FOREST RESOURCES

A forest is a biotic community which is predominantly composed of trees, shrubs or vegetation. Approximately one third of the earth's total land area is covered by forests. Forests are the valuable wealth of a country. They are store houses of biodiversity and provide important environmental services to mankind.

To offer these services, forests have following three types of functions:
1. Productive Functions: Includes the production of timber, bamboos, food and a wide variety of compounds, such as resins, essential oils, latex, pharmaceuticals etc.
The forest products, collected by people include food like fruits, roots, herbs and medicinal plants. People depend on fuel wood to cook food; collect fodder for domestic animals and cut building material for housing; collect medicinal plants that have been known for generations to treat several ailments.

2. Protective Functions: These functions include conservation of soil and water, prevention of drought and protection against wind, cold, radiation, noise and smells.
Forests control the flow of water in streams and rivers. Forest cover reduces the surface run off of rainwater and allows groundwater to be stored. Forests also prevent the erosion of soil.

3. Regulative Functions: Includes absorption, storage and release of gases like CO_2 and O_2, water, mineral elements and radiant energy. Floods, draughts and global biogeochemical cycles, particularly of carbon is also regulated by forests. The regulative functions of forests improve atmospheric and temperature conditions.

Forest Area in India:
India had abundant forests in ancient times. But increase in population, lack of foresight and unplanned felling have drastically reduced the area and quality of forests in India today. At the beginning of the 20^{th} century about 30 per cent of land in India was covered with forests. But by the end of the 20^{th} century the forest cover was reduced to 19.4 per cent.

Deforestation
Destruction of forests is a formidable threat to the quality of life, country's economy and future development.

Causes of Deforestation
The main causes of deforestation are as follows:
1. Shifting Cultivation (Jhum): The jhum or shifting cultivation is a traditional agro-forestry system widely practiced in the north eastern region of our country. It involves felling and burning of forests followed by cultivation of crops for few years and abandoning cultivation to allow forest's regrowth.

2. Explosion of Human Population: Due to overpopulation of human beings, requirement of timber, fuel, paper, wood etc. has been increased. Man has cleared large areas of forests for agriculture, housing, factories, roads and railway tracks.

3. Demand of Wood for Industries: Wood is used for several industrial processes such as making boxes, crates, packing cases, furniture, match boxes, paper, plywood etc.

4. Construction of Roads: Construction of roads along the mountains which cover nearly 30,000 km in ecologically fragile area is another cause of forest degradation.

5. Mining Operations: Mining operations have a serious impact on forest areas. Large areas of forest are cleared and laid barren as a result of open cast mining of mica, coal, manganese, limestone etc.

6. Overgrazing: Overgrazing of forests by livestock has resulted in large scale degradation of forests.

7. Pests: Many kinds of insects and pests destroy trees by eating up leaves, boring into shoots and spreading diseases.

8. Fires: Fire is the worst enemy of forest. It destroys the full grown trees, seedlings, seeds and even humus. It also causes large scale damage to animal life.

9. Weather: Extreme weather conditions such as frost, storms and heat also destroy forests.

10. Dams and Hydroelectric Projects: Dams, reservoirs and hydroelectric projects submerge forest, displace local people cause water logging and siltation and may result in earthquakes.

Effects of Deforestation

1. When forest is removed, the amount of runoff water flowing into rivers and streams increases causing frequent floods.

2. Deforestation results in increased soil erosion and decreased soil fertility.

3. Deforestation causes the extinction of forest dwelling plant, animal and microbial species resulting into a loss of genetic resources.

4. Deforestation induces regional and global climate change.

5. The pattern of rainfall has changed in deforested areas. The rainfall has declined and droughts have become common.

6. Deforestation also contributes to global warming by releasing stored carbon into the atmosphere as carbon dioxide, which is a greenhouse gas.

Forest Conservation and Management

1. A tree removed from the forest for any purpose must be replaced by a new tree.

2. Afforestation should be done in areas unfit for agriculture, along highways and river, around playgrounds and parks. A special programme of trees plantation called **Van Mahotsava** is held in the months of August and February, every year in our country.

