

Chapter 7

Natural Resources And Their Management

- Life is dependent on many factors like resources available on earth, energy from the sun etc. The different resources available on the earth are land, water and air which are required for the existence of life forms.
- The outermost crust of the earth is **lithosphere**.
- 75% of the Earth's surface is covered with water. This water along with underground water comprises the **hydrosphere**.
 - The air covering of earth is called atmosphere.
 - The life-supporting zone of the earth where the atmosphere, hydrosphere and the lithosphere interact and make life possible is known as the biosphere.
 - The living things constitute the biotic components of the biosphere.
 - The non-living things air, water and soil form the abiotic components of the biosphere.
- Air is a mixture of many gases like nitrogen, oxygen, carbon dioxide and water vapour. On Venus and Mars there is no life because carbon dioxide constitutes 95-97% of the atmosphere.
- Carbon dioxide is produced in the atmosphere by following activities :**
 - Breakdown of glucose in presence of oxygen by organisms.
 - Combustion of fuels.
- Carbon dioxide is fixed in two ways :**
 - Green plants convert carbon dioxide into glucose by photosynthesis.
 - Marine animals use carbonates dissolved in sea-water to make their shells.
- The role of atmosphere in climate control :** Atmosphere keeps the average temperature of the earth steady during the day and whole year. Atmosphere prevents sudden increase in temperature during daytime and fall of temperature during night. Moon has no atmosphere, its temperature ranges from -190°C to 110°C .
- The movement of air-winds :** Due to heating of air and formation of water vapour in our atmosphere the phenomenon of movement of air in the form of gentle breeze, wind, storm or rain occurs. On heating, convection currents setup in the air. When air is heated by radiation from land and water, it rises up. During day, the direction of wind is from sea to land in coastal areas. The diversity in atmosphere is due to uneven heating of the atmosphere in different regions of the earth.
- Rain :** Due to heating of water bodies during day time, large amount of water evaporates and goes into the air. The hot air rises up carrying the water vapour. Cooling of air as it rises, causes the water vapour in the air to condense in the form of tiny droplets. After their formation the water droplets grow bigger and heavy and they fall down on the earth in the form of rain. In low temperature the water droplets precipitate to form snow, sleet or hail.
- Air pollution :** The increase in the content of oxides of nitrogen and sulphur, suspended particles, hydrocarbons in air is called air pollution.

Causes : The burning of fossil fuels produces oxides of nitrogen, sulphur and increases the amount of suspended particles in air.

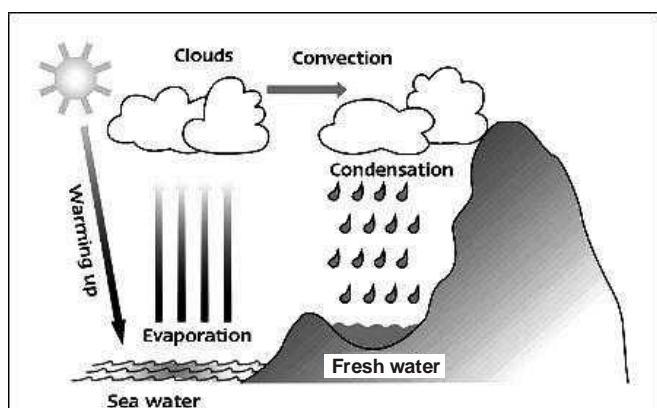
Effects : Allergies, cancer, heart disease, respiratory diseases etc.

Lichens are very good indicators of air pollution.
- Water :** Water occupies a very large area of the Earth's surface. Fresh water is found frozen in the ice-caps at the two poles and on snow covered mountains. Water is required by all living organisms because all cellular processes takes place in water medium. Substances are also transported from one part of the body to the other in dissolved form. Heavy rainfall areas are rich in biodiversity.
- Water pollution :** The addition of undesirable substances to water is called water pollution.

The main causes of water pollution are as follows:

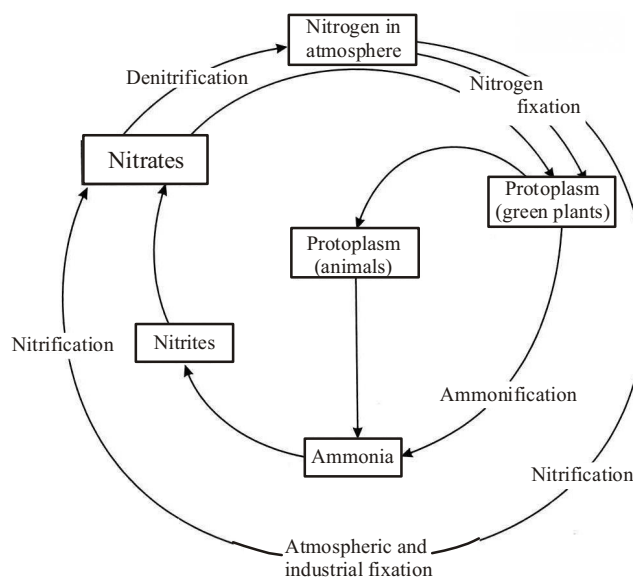
 - Addition of harmful substances to water**—The pesticides and fertilizers used in farming dissolves in water and makes the water impure. Sewage from towns and cities and wastes from factories are also dumped into the rivers and lakes. Water also gets polluted due to man's activities-like bathing, washing etc.
 - Removal of desirable substances from water**—Oxygen dissolved in water is used by animals and plants living in water. Any change that reduces the amount of dissolved oxygen would adversely affect aquatic organisms.
 - Change in water temperature**—Any change in the water temperature would be dangerous for the aquatic organisms. The industries use water for cooling purpose and later return hot water to rivers. The eggs and larvae of aquatic animals are very sensitive to temperature changes.
- soil :** Soil is the most important natural resource which supplies nutrients to the life forms. **Following factors are responsible for making soil from rocks.**
 - Sun :** Due to heating by sun, the rocks expand. This repeated expansion and contraction results in breaking of rocks into small pieces.
 - Water :** Water helps in formation of soil by two ways
 - Water enters into the cracks of rocks and on freezing it causes cracks to widen.
 - Flowing of water through the same rock over long periods of time.

- (iii) **Wind** : Soil is also formed by erosion of rocks by wind. Strong winds breakdown rocks into small particles which are carried away by it.
- (iv) Some organisms like **lichen** and **mosses** grow on the surface of rocks and they release certain substances that cause weathering of rocks and a thin layer of soil is formed.
- **Humus** : The decayed living organisms present in soil is called humus. The quality of soil is decided by the amount of humus and micro-organisms present in it.
 - **Soil pollution** : Removal of useful components from the soil and addition of other substances, which adversely affect the fertility of the soil and kill micro-organisms living in it is called soil pollution. Fertilizers and pesticides destroy the soil structure.
 - **Soil erosion** : Removal of topmost layer of soil by wind, water or other activities is called soil erosion. Roots of plants prevent soil erosion by firmly holding the soil particles.
 - **Biogeochemical cycles** : Various biogeochemical cycles exist in the nature which represent interaction between biotic and abiotic components of the biosphere to make a stable system.
- (i) **Water cycle** : The whole process in which water evaporates and falls on the land as rain and later flows back into the sea via rivers is known as water cycle.



