Minerals and Energy Resources

Political Science
Class-10

Minerals

A homogeneous, naturally occurring substance (crystalline elements or of elements) with a definable internal structure.
All rocks on earth's surface or below it contains Minerals.
e.g. hardest as diamond and softest as talc.

Economic or commercial viability of minerals depend upon various factors like- concentration of minerals in ores, ease of extraction and closeness of market and other supportive infrastructure and services

Rocks: A combination of minerals in varying proportions.
Ores: A collection of any mineral mixed with other elements. Minerals are extracted from these ores if there is sufficient concentration of mineral.

Mode of occurrence or forms in which minerals are found

- Igneous and metamorphic rocks- (veins and lodes) e.g. Tin, Cooper, zinc, lead
- Sedimentary rocks- (beds and layers) e.g. coals, iron (due to intense heat and pressure) gypsum, potash salt and sodium salt (due to evaporation)
- Residual mass of weathered material- e.g. bauxite
- Alluvial deposits- e.g. gold, silver, tin and platinum.
- Ocean water- common salt

Ferrous Minerals

Iron Ore (Australia first and India 4th in the world)
Iron is the backbone of modern civilization and industrial development It is a basic mineral in our life.
India is rich in iron reserves both by quality and quantity.
The two important variety of iron ores-

- Magnetite - up to 70 % iron content (excellent magnetic properties and used in electrical industries)
- Hematite - 50 to 60 %iron content (a major industrial ore in terms of the quantity used in industries)

Major Iron belts of India

1. **Odisha-Jharkhand belt:** good quality of hematite iron ore found
   - Odisha- Badampahar mines in Mayurbhanj and Kendujhar districts
   - Jharkhand- Gua and Noamundi mines in Sighbhum district
2. **Durg- Bastar: Chandrapur belt** (Chattisgarh and Maharashtra)
   - Bailadila Range of hills (Bastar district of Chhattisgarh)
     - High grade hematite iron ore suitable for steel making steel.
     - Exported to Japan & S Korea via Vishakhapatnam Port
3. **Ballare – Chitradurga-Chikkamangaluru Tumakuru** belt (Karnataka)
   - Kudremukh mines – in western ghats of Karnataka
     - 100% export unit
     - Mangalore port
     - One of the largest reserves in the world
4. **Maharashtra-Goa belt**
   - Not high-quality iron ores found
   - Found in Goa and Ratnagiri district of Maharashtra
   - Exported through Marmagao port

Manganese (South Africa First and India 6th in the world)

- Odisha- the largest producer
- Uses- to make alloys. Added to all steels (10 kg manganese for 1 tonne of steel), also used in paints, batteries insecticides, bleaching powder.

Non-Ferrous Minerals

Copper (Chile is the largest producer in the world)

- India is deficient in copper reserves and production of copper.
- Major producers: Balaghat mines (Madhya Pradesh) Khetri mines (Rajasthan) and Singhbhum district (Jharkhand)

Bauxite (Australia first in world and India 5th)

- Bauxite ore is the world's primary source of aluminium. It contains 15-25% aluminium.
- The ore is chemically processed to produce alumina (aluminium oxide). Alumina is then smelted using electrolysis process to produce pure aluminium metal.
- Aluminium is good combination of strength and lightness.
- It is malleable and good conductor also

Distribution:

- Amarkantak plateau
- Maikal Hills
- Bilaspur-Katni region
- Panchpatmali in Koraput district of Odisha.
- Odisha the largest producer of Bauxite

Non-Metallic Minerals

Mica (India first in the world)

- Mica is a group of minerals. It is made up of a series of plates and leaves.
- Comes into colours -black, green, yellow, or brown.
- Uses- used in electrical and electronics industries due to its-
  - di-electric strength
  - insulating properties
  - low power loss factor
  - resistance to high voltage

Distribution:

- North edge of Chhota Nagpur Plateau
- Kodarma-Gaya-Hazaribagh belt
- Azmer (Rajasthan)
- Nellore mica belt (Andhra Pradesh)

Hazards of mining (A Killer Industry)

Board Questions:
How is mining activity injurious to health of miners and environment? Explain. (2015)

1. It is called a killer industry because of the high risks involved
2. The dust and the poisonous fumes inhalation cause pulmonary diseases
3. Collapsing of roofs, inundation and fire risks in coal mines
4. Contamination of water sources near monies
5. Dumping of wastes and slurry causes land degradation, soil and river pollution

Stricter safety regulations and proper implementation of environmental laws are essential to prevent mining from becoming a 'killer industry'.

