All India Civil Services Coaching Centre

(Under the aegis of Government of Tamil Nadu)

NCERT Environment

Answer Key Explanation

Maximum Questions: 100 **Maximum Marks: 200**

1. **Correct Answer: (d)**
   Components of Ecosystem
   Green plants form the biotic component of Ecosystem

2. **Correct Answer: (b)**
   Homeostasis
   - Ecosystems are capable of maintaining their state of equilibrium. They can regulate their own species structure and functional processes. This capacity of ecosystem of self- regulation is known as homeostasis.
   - In ecology, the term homeostasis applies to the tendency for a biological system to resist changes.
   - Example:
   - In a pond ecosystem, if the population of zooplankton increases, they consume a large number of the phytoplankton and as a result, food would become scarce for zooplankton.
   - When the number of zooplanktons is reduced because of starvation, the phytoplankton population start increasing.
   - After some time, the population size of zooplankton also increases, and this process continues at all the trophic levels of the food chain.
   - Note that in a homeostatic system, negative feedback mechanism induced by the limiting resource (here its scarcity of food) is responsible for maintaining stability in an ecosystem.
   - However, the homeostatic capacity of ecosystems is not unlimited as well as not everything in an ecosystem is always well regulated.

3. **Correct Answer: (d)**
   Ecotone
   - An ecotone is a transition area between two biomes.
   - It is where two communities meet and integrate.
   - It may be narrow or wide, and it may be local or regional.
   - Pond is not an example of Ecotone.

4. **Correct Answer: (c)**
   Ecotone
   - Ecotone is a zone of junction between two or more diverse ecosystems.
   - Ecotone is the zone where two communities meet and integrate.
   - For e.g. the mangrove forests represent an ecotone between marine and terrestrial ecosystem.
   - Other examples are grassland (between forest and desert), estuary (between fresh water and salt water) and riverbank or marshland (between dry and wet).

   Characteristics of Ecotone
   - It may be very narrow or quite wide.
   - It has the conditions intermediate to the adjacent ecosystems. Hence it is a zone of tension.
   - It is linear as it shows progressive increase in species composition of one in coming community and a simultaneous decrease in

species of the other out going adjoining community.

- A well-developed ecotones contain some organisms which are entirely different from that of the adjoining communities.

Edge effect

- Sometimes the number of species and the population density of some of the species is much greater in this zone than either community. This is called edge effect.
- The organisms which occur primarily or most abundantly in this zone are known as edge species.
- In the terrestrial ecosystems edge effect is especially applicable to birds.
- For example the density of birds is greater in the mixed habitat of the ecotone between the forest and the desert.

5. Correct Answer: (c)

Niche

- Niche refers to the unique functional role and position of a species in its habitat or ecosystem.
- The functional characteristics of a species in its habitat is referred to as "niche" in that common habitat.
- A niche is unique for a species, which means no two species have exact identical niches.
- Niche plays an important role in conservation of organisms.
- If we have to conserve species in its native habitat we should have knowledge about the niche requirements of the species and should ensure that all requirements of its niche are fulfilled.

6. Correct Answer: (d)

Tropical rain forest

- Multiple storey of broad-leafed evergreen tree species are in abundance in Tropical rain forest.
- Tropical areas in the equatorial regions, which is abound with life. Temperature and rainfall are high.
- Tropical rainforest covers about 7% of the earths surface & 40% of the worlds plant and animal species.
- Multiple storey of broad- leafed evergreen tree species is in abundance.
- Most animals and epiphytic plants are concentrated in the canopy or treetop zones.

