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NATURAL RESOURCES

Introduction:

A resource is a naturally occurring exploitable material that a society perceives to be useful to its economic and material well being. Willing, healthy and skilled workers also constitute a valuable resource, but without access to materials such as fertile soil or petroleum, human resources are limited in their effectiveness. Resources are the basis of the economic development of any nation. Different countries are at different levels of economic development primarily because of the variation in the availability of natural resources.

The US and west European countries are economically prosperous because they possess vast natural and human resources and technology. On the other hand, in most parts of Africa and Asia, though they are naturally rich in resources, due to their lack of knowledge, the resources are unutilised and they are not used in the service of man.

Classification of Resources:

Based on the continual availability,

1. The resources are classified in to renewable and non renewable resources.
2. The resources which can always be used again and again are known as renewable resources. It means these resources have natural regeneration and are inexhaustible. Air, water, solar energy etc are examples of renewable resources.
3. Non renewable resources are available infinite quantities and cannot be obtained once if they are utilized. If these resources are used in large scale, they will get exhausted soon and as such these resources are called as exhaustible resources. Coal, oil and minerals are examples of this type.

On the basis of origin

1. The resources are classified in to biotic and abiotic resources.
2. When a resource is originated from living organism, the resource is known as biotic resource. Coal, mineral oil and forests are examples of biotic resources.

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3. Abiotic resources are composed of non-living inorganic matter. Air, land, water and minerals are examples of this type.

On the basis of status of development

1. The resources are classified in to potential resources and developed resources.
2. Potential resources are those which are known to exist and may be used in the future. Until the resource is extracted and put in to use, it remains a potential resource.
3. Developed resources are those which have been surveyed and their quality and quantity have been determined for utilization. The development of resources depends on technology and level of their feasibility. Petroleum resource from Mumbai High is an example of Developed resources.
4. Apart from the above classifications, the resources which are available in nature are known as natural resources and the one created by man is known as man-made resource.
5. Similarly the air, sunlight, like resources which exist everywhere is called as ubiquitous resources and the resources which are concentrated only at specific places are known as localized resources. This kind of resource may exercise great influence on the economic development of the respective regions.

Energy Resources:

The resources from which the electricity generated are called energy resources. Electricity is an important component of our life. No day to day activity takes without the use of this energy. It is also the key factor for all economic activities and industrial development. Energy resources can be classified into renewable and non-renewable. Coal, petroleum, natural gas and nuclear minerals are the sources of non renewable energy. Water, sun light, wind, bio gas, tides etc., are the sources of renewable energy.

I. Non renewable sources of Energy

Once these resources are used, they cannot be regained again. In other words, they are exhaustible. They are coal, Petroleum, natural gas and atomic fuels.

Coal

Coal is a fossil fuel. It is a flammable, black or brown sedimentary rock and is mainly composed of carbon. It is the altered remains of prehistoric vegetation that originally accumulated in swamps and peat bogs. The dense forest plants were converted into coal due to intense pressure and heat inside the earth by the process of carbonization. Most of the coal resources of the world were formed during the carboniferous period (280 to 350 million years ago). The quality of the coal is determined by its carbon content. The following types of coal have been identified on the basis of their physical properties. They are,

- i. **Peat** is the first stage of transformation of wood into coal and it has only 30 to 35% of carbon.
- ii. **Lignite or Brown coal** is the inferior quality and contains 35-45% carbon
- iii. **Bituminous or coking coal** is the second best variety of coal and contains 70-90% of carbon. It is the most widely spread and most widely used variety of coal. It is the most popular coal in commercial use.
- iv. **Anthracite** is the best quality coal, which contains more than 95% of carbon. It is very hard but emits very less smoke and leaves very less ash. However, its deposits are limited.

Production and world distribution of Coal:

1. Coal reserves are found in more than 70 countries of the world but the major coal reserves occur in the USA, Russia, China and South Africa.
2. China is the largest producer of steam coal in the world followed by India. The other leading producers of steam coal are USA, Indonesia, and South Africa etc. Steam coal – It is used for producing steam and it has high sulphur content.
3. China was the largest producer of coking coal in the world in 2016 followed by Australia.
4. The other leading producers of coking coal are Russia, India and USA.

◆.....◆ **Trade**

The main exporters of coal in the world are Australia, Indonesia, Russia, Colombia and South Africa and the main importers are China, India, Japan, Korea and Germany.

Uses of Coal

- Man has used coal for hundreds of years. But it has gained importance only after industrial revolution. It contributes about 25% of global energy demand.
- Coal is used for various purposes. It is used as a source of steam energy, electrical energy, domestic fuel, metallurgical coke, chemical industries and by products such as Ammonium sulphate, Naphthalene, Phenol, Benzene, etc.

Distribution of Coal in India:

- Indian coal is mostly associated with Gondwana series of rocks and is primarily found in Peninsular India. The states of Jharkhand, Odisha, West Bengal and Madhya Pradesh alone account for nearly 90% of coal reserves of the country. About 2% of India's coal is of tertiary type and is found mostly in Assam and Jammu & Kashmir. Jharkhand is the largest coal producing state in the country followed by Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Andhra Pradesh and Maharashtra.
- The major coal fields of Jharkhand are Bokaro, North Karanpura, South Karanpura, Giridih, Ramgarh, Daltongunj and Rajmahal. Talcher and Ranapur in Odisha, Korba and Chirmiri in Chhattisgarh, Umaria and Singrauli in Madhya Pradesh, Tandur, Singareni, Kothagudem and Ramagundam in Andhra Pradesh, Wardha, Ballarpur, Chanda and Kampati in Maharashtra and, Raniganj, Asansol and Mejia in West Bengal are the other major coal fields of India. Indian lignite (brown coal) deposits occur in the southern and western parts of Peninsular India particularly in Tamil Nadu, Puducherry and Kerala. The Ministry of coal has over all responsibility of determining policies and strategies in respect of exploration and development of coal resource in India.
- Coal India Limited (CIL), NLC India Limited (NLCIL) and Singareni Collieries Company limited (SCCL) are its public sector undertakings.

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Petroleum (or) Mineral oil:

- The word petroleum has been derived from two Latin words petro (meaning – Rock) and oleum (meaning oil). Thus, petroleum is oil obtained from rocks of the earth. Therefore, it is also called mineral oil.
- Petroleum is a mineral that exists under the surface of the earth in liquid, solid and gaseous forms. Liquid petroleum may be in the form of crude oil. The solid form may be mineral waxes or asphalts. The gaseous form is natural gas.
- It is a main source of energy in the World due to its multiple uses. The human activities are directly or indirectly depending on the use of petroleum or its sub products.

Formation and occurrence of mineral oil

- It is formed by slow chemical and bio chemical decomposition of the remains of organic matter in sedimentary rocks. It is found in the pores of the sedimentary rocks. Oil is lighter than water hence, floats over water. Drilling of oil wells is the hole drilled in the earth's crust and when it reaches the rock cap, the natural gas comes out first with a great pressure.
- When the pressure of gas subsides, petroleum starts flowing out when the pressure of natural gas is released
- Petroleum reserves of the world
- The west Asia or Middle East is having the largest petroleum reserves, which is about 60% of the world's oil reserve. The total estimated world's oil reserves in 2008 were 1,243 (109 bbl). Saudi Arabia, Canada, Iran, Iraq and Kuwait have large reserves of petroleum.

Production and world distribution of petroleum

The petroleum producing countries of the world can be grouped in to five geographical regions:

- i. West Asia (or) middle East region
- ii. American region

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- iii. Russian region
 - iv. East & south Asian region and
 - v. African region

Saudi Arabia is the largest oil producer of the world with 13.62% of the world output of oil. Russia is the second largest producer in the world. India is placed at 24th position in petroleum production in the world. The distribution of oil is naturally uneven; Middle East contains 60% of global reserves and rest of the world only 40%.

Trade

The world leading exporters of petroleum are Saudi Arabia, Russia, Iraq, UAE and Canada and the main importers are USA, China, India, Japan and Korea.