3. Maximum economy should be observed in the use of timber and fuel wood by minimizing the wastage.

4. The use of fire wood should be discouraged and alternative source of energy for cooking such as biogas, natural gas etc. should be made available.

5. Forest should be protected from fire. Modern firefighting equipment should be used to extinguish accidental forest fire.

6. Pests and diseases of forest trees should be controlled by fumigation and aerial spray of fungicides and through biological method of pest control.

7. Grazing of cattle's in the forests should be discouraged.

WATER RESOURCES

Water is the main constituent of hydrosphere and is a renewable resource. About ¾ of the earth surface is occupied by oceans which contain about 97.5% of the earth's water in strongly saline condition and the rest 2.5% is fresh water.

Division of Fresh water	
1.97%	Polar or glacial ice
0.5%	Groundwater
0.02%	Lakes & Rivers
0.01%	Soil
0.0001%	Atmosphere

Water cycle play an important role in maintaining different forms of water in nature. Water passes into the atmosphere by evaporation from the surface of moist earth, lakes, streams, oceans etc. Water vapour gets condensed and returns to the earth in the form of rain, hail and snow. There is a circulation of water from sea to land and back.

Forms of Fresh water

Fresh water mainly occurs in two forms: Groundwater and Surface water

1. Groundwater: The groundwater is contained in aquifers. An aquifer is a highly permeable layer of sediment or rock containing water.

2. Surface water: Surface water occurs in the forms of streams, rivers, lakes, ponds, etc. It comes through precipitation (rain fall, snow).

Effects of Overuse of Fresh water:

- **Lowering of water table –** Excessive use of groundwater for drinking, irrigation and domestic purposes has resulted in rapid depletion of groundwater table and drying of wells.
- **Ground subsidence –** When groundwater withdrawal is more than its recharge rate, the sediments in the aquifer become compacted. It results in sinking of land which may damage buildings, reverse the flow of sewers and tidal flooding.

Problems related with water resources

1. About 40% of the world's population lives in arid or semi-arid region. These people have to spend substantial amount of time, energy and effort in obtaining water for their domestic and agricultural use.
2. To meet the requirements of huge population, surface waters are over drawn, resulting in drying up of nearby wet lands.
3. The groundwater may also dry out, when more groundwater is removed for human use than can be recharged by rainfall or snowmelt.
4. Excessive irrigation in semi-arid and arid regions can cause salt accumulation in the soil, which may reduce crop productivity.
5. The continuous depletion of groundwater along the coastal regions often leads to the movement of saline sea water into fresh water wells spoiling their water quality.
6. Heavy rainfall on exposed soils results in rapid runoff causing soil erosion.

Conservation and Management of water

1. Increase in irrigation efficiency in agricultural fields through sprinkle irrigation, drip irrigation etc. and by reducing water wastage.
2. Recycling of used water in industries so as to reduce water wastage.
3. Reduction in domestic water wastage by constructing waste water treatment plants and recycling the treated water.
4. Harvesting of rainwater by adopting practices like storing of rainwater and recharging groundwater.
5. Protection of water sheds and afforestation to improve water economy.
6. Construction of dams and water reservoirs to control floods, ensure year round supply of water and generation of electricity.
7. Desalinization of sea water and saline groundwater to make it fit for human consumption and other purposes.
8. Diversion of water bodies through canals to increase water supply in drier areas.
9. Regular dredging and desiltation of rivers, streams and other water bodies.

MINERAL RESOURCES

Minerals are exhaustible, non-renewable resources found in the earth's crust. They are essential to our industrialized society and daily life. Due to rapid expansion of industries, the consumption of minerals has increased tremendously. A number of minerals such as silver, copper, mercury, tungsten etc. are now in short supply and likely to be exhausted within next 20 to 100 years.

Mining

The term mining refers to the process of taking out minerals or their ores from the earth.

Two Methods of mining: Surface mining and Sub-Surface mining

1. Surface Mining: This method of mining is utilized when mineral deposits occur at or near the surface of earth.

2. Sub-Surface Mining: This method is used when the mineral deposit lies deep beneath the earth's surface. Big holes are dug in the earth surface to extract out ores from the horizontal ore bodies.