7. Correct Answer: (b)

Name of Biome	Region
A. Tropical rain forest	3. Temperature and rainfall high
B. Desert	4. Sporadic rainfall with low humidity
C. Tundra	1. Devoid of trees except stunted shrubs
D. Grassland	2. Temperate conditions with low rainfall

Types of Biomes

	Name of Biome	Region Flora and Fauna
1	Tundra	Northern and Southern most region of world adjoining the ice-bound poles Devoid of trees except stunted shrubs in the southern part of tundra biome, ground flora includes lichen, mosses, and sedges. The typical animals are reindeer, arctic fox, polar bear, snowy owl, lemming, arctic hare, ptarmigan. Reptiles and amphibians are almost absent.
2	Taiga	Northern Europe, Asia, and North America. Moderate temperature than tundra. Also known as boreal forest. The dominating vegetation is coniferous evergreen mostly spruce, with some pine and firs.The fauna consists of birds,

		hawks, fur-bearing carnivores, little mink, elks, puma, Siberian tiger, wolverine, wolves, etc.
3	Temperate	Deciduous Forest Extends over Central and Southern Europe, Eastern North America, Western China, Japan, New Zealand etc. Moderate average temperature and abundant rainfall. The flora includes trees like beech, oak, maple and cherry.Most animals are the familiar vertebrates and invertebrates. These are generally the most productive agricultural areas of the earth
4	Tropical rain forest	Tropical areas in the equatorial regions, which is abound with life. Temperature and rainfall high. Tropical rainforest covers about 7% of the earths surface & 40% of the worlds plant and animal species. Multiple storey of broad-leafed evergreen tree species is in abundance. Most animals and epiphytic plants are concentrated in the canopy or treetop zones.
5	Savannah Tropical region	Savannah is most extensive in Africa. Grasses with scattered trees and fire-resisting thorny shrubs.The fauna includes a great diversity of grazers and browsers such as antelopes, buffaloes, zebras, elephants, and rhinoceros; the carnivores include lion, cheetah, hyena; and mongoose, and many rodents.
6	Grassland	North America, Ukraine, etc. Temperate conditions with low rainfall. Grasses dominate the vegetation. The fauna includes large herbivores like bison, antelope, cattle, rodents, prairie
		dogs, wolves, and a rich and diverse array of ground- nesting bird.
7	Desert	Continental interiors with very low and sporadic rainfall with low humidity. The days are very hot but nights are cold. The flora is drought resistance such as cactus, euphorbias, sagebrush. Fauna: Reptiles, Small Mammals and birds.

8. Correct Answer: (a)

Aquatic Ecosystem

- Aquatic systems are not called biomes; however they are divided into distinct life zones, with regions of relatively distinct plant and animal life.
- The major differences between the various aquatic zones are due to salinity, levels of dissolved nutrients, water temperature, depth of sunlight penetration.

Types of Aquatic ecosystems

- Freshwater ecosystems, such as rivers, Lakes and ponds
- Marine ecosystems, such as oceans, estuary and mangroves

Classification of Aquatic ecosystems:

Aquatic ecosystems are classified on the basis of salinity into the following types:

- Freshwater ecosystems: water on land which is continuously cycling and has low salt content (always less than 5 ppt) is known as fresh water.

There are two types of freshwater ecosystems:

- Static or still water (Lentic) ecosystems, e.g. pond, lake, bogs and swamps.
- Running water (Lotic) ecosystems, e.g. springs, mountain brooks, streams and rivers.

- Marine ecosystems: The water bodies containing salt concentration equal to or above that of seawater (i.e., 35 ppt or above).
- E.g. shallow seas and open ocean. Brackish water ecosystems: These water bodies have salt content in between 5 to 35 ppt. e.g. estuaries, salt marshes, mangrove swamps and forests.

9. Correct Answer: (a)

Biosphere

- Biosphere is a part of the earth where life can exist.
- Biosphere represents a highly integrated and interacting zone comprising of atmosphere (air), hydrosphere (water) and lithosphere (land).
- It is a narrow layer around the surface of the earth. If we visualise the earth to be the size of an apple the biosphere would be as thick as its skin.