Western coast offshore oil fields	Eastern coast offshore Fields
Mumbai high oil fields (largest 65%)	Bharmaputra valley (Dibrugarh and Sibsagar districts of upper Assam.)
Gujarat coast (2nd largest)	Digboi oil fields (oldest fields in country)
Basseim oil field, south of Mumbai high	Nahoratiya oil fields (south west of digboi)
Aliabet oil field, south of Bhavanagar	Moran-Hugrija oil field (Southwest of Nahoratiya)
Ankleshwar	Rudrasagar-Lawa oil fields (sibsagar districts of Assam)
Cambay-Luni Region	Surrma valley (Badarpur, Masimpur, Patharia)
Ahmedabad-Kalol Region	offshore of Andaman and Nicobar, Gulf of Mannar, Baleshwar coast, Punjab, Haryana and Uttar Pradesh.

Natural Gas

- Natural gas usually accompanies the petroleum accumulations. It is naturally occurring hydro carbon gas mixture consisting primarily of methane, but commonly includes varying amounts of other higher alkanes and sometimes a small percentage of carbon dioxide, nitrogen and hydrogen sulphides.

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- It is formed when layers of decomposed plants and animals are exposed to intense heat and pressure over thousands of years. It is used as a source of energy for heating, cooking and electricity generation.
 - It is also used as fuel for vehicles and as a chemical feedstock in the manufacture of plastics and other commercially important organic chemicals.
 - It is considered as an environment friendly fuel because of its low carbon dioxide emissions. Therefore, this is the only fuel for the present century and it is also called **green energy**.
 - A powerful odorant, ethanethiol is added, so that leaks can be detected easily. It is prepared by refining petroleum or wet natural gas.
 - **Natural gas reserves and Production:** The known natural gas reserves in the world is about 6254 trillion cubic feet. Most of these reserves are found in Russia, Iran, Qatar, UAE, Saudi Arabia, USA etc. USA has the largest reserve and is the leading producer of natural gas in the world followed by Russia.
 - India is the 28th producer of natural gas in the world. It is widely used as a fuel in industries and domestic cooking purposes. Petrochemical industries use it as fuel and raw material. It is also used in chemical industries, artificial rubber, plastic, fertilizers, ink, and carbon and as artificial lighting.

Trade

Russia, Qatar, Norway, Canada and Algeria are the leading exporters of Natural gas in the world. Japan, Germany, China, Italy and Turkey are the leading importers of natural gas.

Natural gas Reserves in India:

- India has a very large proportion of tertiary rock and alluvial deposits particularly in the extra peninsular India. These sedimentary rocks, which were once under the shallow seas, hold the possibility of harbouring oil and gas deposits.
- The highest concentration of natural gas is found in the Bombay high and bassein oil fields. Jagatia and Gogha in Gujarat, Naharkatia and Moran in

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Assam, Neypaltur, Mangmadam in Thanjavur district in Tamilnadu, Baranura and Atharnure ranges in Tripura, Barmer and Charaswala in Rajasthan, Miao Pung and Laptang areas in Arunachal Pradesh, Firozpur district in Punjab, Mausar and Maradpur areas in Jammu and Kashmir and Medinipur in West Bengal are the other areas where natural gas reserves have been discovered.

- The Gas Authority of India Ltd [GAIL] is doing pioneer work in the field of natural gas exploration. Discovery of gas made rapid strides in the 1985. Oil strikes at Cauvery offshore, at Nanda in Cambay basin and Tarot in Jaisalmer basin in Rajasthan were major discoveries during 1988-89. Recently, it has been found that Krishna- Godavari delta has reserves of Natural gas
- Gail (India) Limited (GAIL) (formerly known as Gas Authority of India Limited) is the largest state-owned natural gas processing and distribution company in India.
- It is headquartered in New Delhi. It has the following business segments: natural gas, liquid hydrocarbon, liquefied petroleum gas transmission, petrochemical, city gas distribution, exploration and production, GAILTEL and electricity generation

Renewable sources of Energy:

All regions of the world are facing the twin problems of fast increasing demand for energy and limited supplies and rapidly depleting conventional sources of energy. Under these circumstances, non conventional sources of energy are getting more importance. These sources are renewable, clean and non-polluting. They are solar, wind, geothermal, wave, tidal energy, bio-gas etc.

Hydro power

- Power generated from water is termed as hydroelectricity. Hydro electricity is produced by using the potential energy of water falling from a certain height. The falling water spins the turbine blades and energy is produced. It is a clean eco friendly and renewable source of energy.

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- Hydro power is considered as one of the most economic and non-polluting sources of energy. It contributes nearly 7% of global electricity production. It is also a flexible mode of power generation as the quantity of production can either be increased or decreased very quickly adapting to changing demands.
 - China has the largest potential followed by Brazil, Indonesia, Canada and Zaire. China is the largest producer of Hydro-electricity in the world, followed by Canada.

Hydro power in India:

- India is fortunate to have a large potential of hydro- power potential. It is quite unevenly distributed in India. Of the total hydro-electric potential of the country, rivers of Assam, Arunachal Pradesh, Manipur, Nagaland and Tripura account for 30.4%, eastward flowing rivers of the peninsular India 20.9%, westward flowing rivers of the western Ghats (South of the Tapti) 10.5%, the Ganga Basin (excluding the potential of Nepal) 11.7%, the Indus Basin 16.0% and the rivers of central India 10.5%.
- NHPC Limited (National Hydroelectric Power Corporation) is located in Faridabad, India
- The first hydro-electric power station in India was established at “Darjeeling” in 1897.

Solar Energy

- Solar Power is the conversion of sunlight into electricity, either directly using photovoltaics (PV) or indirectly using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking system to focus a large area of sunlight into a small beam. Photovoltaics convert light into an electric current using the photovoltaic effect.
- USA is the major producer of solar cells at present. It is simply the energy provided by the sun, which makes production of solar electricity possible. **Solar power in India** is a fast-developing industry.

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- The country's solar installed capacity reached 26 GW as of 30 September 2018. India expanded its solar generation capacity 8 times from 2,650 MW on 26th May, 2014 to over 20 GW as on 31st January, 2018.
 - The country added 3 GW of solar capacity in 2015-2016, 5 GW in 2016-2017 and over 10 GW in 2017-2018, with the average current price of solar electricity dropping to 18% below the average price of its coal-fired counterpart.
 - The mass objectives of the solar thermal energy programme, being implemented by the Ministry of Non-Conventional Energy Source (MNES) are market development, commercialisation and utilisation of heat energy requirement of different applications in domestic, institutional and industrial sectors.
 - Solar power is used in water heaters, refrigerators, drying, street lighting, cooking, pumping, power generator, photovoltaic cells, salon parts etc.
 - Andhra Pradesh, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh are the major solar power producers.
 - Solar Energy Corporation of India Limited (A Government of India Enterprise) head quarter is located at New Delhi.
 - Noor Complex is the world's largest concentrated solar power (CSP) plant, located in the Sahara Desert.
 - Kamuthi solar plant, the World's largest single solar power plant, in Kamuthi, Ramanathapuram district.

Wind Energy

- Wind energy is extracted from air flow using wind turbines. It is a cheap and pollution free source of energy. Power from wind mills are used for pumping water and to sail propel ships. Wind power is plentiful, renewable, widely distributed, clean and produces no greenhouse gas emissions during operation. These plants occupy only a less space.
- Wind energy is now the second fastest growing source of electricity in the world. It fulfils about 5% of world's electricity demand.

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- The world's largest wind farm is in Altamont pass in California. India is emerging as a major wind power producer of world.
 - The important wind farms in India - (i). The largest wind farms in India are Muppandal in Kanyakumari District of Tamil Nadu and Jaisalmer wind park in Rajasthan. They are the first and second largest wind farms of India.
 - The development of wind power in India began in 1986 with first wind farms were set up in coastal areas of Gujarat (Okha), Maharashtra (Ratnagiri) and Tamilnadu (Thoothukudi) with 55 KW Vestas wind turbines.
 - The capacity has significantly increased in the last few years. India has the fourth largest installed wind power capacity in the world.
 - Based on the location of its generation it is classified into
 1. Onshore wind energy and
 2. Offshore wind energy
1. **Onshore wind energy**–Energy generated from the plants located on the land is known as onshore wind energy. Onshore wind has the advantage of being one of the most affordable renewable energy sources. It is cheaper than any other renewable source of energy but it requires more area to install than any other energy.
 2. **Offshore wind energy** –It refers to the use of wind farms developed in seas and oceans. The largest offshore wind farms are currently in the U.K and Germany. These two countries installed 2/3 capacity.
- London Array is the largest offshore wind farm in the world. The first offshore wind farm is planned near Dhanuskodi in Tamil Nadu.
 - The National Institute of Wind Energy (NIWE), Chennai was established in Tamil Nadu in 1998 as an autonomous institution under the administrative control of the Ministry of New and Renewable Energy. CIWE main activities include resource assessment and testing & certification.