Energy Resources

Classification of Energy Resources

Conventional sources	Non-conventional sources
1. Are in use since long past 2. Cause pollution 3. Are exhaustible and non-renewable 4. Generation of these resources is expensive 5. E.g. petroleum, natural gas, electricity firewood, (cattle dung cake is most common in rural area),	1. Have in use from recent times 2. Generally eco-friendly and pollution free 3. Renewable and inexhaustible sources of energy 4. E.g. solar, wind, tidal, geo-thermal, biogas and atomic energy

Conventional sources of energy

Coal

Importance:

India is highly dependent on coal to meet energy requirements.

Used for power generation, energy supply and meet domestic needs.

Formation:

Coal is an organic deposit of forest vegetations and formed over millions of years due to compression of plants material.

It is found in layers of Sedimentary Rocks.

Varieties: (depends on compression, depth and time of burial)

i. *Peat* – less than 50% carbon, high moisture content and low heating capacity.
   i. Decaying plants in swamps produce peat.

ii. *Lignite* – Contains 60% carbon, low grade brown coal, soft, low moisture content.
   i. Increased temperature and depth form this coal.
   ii. Uses – generation of electricity
   iii. Major reserves- Niveyeli in Tamil Nadu

iii. *Bituminous* – 60%-80% carbon, high grade coal,
   i. Uses- commercial use, as metallurgical coal used in smelting blast furnace

iv. *Anthracite*- 80% carbon, highest quality coal, high heating capacity, black and compact.
   It is found in Jammu and Kashmir.

Distribution of Coal

Coal deposits India are found in rocks of two different geological ages- Gondwana and Tertiary ages

1. *Gondwana age* -(over 200 million years ago)
   — Major areas - Damodar Valley (W. Bengal-Jharkhand) Bokaro, Raniganj, Jharia.
   The Godavari, Mahanadi, Son and Wardha valleys

2. *Tertiary age*- (about 55 million years old)
   — Major deposits- N.E. States - Meghalaya, Assam Arunachal Pradesh and Nagaland.

Petroleum: (by 2017 data Russia is the top crude oil producer in the world)

- Derived from Latin words Petra (means Rock) and oleum (means oil)
- It is also called rock oil
- It contains hydrogen and carbon is varying amounts.
- India is heavily dependent on oil imports which is 78% of the needs

Uses of petroleum or its importance

- It provides fuel for heat and lighting
- Lubricants for machinery
- Raw material for manufacturing industries
- Petroleum refineries act as 'nodal industry' for synthetic textile & chemical industries.

Petroleum is found

- In rocks of the tertiary age in the folds, anticlines and fault traps.
- Oil bearing layers are porous limestone and sandstone

Distribution: Assam is the oldest oil producing state in India.

- Mumbai High (offshore oil field) …. 63% of total production
- Ankleshwar (Gujarat)….18%
- Digboi, Naharkatiya, Moran-hugrizan (Assam)….16%
- E.g. of offshore fields…. Mumbai High, Bassien, Aliabet

Natural Gas

- Fuel for the present century.
- It is clean and environment friendly fuel because of low $CO_{2\ \text{emission}}$
- A source of energy and raw material for petrochemical, power and fertilizer industries.
- CNG is replacing liquid fuel like petrol and diesel.
- Key users of natural gas - power and fertilizer industries

Distribution

- Krishna-Godavari basin region
- Andaman and Nicobar Islands
- Along west coast – Mumbai High and gulf of Cambay
- Supply through pipeline
  - Hazira- Vijaipur-Jagdishpur gas pipe line
  - 17000 Km long and has provided impetus to gas production.
  - Links Mumbai High and Gujarat gas field and Gujarat gas field with N.W India

Electricity: Two ways of generating electricity

Hydro-electricity: Produced by a number of multi-purpose projects like Bhakra Nangal, Damodar Valley Corporation, the Kopili Hydel Project.