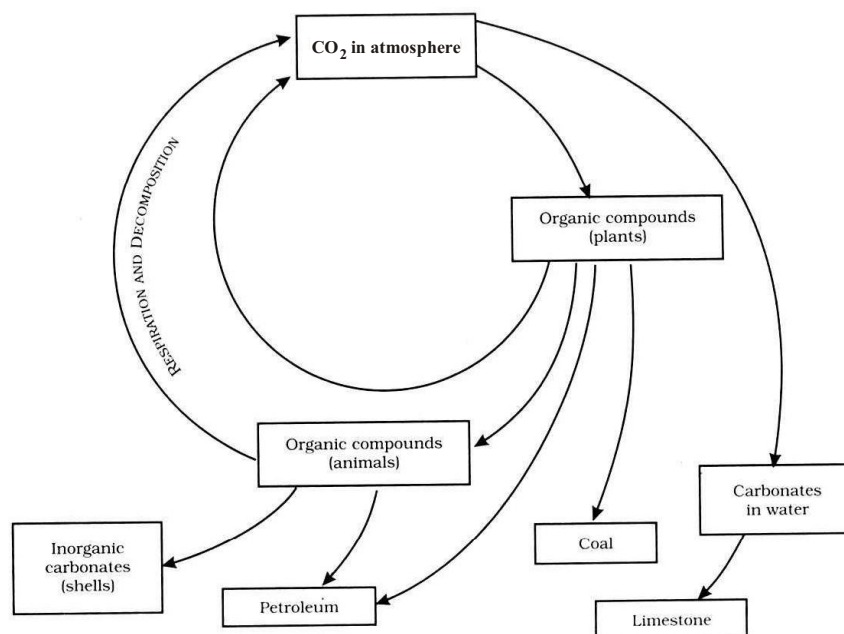
Water cycle in nature

- (ii) **Nitrogen cycle** : About 78% of nitrogen is present in our atmosphere. It is also present in proteins, nucleic acids and vitamins, alkaloids, urea etc. The free nitrogen is fixed by nitrogen fixing bacteria into nitrates and nitrites. After death and decay of plants and animals the nitrogen is returned back to the atmosphere.



Nitrogen cycle in nature

- (iii) **Carbon cycle** : Carbon is present in elemental form as diamond and graphite and in combined form as carbon dioxide, carbonate and hydrogen-carbonate salts. Carbon containing molecules are proteins, carbohydrates, fats, nucleic acids and vitamins. In nature, carbon is cycled repeatedly through different forms by various physical and biological activities.



Carbon Cycle in nature

- **Green House Effect :** Greenhouse gases such as carbon dioxide, methane, nitrogen oxide and Chlorofluorocarbons present in atmosphere prevents the escape of heat falling on earth's surface rather than absorbing it. This keeps the earth warm and the phenomenon is known greenhouse effect.

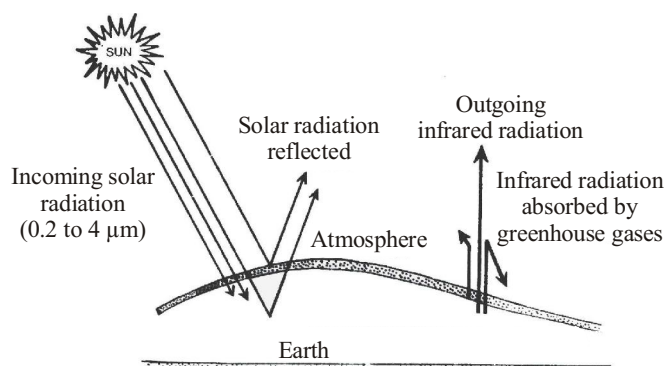


Fig. Greenhouse effect in keeping the earth warm.

Green house effect will give rise to global warming due to which the average temperature will increase by 1° or 2°C worldwide. Due to increased temperature the ice-caps would melt, there is rise in the sea-level and it is feared that coastal areas would be destroyed by floods.

- **Oxygen-cycle :** In our atmosphere 21% of oxygen is present. It is found as combined form in carbon dioxide. O_2 is an essential component of biological molecules like carbohydrates, proteins, nucleic acids and fats. Oxygen is returned back to the atmosphere by photosynthesis.

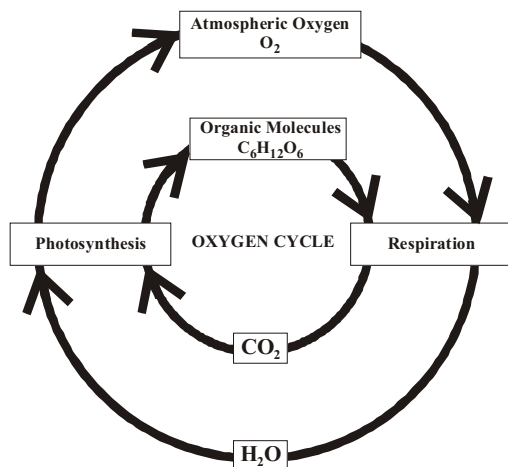


Fig. Oxygen-cycle in nature

- **Ozone layer :** Three molecules of oxygen combine to form ozone. Ozone layer is found in stratosphere. It acts as a ozone shield and protects earth from harmful effects of ultraviolet radiation. However many man-made components like CFCs (Chlorofluorocarbons) reacts with ozone releasing molecular oxygen, causing ozone depletion. Depletion of ozone layer thickness is called **ozone hole**.
- **Management of Natural Resources :**
- Controlling system for the use of natural resources in such a way as to avoid their wastage and to use them in the most effective way is called **management of natural resources**.

- **The reasons to manage our natural resources are :**

- (i) The proper management can ensure that the natural resources are used judiciously so that to fulfil the needs of present generation and also last for the generations to come.
- (ii) The proper management of natural resources takes into consideration long-term perspective (or view) and prevents their exploitation.
- (iii) The proper management can ensure equitable distribution of natural resources so that all the people can benefit from the development of these resources.
- (iv) The three R's to save the environment are Reduce, Recycle and Reuse.

- **Ganga Action Plan**

Ganga (Ganges) along with its tributaries is the largest river system of India. Over the years, the river has been grossly misused. Cities and towns along the banks of the river had been discharging some 1000 million (1 billion) litres of untreated sewage. Thousands of industries had been pouring their untreated effluents into the river.

The result was that BOD of the river had risen to 9.7 mg/l (48.9 mg/l at Hardwar in 2007-2008) instead of the maximum of 2mg/l. Pollution load and toxicity had started killing of fish in large sections of the river. Ganga Action Plan (GAP) was formulated to reduce pollution load of river Ganga by more than 75%. The water quality has been tested from time to time by checking coliform (group of harmless bacteria in human intestine) number/100 ml.