Effects of Mining

1. The top soil is removed from the mining area to get access to the deposit. It disturbs and damages the land and results in spoiling the landscape.
2. Mining often causes ground subsidence, which results in tilting of buildings cracks in houses, buckling's of roads, bending of rail tracks and leaking of gas from cracked pipelines leading to serious disasters.
3. Mining disturbs the natural hydrological processes and also pollute groundwater as well as surface water. Sometimes radioactive substances like uranium also contaminate the water bodies through mine mine wastes.
4. Extraction and processing of ores emits enormous quantities of air pollutants such as suspended particulate matter leading to serious environmental hazards.
5. Miners often suffer from serious respiratory and skin diseases like asbestosis, silicosis, black lung disease etc due to constant exposure to the suspended particulate matter (SPM) and toxic substances.

Conservation of Minerals

1. **Recycling –** In recycling used and discarded items are collected, remelted and reprocessed into new products e.g. iron scraps, aluminium cans, etc. Some minerals present in products can be recycled e.g. gold, silver, lead, nickel, steel, copper, aluminium, zinc, etc.
2. **Reuse –** Certain items can be collected and can be used over and over again. e.g. reuse of glass bottles.
3. **Substitution –** The use of rare minerals can be substituted with more abundant minerals. For instance, in recent years, plastics, ceramics, high strength glass fibres and alloys have been substituted for rare materials like steel, tin and copper in many industries.
4. **Decreased Consumption –** Products that are durable and repairable should be used again instead of discarding them as waste.
5. **Use of waste –** The manufacturing industries may use the waste products of one manufacturing process as the raw materials for another industry.

FOOD RESOURCES

The main sources of human food are plants and animals. We consume almost all parts of one or the other plant in the form of cereals, pulses, vegetables, fruits and spices. A number of animal products such as milk, butter, egg and meat also supplement our food requirements.

World Food Problems – World's population is growing every year and so the demand of food is increasing constantly. Although world's food production has increased almost three times during the last 50 years, but at the same time rapid population growth especially in less developed countries has outstripped the food production. About 40 million people die every year due to undernourishment and malnutrition.

The major source of food are crops. The cropping pattern and crop yield are determined mainly by natural factors like rainfall, climate and soil conditions.

Impacts of Overgrazing

1. Overgrazing removes the vegetal cover of the soil and makes it compact. It reduces the humus content due to decline in organic cycling and infiltration capacity of the soil. As a result, more water is lost from the ecosystem along with surface runoff and the soil loses its fertility.
2. Due to the loss of vegetal cover the soil becomes susceptible to the action of wind and water and gets eroded.
3. Overgrazing affects the composition of plant population and their generation capacity.

Impacts of Traditional Agriculture – About half of global population practice traditional agriculture. It involves small fields simple implements, naturally available water, organic fertilizers and mix crops and results in low production.

1. Shifting cultivation (Slash and burn cultivation) practiced in many tribal areas results in deforestation.
2. Loss of forest cover exposes the soil to wind, rain and storms, thereby resulting in soil erosion.
3. Slash and burn cultivation destroys the organic matter and makes the soil nutrient poor within a short period.

Impacts of Modern Agriculture – Modern agriculture is largely based upon technological factors like the use of improved seeds, chemical fertilizers, synthetic pesticides and extensive irrigation.

1. Intensive farming has reduced the fertility and productivity of the soil without the use of chemical fertilizers.
2. Fertilizers have contaminated groundwater with nitrate. Nitrate reacts with haemoglobin and impairs the oxygen transport by the blood for infants. This condition is called **methaemoglobinemia** or **blue baby syndrome**.
3. Excessive NPK fertilizers used in agriculture fields are often washed off with runoff water to water bodies and lakes causing overnourishment of the lakes called **Eutrophication**. **Eutrophication** often leads to algal blooms, which make water unfit for consumption and kill the aquatic life.