Thermal Electricity: It is produced by using non-renewable fossil fuels like coal, petroleum and natural gas.

Non-conventional sources of Energy

Need to use non-conventional sources of energy

Board Questions:

1. The use of non-conventional sources of energy is becoming necessary in our country? Give reasons. (2011)
2. What are non-conventional sources of energy? Why is there pressing need to use these sources of energy? (2013, 14)

- We are heavily dependent on Fossil fuels to fulfil the most of our energy requirements
- Rising prices of oil hit the economy hard. India is heavily dependent on import of oil.
- Potential shortage of Fossil fuel reserves
- Uncertainty over supply of energy in future
- National economy is affected due to disruption in energy supply chain
- The non-conventional resources like natural gas are eco-friendly. Environmental problems arise out of Fossil fuel use in the form of different kinds of pollutions
- They are an aid to sustainable path of development
- They are comparatively economical and less expensive than conventional sources.

All these scenarios make it the need of the hour to search for alternative renewable sources of energy which we find in non-conventional sources of energy like- Solar energy, wind, tide biomass etc.

Nuclear Energy:

Nuclear or atomic Power is obtained when radioactive elements like uranium or thorium break up into small atoms. The heat released is used to generate electric power.

- *Uranium in India-* Jharkhand and Aravalli ranges in Rajasthan.
- *Thorium-* Monazite sands of Kerala. India possesses 50% of world's thorium.

Board Questions:

1."Nuclear energy is expected to play an increasingly important role in India." Give arguments to support this statement. (2016)

2. Mention the negative impacts of wastes from the Nuclear plants. (2013)

Negative impacts of nuclear energy:

- Nuclear energy has its own hazards. Radioactive wastes cause environmental pollution.
- Mention the negative impacts of waste from the nuclear plant.
- Dumping of nuclear wastes in deep sea water puts aquatic life to threat.

Solar Energy

Importance:

The energy that we get from sun is called solar energy. Photovoltaic technology is used to convert sunlight directly into electricity.

- It doesn't cause environmental problems because it is pollution free
- It is inexhaustible resource and India has abundance of sunlight.
- In rural areas it can help minimise the dependence on firewood and dung cakes. It will help in conservation of environment. The dung can be used as manure in agriculture
- India has enormous possibility of tapping these non-conventional sources of energy.

Bright future of solar energy in India:

Solar energy can solve the energy problem in India to some extent.

- India is a tropical country with enormous possibility of tapping the solar energy. Abundance of sunlight is available to use this energy.
- It is a renewal source of energy. Besides in urban area it is getting popular in rural areas also
- It is easy to establish solar plants. The cost of solar panels is also coming down making it accessible to common people also.
- It minimises the dependence of rural people on firewood and dung cakes.
- Considering the good availability of sunshine government can do its every bit to make its use popular among people.
- There is an urgent need to shift to non-conventional sources of energy. Solar energy can be a very effective alternative to conventional sources which cause environmental problems and also are non-renewable.

Board Questions:

1. What is solar energy? What is its importance? (2013)

2. How can solar energy solve the energy problem to some extent in India? Give your opinion. (2015)

Wind Energy:

- India now ranks as the wind super power in the world.
- The rotation of Windmill causes turbine to turn

Wind farm locations in India:

- Largest cluster of wind farm -" Nagarcoil to Madurai in Tamil Nadu
- Other areas – Andhra Pradesh, Karnatka, Kerala,
- Jaisalmer is also known for effective use of wind energy.

Biogas

- Biogas provides twin benefits to the rural people in the form energy and quality manure.
- Biogas is produced from shrubs, farm wastes, animal and human wastes.
- It produces gas having higher thermal efficiency kerosene and charcoal
- It is perfectly suitable for rural areas as organic wastes like cow dung and shrubs are easily available.
- The rural people can make use of biogas for cooking and lighting purposes
- The exhausted material in the biogas plant acts as a good manure for agricultural purposes.
- Biogas is a model of optimum utilisation of organic wastes in rural areas.