- **The important aspect of GAP has been** (1) Diversion of sewers away from river (2) Treatment of sewage and changing it into an energy source (3) Construction of community toilets. (4) Development of solid waste management system (5) Enforcement of setting up of effluent treatment plants by the industry.

Forest and wild life : Forests are vast areas, located far away from human inhabitation where wild plants of various kinds grow and animals of different varieties live without the intervention of humans.

- One of the main aims of conservation is to try and preserve the biodiversity we have inherited. Experiments and field studies suggest that a loss of diversity may lead to a loss of ecological stability.

To consider the conservation of forests, we need to look at the stakeholders who are :

- (i) The people who live in or around forests, are dependent on forest products for various aspects of their life.
 - (ii) The Forest Department of the Government which owns the land and controls the resources from forests.
 - (iii) The industrialists – from those who use 'tendu' leaves to make bidis to the ones with paper mills – who use various forest produce.
- A major programme called **silviculture** has been started to replenish the forests by growing more trees and plants.
 - **The silviculture programme has many advantages :**
 - (i) It produces a large quantity of raw materials for industry (like timber and paper industry).
 - (ii) It increases the area of earth under forests (which is good for the conservation of wildlife).
 - (iii) It maintains a perfect water cycle in nature.

• **Steps for conservation of energy resources are :-**

- (i) Use energy efficient electrical appliances to save electricity.
- (ii) Use solar cookers.
- (iii) Encourage the use of biogas as domestic fuel.
- (iv) Fuel efficient motor vehicle should be designed to reduce consumption of petrol and diesel.
- (v) The harnessing of water resources by building dams has social, economic and environmental implications. These are local-specific and may be developed so as to give local people control over their local resources.
- (vi) The fossil fuels, coal and petroleum, will ultimately be exhausted. Because of this and because their combustion pollutes our environment, we need to use these resources judiciously.

• **Rain water harvesting** is an age-old practice in India. Water-harvesting techniques used depend on the location where it is to be used.

• **Various advantages of water stored in the ground are :**

- (i) The water stored in ground does not evaporate.
- (ii) The water stored in ground spreads out to recharge wells and provides moisture for crops over a wide area.
- (iii) The water stored in ground does not promote breeding of mosquitoes (unlike stagnant water collected in ponds or artificial lakes).
- (iv) The water stored in ground is protected from contamination by human and animal wastes.

Exercise

1

DIRECTIONS : This section contains multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which only one is correct.

1. Cycling of elements in an ecosystem is called
 - (1) chemical cycle
 - (2) geochemical cycle
 - (3) biogeochemical cycle
 - (4) geological cycle
2. If there was no CO₂ in the earth's atmosphere, the temperature of earth's surface would be
 - (1) as such
 - (2) less than the present level
 - (3) increase from present level
 - (4) dependent upon oxygen amount of the environment
3. Green house effect is due to the presence of
 - (1) ozone layer in the atmosphere
 - (2) infrared light reaching the earth
 - (3) moisture layer in the atmosphere
 - (4) CO₂ layer in the atmosphere
4. The pollution in city like Delhi may be controlled to great extent
 - (1) by proper sewage and proper exit of chemicals from factories
 - (2) by wide roads and factories away from the city
 - (3) by cleaning city and scanty use of pesticides
 - (4) All of the above
5. Living things constitute the biotic component of the biosphere and the abiotic component consists of
 - (1) air, water and soil
 - (2) oceans, land and mountains
 - (3) sunlight, oxygen and carbon dioxide
 - (4) All of these
6. Fixation of carbon dioxide in our atmosphere takes place by
 - (1) conversion of carbon dioxide into glucose by green plants in presence of sunlight
 - (2) many marine animals use carbonates dissolved in sea water to make their shells
 - (3) Both (1) and (2)
 - (4) fire fighting operations in forests
7. Average temperature on earth remains fairly steady because
 - (1) the atmosphere slows down the escape of heat into outer space during night.
 - (2) the atmosphere prevents the sudden increase in temperature during day time.
 - (3) air is a bad conductor of heat.
 - (4) All of these
8. The stratospheric ozone depletion leads to
 - (1) global warming
 - (2) increase in the incidence of skin cancers
 - (3) forest fires
 - (4) All the above
9. Biological Oxygen Demand (BOD) is a measure of
 - (1) industrial wastes poured into water bodies.
 - (2) extent to which water is polluted with organic compounds.
 - (3) amount of carbon monoxide inseparably combined with haemoglobin.
 - (4) amount of oxygen needed by green plants during night.
10. Recent reports of acid rain in some industrial cities are due to the effect of atmospheric pollution by
 - (1) excessive release of CO₂ by burning of fuels like wood and charcoal, cutting of forests and increased animal population.
 - (2) excessive release of NO₂ and SO₂ in atmosphere by burning of fossil fuel.
 - (3) excessive release of NH₃ by industrial plants and coal gas.
 - (4) excessive release of CO in atmosphere by incomplete combustion of coke, charcoal and other carbonaceous fuel.
11. Photochemical smog formed in congested metropolitan cities mainly consists of
 - (1) ozone, peroxyacetyl nitrate and NO_x
 - (2) smoke, peroxyacetyl nitrate and SO₂
 - (3) hydrocarbons, SO₂ and CO₂
 - (4) hydrocarbons, ozone and SO_x