Characteristics:

- Life in the biosphere is abundant between 200 metres (660 feet) below the surface of the ocean and about 6,000 metres (20,000 feet) above sea level.
- Biosphere is absent at extremes of the North and South poles, the highest mountains and the deepest oceans, since existing hostile conditions there do not support life.
- Occasionally spores of fungi and bacteria do occur at great height beyond 8,000 metres, but they are not metabolically active, and hence represent only dormant life.
- The energy required for the life within the biosphere comes from the sun. The nutrients necessary for living organisms come from air, water and soil.
- The same chemicals are recycled over and over again for life to continue.
- Living organisms are not uniformly distributed throughout the biosphere.
- Only a few organisms live in the polar regions, while the tropical rain forests have an exceedingly rich diversity of plants and animals (50% of Global Biodiversity).

10. Correct Answer: (d)

Trophic levels

- A trophic level is the representation of energy flow in an ecosystem.
- Producers belong to the first trophic level, herbivores to the second and carnivores to the third trophic level.
- Organisms at each trophic level depend on those at the lower trophic level for their energy demands.

Standing crop

- Each trophic level has a certain mass of living material at a particular time called the standing crop.
- The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area.
- The biomass of a species is expressed in terms of fresh or dry weight.

11. Correct Answer: (b)

Food Chain

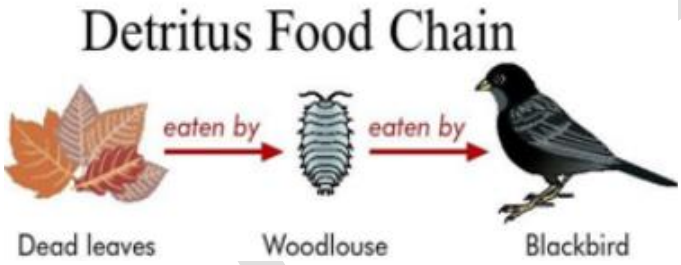
- Transfer of food energy from green plants (producers) through a series of organisms with repeated eating and being eaten link is called a food chain.
- E.g. Grasses Grasshopper Frog Snake Hawk/ Eagle.
- Each step in the food chain is called the trophic level.
- A food chain starts with producers and ends with top carnivores.
- The trophic level of an organism is the position it occupies in a food chain.
- It illustrates the order in which a chain of organisms feeds upon each other.

Types of Food Chains

Grazing Food Chain

- The consumers who start the food chain, utilising the plant or plant part as their food, constitute the grazing food chain.
- For example, in a terrestrial ecosystem, the grass is eaten by a caterpillar, which is eaten by lizard and lizard is eaten by a snake.
- In the Aquatic ecosystem, phytoplankton (primary producers) are eaten by zooplanktons which are eaten by fishes and fishes are eaten by pelicans (water birds).

Detritus Food Chain



- This type of food chain starts from the organic matter of dead and decaying animals and plant bodies from the grazing food chain.
- Dead organic matter or detritus feeding organisms are called detrivores or decomposers.
- The detrivores are eaten by predators.

12. Correct Answer: (d)

- Trophic levels associated with a food chain The trophic level of an organism is the position it occupies in a food chain.
- At the base of the food chain lie the primary producers (and not secondary consumers).
- The primary producers are autotrophs and are most often photosynthetic organisms such as plants, algae, or cyanobacteria.
- The organisms that eat the primary producers are called primary consumers.
- Primary consumers are usually herbivores, plant- eaters, though they may be algae eaters or bacteria eaters.
- The organisms that eat the primary consumers are called secondary consumers. Secondary consumers are generally meat-eaters— carnivores.
- The organisms that eat secondary consumers are called tertiary consumers.
- These are carnivore-eating carnivores, like eagles or big fish.
- Impact of the removal of an intermediate level of the food chain in a food web, If we remove any one level from the food web, all the other levels are automatically affected.
- For example, if we remove the consumers, producers will have no predator and hence will grow unchecked, while any higher-level consumer dependent upon these consumers will die out.