Suggestions to promote the establishment of biogas plants

i. People be made aware of energy crisis and benefits of biogas energy
ii. Govt should honestly provide every assistance of whatever kind to rural people
iii. Relevant advertisement can help in the promotion of biogas awareness.

Board Questions:

1. How can Biogas solve the energy problem in the rural areas? Give your suggestions. (2015)

2. Explain any five points of significance of bio-gas generation in the rural areas of India. (2013)

Tidal Energy:

The oceanic tides are used to generate electricity. The tidal water is let in through inlet of the floodgate dams and when it recedes back it is passed through a pipe to turn the turbine.

Regions of Tidal power in India- Gulf of Kuchh (Gujarat) and Sunderban regions in West Bengal

Geo-thermal

Geothermal energy uses heat which is generated in the interior of the earth. At the palaces of high gradient of geothermal ground water heats and is released as steam to the earth' surface.

- Hot springs, and geysers are found in volcanic regions or in those areas where geothermal gradient is high.
- Two experimental projects- 1. Parvati Valley in Himachal Pradesh.
  2. Puga Valley in Laddakh in Kashmir

Conservation of Minerals and Energy Resources

Mineral resources and their conservation:

Need for conservation of mineral resources:

- The importance of minerals has made them an indispensable part of our life. Industrial and agricultural sector is strongly dependent on mineral resources.
- Formation of minerals is a slow geological process. It takes millions of years to form and get replenished.
- They are finite, non-renewable and would exhaust one day.
- Extremely valuable mineral deposits are our short-lived possession.
- Rate of mineral replenishment of mineral resources is infinitely small in comparison to rate of consumption

Methods of conservation of minerals

- Concerted efforts are needed to use mineral in a planned and sustainable manner so that made available for a longer time.
- Improving and evolution technologies to efficiently use low grade ores at low cost. Technological improvements reduce the wastage at the time of mining and processing of minerals.
- Recycling of metals. Used metals can be recovered, melted and reused
- Using scrap metals and other substitutes. A proper awareness and will of people can play a great role in searching for better alternatives to replace minerals with non-minerals like wood, plastic, glass etc.

Board Questions:

1. Explain the importance of conservation of minerals. Highlight some measures to conserve minerals. (2016)

2. Why is it necessary to conserve mineral resources? Explain any four ways to conserve minerals. (2010, 11, 12, 13, 14, 17)

Energy resources and their conservation

Need to conserve energy resources:

- Energy resources are a basic requirement for all activities. Every sector of economy needs inputs of energy
- Since independence, National developmental plans have required increasing amount of energy to remain operational
- Rate of consumption of energy is steadily rising due to rapid increase in population and Industrial activities.
- India is presently one of the least efficient country in the world.

Methods of conservation of energy resources:

Conservation of energy needs urgent attention. As a concerned citizen we should contribute our bit to conserve energy resources.

- We need to adopt a cautious approach for judicious use of our limited energy resources.
- Use public transport instead of individual vehicles. Use of bicycles or walking have healthy effect on our health as well as save energy and conserve environment
- Switching of electricity when not in use
- Using power saving devices to make efficient use of energy. The different star levels on electronic items indicate their power efficiency.
- Increased use of renewable sources of energy. Non-conventional sources of energy be used like solar energy, wind, tidal and geothermal energy.
- Using biogas in rural areas. It will curb the use the firewood and dung cakes.
  Educational awareness among one and all to make them sensitive toward saving energy.

  After all, "**energy saved is energy produced"**

Board Questions:

1. "Consumption of energy in all forms has been rising all over the country. There is an urgent need to develop a sustainable path of energy development and energy savings". Suggest and explain any three measures to solve this burning problem. (2016)

2. "Energy saved is energy produced." Justify the statement by giving any six measures to conserve the energy resources. (Delhi-2017)

3. "Crude oil reserves are limited all over the world. If people continue to extract it at the present rate, the reserves would last only 35-40 years more." Explain any three ways to solve this problem. (2019)