12. Besides uneven heating of atmosphere in different regions of the earth, other factors resulting in diverse atmospheric phenomenon are
- rotation of the earth and mountain ranges coming in the paths of the winds.
 - water vapours formed due to excessive heat get into air.
 - air expands and cools as it rises up carrying the water vapours with it.
 - All of these
13. Presence of high level of pollutants in atmosphere during cold weather lead to formation of
- fog
 - acid rains
 - smog
 - All of these
14. All organism require water to stay alive because
- all cellular processes take place in a water medium.
 - biochemical reactions inside the body take place in aqueous medium.
 - substances are transported from one part of the body to other parts in a dissolved form.
 - All of these
15. Sustainability and diversity of life is dependent on
- availability of water alone
 - not only temperature, nature of soil but also the availability of water
 - nature of soil
 - temperature
16. Soil conservation is the process where
- sterile soil is converted to fertile soil
 - soil is aerated
 - soil erosion is allowed
 - soil is protected against loss
17. Nitrogen cycle involves bacteria capable of changing proteins to ammonia called as
- bacteria of decay
 - denitrifying bacteria
 - nitrogen fixing bacteria
 - ammonifying bacteria
18. Phosphorus cycle is
- gaseous cycle
 - perfect cycle
 - imperfect cycle
 - partly gaseous and partly sedimentary
19. Nitrogen content of biosphere remains constant due to
- nitrogen fixation
 - nitrogen cycle
 - industrial pollution
 - absorption of nitrogen
20. Breaking down of rocks at or near the surface of the Earth by various physical, chemical or biological processes results in the formation of _____.
- nutrients
 - soil
 - minerals
 - water
21. Expansion of certain parts of rocks due to heat during the day and contraction at night lead to
- formation of cracks in the rocks
 - breaking of rocks
 - formation of cracks and ultimately the huge rocks breaking into smaller pieces
 - formation of soil directly
22. Water is helpful in formation of soil as
- it enters into the cracks formed due to uneven heating and then freezes inside the rocks.
 - flowing water wears away even hard rocks.
 - fast flowing water crushes big and small rocks into smaller particles while flowing downstream.
 - All of these
23. Besides water _____ also erode rocks down and carry sand from one place to other.
- the sun
 - strong winds
 - living organism
 - plants
24. Conservation is
- protection of natural resources
 - management of natural resources
 - proper use of natural resources
 - All the above
25. Largest amount of fresh water is found in
- lakes and streams
 - underground
 - polar ice and glaciers
 - rivers
26. The major factor in causing global warming is
- increase in oxygen concentration in atmosphere.
 - decrease in carbon dioxide concentration in atmosphere.
 - increase in carbon dioxide concentration in atmosphere.
 - decrease in atmospheric nitrogen.
27. The major source(s) of carbon for living things is/are
- coal, oil, and natural gas
 - plants
 - CO₂ in the atmosphere and oceans
 - methane in the atmosphere
28. Lichens while growing on the surface of rocks release certain substances
- that erodes the rock surface to powder
 - that enters into the cracks
 - that grows into more organisms
 - None of these
29. The type of soil is decided by the average size of particles, but the quality of soil is decided by
- quantity of particles
 - amount of humus
 - microscopic organisms
 - amount of humus and the microscopic organisms found in it
30. Humus is a major factor in deciding soil structure because
- soil becomes more porous
 - allows water and air to penetrate deep underground
 - Both (1) and (2)
 - None of these
31. Soil pollution is
- removal of useful components or addition of harmful ingredients.
 - adversely affecting fertility of soil.
 - killing the diversity of organism that live in it.
 - All of these
32. Adding iron to the ocean might
- cause algal blooms, thus reducing levels of atmospheric carbon dioxide
 - increase the productivity of the oceans, providing more food for people
 - upset the balance within this delicate ecosystem
 - All of these are correct

33. Soil erosion can be prevented by
 - (1) afforestation (2) deforestation
 - (3) overgrazing (4) removal of vegetation
34. Which of the following is not the function of forest ?
 - (1) It is used to make paper.
 - (2) Resin, gum and drugs are obtained.
 - (3) Controls flood.
 - (4) Causes soil erosion.
35. Which of the following bacteria is found in Ganga water ?
 - (1) Coliform bacteria
 - (2) *Streptococcus* bacteria
 - (3) *Staphylococcus* bacteria
 - (4) *Diplococcus* bacteria
36. Pick the most appropriate statement.
 - (1) Soil erosion cannot be prevented by the roots of plants.
 - (2) Bare topsoil provides space for vegetation.
 - (3) Vegetative cover on the ground helps in percolation of water into deeper layers.
 - (4) Large scale deforestation limits biodiversity.
37. Water cycle gets complicated because
 - (1) water dissolves many minerals and nutrients.
 - (2) some of the water that falls as rain seeps into the soil and become part of underground reservoir of fresh water.
 - (3) water is used by terrestrial animals and plants for carrying their life processes.
 - (4) Both (2) and (3)
38. Many molecules essential to life like proteins, nucleic acids and vitamin or biologically essential compounds like alkaloids and urea contain
 - (1) nitrogen (2) hydrogen
 - (3) oxygen (4) water
39. Nitrogen fixing bacteria are usually found in
 - (1) soil
 - (2) atmosphere
 - (3) some species of dicot plants and the root-nodules present in the roots of legumes
 - (4) None of these
40. Which of the following will be released during combustion of fossil fuels ?
 - (1) Carbon dioxide (2) Oxide of nitrogen
 - (3) Carbon monoxide (4) All of these
41. Biodiversity hotspots are
 - (1) oceans (2) glaciers
 - (3) rivers (4) forests
42. Van Mahotsava is meant for
 - (1) afforestation
 - (2) deforestation
 - (3) start of grazing season
 - (4) commercial forestry
43. Kulhs are irrigation canals of
 - (1) Rajasthan (2) Bihar
 - (3) Himachal Pradesh (4) Karnataka
44. Bacteria in the soil converts the various compounds of nitrogen present in the dead bodies of plants and animals back to
 - (1) nitrogen
 - (2) proteins
 - (3) nitrates and Nitrites
 - (4) living organisms
45. Plants utilise carbon dioxide from atmosphere in presence of sunlight to produce glucose during the process of photosynthesis. On the other hand carbon dioxide is released into atmosphere by the living things during
 - (1) industrialization
 - (2) respiration
 - (3) combustion
 - (4) both respiration and combustion
46. The three R's referred to in context to save environment are
 - (1) Reduce, Recycle and Reuse
 - (2) Refuse, Reduce and Reuse
 - (3) Remain, Relent and Repent
 - (4) Reinforce, Repair and Render
47. Recycling of waste materials involve the steps of
 - (1) collecting all the waste material and bury under the soil.
 - (2) segregating the bio-degradable and non-biodegradable material to dispose separately.
 - (3) extracting fresh plastic, paper, glass or metal from waste material.
 - (4) Both (2) and (3)
48. The most appropriate definition of a natural resource is that it is a substance/commodity that is
 - (1) present only on land.
 - (2) a gift of nature which is very useful to mankind.
 - (3) a man-made substance placed in nature.
 - (4) available only in the forest.
49. The important message conveyed by the 'Chipko Movement' is
 - (1) to involve the community in forest conservation efforts.
 - (2) the ignore the community in forest conservation efforts.
 - (3) to cut down forest trees for development activities.
 - (4) government agencies have the unquestionable right to order destruction of trees in forests.
50. Khadins, Bundhis, Ahars and Kattas are ancient structures that are examples for
 - (1) grain storage (2) wood storage
 - (3) water harvesting (4) soil conservation
51. Given below are a few statements related to biodiversity. Pick those that correctly describe the concept of biodiversity.
 - (i) Biodiversity refers to the different species of flora and fauna present in an area.
 - (ii) Biodiversity refers to only the flora of a given area.
 - (iii) Biodiversity is greater in a forest.
 - (iv) Biodiversity refers to the total number of individuals of a particular species living in an area.
 - (1) (i) and (ii) (2) (ii) and (iv)
 - (3) (i) and (iii) (4) (ii) and (iii)
52. We are getting a large number of items for daily consumption in disposable packing. Is it possible to save environment by not throwing them immediately after use?
 - (1) Yes, they can be used to store things in the kitchen
 - (2) Yes, we can use our innovative ideas to utilize them
 - (3) Yes, we can give them to others who are in need of them
 - (4) All of these
53. Ignorance of local knowledge and local needs in forest management practices has led to
 - (1) conversion of vast tracts of forests to mono culture of pine, teak and eucalyptus
 - (2) extinction of wild life and several species
 - (3) Both (1) and (2)
 - (4) None of these