4. Some individuals of the pest species survive even after pesticide spray and give rise to highly resistant super pests which are immune to all types of pesticides.
5. Intensive irrigation is bringing the underground soluble salts to the soil surface and increasing the salinity of the soil. A large area of fertile land has become saline and water logged in the recent years due to excessive irrigation.

LAND RESOURCES

Land is a major constituent of life supporting system – the lithosphere. It forms about $1/5^{th}$ of the earth surface, which is largely covered with natural forests, grasslands, wetlands, agricultural land and urban and rural settlements.

The fertile surface layer of earth capable of supporting plant life is called soil. Plants and animal materials decay are released into the nutrient bank in the soil.

Land Degradation: A number of factors are responsible for the degradation of land.
These include

- Soil erosion,
- Water logging,
- Salination,
- Shifting cultivation,
- Desertification and
- Various developmental activities.

Soil Erosion – Removal of top fertile layer of the soil by water, wind oceanic waves and glaciers is called soil erosion.

- Erosion of soil by water generally occur near hills where high speed streams and flooding removes top soil.
- Strong winds also erode the soil and bring sand from deserts to adjacent fertile land, converting the latter into desert (Example Thar Desert in Rajasthan).
- Various human activities such as felling of trees, over-grazing, over cropping and improper tilling accelerate soil erosion.

Desertification – Transformation of fertile land into a desert by natural or man's activities is called desertification. It can result from various causes such as erosion of top soil, shifting of sand dunes by wind and overgrazing in lands sparsely covered by grass. Many deserts of the world have developed by the human activities.

Landslides – Landslides is the moving down of rock of soil mass due to gravitational pull. Various anthropogenic activities like hydroelectric project, large dams, reservoirs, construction of roads and railway lines, mining etc. make mountain slopes brittle leading to landslides.

Soil Conservation

1. **Conservational Tillage –** The incorporation of residues from previous crops into the soil by ploughing is called conservational tillage. It improves soil permeability and increases the organic matter which in turn improve soil moisture and nutrients.
2. **Organic Farming –** Application of biofertilizers is an important practice of organic farming. The organic farming has long term beneficial effects on soil fertility.
3. **Crop Rotation –** It is a practice of growing different crops in successive years on the same piece of land. It decreases soil loss and prevents depletion of nutrients from the soil.
4. **Contour Ploughing –** Rain water is caught in circular and held in furrows and stored which reduces runoff and erosion.

5. **Contour Terracing –** A slope is divided into a number of small flat fields called terraces. The terraces slow down the velocity of the run off and allow the water to move to the sides of the fields where it flows away without eroding the soil.
6. **Afforestation –** Trees or windbreaks are planted in deserts which check the velocity of wind.

Multiple choice questions:

1. Common energy source in Indian villages is
a. Electricity
b. Coal
c. Sun
d. Wood and animal dung

2. Fossil fuels and metallic minerals are
a. Renewable resources
b. Inexhaustible resources
c. Non-renewable resources
d. None of these

3. Forests and wildlife are
a. Renewable resources
b. Non-renewable resources
c. Inexhaustible
d. None of these

4. Soil conservation is a process in which
a. Soil is aerated
b. Soil erosion is allowed
c. Sterile soil is made fertile
d. Soil is protected against loss

5. Which of the following is a non-renewable resource
a. Coal
b. Forests
c. Water
d. Wildlife

6. Deforestation generally decreases
a. Rainfall
b. Soil erosion
c. Draught
d. Global warming

7. Extensive planting of trees to increase forest cover is called
a. Afforestation
b. Agro forestation
c. Deforestation
d. Social forestry

8. Terrace farming is practiced in
a. Coastal areas
b. Deserts
c. Hills
d. Plains

9. The practice of felling and burning of forests followed by cultivation of crop for few years is called
a. Shifting cultivation
b. Contour farming
c. Modern agriculture
d. None of these

10. The major environmental impact of agriculture is
a. Conversion of forest land to crop land
b. Conversion of grassland to crop land
c. Planting trees in crop land
d. Both (a) and (b)