Tidal energy

- It is a renewable energy powered by the natural raise and fall of ocean water. Its production is very small. The first tidal power station was located in La Rance in France. The largest tidal power station is at Sihwa Lake in South Korea and it is the largest tidal power producer in the world.
- There are three different category of sources from which the tidal energy is generated. The sources are tidal streams, barrages and tidal lagoons.
- There are two main sources of ocean energy. They are Ocean tides and Ocean waves.
- It is estimated that India possesses 8,000-9,000 MW of tidal energy potential. The Gulf of Cambay is the best suited area with about 7,000 MW potential of tidal energy. This is followed by Gulf of Kachchh (1,000MW) and Sundarbans (100MW).
- At present a 900 MW tidal power plant is proposed to be set up in the Gulf of Kachchh region. Wave energy potential in India is estimated to be 40,000 MW. A wave energy power plant of 150 KW (maximum) has been installed at Vizhinjam near Tiruvananthapuram.
- An another plant of this kind has been set up near Andaman & Nicobar Islands.

Conservation of Resources

It takes millions of years for the formation of minerals. Compared to the present rate of consumption, the replenishment rate of minerals is very slow. Hence, mineral resources are finite and non- renewable. Due to this, it is important to conserve the mineral resources.

Ways of Conserving Resources

- Controlling population growth will reduce the demand for resources.
- Creating social awareness regarding the importance of conservation of resources
- Reusing and recycling of resources.
- Using the renewable source of energy as an alternative to non- renewable resources.

- Developing the usage methods which minimize the wastages.
- Propagating the environmental ill effects caused by various products.
- Choosing the products with less packaging.

ENERGY RESOURCES IN TAMILNADU

Name of the Plant	District	Types of Fuel	Capacity in MW
Neyveli Lignite Corporation	Cuddalore	Coal	2490
North Chennai Thermal Power Unit-I	Thiruvallur	Coal	1200
Thuthukudi Thermal Power Plant	Thuthukudi	Coal	1000
Mettur Thermal Power Station	Salem	Coal	600

HYDROPOWER PLANTS OF TAMIL NADU

S. No	HYDRO POWER PLANT	RIVERS	MW
1.	Kundah I to V	Bhavani	500
2.	Mettur Tunnel	Kaveri	840
3.	Aliyar	Aliyar	60
4.	Kodayar I and II	Kodayar	100
5.	Sholaiyar and I and II	Sholayar	95
6.	Kadamparai	Kadamparai	400
7.	Lower Mettur	Kaveri	120
8.	Papanasam Hydro Electric Power	Papanasam	32
9.	Pykara	Pykara	150

Nuclear Energy

The Kalpakkam Nuclear Power Plant and the Koodankulam Nuclear Power Plant are the major nuclear energy plants for the energy grid.

Units	Existing Installed capacity (2018)
Kudankulam	1834 MW (2 x 917)
Kalpakkam	470 MW (2 x 235)



Thermal Power

In Tamil Nadu the share of thermal power in total energy sources is very high and the thermal power plants are at Athippattu (North Chennai) Ennore, Mettur, Neyveli and Thoothukudi.

The generation of power under various sources is given below.

Source	Million Units	%
Thermal	13304	49.52
Hydel	2203	8.20
Nuclear	986	3.67
Others (Wind, Solar)	10372	38.61
Total	26865	100.00

Hydel Energy

There are about 20 hydroelectric units in Tamil Nadu. The prominent units are Hundah, Mettur, Periyar, Maravakandy, Parson Valley etc.

Solar Energy

Southern Tamil Nadu is considered as one of the most suitable regions in the country for developing solar power projects.

Wind Energy

Tamil Nadu has the highest installed wind energy capacity in India. The State has very high quality of off shore wind energy potential off the Tirunelveli coast and southern Thoothukudi and Rameswaram coast.

Questions:

Natural Resource

1. Write a detailed account on natural resources & its classification.
2. Give an account of the wind energy in India.
3. Enumerate the mineral oil in India & its distribution.

SOILS

Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life. Soil minerals form the basis of soil. It forms on the surface of the earth. It is known as the '**skin of the earth**'.

Soils are produced from rocks (parent material) through the processes of weathering and natural erosion. Water, wind, temperature change, gravity, chemical interaction, living organisms and pressure differences all help break down parent material.

It leads to the formation of loose material. In course of time, they further break down into fine particles. This process releases the minerals locked in the rock fragments. Later on, the vegetative cover which develop in that region forms humus content in the soil. This way the soil gets matured gradually.

India's varied natural environments resulted in a great variety of soils compared to any other country of similar size in the world. The rich, deep and fertile soils support high density of population through agricultural prosperity.

Soil Composition:

The basic components of soil are mineral, organic matter, water and air. It consists of about 45% mineral, 5% organic matter, 25% of water and 25% air. It is only a generalized fact. The composition of soil varies from place to place and time to time.

Soil Formation:

The time needed to form a soil depends on the Climate. The environments which is characterized by mild climate, takes 200- 400 years to form one cm of soil and in wet tropical area, soil formation is faster and takes upto 200 years. To become a well matured soil, it takes about 3000 years

Classification of soils:

Soils are classified on the basis of their formation, colour, physical and chemical properties. Based on these, soil is classified into six major types.

They are: Alluvial soil, Black soil, Red soil, Laterite soil, Mountain soil, Desert soil.



Alluvial soil:

Formation - sediments deposited by streams and rivers when they slowly loose

Chemical properties - rich in potash, phosphoric acid, lime and carbon compounds but poor in nitrogen

Nature –Sandy-loam-silt-clay profile shows no marked differentiation

Distribution - Ganga and Brahmaputra river valleys; Plains of Uttar Pradesh, Uttaranchal, Punjab, Haryana, West Bengal and Bihar

Crops - Rice, Wheat, Sugarcane and Oilseeds.

Black soils:

These soils are formed by weathering of igneous rocks.

Formation - Derived from basalts of Deccan trap.

Colour - black colour, due to presence of titanium, iron.

Chemical properties - Consist of calcium and magnesium carbonates, high quantities of iron, aluminium, lime and magnesia. Rich in potash lime, Aluminium calcium and magnesium poor in Nitrogen Phosphoric acid and humus

Nature - Sticky when wet High degree of moisture retentivity.

Distribution – Maharashtra and Malwa plateaus, Kathiawar peninsula, Telangana and Rayalaseema region of Andhra Pradesh and northern part of Karnataka.

Crops - Cotton, Millets, Tobacco and Sugarcane.

Red Soils:

Formation - decomposition of ancient crystalline rocks like granites and gneisses and from rock type

Chemical properties - rich in minerals such as iron and magnesium. Deficient in nitrogen, humus, phosphoric acid and lime.

Nature - Light texture, porous friable presence of limited soluble salts Clay fraction of the red soils generally consists of Kaolinitic minerals.



Distribution - Eastern parts of Deccan plateau, southern states of Kerala, Tamilnadu, Karnataka and Chota Nagpur plateau (Jharkhand).

Crops - Wheat, Rice, Cotton, Sugarcane and Pulses

Laterite soils:

Formation - formed in the regions where alternate wet and hot dry conditions prevail. It is formed by the process of leaching

Chemical properties - Composed mainly of hydrated oxides of iron and aluminium,

Nature - More acidic on higher areas poor in high level, cannot retain moisture while plains they consist of heavy loam and clay and easily retain moisture.

Distribution -Assam hills, hill summits of Kerala and Karnataka and eastern Ghats and region of Odisha

Crops -Coffee, Rubber, Cashew nut and Tapioca

Forest and mountain soils:

Differ from region to region depending on climate.