54. Construction of big dams, though useful still draws flak from society
- (1) displacement of large number of peasants and tribes without compensation lead to social problems.
 - (2) expenditure of huge amounts of public money without proportional benefits cause economic problems.
 - (3) deforestation and loss of biodiversity result in environmental problems.
 - (4) All of these
55. Increased fuel efficiency and reduced air pollution can be affected by ensuring
- (1) complete combustion in internal combustion engines
 - (2) avoiding use of machines
 - (3) adhering to emission norms in automobiles but ignoring elsewhere
 - (4) All of these
56. Among the statements given below select the ones that correctly describe the concept of sustainable development.
- (i) Planned growth with minimum damage to the environment.
 - (ii) Growth irrespective of the extent of damage caused to the environment.
 - (iii) Stopping all developmental work to conserve the environment.
 - (iv) Growth that is acceptable to all the stakeholders.
- (1) (i) and (iv)
 - (2) (ii) and (iii)
 - (3) (ii) and (iv)
 - (4) (iii) only
57. In our country, there are attempts to increase the height of several existing dams like Tehri and Almati, dams across Narmada.
- Choose the correct statements among the following that are a consequence of raising the height of dams
- (i) Terrestrial flora and fauna of the area is destroyed completely.
 - (ii) Dislocation of people and domestic animals living in the area.
 - (iii) Valuable agricultural land may be permanently lost.
 - (iv) It will generate permanent employment for people.
- (1) (i) and (ii)
 - (2) (i), (ii) and (iii)
 - (3) (ii) and (iv)
 - (4) (i), (iii) and (iv)
58. It is important to make small check dams across the flooded gullies because they
- (i) hold water for irrigation.
 - (ii) hold water and prevent soil erosion.
 - (iii) recharge ground water.
 - (iv) hold water permanently.
- (1) (i) and (iv)
 - (2) (ii) and (iii)
 - (3) (iii) and (iv)
 - (4) (ii) and (iv)
59. The term "water-pollution" can be defined in several ways. Which of the following statements does not give the correct definition ?
- (1) The addition of undesirable substances to water-bodies.
 - (2) The removal of desirable substances from water-bodies.
 - (3) A change in pressure of the water bodies.
 - (4) A change in temperature of the water bodies.
60. The laws, rules and regulations will be more effective in allowing everyone reap the benefits of development
- (1) if we adjust our requirement individually
 - (2) if we adjust our requirement collectively
 - (3) if we adjust our requirement both individually and collectively
 - (4) even if we do not adjust our requirements
61. Seniors usually ask you to switch off fans and light while going out. Which 'R' is being suggested by them?
- (1) Reduce
 - (b) Repair
 - (3) Render
 - (d) Refuse
62. Management of resources has become necessary so that
- (1) the resources are used with long term perspectives.
 - (2) the resources are distributed equitably between rich and poor.
 - (3) the wastes are disposed in safe and environment-friendly manner.
 - (4) All of these
63. Forests are far away from the cities and we hardly ever visit them, still they are important as
- (1) many resources are available in the forests.
 - (2) bio-diversity in the forests help in maintaining ecological balance.
 - (3) local people use the forests for grazing their animals.
 - (4) those listed above are just a few advantages of forests.
64. Loss of vegetation cover, diversion for high water demanding crops, pollution from industrial effluents and urban wastes have resulted in
- (1) non-sustainability of water availability underground
 - (2) unpredictable rainfall
 - (3) neglect of local irrigation methods
 - (4) frequent floods
65. Large dams are found to be useful as
- (1) they ensure storage of water for irrigation.
 - (2) generation of electricity.
 - (3) development of canal systems to distribute water to far off places.
 - (4) All of these
66. The process of introgen-fixation by bacteria does not take place in the presence of
- (1) molecular form of hydrogen
 - (2) elemental form of oxygen
 - (3) water
 - (4) elemental form of nitrogen
67. Choose the correct sequences
- (1) CO_2 in atmosphere \rightarrow decomposers \rightarrow organic carbon in animals \rightarrow organic carbon in plants.
 - (2) CO_2 in atmosphere \rightarrow organic carbon in plants \rightarrow organic carbon in animals \rightarrow inorganic carbon in soil.
 - (3) Inorganic carbonates in water \rightarrow organic carbon in plants \rightarrow organic carbon in animals \rightarrow scavengers.
 - (4) Organic carbon in animals \rightarrow decomposers \rightarrow CO_2 in atmosphere \rightarrow organic carbon in plants.
68. Ozone-layer is getting depleted because of
- (1) excessive use of automobiles.
 - (2) excessive formation of industrial units.
 - (3) excessive use of man-made compounds containing both fluorine and chlorine.
 - (4) excessive deforestation.
69. What happens when rain falls on soil without vegetational cover ?
- (1) Rain water percolates in soil efficiently.
 - (2) Rain water causes loss of surface soil.
 - (3) Rain water leads to fertility of the soil.
 - (4) Rain water does not cause any change in soil.
70. International and national laws and regulations regarding environment and resources are being formulated for
- (1) sustenance of resources
 - (2) conservation of environment
 - (3) increased awareness about the problems
 - (4) All of these

Exercise

2

Matching Based MCQ

DIRECTIONS (Qs. 1 to 8) : Match Column-I with Column-II and select the correct answer using the codes given below the columns.

- | Column I | Column II |
|--|------------------------------|
| (A) DDT | (p) CO, CO ₂ |
| (B) PAN | (q) Smog |
| (C) Acid rain | (r) Biological magnification |
| (D) Global warming | (s) SO ₂ |
| (1) (A) → (r), (B) → (q), (C) → (s), (D) → (p) | |
| (2) (A) → (q), (B) → (r), (C) → (s), (D) → (p) | |
| (3) (A) → (r), (B) → (q), (C) → (p), (D) → (s) | |
| (4) (A) → (r), (B) → (p), (C) → (q), (D) → (s) | |
- | Column I | Column II |
|--|----------------------|
| (A) Green house gas | (p) CO ₂ |
| (B) Nitrogen fixation | (q) O ₃ |
| (C) Ozone | (r) <i>Rhizobium</i> |
| (D) Carbon cycle | (s) Biogeochemical |
| (1) (A) → (r), (B) → (p), (C) → (q), (D) → (s) | |
| (2) (A) → (p), (B) → (r), (C) → (q), (D) → (s) | |
| (3) (A) → (p), (B) → (r), (C) → (s), (D) → (q) | |
| (4) (A) → (p), (B) → (q), (C) → (r), (D) → (s) | |
- | Column I | Column II |
|--|---------------------|
| (A) Ozone hole discovery | (p) Denitrification |
| (B) Algal bloom | (q) Paedogenesis |
| (C) Humification | (r) 1985 |
| (D) <i>Pseudomonas</i> | (s) Eutrophication |
| (1) (A) → (s), (B) → (r), (C) → (p), (D) → (q) | |
| (2) (A) → (r), (B) → (s), (C) → (p), (D) → (q) | |
| (3) (A) → (r), (B) → (s), (C) → (q), (D) → (p) | |
| (4) (A) → (r), (B) → (q), (C) → (s), (D) → (p) | |
- | Column I | Column II |
|--|-------------------------|
| (A) Inexhaustible resource | (p) Wildlife |
| (B) Man-made source of air pollution | (q) Fossil fuel |
| (C) Renewable resource | (r) Solar radiations |
| (D) Non-renewable resource | (s) Thermal power plant |
| (1) (A) → (s), (B) → (r), (C) → (q), (D) → (p) | |
| (2) (A) → (r), (B) → (s), (C) → (q), (D) → (p) | |
| (3) (A) → (r), (B) → (p), (C) → (s), (D) → (q) | |
| (4) (A) → (r), (B) → (s), (C) → (p), (D) → (q) | |
- | Column I
(Canal irrigation system) | Column II
(State) |
|--|----------------------|
| (A) Kulhs | (p) Karnataka |
| (B) Kattas | (q) Maharashtra |
| (C) Tals | (r) Rajasthan |
| (D) Kadin | (s) Himachal Pradesh |
| (1) (A) → (s), (B) → (p), (C) → (q), (D) → (r) | |
| (2) (A) → (p), (B) → (s), (C) → (q), (D) → (r) | |
| (3) (A) → (s), (B) → (p), (C) → (r), (D) → (q) | |
| (4) (A) → (s), (B) → (q), (C) → (p), (D) → (r) | |