EXAMPLE: Grassland ecosystem

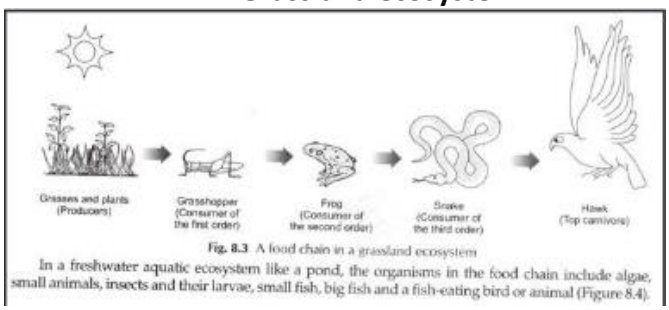


Fig. 8.3 A food chain in a grassland ecosystem

In a freshwater aquatic ecosystem like a pond, the organisms in the food chain include algae, small animals, insects and their larvae, small fish, big fish and a fish-eating bird or animal (Figure 8.4).

A food chain in a grassland ecosystem may consist of grasses and other plants, grasshoppers, frogs, snakes, and hawks.

13. Correct Answer: (b)

Ecological Pyramids

- An ecological pyramid is a graphical representation of the relationship between different organisms in an ecosystem.
- An ecological pyramid is a graphical representation of a food chain (and not food web).
- In fact, the major limitation of the ecological pyramid is that it does not take into account the food webs.
- Each bar that makes up the pyramid represents a different trophic level; and their order, which is based on who eats whom, represents the flow of energy.
- Energy moves up the pyramid, with the primary producers (or autotrophs) such as plants forming the base of the pyramid.
- They are followed by primary consumers, which feed on plants. They, in turn, are followed by secondary consumers, which feed on the primary consumers, and so on.
- The width of each bar represents the total number of individuals at the trophic level.

The ecological pyramids are of three categories:

1. Pyramid of numbers

- A pyramid of numbers is a graphical representation that shows the number of organisms at each trophic level. Depending upon the size, the pyramid of numbers may be upright or inverted.

2. Pyramid of biomass

- A pyramid of biomass is a graphical representation of biomass present in a unit area of various trophic levels. It can be both: upright or inverted.

3. Pyramid of energy or productivity

- An energy pyramid is useful in quantifying the transfer of energy from one organism to another along a food chain. Pyramid of energy is always upright, can never be inverted.

14. Correct Answer: (a)

Nutrient Cycling or Biogeochemical cycle

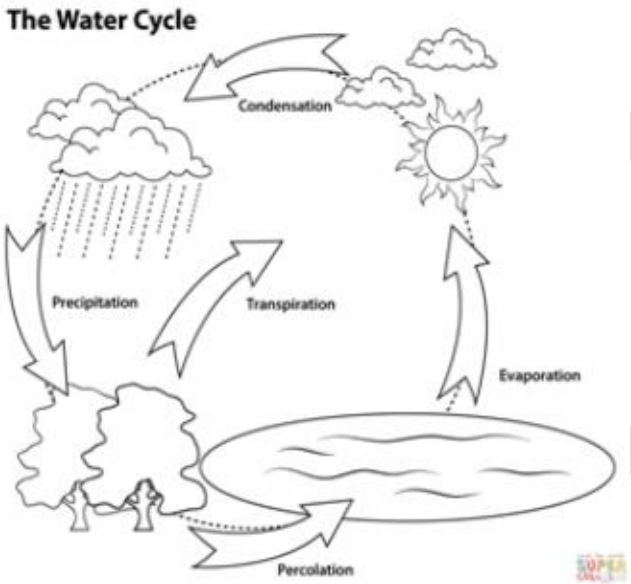
- Nutrient cycling is an essential process in an ecosystem.
- The nutrient cycle describes the usage of the nutrients in the environment, their movement and the processes of their recycling.
- Important nutrients like carbon, oxygen, hydrogen, phosphorus, and nitrogen are required to be recycled for the existence of organisms.
- Nutrients cycling involve not only living organisms but non-living components as well. They also involve biological, geological, and chemical processes.
- Nutrient circuits are also known as biogeochemical cycles.
- Based on the nature of the reservoir Biogeochemical cycles can be classified into two types:
- Gaseous and (e.g., nitrogen, carbon cycle) Sedimentary. (e.g., sulphur and phosphorus cycle)
- Environmental factors, e.g., soil, moisture, pH, temperature, etc., regulate the rate of release of nutrients into the atmosphere.