Formation - due to mechanical weathering caused by snow, rain, temperature variation

Chemical properties - are deficient in potash, Phosphorus and lime.

Nature - light, sandy, thin and found with the pieces of rock. Their character changes with the parent rocks. Very rich in humus. slow decomposition makes it acidic.

Distribution – Coniferous forest belts of Jammu and Kashmir, Himachal Pradesh, Uttarakhand and Sikkim. Eastern and Western Ghats

Crops -Coffee, tea, rice, maize, potato, barley, tropical fruits and various types of spices.

Arid and desert soils:

Formation - Due to prevalence of the dry climate, high temperature and accelerated evaporation, the soil is dry, it also lacks humus content due to the absence of vegetative cover

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Chemical properties - Contain high percentages of soluble salts, alkaline with varying degree of calcium carbonate and are poor in organic matter; rich enough in phosphate though poor in nitrogen

Nature - light in colour, low humus, friable structure, low in moisture.

Distribution -Rajasthan, Northern Gujarat and southern Punjab.

Crops - millets, barley, cotton, maize and pulses (with irrigation)

Saline and alkaline soils:

Formation - formed due to ill drainage which causes water logging, injurious salts are transferred from subsurface to the top soil by the capillary action, it causes the salinisation of soils

Chemical properties - liberate sodium, magnesium and calcium salts and sulphurous acid

Nature - Consists of un decomposed rock and mineral fragments which on weathering.

Distributions -Andhra Pradesh and Karnataka. In the drier parts of Bihar, Uttar Pradesh, Haryana, Punjab, Rajasthan and Maharashtra.

Peaty and marshy soils:

Formation - formed in humid regions from the organic matter. It is found in the areas of heavy rainfall and high humidity Peaty soils are black, heavy and highly acidic.

Chemical properties - deficient in potash and phosphate. Contain considerable amount of soluble salts and 10-40 per cent of organic matter; and high proportion of vegetable matter.

Nature - Contain considerable amount of Soluble salts and 10-40 per cent of organic matter; and high proportion of vegetable matter.

Distribution - Kottayam and Alappuzha districts of Kerala; and coastal areas of Odisha and Tamil Nadu, Sundarbans of West Bengal, in Bihar and Almora district of Uttarakhand

Crops - Paddy, jute.

TYPES OF SOILS IN TAMILNADU AND THEIR DISTRIBUTION

S.No	Soil	District
1.	Alluvial soils	Thanjavur, Thiruvarur and Nagapattinam, Villupuram, Cuddalore, Thirunelveli and Kanyakumari
2.	Regur or the black soils	Coimbatore, Madurai, Virudhunagar, Thuthukudi and Tirunelveli
3.	Red Loams	Sivagangai, Ramanathapuram
4.	Laterite soils	Kancheepuram, Thiruvallur, Thanjavur, hill tops of western ghats and eastern ghats.
5.	Saline soils	Predominantly in Vedaranyam, Coronmandal coast and for about 10 km in all the coastal districts of Tamilnadu

Soil degradation

1. Soil degradation is an acute problem in India.
2. According to a 2015 report of the Indian institute of remote sensing (IIRS). The estimated amount of soil erosion that occurred in India was 147 million hectares.
3. The main problems of the Indian soils are i) soil erosion (sheet erosion, Rill erosion, Gully erosion, Ravine and Bad land) ii) Degradation of Soil, iii) Water-logging, iv) Saline and Alkaline and v) Salt Flats, types of soils are different erosion.

Soil conservation

Soil conservation is the process of protecting the soil from erosion to maintain its fertility.

Methods of Conservation and Management of Soil:

1. Afforestation
2. Constructing Dams and Barrages
3. Prevention of Overgrazing
4. Improved methods of Agricultural practices
 - Contour method

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- Rotation of crops
 - Contour bunding
 - Strip cropping
 - Planting of shelter belts
 - Adopting the techniques of sustainable agriculture are different conservation methods for better soil management.

Uses of soils:

Soil is one of the important natural resource. It is a basic requirement for plant growth and supports various life forms on the earth.

The minerals present in the soil enhance and nourishes the crops and plants.

- It is used in making of ceramics or pottery.
- It is a source of material for construction and handicraft works.
- It acts as natural filter of water and purifies it.
- Soil supports ecosystem and play an important role in land management.

Soils attract human settlement and other economic activities. As India is an agricultural country, the proper management of soil resource will lead to sustainable food production besides its use for various other purposes. So, the soil resources must be conserved.

Questions:

1. Give a short note on soil and its composition & conservation.
2. What are the classification of soils? Give a short note on each.

WATER

Introduction:

“World cannot survive without water and morality cannot exist without rain”

- As Thirukkural quotes, water is the most important resource in the world.
- One of the most indispensable natural resources on earth is water. All plants and animals need water for survival. Apart from drinking, water is required for domestic, agriculture, industrial purposes etc. Water is very essential for carrying out almost all economic activities.
- The Earth is also called the **Blue planet**, as it holds water in abundance and thus stands unique among all other planets. Over 90% of the world's supply of fresh water is in Antarctica. You must know that 85% of the world population lives in the driest half of the planet.
- Our planet Earth consists of **four spheres**. They are the **Lithosphere, Atmosphere, Hydrosphere** and **Biosphere**.
- The hydrosphere includes the water on the surface of the earth, the water below the surface called ground water and the water in the atmosphere above earth's surface. Oceans, rivers, lakes and glaciers form part of surface water. There is substantial amount of water under the surface of the earth.
- The atmosphere has water in all the three forms. The total amount of water on the earth does not change over time. Water is constantly in motion within the spheres of the earth which is being transformed and reused all over the earth. The earth's hydrosphere, thus, acts as a closed system.
- A nationwide water resources information system, “Generation of Database and Implementation of Web Enabled Water Resources Information System (India-WRIS) in the country” contain all aspects of water resources and related data provide data and information in public domain through India-WRIS Web GIS portal



Hydrologic Cycle or Water Cycle:

- Hydrology is the science which deals with the various aspects of water such as its occurrence, distribution, movement and properties on the planet earth. Availability of water on the earth is not uniform. Some places are very rich in water resources while some other places are poor in water resources.
- Hydrologic cycle is a global sun-driven process where water is transported from oceans to atmosphere, from atmosphere to land and from land back to oceans.
- Evaporation takes place from the surface water and transpiration from the plants. Water vapour gets condensed at higher altitudes by condensation nuclei and form clouds (resulting in droplet growth). The clouds melt and sometimes burst resulting in precipitation of different forms. A part of water from precipitation flows over the land is called runoff and the other part infiltrates into the soil which builds up the groundwater.

Components of Hydrologic Cycle

There are six main components in hydrologic cycle.

They are:

- | | | |
|-----------------------|-----------------|------------------|
| 1) Evapotranspiration | 2) Condensation | 3) Precipitation |
| 4) Infiltration | 5) Percolation | 6) Runoff. |

1. Evapotranspiration

It is defined as the total loss of water from the earth through evaporation from the surface water bodies and the transpiration from vegetation. In cropped area, it is difficult to determine the evaporation and transpiration separately. Therefore it is collectively called as evapotranspiration

Evaporation

- Evaporation refers to the process in which the liquid form of water changes into gaseous form. Water boils at 100°C (212°F) temperature but, it actually begins to evaporate at 0°C (32°F); and the process takes place very slowly.
- Temperature is the prime element which affects the rate of evaporation. There is a positive relationship between these two variables. Areal extent of surface

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water, wind and the atmospheric humidity are the other variables which affect the rate of evaporation.

- Many studies reveal that the oceans, seas, lakes and rivers provide nearly 90 % of the moisture in the atmosphere through evaporation and the remaining 10 % is contributed by plants through transpiration. On a global scale, the amount of water gets evaporated is about the same as the amount of water delivered to earth as precipitation. This process varies geographically, as the evaporation is more prevalent over the oceans than precipitation, while over the land, precipitation routinely exceeds evaporation. The rate of evaporation is low during the periods of calm winds than during windy times. When the air is calm, evaporated water tends to stay close to the water body. During windy, the water vapour is driven away and is replaced by dry air which facilitates additional evaporation

Transpiration

1. Transpiration refers to the process by which the water content in the plants are released into the atmosphere in the form of water vapour.
2. Much of the water taken up by plants is released through transpiration. The rate of transpiration is also affected by the temperature, wind and humidity. The soil water content and the ability of the soil to conduct water to the roots, the nature of the plant parts including barks and leaves also determine the transpiration rate.
3. In case of agriculture, the crop characteristics, its environment and cultivation practices also affect the transpiration process.