- | Column I
(Lake) | Column II
(State) |
|--|-----------------------|
| (A) Wullar | (p) Orissa |
| (B) Chilka | (q) Rajasthan |
| (C) Sambhar | (r) Jammu and Kashmir |
| (D) Harike | (s) Punjab |
| (1) (A) → (p), (B) → (r), (C) → (q), (D) → (s) | |
| (2) (A) → (r), (B) → (p), (C) → (q), (D) → (s) | |
| (3) (A) → (p), (B) → (r), (C) → (s), (D) → (q) | |
| (4) (A) → (r), (B) → (q), (C) → (p), (D) → (s) | |
- | Column I | Column II |
|--|---------------------------|
| (A) Desertification | (p) Amrita Devi Bishnoi |
| (B) Protection of khejri trees | (q) Incomplete combustion |
| (C) Plastic | (r) Deforestation |
| (D) Carbon monoxide | (s) Recycle |
| (1) (A) → (p), (B) → (r), (C) → (q), (D) → (s) | |
| (2) (A) → (r), (B) → (p), (C) → (q), (D) → (s) | |
| (3) (A) → (r), (B) → (p), (C) → (s), (D) → (q) | |
| (4) (A) → (r), (B) → (s), (C) → (p), (D) → (q) | |
- | Column I | Column II |
|--|---------------------|
| (A) Ganga Sagar | (p) Chipko Movement |
| (B) Biodiversity hot spots | (q) A.K. Banerjee |
| (C) Protection of Sal forest | (r) Bay of Bengal |
| (D) Hug the trees movement | (s) Forests |
| (1) (A) → (r), (B) → (s), (C) → (q), (D) → (p) | |
| (2) (A) → (s), (B) → (r), (C) → (q), (D) → (p) | |
| (3) (A) → (s), (B) → (r), (C) → (p), (D) → (q) | |
| (4) (A) → (s), (B) → (p), (C) → (r), (D) → (q) | |

Statement Based MCQ

- Consider the following statements :
 - Air forms a protective blanket around the earth and does not allow all the solar radiations to reach the earth.
 - Green house gases are the ones which allow the heat emitted by earth to pass out.
 - Carbon dioxide, methane, ozone, nitrous oxide are green house gases.
 Which of these statement(s) is/are correct?
 - (a) only
 - (b) only
 - (c) only
 - All of these
- Consider the following statements :
 - Topsoil is the uppermost fertile layer of soil that is rich in mineral nutrients.
 - Soil profile shows four distinct layers, called horizons.
 - Sun, water, wind and living organisms are main factors that influence the formation of soil from the rocks.
 Which of these statement(s) is/are correct?
 - (a) only
 - (b) and (c)
 - (c) and (a)
 - None of these

Passage Based MCQ

11. Consider the following statements :

- (a) Pesticides and fertilizers are harmful to soil as they kill the microorganisms involved in recycling of nutrients.
- (b) Eutrophication leads to depletion of dissolved oxygen in water bodies resulting in loss of all aquatic life.

Which of these statement(s) is/are correct?

- (1) (a) only (2) (b) only
- (3) Both (a) and (b) (4) Neither (a) nor (b)

12. Consider the following statements :

- (a) The amount of rainfall directly influences the abundance and diversity of life forms.
- (b) Global warming may lead to melting of ice present on the poles resulting in rise in the sea level.

Which of these statement(s) is/are correct?

- (1) (a) only (2) (b) only
- (3) Both (a) and (b) (4) Neither (a) nor (b)

13. Consider the following statements :

- (a) Exhaustible resources are present in unlimited quantity in nature and are not likely to be finished by human use.
- (b) Smog is the alternative name of exhaust gases that come out of automobiles due to burning of petrol and diesel.

Which of these statement(s) is/are correct?

- (1) (a) only (2) (b) only
- (3) Both (a) and (b) (4) Neither (a) nor (b)

14. Consider the following statements :

- (a) An important protective function of forests is reduction of atmospheric pollution.
- (b) The wildlife resources are renewable resources.
- (c) A successful forest conservation strategy should involve protection of only consumers.

Which of these statement(s) is/are correct?

- (1) (a) and (b) (2) (b) only
- (3) (c) only (4) None of these

15. Consider the following statements :

- (a) Biodiversity means variations present in the species of the flora of an area.
- (b) The three R's referred to conserve natural resources are —recycle, regenerate and reuse.

Which of these statement(s) is/are correct?

- (1) (a) only (2) (b) only
- (3) Both (a) and (b) (4) Neither (a) nor (b)

16. Consider the following statements :

- (a) Improper use of land converts fertile land into unusable land.
- (b) Increase in human population puts more pressure on land.
- (c) Use of sewage, domestic waste, farm yard manure, etc. will decrease the fertility of the degraded lands.

Which of these statement(s) is/are correct?

- (1) (a) and (b) (2) (b) only
- (3) (c) only (4) All of these

DIRECTIONS (Qs. 17 to 22) : Read the passage(s) given below and answer the questions that follow.

PASSAGE-1

Coal and petroleum have organic origin, being decomposed plant and animal matter buried deep inside the earth. Coal is mined like any other mineral.

The chief coal producing countries in the world are China, U.S.A., U.S.S.R., UK., Germany, Poland, Australia and India. In India, coal is mainly mined in Bihar, West Bengal, Madhya Pradesh and to some extent in Andhra Pradesh.

Petroleum occurs deep inside the Earth at depth ranging from a few hundred to few thousands metres. The name petroleum has been given to the crude oil because it occurs under the Earth's crust entrapped in rocks (petra = rocks; oleum = oil). Crude oil (petroleum) is pumped out of Earth by drilling oil reserve, oil wells. Petroleum is obtained by drilling a hole through the crust till it reaches the oil gushes out of its own due to high pressure of the gas over its surface. However, when the pressure falls, it is pumped out with the help of pumps. Large quantity of natural gas is generally associated with petroleum. Petroleum is often referred to as liquid gold, due to its importance in transportation, commerce and industry. Prosperity of any country depends upon its petroleum reserves.