11. Effect of modern agriculture on soil is due to
a. Erosion
b. Acidification
c. Salinization
d. All

12. Mining of ore is done by
a. Surface mining
b. Sub-surface mining
c. Tunneling
d. Both (a) and (b)

13. Environmental issues of mining activities are
a. Contamination of groundwater by chemicals
b. Loss of biodiversity
c. Formation of sink holes and deep holes
d. All

14. Remediation means the removal of contaminants from
a. Soil
b. Waste water
c. Groundwater
d. Both (a) and (c)

15. Sustainability requires
a. Conservation of resources
b. Minimizing depletion of non-renewable resources
c. Using sustainable practices for managing renewable resources
d. All

16. Sustainable development requires change in
a. Utilization of natural resources
b. Elimination of waste
c. Consumption of energy
d. All

17. Blue baby syndrome is due to high concentration of
a. Arsenic
b. Nitrates
c. Phosphates
d. Sulphates

18. Eutrophication of water bodies are due to increased levels of
a. Fertilizers
b. Mining
c. Salinization
d. None of these

19. Eutrophication is
a. An improved quality of water in lakes
b. A process in carbon cycle
c. The result to accumulation of plant nutrients in water bodies
d. A water purification technique

20. Which of the following is the most environmental friendly agriculture practice?
a. Using chemical fertilizers
b. Using insecticides
c. Organic farming
d. None of the above

21. The adverse effect of modern agriculture is
a. Water pollution
b. Soil degradation
c. Water logging
d. All of the above

22. Soil erosion removes surface soil which contains
a. Organic matter
b. Plant nutrients
c. Both (a) and (b)
d. None of the above

23. Water logging is a phenomenon in which
a. Crop patterns are rotated
b. Soil root zone becomes saturated due to over irrigation
c. Erosion of soil
d. None of the above

24. Organic farming is
a. Farming without using pesticides and chemical fertilizers
b. Enhances biodiversity
c. Promotes soil biological activity
d. All of the above

25. Decrease of oxygen level in water mainly causes
a. Fluorosis
b. Death of aquatic life
c. Water pollution due to non-metabolism of organic matter in human wastes
d. All the above

26. Non-renewable resource that cannot be recycled is
a. Fossil fuels
b. Uranium
c. Oil
d. All of the above

27. Percentage of fresh water available on the earth is
a. 2.5%
b. 0.5%
c. 1.5%
d. None of the above

28. Important phases of the hydrologic cycle is
a. Evaporation
b. Precipitation
c. Both (a) and (b)
d. None

29. Storm water is rich in
a. Pollutants
b. Organic matters
c. Nutrients
d. All

30. Waterborne diseases are caused due to the
a. Fecal contamination
b. Sewage contamination
c. Both (a) and (b)
d. Toxic matter

31. Mineral is a
a. Organic matter
b. Naturally occurring inorganic substance
c. Synthetic compound
d. None

32. Ore is a
a. Metallic element
b. Non-metallic element
c. Both (a) and (b)
d. None

33. Forests are

a. Simple ecosystem
b. Complex ecosystem
c. Group of trees
d. None of the above

34. Modern civilization began with
a. Copper age
b. Iron age
c. Gold age
d. Stone age

35. Fluoride in water can be removed by
a. Boiling
b. Reverse osmosis
c. Adding alum
d. Aeration

36. Water stress is felt when there is.
a. Abundant water
b. No water
c. Less water
d. None of the above

37. Plants use _____ gas for photosynthesis
a. Oxygen
b. Carbon dioxide
c. Methane
d. Nitrogen

38. Deforestation means
a. Preservation of forests
b. Destruction of forests
c. Monocrop cultivation
d. Agriculture

39. About _____% of the earth's surface is covered by water
a. 53%
b. 19%
c. 71%
d. 90%

40. During photosynthesis, trees produce
a. Oxygen
b. Carbon dioxide
c. Nitrogen
d. Carbon monoxide

41. Forests prevent soil erosion by binding soil particles in their
a. Stems

b. Roots
c. Leaves
d. Buds

42. Major causes of deforestation are
a. Shifting cultivation
b. Fuel requirements
c. Raw materials for industries
d. All of these