Condensation

1. It refers to the process in which the gaseous form of water changes into liquid form.
2. Condensation generally occurs in the atmosphere when warm air rises, cools and loses its capacity to hold water vapour. As a result, excess water vapour condenses to form cloud droplets.

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3. Condensation is responsible for the formation of clouds. These clouds produce precipitation which is the primary route for water to return to the earth's surface in the water cycle. Condensation is the opposite of evaporation.

Forms of Condensation

Dew, Fog and Clouds are the three major forms of condensation

a) Dew:

It is a water droplet formed by the condensation of water vapour on a relatively cold surface of an object. It forms when the temperature of an object drops below the dew point temperature.

Frost: The ice crystals formed by deposition of water vapour on a relatively cold surface of an object is known as frost. It forms when the temperature of an object drops below the freezing point of temperature.

b) Fog:

Fog is the suspended tiny water droplets or ice crystals in an air layer next to the earth's surface that reduces the visibility to 1,000 m or lower. For aviation purposes, the criterion for fog is 10 km or less.

Mist: Mist is the tiny droplets of water hanging in the air. These droplets form when the water vapour in the air is rapidly cooled, causing it to change from invisible gas to tiny visible water droplets. Mist is less dense than fog.

c) Clouds:

Clouds consist of tiny water droplets/ice particles which are so small and light in weight. Clouds are formed by microscopic drops of water or by small ice crystals. The size of the droplets generally ranges from a couple of microns to 100 microns. This is the limit beyond which cloud drops become rain drops.

3. Precipitation

1. Precipitation refers to all forms of water that fall from clouds and reaches the earth's surface. For the occurrence of precipitation, cloud droplets or ice crystals must grow heavy enough to fall through the air.

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2. When the droplets grow large in size, they tend to fall. While moving down, by collecting some small droplets, they become heavy enough to fall out of the cloud as raindrops.
 3. In the earlier chapters, we have studied about the Precipitation and forms of Precipitation in a detailed manner.

4. Infiltration

1. Water entering the soil at the surface of the ground is termed as infiltration. Infiltration allows the soil temporarily to store water, making it available for plants use and organisms in the soil. Infiltration is an important process where rain water soaks into the ground, through the soil and underlying rock layers. Some of this water ultimately returns to the surface through springs or low spots down hills. Some of the water remains underground and is called groundwater.
2. The rate of infiltration is influenced by the physical characteristics of the soil, vegetative cover, moisture content of the soil, soil temperature and rainfall intensity. The terms infiltration and percolation are often used interchangeably

5. Percolation

1. Percolation is the downward movement of infiltrated water through soil and rock layers. Infiltration occurs near the surface of the soil and delivers water from the surface into the soil and plant root zones.
2. Percolation moves the infiltrated water through the soil profile and rock layers which leads to the formation of ground water or become a part of sub-surface run-off process. Thus, the percolation process represents the flow of water from unsaturated zone to the saturated zone.

6. Runoff

Runoff is the water that is pulled by gravity across land's surface. It replenishes groundwater and surface water as it percolates into an aquifer (it is an underground layer of water-bearing rock) or moves into a river, stream or watershed. It comes from unabsorbed water from rain, snowmelt, irrigation or other sources, comprising a significant element in the water cycle as well as the water supply when

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it drains into a watershed. Runoff is also a major contributor to the erosion which carves out canyons, gorges and related landforms. The amount of runoff that can happen depends on the amount of rainfall, porosity of soil, vegetation and slope. Only about 35% of precipitation ends up in the sea or ocean and the other 65% is absorbed into the soil

Types of Runoff:

Based on the time interval between the instance of rainfall and generation of runoff, the runoff may be classified into following three types

i. Surface Runoff:

It is the portion of rainfall, which enters the stream immediately after the rainfall. It occurs, when the rainfall is longer, heavier and exceeds the rate of infiltration. In this condition the excess water makes a head over the ground surface, which tends to move from one place to another following land gradient and is known as overland flow. When the overland flow joins the streams, channels or oceans, it is termed as surface runoff or surface flow.

ii. Sub-Surface Runoff:

The water that has entered the subsoil and moves laterally without joining the water-table to the streams, rivers or oceans is known as sub surface runoff. The sub-surface runoff is usually referred as interflow.

iii. Base Flow:

It is a flow of underground water from a saturated ground water zone to a water channel. It usually appears at a downstream location where the channel elevation is lower than the groundwater table. Groundwater provides the stream flow during dry periods of small or no precipitation.

Distribution of Land and Water in the Earth

1. Earth is covered by land and water. About 70.8% of its area (361 million sq.km) is covered by water and 29.2% (148 million sq.km) of its area by land. About 96.5% of water is salty found in seas and oceans.

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2. Fresh water occupies only 2.5%. Saline ground water and saline lakes together form 1%.

Fresh water

1. Fresh water is defined as water with a salinity of less than 1% compared to that of the oceans (i.e. below 0.35‰). Water with salinity between 0.35‰ and 1‰ is typically referred to as marginal water because it is marginal for many uses by humans and animals.
2. Considering the distribution of fresh water 68.6% of it is locked in Glaciers and icecaps. About 30.1% is stored as ground water and the remaining 1.5% is available as surface water.
3. Surface water includes ice and snow on the land and sea, water in the lakes, rivers, swamps and marshes, moisture in soil, atmosphere and biosphere. Rivers and lakes are the major sources of fresh water around the world, and are vital to the communities they serve.

Rivers:

1. Rivers generally have a source on a mountain either from a glacier, a spring or a lake.
2. River Ganga has its source from Gangotri glacier in the Himalayas. River Cauvery has its source from a spring in Thalacauvery located in Kodagu district of Karnataka. River Nile has its source near Lake Victoria in Uganda.
3. The river flows through confined channel between two banks and ends up at the mouth which is either on a sea or lake. When rivers drain their water into a lake or an inland sea, it is said to be an inland drainage.
4. The Nile River in Africa is the longest river in the world. The Nile River flows through Egypt, Uganda, Ethiopia, Kenya, Tanzania, Democratic Republic of the Congo, Rwanda, Burundi, Sudan and Eritrea drains and into the Mediterranean Sea forming a delta to the north of Cairo city.
5. The river Amazon in South America, is the second longest river, and has the largest drainage basin of any river. The Amazon River flows through Peru, Colombia, and Brazil and drains into the Atlantic Ocean forming an estuarine delta.

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6. The Yangtze River, which flows in China, is the longest river in Asia, and the third longest river in the world. The longest river system in the United States, the Mississippi-Missouri system is considered the fourth longest river in the world.
 7. The total volume of water in rivers in the world is estimated at 2,120 km³. Asia excluding Middle East, has the largest run off of 13,300 km³/year followed by North America with 12,000 km³ per year

Lakes: Lakes are larger bodies of water with outlet through a river or stream. Lakes may have their origin through tectonic activity, volcanic activity, river, glacier and wave action or sometimes meteoric origin. Caspian Sea, Lake Baikal and Wular Lake have been formed by earth movements. Lake Baikal is the deepest freshwater lake in the world. Caspian Sea is the largest salt water lake in the world.

Lagoon lakes are formed by wave deposition. Chilika Lake is the largest lagoon lake in India. Lonar Lake in Maharashtra is believed to be formed by depression created by meteor impact which hit during Pleistocene Epoch.

Wetlands: Wetlands are areas of marsh, fen, peat land or water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which a low tide does not exceed six metres. Marshes are shallow wetlands around lakes, streams, or the ocean where grasses and reeds are common, without trees. Rann of Kutch in India is a salt marsh. A Swamp is a wetland with lush trees and vines found in a low-lying area beside slow-moving rivers. Pallikaranai wetland is a fresh water swamp adjacent to the Bay of Bengal situated in the southern part of Chennai.