17. Petroleum is

- (1) inexhaustible resource
- (2) exhaustible resource
- (3) non-renewable resource
- (4) Both (2) and (3)

18. Which one of the following is a non-replenishable resource?

- (1) Minerals (2) Forests
- (3) Mineral fuel (4) Hydroelectricity

19. Which one of the following is not a fossil fuel ?

- (1) Uranium (2) Coal
- (3) Natural gas (4) Petroleum

PASSAGE-2

When we hear the term "wildlife", it generally refers to large ferocious animals living in jungles and forests such as tigers, lions, elephants, wolves, etc. But in fact, "wildlife" implies to any living organism in its natural habitat which includes all plants, animals and micro-organisms except cultivated plants and domesticated animals. From ecological view-point, wildlife is a renewable resource.

The conservation of wildlife is required for the following benefits: The wildlife helps us in maintaining the 'balance of nature'. Once this equilibrium is disturbed, it leads to many problems. The destruction of carnivores or insectivores often leads to the increase of herbivores which in turn affects the forest vegetation or crops.

The wildlife can be used commercially to earn more money. It can increase our earning of foreign exchange, by tourism.

The preservation of wildlife helps many naturalists and behaviour biologists to study morphology, anatomy, physiology, ecology, behaviour biology of the wild animals under their natural surroundings.

The wildlife provides best means of sports and recreation.

The wildlife of India is our cultural asset and has deep-rooted effect on Indian art, sculpture, literature and religion.

20. A successful forest conservation strategy should involve
 - (1) protection of animals at the highest trophic level.
 - (2) protection of only consumers.
 - (3) protection of only herbivores.
 - (4) comprehensive programme to protect all the physical and biological components.
21. Wild life is destroyed mostly when
 - (1) there is lack of proper care.
 - (2) there is mass scale hunting for foreign trade.
 - (3) its natural habitat is destroyed.
 - (4) natural calamity occurs.
22. Which of the following is not done in a wild life sanctuary?
 - (1) Fauna conservation
 - (2) Flora conservation
 - (3) Soil and Fauna utilisation
 - (4) Hunting prohibition

Assertion Reason Based MCQ

DIRECTIONS (Qs. 23 to 32) : Following questions consist of two statements, one labelled as the 'Assertion' and the other as 'Reason'. You are to examine these two statements carefully and select the answer to these items using the code given below.

Code :

- (1) Both A and R are individually true and R is the correct explanation of A:
- (2) Both A and R are individually true but R is not the correct explanation of A.
- (3) A is true but R is false
- (4) A is false but R is true.

23. **Assertion :** Hydrologic cycle is a perfect one.
Reason : The cycling of water is a fast process.
24. **Assertion :** Presently, the global atmosphere is warming up.
Reason : The depletion of stratospheric ozone layer has resulted in increase in ultraviolet radiations reaching the earth.
25. **Assertion :** All resources are not exhaustible.
Reason : Renewable resources can become non-renewable.
26. **Assertion :** The upper layer to soil is the main site of decomposition.
Reason : It is the fertile layer of soil.
27. **Assertion :** Acid rain disrupts ecological balance.
Reason : Acid rain affects flora and fauna.
28. **Assertion :** Conservation of biological diversity under natural conditions is *in situ* conservation.
Reason : Increase of Manipur deer from 17 animals to 150 in Calcutta and Delhi zones is one of an example of these.
29. **Assertion :** Every biological system resist a change and wants to remain in state of equilibrium.
Reason : Climax communities of an ecosystem are produced after several changes it has gone through succession.
30. **Assertion :** Regions in Gangetic plains are very fertile.
Reason : It has mainly alluvial soils.
31. **Assertion :** The flora of tundra consists of lichens, mosses and conifers.
Reason : Temperature and water supply to plants are the limiting factors.
32. **Assertion :** An estimation of BOD gives an indication of water pollution.
Reason : It is measure of O₂ requirement of bacteria living in that media.

Correct Definition Based MCQ

33. Ozone hole is
 - (1) thinning of ozone in the stratosphere where it is normally present in high concentration as ozone layer.
 - (2) thinning of ozone in the troposphere where it is normally present in high concentration as ozone layer.
 - (3) thinning of ozone in the thermosphere where it is normally present in high concentration as ozone layer.
 - (4) thinning of ozone in the mesosphere where it is normally present in high concentration as ozone layer.
34. Weathering is
 - (1) the process of breaking down of rocks present on the surface of earth into fine particles.
 - (2) the process of breaking down of soil into particles with the help of living organisms.
 - (3) the formation of rocks with the help of living organisms.
 - (4) the formation of rocks by physical and chemical methods.
35. Biosphere is
 - (1) the blanket of air that covers the whole earth.
 - (2) the outer solid crust of earth.
 - (3) the part of earth which supports life.
 - (4) the water component of earth.
36. Hotspot is
 - (1) an area rich in biodiversity and endemism which is being threatened by human activity as well as other forces.
 - (2) a large uncultivated self-maintained wooded tract dominated by trees forming a nearly closed canopy.
 - (3) a protected area maintained by government where wild life is kept without threat of any type of exploitation.
 - (4) a developing forest cover in the area which has been damaged or cleared during exploitation.

Feature Based MCQ

37. On the basis of following features identify the correct option.
 - (I) They are barriers constructed across streams to hold back water, raise its level and form reservoirs.
 - (II) They are used for generation of electricity.
 - (1) Kulhs (2) Dams
 - (3) Kattas (4) Tanks
38. On the basis of following features identify the correct option.
 - (I) It is growing of forests on unprotected barren lands.
 - (II) Van Mahotsava is a tree plantation movement carried out twice a year by both government and voluntary agencies.
 - (1) Reforestation (2) Afforestation
 - (3) Deforestation (4) Agroforestry
39. On the basis of following features identify the correct option.
 - (I) It is a dark coloured liquid fuel that is taken out from various depths of earth both on land and sea shore.
 - (II) With the help of fractional distillation, a number of products are obtained – Kerosene, fuel oil, lubricating oil, paraffin wax etc.
 - (1) Fossil fuels (2) Coal
 - (3) Petroleum (4) LPG
40. On the basis of following features identify the correct option.
 - (I) It is dark brown or greyish smoky mist that occurs in cold weather.
 - (II) It is a visible indication of air pollution.
 - (III) It reduces visibility as well as highly suffocating and harmful to human beings, animals and plants.
 - (1) Fog (2) Mist
 - (3) Smoke (4) Smog

