.

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Non-Conventional Energy Resources:

Solar Energy

- Because India is a tropical country, there are immense possibilities to harness solar energy. Solar plants are being set up in various parts of the country.
- Various residential apartments have also installed solar cell panels on their roofs for generating electricity.

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Non-Conventional Energy Resources:

- Solar energy is the radiation from the Sun capable of producing heat, causing chemical reactions, or generating electricity. The total amount of solar energy received on Earth is vastly more than the world's current and anticipated energy requirements.

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Non-Conventional Energy Resources:

Wind Power

- Windmills are used for generating electricity. India has a great potential of becoming a wind power.
- Windmills are located from Nagercoil to Madurai in Tamil Nadu. Gujarat, Andhra Pradesh, Kerala, Maharashtra and Lakshadweep Islands have important wind farms.

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Non-Conventional Energy Resources:

- Nagercoil and Jaisalmer have made effective use of wind energy.
- Wind power, form of energy conversion in which turbines convert the kinetic energy of wind into mechanical or electrical energy that can be used for power.

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Non-Conventional Energy Resources:

Biogas

- Farm wastes, shrubs and animal wastes are used to produce biogas. Biogas is used for the production of electricity.
- Many biogas plants have been set up at municipal and village levels. Many plants use cattle dung to produce electricity.

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Non-Conventional Energy Resources:

Tidal Energy

- When energy of the oceanic tides is used for the generation of electricity, it is known as tidal energy.
- Floodgates are built across inlets. When water flows in during high tides, it gets trapped. After the gated are closed, this water goes back to the sea through pipes passing through power-generating turbines.
- Gulf of Khambhat and Gulf of Kutch in Gujarat and the Gangetic delta in the Sundarban region in West Bengal can be used for the generation of electricity.

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Non-Conventional Energy Resources:

Geo-thermal Energy

- When heat emanating from the interior of the Earth is used for the generation of electricity, it is called geo-thermal energy.
- When groundwater under the surface of the Earth becomes hot because of the existence of high temperature, hot water rises on the surface of the Earth in the form of steam. This steam is then used to generate electricity.
- Two geothermal projects have been started in India-one in Manikarn in Himachal Pradesh and the other in Puga Valley in Ladakh.

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Differences between Conventional and Non-conventional Sources of energy:

Conventional Sources	Non-conventional Sources
Conventional sources of energy such as coal, petroleum and natural gas are non- renewable sources of energy.	Non-conventional sources of energy such as solar and wind energy are renewable sources of energy.

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Differences between Conventional and Non-conventional Sources of energy:

Conventional Sources	Non-conventional Sources
They have been in use since a long time. Examples: Firewood, coal.	These sources have been recently developed and are still developing. Example: Technology for producing electricity from solar panels.

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Differences between Conventional and Non-conventional Sources of energy:

Conventional Sources	Non-conventional Sources
Most of these energy sources cause pollution when used. Examples: Firewood, coal, petrol.	They do not cause any pollution. Examples: Solar energy, geothermal energy.

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Differences between Conventional and Non-conventional Sources of energy:

Conventional Sources	Non-conventional Sources
They are common and widely used sources. Example: Thermal power.	They are comparatively new sources of energy and hence are not widely used. Examples: Solar panels, windmills.

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Conservation of Minerals:

Conservation of mineral resources is essential because they are a country's valuable possession. They are used as raw materials in many industries and help in the economic development of a nation. Some methods by which we can conserve minerals are :

- Minerals should be used in a planned and sustainable manner.

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Conservation of Minerals:

- Technology should be upgraded to allow the use of low-grade ore at low costs.
- Recycling of metals also results in the conservation of mineral resources.
- Non-conventional sources of energy should be harnessed for the generation of electricity.
- Small steps should be taken by every individual such as using public transport, car pooling and switching off lights and fans when not in use. Using power-saving devices also go a long way in conserving minerals and energy resources.