Groundwater

Groundwater is the most valuable resource for any country. The rain water that fall on the earth either runs off as surface water or percolates into the ground to recharge the groundwater. The permeable rocks that can hold water and allow water to pass through them are called aquifers. The upper part of the saturated zone of the aquifer is called the water table. The level of water table fluctuates according to seasons.

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Cryosphere:

- Cryosphere includes the water in frozen state. Glaciers, ice sheets, ice caps, lake and river ice, permafrost, seasonal snow and ice crystals in the atmosphere together form cryosphere.
- Earth's climate is highly influenced by the extent of cryosphere as it controls the energy budget of the earth. Perennial ice cover is found in Greenland and Antarctica as ice sheets, as mountain glaciers and as permafrost in higher latitudes.
- Permafrost is the condition prevailing when water freezes above and below the ground, (including rock or soil) for more than two consecutive years. Most permafrost regions are located in high latitudes, but alpine permafrost may exist at high mountains in much lower latitudes.
- Seasonal snow and ice crystals are confined to middle latitudes and high mountains in lower latitude. Sea ice is frozen ocean water. Its formation, growth and melting are all confined to the ocean.
- An ice shelf is a thick, floating slab of ice that forms where a glacier or ice flows down a coastline. The world's largest ice shelves are the Ross Ice Shelf and the Filchner-Ronne ice shelf in Antarctica.
- An iceberg is ice floating in open water that has broken off from glaciers or ice shelf.

Interaction of cryosphere with other spheres

- Cryosphere is a climate indicator. Cryosphere with its high albedo influences the energy balance of the whole planet.
- Changes in cryosphere will alter land cover, surface temperature, soil moisture, air temperature, radiation, air circulation, clouds, precipitation, sea level, sea surface temperature, salinity, ocean current, fauna, flora and microbes.
- There is a complex interaction and balance among the spheres of the earth which makes life to flourish in the earth. If there is a change in one sphere it affects the other spheres as well. Nature maintains this balance. Understanding this complex interaction and living in harmony with nature will help to mitigate the environmental problems faced by the earth.

◆.....◆ **Oceans and Seas**

- Continuous water body that surrounds the continents, created by earth's internal force is known as Ocean. The area of the World Ocean is 361 million square kilometre.
- The earth has at present five major oceans: The Pacific Ocean, the Atlantic Ocean, the Indian Ocean, the Arctic Ocean, and the Southern Ocean

Sea is a body of saline water (generally a division of the world ocean) partly or fully enclosed by land. **Marginal sea** is a sea partially enclosed by islands, archipelagos, or peninsulas and extension of oceans towards land. They are generally shallow.

Andaman Sea, Arabian Sea, Bay of Bengal, Java Sea, Persian Gulf and Red Sea are marginal seas of the Indian Ocean.

Water resources in Tamilnadu:

Tamil Nadu is not endowed with rich natural resources compared to other States. It accounts for three per cent of water sources, four per cent of land area against six per cent of population.

North East monsoon is the major source of rainfall followed by South West monsoon. There are 17 river basins in Tamil Nadu. The main rivers are Palar, Cheyyar, Ponnaiyar, Cauvery, Bhavani, Vaigai, Chittar, Tamiraparani, Vellar, Noyyal Siruvani, Gundar, Vaipar, Valparai etc. Wells are the largest source of irrigation in Tamil Nadu (56%).

Source of Irrigation	Numbers
Reservoirs	81
Canals	2239
Tanks	41262
Tube Wells	3,20,707
Open Wells	14,92,359

Questions:

1. Elaborate the hydrological cycle & its components.
2. Explain about the cryosphere.

MINERALS

Introduction:

1. A homogeneous, naturally occurring substance which has a definite chemical composition is called a mineral. They can be identified by their physical properties and chemical components.
2. Minerals exist in different types based on their formation. Minerals play an indispensable part of our daily activities. Almost everything we use, from a tiny particle to a huge building or a big ship all, is made up of minerals.
3. Minerals are one of the most valuable resources of the earth. All the stages of human development or progress have been named after them. For example, stone age, copper age, bronze age and Iron Age.
4. They are exhaustible or non renewable. Besides, they are distributed very unevenly. They are generally found in the form of ores. The ore contains several impurities. Minerals are separated from the ores involving a number of distinct processes.
5. A country's economic development is depending on the minerals. There are several types of minerals, but according to their characteristics and commercial use.
6. The organisations associated with minerals in India are the Geological Survey of India (Headquarter is at Kolkata), Indian Bureau of Mines (Headquarter at Nagpur) and Non-Ferrous Material Technology Development Centre (NFTDC), located at Hyderabad.
7. The Ministry of Mines is responsible for the administration of all mines and minerals (Development and Regulation Act, 1957).

Uses of Minerals:

Minerals are basic and essential raw materials in our daily lives and are vital for economic, social and technological development.

They are used,

- In the construction of buildings, bridges and settlement.
- As raw materials in industries

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- As fuels
 - In the manufacture of defence equipment's.
 - In the field of communication like manufacturing telephone, wires, cables, electronic devices etc.
 - In making of alloys for various purposes.
 - In making of ornaments.
 - In the manufacture of fertilizers, pesticide, fungicides etc.

Mode of Occurrence of Minerals

Minerals are generally found in 'Ores'. It is actually an accumulation of any mineral mixed with other elements. Minerals generally occur in many forms.

They are

- **Veins and lodes**

Minerals generally occur in the cracks, crevices, faults and joints of the igneous and metamorphic rocks. Minerals in smaller occurrence are called a 'Vein' and a larger occurrence is called a lode, for example, Copper and Gold are found in lodes and veins.

- **Beds or Layers**

Minerals that are formed as a result of deposition, accumulation and concentration generally occur in horizontal layers. E.g. Coal, Potash, etc. Residual mass of weathered particles:

When the decomposed rocks are washed away by water, the soluble particles are removed, leaving a mass containing ores. Such occurrences are called **residual mass**. E.g. Bauxite.

- **Alluvial deposits or placer deposits**

These are the deposits found in the sands of valley floor and at the foot hills. These deposits consist of the minerals such as Gold, Silver and Platinum.

The world distribution of minerals

a) Metallic Minerals

Metallic minerals are the minerals which contain one or more metallic elements in them. Metallic minerals occur in rare, naturally formed concentrations known as mineral deposits. These deposits consist of a variety of valuable metals such as iron, manganese, copper, bauxite, nickel, zinc, lead, gold etc.

Iron – Ore:

It is the basic mineral and the backbone of industrial development of the world. Iron Ore is the most widely distributed element of the earth's crust and it rarely occurs in a free state. It is found as the composition of many rocks and minerals. Iron-ore makes up 4.6% of the earth crusts. Iron is found in the form of Iron - ore.

They are classified into 4 categories.

1. **Magnetite:** It is red in colour and has 72% of pure Iron
2. **Hematite:** It is black in colour and has 70% of pure Iron
3. **Limonite:** Its colour varies from dark brown to yellow and has 50% of pure iron.
4. **Siderite:** It is brown in colour and contains only 30% of pure iron is present.

The iron content of these ores is highly variable. If the iron content is less than 30% in an ore, it is considered to be uneconomical. Iron is mixed with fixed proportions of Manganese, Nickel, Chromium or Vanadium to make different varieties of steel.

Distribution of Iron ore

1. Iron - ore is unevenly distributed in the world. Good quality Iron ore is found in Australia, Brazil, Russia, China, USA, Ukraine, Canada, etc.
2. Russia has the largest proven reserves of iron ore in the world. Australia is the largest producer of Iron ore in the world. Other leading producers are China, Brazil, India and Russia.
3. The Majority of Iron ore is (84%) produced by 5 countries alone.

◆.....◆ **Distribution of Iron ore in India**

1. The total recoverable reserves of iron ore in India are about 9602 million tons of haematite and 3408 million tons of magnetite.
2. About 79% haematite deposits are found in Assam, Bihar, Chhattisgarh, Jharkhand, Odisha and Uttar Pradesh. About 93% magnetite deposits occur in Andhra Pradesh, Goa, Karnataka, Kerala and Tamil Nadu.
3. Karnataka alone contributes about 72% of magnetite deposits of India.