15. Correct Answer: (b)

Hydrogen Cycle

- Hydrogen or water cycling is extremely important to ecosystem dynamics as it has a major influence on climate and, thus, on the environments of ecosystems.
- There are various processes that occur during the cycling of water, which include the following:
- Evaporation / sublimation condensation / precipitation subsurface water flow surface runoff / snowmelt streamflow

- The water cycle is driven by the sun's energy as it warms the oceans and other surface waters.
- This leads to the evaporation (water to water vapor) of liquid surface water and the sublimation (ice to water vapor) of frozen water, which deposits large amounts of water vapor into the atmosphere.
- Over time, this water vapor condenses into clouds as a liquid or frozen droplets, which is eventually followed by precipitation (rain or snow), returning water to the earth's surface.
- The rain eventually percolates into the ground, where it may evaporate again (if it is near the surface), flow beneath the surface, or be stored for long periods.



16. Correct Answer: (a)

Adaptation

- The presence of specific features or certain habits, which enable a plant or an animal to live in its surroundings, is called adaptation.

Hibernation

- Hibernation is a state of inactivity and metabolic depression in endotherms (an animal that is dependent on or capable of the internal generation of heat).
- Hibernation refers to a season of heterothermy that is characterized by low body temperature, slow breathing and heart rate, and low metabolic rate.
- Example: Bears going into hibernation during winter is an example of escape in time.

Aestivation

- Some snails and fish go into aestivation to avoid summer-related problems-heat and desiccation.

Difference between Aestivation and Hibernation

Properties	Aestivation	Hibernation
Pattern	Summer sleep	Winter sleep
Duration	Shorter	Longer
Resting place	Moist, shady or cool	Warm
Species	Cold-blooded amphibians	Cold- blooded as well as warm-blooded reptiles and amphibians
Example	Snails, frogs, lizards, earthworms, crocodiles, etc.	Insects, mouse, birds, bats, mammals, etc

17. Correct Answer: (c)

Edge Species

- The species which are found abundantly in ecotone boundary are known as edge species.
- An ecotone is a zone of junction or a transition area between two biomes (diverse ecosystems).
- It is the zone where two communities meet and integrate.

18. Correct Answer: (d)

Indicator Species

- An indicator species is an organism whose presence, absence or abundance reflects a specific environmental condition.
- It can signal a change in the biological condition of a particular ecosystem.
- It may be used as a proxy to diagnose the health of an ecosystem.

19. Correct Answer: (b)

Critical Link Species

- They are species that play an important role in supporting network species as pollinators, dispersal agents, absorption or circulation of nutrients, etc.
- For example, Mycorrhizal fungi help the vascular plants in obtaining inorganic nutrients from the soil and inorganic residues.

20. Correct Answer: (a)

Acclimatization

- It is the process by which an organism tries to accommodate itself against the change in a physical environment like changes in altitude, temperature, humidity, photoperiod or pH, etc.
- It involves the development of a favourable, morphological and physiological response to a change. It is achieved by a slight change in the morphological (physical appearance) or biochemical process.

Examples of acclimatization:

- Increase in the rate of breathing in altitudes,
- The decrease in the salt content of sweat with the increase in temperature,
- Physical alterations in the body like shivering or sweating with decrease and increase in temperature respectively, and
- Changes in photosynthesis rate of plants with a change in temperature etc.

21. Correct Answer: (b)

Neutralism

- Neutralism, in which neither population is affected by association with the other.
- Examples: Rabbits, deer, frogs, live together in grassland with no interaction between them.