Chapter 5: Minerals and Energy Resources

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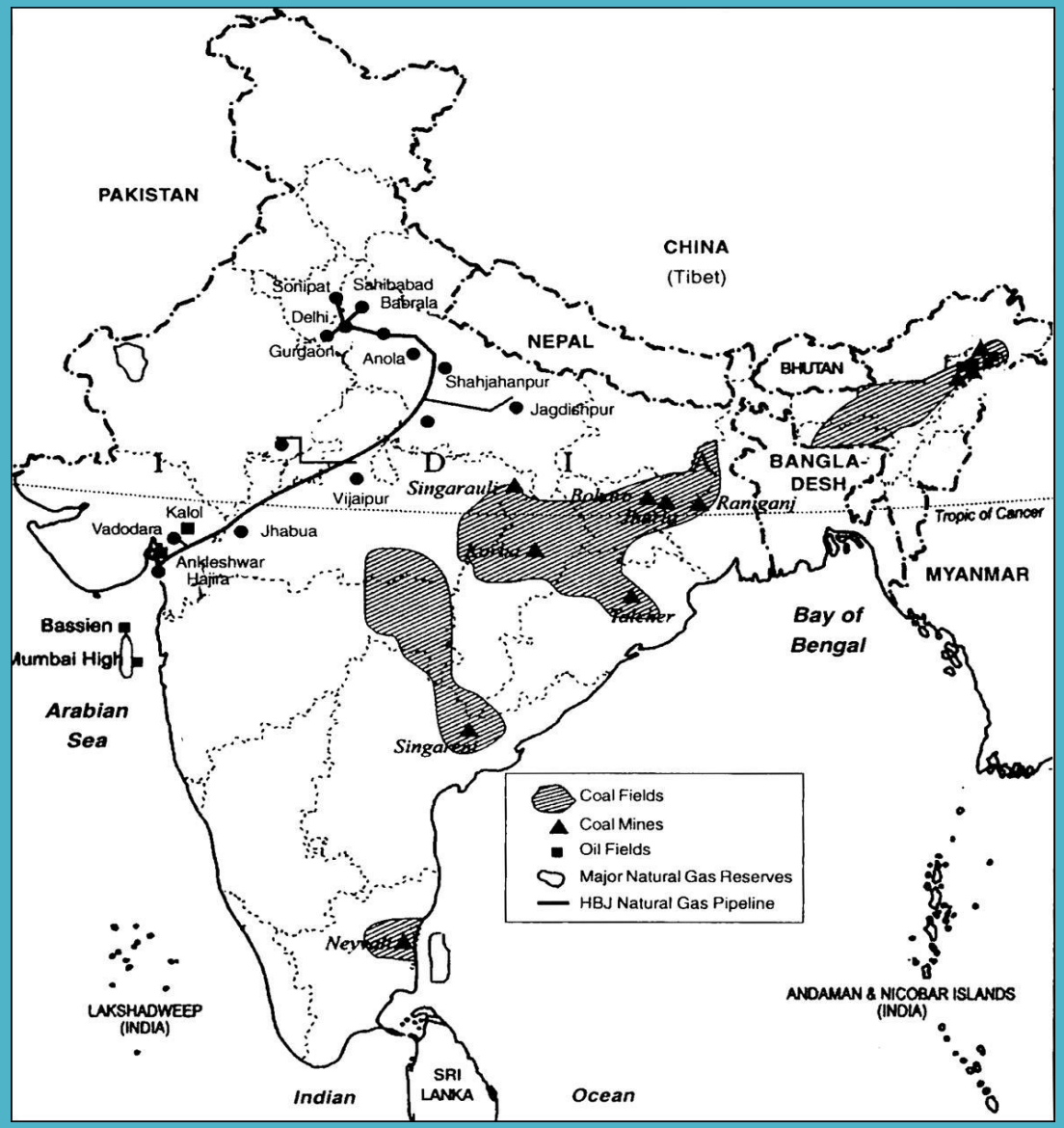

Chapter 5: Minerals and Energy Resources

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