43. What is the permissible range of pH for drinking water as per the Indian Standards?
a. 6 to 9
b. 6.5 to 7.5
c. 6 to 8.5
d. 6.5 to 8.5

44. What is the maximum allowable concentration fluorides in drinking water?
a. 1.0 milligram per liter
b. 1.25 milligram per liter
c. 1.50 milligram per liter
d. 1.75 milligram per liter

45. Excess fluorides in drinking water is likely to cause
a. Blue babies
b. Fluorosis
c. Taste and odour
d. Intestinal irritation

46. Which of the following is a non-point source of water pollution?
a. Factories
b. Sewage treatment plants
c. Urban and suburban lands
d. All of the above

47. The depletion of trees is causing accumulation of
a. NO_2
b. SO_2
c. CO_2
d. O_2

48. _____ are referred to as Earth's lungs
a. Forests
b. Carbon cycles
c. Water sources
d. Mines

49. Among the fresh water available in the Earth, the percentage of surface water is about
a. 50%
b. 10%

c. 5%
d. less than 1%

50. Major source of fluoride is
a. River water
b. Tooth paste
c. Groundwater
d. Food products

51. Excessive Nitrate in drinking water causes
a. Fever
b. Cough & chill
c. Blue babies
d. Gastro Enteritis

52. Disfigurement in the teeth is caused by excessive amount of
a. Mercury
b. Nitrate
c. Fluoride
d. Lead

53. Forests are extremely important because they
a. Provide clean water and clean air
b. Provide habitat for wild life
c. Provide recreation and a change from the hectic urban life
d. All of the above

54. Mineral resources are
a. Renewable
b. Available in plenty
c. Non renewable
d. Equally distributed

55. The oceans are the largest storage of water on earth containing
a. 95% of earths water
b. 85% of earths water
c. 97% of earths water
d. 75% of earths water

56. Which of the following is not a part of the hydrological cycle?
a. Precipitation
b. Infiltration
c. Transpiration
d. Perspiration

57. Overgrazing results in
a. Deforestation
b. Soil erosion
c. Infiltration

d. Precipitation

58. When fluoride concentration in H_2O exceeds about 1.5 mg/l, the disease that may be caused is
a. Fluorosis
b. Blue baby
c. Cancer
d. Ulcer

59. Major consumer of wood from forest is
a. Mining
b. Textile industry
c. Automobile industry
d. Paper industry

60. _____ is a form of agriculture which discourages the use of synthetic fertilizers and pesticides
a. Modern agriculture
b. Tradition agriculture
c. Both (a) and (b)
d. None of the above

61. Tailing is the ill effect of
a. Deforestation
b. Modern agriculture
c. Land slide
d. Mining

62. Water logging and salinity are the common problems of
a. Deforestation
b. Modern agriculture
c. Land slide
d. Mining

63. Transformation of fertile land into desert is called
a. Desertification
b. Deforestation
c. Soil erosion
d. Land slide

64. Excess concentration of salts in soil is known as
a. Water logging
b. Desertification
c. Salinization
d. Infiltration

65. Saturation of soil with water is referred as
a. Water logging
b. Desertification
c. Salinization
d. Infiltration

Answer the following questions:

1. List benefits/importance of forest resources.
2. Discuss the effects on the surrounding environment due to over exploitation of forest.
3. Write a note on causes and effects of deforestation.
4. Discuss about the remedial measures taken for deforestation.
5. How global water resources are distributed?
6. What are effects of overusing surface and groundwater?
7. Classify the sources of water resources?
8. What are the methods of conserving water resources?
9. Discuss the measures adopted to regulate the utilization of water.
10. Discuss the major environmental effects caused due to mining activity.

11 Discuss in detail the problems of exploitation of mineral resources.

12. How can mineral resources be conserved?
13. Discuss the impacts of modern agriculture on crop production.
14. What are the impacts of traditional agriculture on crop production.
15. Discuss about the problems faced by using excess fertilizers and pesticides.
16. Explain water logging and soil salinity along with the environmental effects.

18. Describe the main factors of land degradation.
19. Define soil erosion. List out the causes and effects of soil erosion.
20. What are the methods of conserving soil erosion?