22. Correct Answer: (c)

Gause's 'Competitive Exclusion Principle'

- It states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually.
- This may be true in limited resources, but not otherwise.
- Species facing competition may evolve mechanisms that promote co- existence rather than exclusion. E.g. 'resource partitioning'.

23. Correct Answer: (d)

Predation

- In this type of Biological interaction, a predator feeds upon its prey and in this type of relationship, one species is benefitted while other is harmed.
- Although the predator may or may not kill its prey, the act of predation often results in the death of its prey and the tissues of the prey are eventually consumed by the predator.
- Sometimes a species can act as both as prey and as a predator.
- Like in the case of Snake, as it becomes prey to Hawk while acts as a predator with Frog.
- Example: An interaction between Lion and Deer results in predation.

24. Correct Answer: (d)

Forest Ecosystem

- The forest ecosystem includes a complex assemblage of different kinds of biotic communities.

- Optimum conditions such as temperature and ground moisture are responsible for the establishment of forest communities.
- The nature of the soil, climate, and local topography determine the distribution of trees and their abundance in the forest vegetation.
- Forests may be evergreen or deciduous.
- They are distinguished on the basis of a leaf into broad-leafed or needle leafed coniferous forests in the case of temperate areas.
- The forest ecosystems have been classified into three major categories: coniferous forest, temperate forest, and tropical forest.
- All these forest biomes are generally arranged on a gradient from north to south latitude or from high to lower altitude.

25. Correct Answer: (a)

Temperate Deciduous Forest

- The temperate forests are characterized by a moderate climate and broad-leafed deciduous trees, which shed their leaves in fall, are bare over winter and grow new foliage in the spring.
- The precipitation is fairly uniform throughout.
- Soils of temperate forests are podzolic and fairly deep.

26. Correct Answer: (a)

Littoral and Swamp

- Littoral and swamp forests are found along the Andaman and Nicobar Islands and the delta area of the Ganga and the Brahmaputra.
- They have roots that consist of soft tissue so that the plant can breathe in the water.

27. Correct Answer: (d)

Montane Wet Temperate Forests

- In the North, Montane wet temperate forests are found in the region to the east of Nepal into Arunachal Pradesh, receiving a minimum rainfall of 2000 mm.
- In the North, there are three layers of forests:
- the higher layer has mainly coniferous, the middle layer has deciduous trees such as the oak and the lowest layer is covered by rhododendron and Champa.
- In the South, it is found in parts of the Niligiri Hills, the higher reaches of Kerala. The forests in the northern region are denser than in the South.
- Rhododendrons and a variety of ground flora can be found here.

28. Correct Answer: (c)

Grassland Ecosystem

- The grasslands are found where rainfall is about 25-75 cm per year, not enough to support a forest, but more than that of a true desert.
- Typical grasslands are vegetation formations that are generally found in temperate climates.
- In India, they are found mainly in the high Himalayas. The rest of India's grasslands are mainly composed of steppes and savannas.

29. Correct Answer: (b)

Neuston

- These are unattached organisms that live at the air-water interface such as floating plants, etc.
- Some organisms spend most of their lives on top of the air-water interface such as water striders, while others spend most of their time just beneath the air-water interface and obtain most of their food within the water.
- E.g., beetles and back-swimmers.

30. Correct Answer: (d)

Removal of the nutrients from a lake

- Deepwater abstractions Flushing with nutrient-poor waters
- On-site algae removal by filters and P-adsorbers

- On-site algae skimming and separator thickening
- Artificial mixing / Destratification (permanent or intermittent)
- Harvest of fishes and macrophytes Sludge removal

31. Correct Answer: (d)
Effects of Eutrophication

Change in an Ecosystem
- Eutrophication eventually creates a detritus layer in the ponds & lakes and produces a successively shallower depth of surface water.
- Eventually, the water body is reduced into marsh whose plant community is transformed from an aquatic environment to a recognizable terrestrial ecosystem.