Jharkhand is the leading producer of iron ore with 25% the country's production. Singhbhum, Hazaribagh, Dhanbad and Ranchi districts are its major producers. Odisha with 21% production ranks second. Sundargarh, Mayurbhanj, Sambalpur and Keonjhar districts are its major producers. The magnetite production of Chhattisgarh is 18% (Rajgarh and Bilaspur are its leadings districts) and the Karnataka is 20% (Chikmangalur, Chitradurga, Shimoga and Dharwad districts are its major producers). Andhrapradesh and Karnataka produce about 5% each. Kurnool, Guntur, Cuddapah and Anantapur districts in Andhra Pradesh and Salem, Namakkal, Tiruvannamalai, Tiruchirappalli, Coimbatore, Madurai and Tirunelveli districts in Tamil Nadu are notable for the production of iron ore.

SAIL (Steel Authority of India Limited):

The Ministry of Steel is responsible for planning and development of iron and steel industry in India

Manganese ore:

It is a kind of Ferro-alloy used to manufacture the special quality steel. A little manganese added to iron, removes gases and acts as a 'Cleanser' in the manufacturing process. Nearly 6 Kg of manganese is used for making one ton of steel.

Manganese is used for special quality steel making; it makes steel anti - corrosive, hard and clean. It helps to increase toughness, strength and durability to resist oxidation in blast furnaces. It is used to produce alloys with Copper, Bronze, and

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Nickel. It is used for producing heavy machinery, tools, bleaching powder, insecticides and paints.

Distribution of Manganese ore

South Africa, Australia, China, Gabon, Kazakhstan, Brazil, India, Ghana, Ukraine and Mexico are the major countries possessing manganese ore. South Africa is the largest producer of manganese ore in the world, followed by Australia. The other leading manganese producers are China, Gabon and Brazil.

Distribution of Manganese ore in India:

1. The largest deposits of manganese are found in Odisha (44%) followed by Karnataka (22%), Madhya Pradesh (12%), Maharashtra & Goa (7% each), Andhra Pradesh (4%) and Jharkhand (2%). Rajasthan, Gujarat, Telengana and West Bengal together constitute about 2% of the India's manganese resource.
2. Nagpur, Bhandara and Ratnagiri districts in Maharastra and Balaghat and Chhindwara districts in Madhya Pradesh are the leading producers. Odisha is the third largest producer with 24% (Sundargarh, Kalahandi, Koraput and Bolangir districts are the major ones).
3. Other producers are Andhra Pradesh (13%) and Karnataka (6%). Srikakulam, Visakhapatnam, Cuddapah and Guntur districts in Andhra Pradesh and the districts of Shimoga, Bellary, Chitradurga and Tumkur are the important districts of Karnataka.
4. It is the most important mineral for making iron and steel. India is the fifth largest producer of manganese in the world.

MOIL - Manganese Ore India Limited state-owned manganese-ore mining company headquartered in Nagpur. With a market share of 50%, it was the largest producer of manganese ore in India.

Copper

1. It is a non - ferrous, soft brown metal. It is a good conductor, with high luster, density and melting point. Copper occurs in three forms as native metal in its pure state, as oxides and as sulphide. The chief ore of copper is copper pyrite. It yields nearly 76% of the world production of copper.

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2. Copper is extracted by the process of crushing, concentration, roasting, smelting and refining. It was discovered in the earliest stage of civilization. Copper is one of the first metals known and used by man.
 3. It is found in the igneous and metamorphic rocks. Copper is unfortunately very soft, but by mixing with tin, bronze can be obtained and mixing with zinc, brass can be obtained which is harder and tougher than pure copper.

Copper is used in

1. Electrical Engineering
 2. Metallurgical Industries
 3. Making of alloys and making tubes, pipes, pumps, radiators and boilers.
- They are also used in the production of a wide range of ornamental materials.

Production and distribution of Copper:

Copper deposits are found in almost every country. The main producers are Chile, Peru, China, USA and Congo. Chile is the largest producer of Copper in the world. It produces 27.20% of the world Copper, followed by Peru, which produces 11.53%. India holds 35th rank and it produces only 0.15% of the world's production

Distribution of Copper in India:

1. Largest reserves of copper ore are in the state of Rajasthan (53.81%) followed by Jharkhand (19.54%) and Madhya Pradesh (18.75%).
2. The states of Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal account for 7.9% of the total copper reserves of India.
3. Jharkhand is the largest producer of copper with 62% of India's production. Singhbhum and Hazaribagh districts are its leading producers of copper. Odisha is the other major producer with 50.2% production.
4. Rajasthan ranks third with 28% production. The districts of Khetri, Alwar and Bhilwara are notables in this state. The states of Uttarakhand (Dehradun and Garhwal districts), Andhra Pradesh (Guntur, Kurnool and Nellore districts),

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Karnataka (Chitradurga and Hassan districts) and Tamil Nadu contributes about 7% of production each.

5. Hindustan Copper Ltd is a Government-owned corporation in the central public Enterprise under the Ministry of mines, India. HCL is the only vertically integrated copper producer in India engaged in a wide spectrum of activities ranging from Mining, Beneficiation, Smelting, Refining and Continuous Cast Rod manufacturer.

Bauxite

Bauxite is an important ore which is the main source of Aluminum. It is an impure raw material. It generally occurs as an ingredient of chemical compounds in highly complex minerals such as Cryolite, Corundum and Kaolin. Bauxite occurs quite near the surface and is generally mined by open cast method. It has a wide range of applications which include construction of buildings, utensils and airplane parts.

Production and world distribution of Bauxite:

The main Bauxite producers are Australia, China, Brazil, Guinea and India. The World's greatest Bauxite producers and exporters are the countries located in the tropical and sub-tropical region. Australia is the largest producer of bauxite in the world. India is the 5th largest producer of bauxite in the world

Distribution of Bauxite in India:

The main bauxite deposits occur in Odisha – 50.2%, Gujarat – 15.8% (Junagadh, Amreli and Bhavnagar districts), Jharkhand – 11.9% (Ranchi and Gumila districts), Maharashtra – 9.9% (Sindhudurg and Ratnagiri), Chhattisgarh – 6.2% (Ballarpur and Durg districts), and Tamilnadu – 2.7%. Being light in weight and tough, aluminium is used in the manufacture of aircrafts and automobile engines. Bauxite is also used in the manufacture of cement and chemicals. Orissa is the largest producer of bauxite in India with approx. 1,370.5 million tones. India's State and Central Government is very supportive in production of Bauxite and other Industrial Minerals in Orissa, Jharkand, Tamil Nadu.



Gold

1. Gold is a precious metal which occurs in alluvial or placer deposits or as reefs or lodes in the underground. Gold is used extensively for jewellery and also in dentistry, glass and porcelain dyes, in medicines and other industries.
2. The purity of gold is expressed in terms of carat. China, Australia, Russia, USA and Canada are the leading producers of gold in the world.
3. India ranked 33rd position in the gold production in 2016.

Platinum

Platinum is a rare metal. It is costlier than gold. It has a very high melting point. It is a heavy, malleable, ductile, highly inactive, silverish, white transition metal. It is one of the densest metals almost twice as dense as lead.

Platinum is found with other rare metals such as osmium, Palladium, Iridium and rhodium. Platinum is also used in industrial applications. South Africa is the largest producer of platinum in the world. The other leading producers are Russia, Zimbabwe, Canada and USA.

b) Non-Metallic Minerals

These minerals do not contain metal in them. Mica, limestone, gypsum, nitrate, potash, dolomite, coal, petroleum etc. are the non-metallic minerals.

Mica

1. Mica is a Latin word mica means to shine, to flash or to glitter. Mica has a crystalline and layered structure and can be split into very thin sheets.
2. It does not react to water, acids, oil or solvents. It is light weight, flexible and strong. It can resist extremely high temperatures or sudden changes in temperature and is able to withstand high voltages and insulate with low power loss.
3. It can absorb or reflect light, which enables a decorative effect and protects against ultra-violet (UV) light.

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Major Uses of Mica:

Mica has several applications. There are several main sectors where the use of mica is identified. They are the paint and coatings sector, Cosmetics and personal care companies, Plastics and printing ink manufactures, the electronics sector, the automotive sector, the construction industry and the oil industry.