Hints & SOLUTIONS

Exercise 1

1. (3) 2. (2) 3. (4) 4. (4)
5. (1) Living things constitute the biotic component of the biosphere and the abiotic component consists of air, water and soil.
6. (3) Fixation of carbon dioxide in our atmosphere takes place by conversion of carbon dioxide into glucose by green plants in presence of sunlight and also by use of carbonates dissolved in sea water by some marine animals to make their shells.
7. (4) Average temperature on earth remains fairly steady because air is a bad conductor of heat. The atmosphere slows down the escape of heat into outer space during night and prevents the sudden increase in temperature during day time.
8. (4) 9. (2) 10. (2) 11. (2)
12. (4) Besides uneven heating of atmosphere in different regions of the earth, other factors resulting in diverse atmospheric phenomenon are: Rotation of the earth and mountain ranges coming in the paths of the winds; Water vapours formed due to excessive heat get into air; and Air expands and cools as it rises up carrying the water vapours with it.
13. (3) Presence of high level of pollutants in atmosphere during cold weather leads to formation of smog.
14. (4) All organism require water to stay alive because all cellular processes and biochemical reactions take place in a water medium. Transportation of substances from one part of the body to other parts is in a dissolved form.
15. (2) Sustainability and diversity of life is dependant on not only temperature, nature of soil but also the availability of water.
16. (4) 17. (4) 18. (3) 19. (2)
20. (2) Breaking down of rocks at or near the surface of the Earth by various physical, chemical or biological processes results in the formation of soil.
21. (3) Expansion of certain parts of rocks due to heat during the day and contraction at night lead to formation of cracks and ultimately the huge rocks breaking into smaller pieces.
22. (4) Water is helpful in formation of soil as it enters into the cracks formed due to uneven heating and then freezes inside the rocks. Flowing water wears away even hard rocks and fast flowing water crushes big and small rocks into smaller particles while flowing downstream.
23. (2) Besides water, strong winds also erode rocks down and carry sand from one place to other.
24. (4) 25. (3) 26. (3) 27. (3)
28. (1) Lichens while growing on the surface of rocks release certain substances that erode the rock surface to powder.
29. (4) The type of soil is decided by the average size of particles, but the quality of soil is decided by the amount of humus and microscopic organisms found in it.
30. (3) Humus is a major factor in deciding soil structure because soil becomes more porous and allows water and air to penetrate deep underground.
31. (4) Soil pollution is caused due to removal of useful components or addition of harmful ingredients adversely affecting fertility of soil. Killing the diversity of organism that live in it also affects the fertility of land.
32. (4) 33. (1) 34. (4) 35. (1)
36. (4) Large scale deforestation limits biodiversity.
37. (4) Water cycle gets complicated because some of the water that falls as rain seeps into the soil and become part of underground reservoir of fresh water and also water is used by terrestrial animals and plants for carrying their life processes.
38. (1) Many molecules essential to life like proteins, nucleic acids and vitamin or biologically essential compounds like alkaloids and urea contain nitrogen.
39. (3) Nitrogen fixing bacteria are usually found in some species of dicot plants and the root-nodules present in the roots of legumes.
40. (4) 41. (4) 42. (1) 43. (3)
44. (3) Bacteria in the soil converts the various compounds of nitrogen present in the dead bodies of plants and animals back to nitrates and nitrites.
45. (4) Plants utilise carbon dioxide from atmosphere in presence of sunlight to produce glucose during the process of photosynthesis. On the other hand carbon dioxide is released into atmosphere by the living things during respiration and combustion.
46. (1) The three R's referred to in context to save environment are: Reduce, Recycle and Reuse. The resources can be conserved by implementing these three R's.
47. (4) Recycling of waste materials includes extraction of all possible items that can be reused and also to dispose the biodegradable waste in a meaningful manner.
48. (2) 49. (1) 50. (3) 51. (3)
52. (4) We are humans capable of thinking and can always find purposeful ways of utilizing waste materials irrespective of their being biodegradable or non biodegradable.
53. (3) Ignorance of local knowledge and local needs in forest management practices has led to growth of similar plants which in turn has affected the habitat.
54. (4) Construction of big dams require huge water reservoirs to store water necessitating displacement of local habitat. Poor selection of site can put extra pressure on the exchequer.
55. (1) Complete combustion in internal combustion engines will not increase the fuel efficiency but also reduce formation of carbon monoxide.
56. (1) 57. (2) 58. (2) 59. (3)
60. (3) The laws, rules and regulations will be more effective only if we all comply to their provisions.
61. (1) One can reduce consumption of energy resources by switching off fans and light while going out.
62. (4) Management of resources has become necessary so that the resources available to all in the present or future generations.
63. (4)
64. (1) Loss of vegetation cover, diversion for high water demanding crops, pollution from industrial effluents and urban wastes is leading to contamination and depletion of water table.
65. (4) Large dams are built to generate electricity by converting the potential energy of stored water into kinetic energy to rotate the turbines of generator. The water is canalised through canals.
66. (2) 67. (2) 68. (3) 69. (2)
70. (4) International and national laws and regulations regarding environment and resources are being formulated for sustenance of resources, conservation of environment and increased awareness about the problems so that the future generations are able to fulfil their energy requirements.

Exercise 2

1. (1) 2. (2) 3. (3) 4. (4)
5. (1) 6. (2) 7. (3) 8. (1)
9. (3) Air forms a protective blanket around the earth and allows all the solar radiations to reach the earth surface. Green houses gases trap the heat radiations emitted by earth and maintain the earth's temperature.
10. (2) Mostly living organisms and humus are restricted to upper portion of soil. It is called topsoil. Roots of plants are generally restricted to topsoil due to its porosity or aeration.
11. (3) 12. (3)
13. (4) Exhaustible resources are natural resources with limited availability that are likely to get exhausted by continued indiscriminate use. Smog is dark brown or greyish smoky mist that occurs in cold weather. It is a visible indication of air pollution.
14. (1) Forest conservation strategy should involve protection of all natural resources like all forest products and all living organisms living in forest.
15. (4) Biodiversity is the occurrence of diverse types of organisms and their variants adapted to different environment. The three R's referred to conserve natural resources are – Reduce, Recycle and Reuse.
16. (1) Use of sewage, domestic waste, farmyard manure, etc. increase the fertility of the degraded lands because they add essential nutrients in the soil for the growth of plants.
17. (4) Non-renewable resources are those resources which are likely to get exhausted with continued use because of lack of regeneration, *e.g.*, fossil fuels.
18. (3)
19. (1) Uranium is an element obtained from earth's crust.
20. (4)
21. (3) Wildlife for any living organisms is their natural habitat which includes all plants, animals and micro-organisms except cultivated plants and domesticated animals.
22. (3) Sanctuaries are tracts of land where wild animals are not hunted, neither their habitat disturbed.
23. (2) Hydrological cycle is the circulation of water between various components of biosphere especially evaporation of water from sea, falling on land and flowing back into sea by rivers. The store house or pool of water is sea where 97.5% of water occurs.
24. (2) Raising the temperature of surface of earth and its immediate atmosphere due to green house gases is called global warming.
25. (2) Inexhaustible resources are natural resources which occur in such abundance that they are not likely to get exhausted by continued use, *e.g.* air, water and solar energy.
26. (2) 27. (1) 28. (3) 29. (2)
30. (1) 31. (1) 32. (1) 33. (1)
34. (1) 35. (3) 36. (1) 37. (2)
38. (2) 39. (3) 40. (4)