Decreased Biodiversity
- Algal blooms restrict the sunlight to penetrate & affect the photosynthesizing plants. It causes the death of plants.
- Bacteria consumes all the oxygen on decomposition & results in devoid of oxygen. Eventually, it leads to the death of all living organisms in the aquatic ecosystem.

New Species Invasion
- Eutrophication may cause the ecosystem competitive by transforming the normal limiting nutrient to an abundant level.
- This cause shifting in the species composition of an ecosystem.

32. Correct Answer: (c)
Red Tide
- "Red Tide" is a common name for such a phenomenon where certain phytoplankton species contain pigments and "bloom" such that the human eye perceives the water to be discolored.
- Blooms can appear greenish, brown, and even reddish-orange depending upon the type of organism, the type of water, and the concentration of the organisms.
- The term "red tide" is thus a misnomer because blooms are not always red, they are not associated with tides, they are usually not harmful, and some species can be harmful or dangerous at low cell concentrations that do not discolor the water.
- They are scientifically referred to as Harmful Algal Blooms (HABs).

33. Correct Answer: (a)
Aquatic Ecosystem
- The foremost implication of the addition of fertilizers to the aquatic ecosystems is eutrophication which in turn leads to increased growth of Phytoplanktons and other algae matter.
- When these dense algal blooms eventually die, microbial decomposition severely depletes dissolved oxygen, creating a hypoxic or anoxic 'dead zone' lacking sufficient oxygen to support most organisms.

34. Correct Answer: (c)
Species diversity
- Species differ from one another in their genetic makeup and do not interbreed in nature.
- Closely-related species, however, have in common much of their hereditary characteristics.
- For example, about 98.4 percent of the genes of humans and chimpanzees are the same.
- Species diversity is the different variety of living organisms present on the earth.
- It is the ratio of one species population over a total number of organisms across all species in the given biome.
- 'Zero' would be infinite diversity, and 'one'

35. Correct Answer: (a)

Ecosystem diversity

- Community/Ecosystem diversity is the variety of different types of habitats in an area.
- A habitat is the cumulative factor of the climate, vegetation, and geography of a region.
- There are several kinds of habitats around the world.
- Corals, grasslands, wetland, desert, mangrove, and tropical rain forests are examples of ecosystems. Change in climatic conditions is accompanied by a change in vegetation as well.
- Each species adapts itself to a particular kind of environment.
- As the environment changes, species best adapted to that environment becomes predominant.
- Thus the variety or diversity of species in the ecosystem is influenced by the nature of the ecosystem.

36. Correct Answer: (c)

Biological services include-

- Food provision
- Medicinal resources and pharmaceutical
- drugs availability
- Wood products
- Ornamental plants
- Breeding stocks
- Diversity in genes, species, and ecosystems
- Social Services include-
- Research, education, and monitoring
- Recreation and tourism
- Cultural values

37. Correct Answer: (a)

Insects

- Insects have an exoskeleton that covers their entire body.
- An insect's consists of 3 body parts and 6 legs and an antenna.
- Prominent examples include: beetle, butterfly, moth, dragonfly, bee, wasp and praying mantis.

38. Correct Answer: (b)

Saprophytes

- Saprophytes are a heterotrophic organism that grows on dead and decaying organic matter.
- Fungi are Saprophytic in nature. Molds and mushrooms are familiar examples of saprophytic fungi.
- The maximum diversity of fungi is in the Western Ghats followed by the eastern Himalaya and the western Himalaya.

39. Correct Answer: (c)

Indian Flora

- Western Ghats and Northeast region of India has flora of extensive grasslands interspersed with densely forested gorges of evergreen vegetation.
- It is famously known as sholas and occurs in the Nilgiri (an offshoot of Western Ghats), Aanaimalai and Palani hills.
- The rain forests of the Western Ghats have dense and lofty trees with much species diversity.
- Stratification in rain forests is very distinct as three horizontal layers are distinguished.
- Mosses, ferns, epiphytes, orchids, lianas and vines, herbs, shrubs make diverse habitat.
- Ebony trees are predominate in these forests along with a variety of tropical orchids are also found here.