Distribution of Mica in India

1. The major deposits of mica are found in Andhra Pradesh (41%) with Nellore, Visakhapatnam, West Godavari and Krishna are its major districts.
2. Other important states in mica deposits are Rajasthan (21%) and Odisha (20%). Bhilwara, Jaipur and Ajmer are the notable districts in Rajasthan and, Rayagada, Bolangir and Sundargarh districts are the major producers in Odisha.
3. Dhanbad, Palamu, Ranchi and Singhbhum districts are the major mica mines in Jharkhand state.

Minerals in Tamilnadu

1. Tamil Nadu has a few mining projects based on Titanium, Lignite, Magnesite, Graphite, Limestone, Granite and Bauxite.
2. The first one is the Neyveli Lignite Corporation that has led development of large industrial complex around Neyveli in Cuddalore district with Thermal power plants, Fertilizer and Carbonisation plants.
3. Magnesite mining is at Salem from which mining of Bauxite ores are carried out at Yercaud and this region is also rich in Iron Ore at Kanjamalai.
4. Molybdenum is found in Dharmapuri, and is the only source in the country.

Questions

1. Discuss about the Iron ore & its distribution in India.
2. Enumerates the distribution of minerals in India.

FOREST AND WILD LIFE

Forest:

Tropical Evergreen Forest:

1. Tropical Evergreen Rain Forest extends between 10° North and South of the equator.
2. This biome receives direct sunlight throughout the year and so temperatures are high year around. The average annual temperature is 20°C to 30°C. The average annual rainfall of the tropical evergreen rain forest is 200 cm and the average annual humidity exceeds 70 percent in this region.
3. The Tropical Evergreen Rain Forest has the largest number of plant and animal species. Broad leaved, tall evergreen hard wood trees are found in this biome. Trees grow up to 20 to 35 meters high. The forest is characterized by thick undergrowth and creepers.
4. Western Ghats in Maharashtra, Karnataka, Kerala, Andaman-Nicobar Islands, Assam, West Bengal, Nagaland, Tripura, Mizoram, Manipur and Meghalaya states have this type of forests.
5. The most important trees are rubber, mahogany, ebony, rosewood, coconut, bamboo, cinchona, candel, palm, iron wood and cedar.

Tropical Deciduous Forest

1. Tropical deciduous forest is found in the regions experiencing monsoon climate. In this forest, the temperature varies from one season to another season. In summer the maximum temperature ranges from 38°C to 48°C. Summer season is warm and humid. In the dry winter season temperature ranges between 10°C to 27°C.
2. The total amount of precipitation is 75 to 150 cm/year and this affects the natural vegetation of the tropical deciduous forest biome
3. The plants shed their leaves during the dry season. Trees here have huge trunks with thick rough barks. The plants grow at three different levels.

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4. Sub Himalayan - Region from Punjab to Assam, Great Plains- Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Central India - Jharkhand, Madhya Pradesh, Chattisgarh, South India Maharashtra, Karnataka, Telangana, Andhra Pradesh, Tamilnadu and Kerala states are notable for this type of natural vegetation.
 5. The common trees are teak, sal, sandalwood, mahua (illupai), Mango, Wattle, Bamboo, semal (Illavamaram), sheesham (Karuvellamaram) and banyan.
 6. Teak and sal are the most important trees. Sandalwood, rosewood, kusum, mahua, palas, haldu, amla, padauk, bamboo and tendu are the other trees of economic importance.
 7. These forests also provide fragrant oil, varnish, sandal oil and perfumes.

Tropical Dry Forest:

These are found in the areas with 50 to 100 cm annual rainfall. They represent a transitional type of forests. These are found in east Rajasthan, Haryana, Punjab, Western Uttar Pradesh, Madhya Pradesh, Eastern Maharashtra, Telangana, West Karnataka and East Tamilnadu.

The important species are mahua, banyan, amaltas, palas, haldu, kikar, bamboo, babool, khair etc.,

Desert and Semi-desert Vegetation:

These are also called as ‘Tropical thorn forests’. These are found in the areas having annual rainfall of less than 50 cm. They have low humidity and high temperature.

These forests are found in north-west India which includes west Rajasthan, south-west Haryana, north Gujarat and south-west Punjab. They are also found in the very dry parts of the Deccan plateau in Karnataka, Maharashtra and Andhra Pradesh.

Babul, kikar and wild palms are common trees found here.



Mountain or Montane Forest:

These forests are classified on the basis of altitude and amount of rainfall. Accordingly, two different types of forests namely Eastern Himalayas Forests and Western Himalayas Forests.

i. Eastern Himalayan Forest:

These are found on the slopes of the mountains in north-east states. These forests receive rainfall of more than 200 cm. The vegetation is of evergreen type. The Altitude between 1200-2400 m found in this type of forest sal, oak, laurel, amura, chestnut, cinnamon are the main trees from 1200 to 2400 m altitude oak, birch, silver, fir, spruce and juniper are the major trees from 2400 to 3600 m height.

ii. Western Himalayan Forest:

- i. The rainfall of this region is moderate. These forests are found in the states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand.
- ii. Upto 900 m altitude semi desert vegetation is found and it is known for bushes and small trees.
- iii. In altitude from 900 to 1800 m, chir tree is the most common tree. The other important trees of this region are sal, semal, dhak, jamun and jujube. (height from 1800 to 3000 m is covered with semi temperate coniferous forests.) Chir, deodar, blue pine, poplar, birch and elder are the main trees of this region.

Alpine Forest: It occurs all along the Himalayas with above 2400 m altitude. These are purely having coniferous trees. Oak, silver fir, pine and juniper are the main trees of these forests. The eastern parts of Himalayas have large extent of these forests.

Tidal Forest: These forests occur in and around the deltas, estuaries and creeks prone to tidal influences and as such are also known as delta or swamp forests. The delta of the Ganga Brahmaputra has the largest tidal forest. The deltas of Mahanadi, Godavari and Krishna rivers are also known for **tidal forests**. These are also known as **mangrove forest**.



Coastal Forest: These are littoral forests. Generally, coastal areas have these types of forests. Casurina, palm and coconut are the dominant trees. Both the eastern and western coasts have this type of forests. The coasts of Kerala and Goa are known for this type.

Riverine Forest: These forests are found along the rivers on Khadar areas. These are known for tamarisk and tamarind trees. The rivers of Great Plains are more prominent for this type of natural vegetation.

Wildlife:

The term '**Wildlife**' includes animals of any habitat in nature. Wild animals are non domesticated animals and include both vertebrates (fish, amphibians, reptiles, birds and mammals) and invertebrates (bees, butterflies, moths etc.). India has a rich and diversified wildlife.

The Indian fauna consists of about 81,251 species of animals out of the world's total of about 1.5 million species. The faunal diversity of the country consists of about 6500 invertebrates, 5000 molluscs, 2546 fishes, 1228 birds, 458 mammals, 446 reptiles, 204 amphibians, 4 panthers and about 60,000 species of insects.

Our country is home to tigers, lions, leopards, snow leopards, pythons, wolves, foxes, bears, crocodiles, rhinoceroses, camels, wild dogs, monkeys, snakes, antelope species, deer species, varieties of bison and the mighty Asian elephant. Hunting, poaching, deforestation and other anthropogenic interferences in the natural habitats have caused extinction of some species and many are facing the danger of extinction.

In view of this and the role of wild life in maintaining ecological balance, conservation and management of biodiversity of India is necessary at present situation.

The **Indian Board for Wildlife** (IBWL) was constituted in 1952 to suggest means of protection, conservation and management of wildlife to the government. The Government of India enacted Wildlife (Protection) Act in 1972 with the objective of effectively protecting the wild life of the country and to control poaching, smuggling

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and illegal trade in wildlife and its diversities. United Nations **Convention on Biological Diversity** (CBD) in 1992 recognizes the sovereign rights of states to use their own Biological Resources. To preserve the country's rich and diverse wildlife a network of **102 National Parks** and about **515 Wildlife Sanctuaries** across the country have been created.

Questions:

1. Write a detailed account on the forest resources in India?
2. Discuss about the wildlife in India and its conservation?