40. Correct Answer: (b)

Epiphytes

- These are plants that grow on the host plant but do not get nourishment from the host plant i.e. they do not draw food from the host plant.
- They only take the help of the host plant in getting access to light.
- Their roots perform two functions: While changing roots establish the plant on the

branches of the host plant, aerial roots draw moisture from the air.
- 'Vanda' is an example of Epiphyte.

Parasites
- These are organisms that draw a part or whole of its nourishment from another living organism.
- These plants do not draw moisture and mineral nutrients from the soil.
- They grow on some living plant called host and penetrate their sucking roots, called haustoria, into the host plants.
- Total parasites draw the whole of its nourishment while Partial parasites draw a part of its nourishment from the host.

41. Correct Answer: (d)

Invasive alien flora of India

Needle Bush
- It is native to tropical South America and distributed throughout India.
- It is occasional in thorny scrub and dry degraded forests and often creates close thickets.

Black Wattle
- It is native to South East Australia and distributed in the Western Ghat forests and its grazing lands in high altitude areas.
- It was introduced for afforestation in the Western Ghats.
- It regenerates rapidly after the fire and forms dense thickets.

Goat weed
- It is native to tropical America and distributed throughout India.
- It is known for its aggressive colonizer identity and is a troublesome weed in gardens, cultivated fields, and forests.

42. Correct Answer: (d)

There are two main types of trees i.e. Deciduous and Evergreen.

Deciduous trees
- They lose all their leaves for part of the year. In cold climates, this happens during the autumn so that the trees are bare throughout the winter.
- In hot and dry climates, deciduous trees usually lose their leaves during the dry season.
- Examples include Red Maple, White Ash, Red Oaks, etc.

Evergreen trees
- They do not lose all their leaves at them any time of the year i.e. they always have some foliage.
- They do lose their old leaves a little at a time with new ones growing in to replace the old.
- An evergreen tree is never complete without leaves.

43. Correct Answer: (c)

Sapwood
- The scientific name for sapwood is xylem.
- It is made up of a network of living cells that bring water and nutrients up from the roots to the branches, twigs, and leaves.
- It is the youngest wood of the tree.
- Over the years, the inner layers of sapwood die and become heartwood.

44. Correct Answer: (d)

Etiolation
- It the process in which the plant becomes pale yellow and has long thin internodes due to the absence of adequate light.

Taper
- It is the decrease in the diameter of the stem of a tree from the base upwards.

- Tapering occurs due to the pressure of the wind which is centered in the lower one-third of the crown and is conveyed to the lower parts of the stem, increasing with increasing length.
- To counteract this pressure, which may snap the tree at the base, the tree reinforces itself towards the base.
- They are generally associated with the absence of a long taproot system due to either shallow soil are badly aerated and infertile subsoil.

Phenology

- It is the science that deals with the time of appearance of characteristic periodic events such as leaf shedding etc.

Aerial seeding

- It is the process of dispersing the seed aerially.
- In India, aerial seeding has been done on an experimental basis in Chambal ravines in UP, Rajasthan, West Bengal and Western Ghats of Maharashtra.

45. Correct Answer: (d)

Causes of Biodiversity Losses

- The accelerated rates of species extinctions that the world is facing now are largely due to human activities.

There are four major causes (' The Evil Quartet' is the sobriquet used to describe them).

- The Evil Quartet
- Habitat loss and fragmentation
- Over-exploitation
- Alien species invasions
- Co-extinctions

46. Correct Answer: (d)

Preventive strategies for Man-Animal Conflict

Creation of Artificial and natural barriers (physical and biological).

- Alternative high-cost livestock husbandry practices.
- Voluntary relocation by the human population and resettlement.
- Mitigative strategies for Man-Animal Conflict
- Insurance programs for compensation of loss due to destruction caused by animals.
- Community-based natural resource management schemes (CBNRMS).
- Increasing alternate crops preys or water points.

Wildlife translocation.

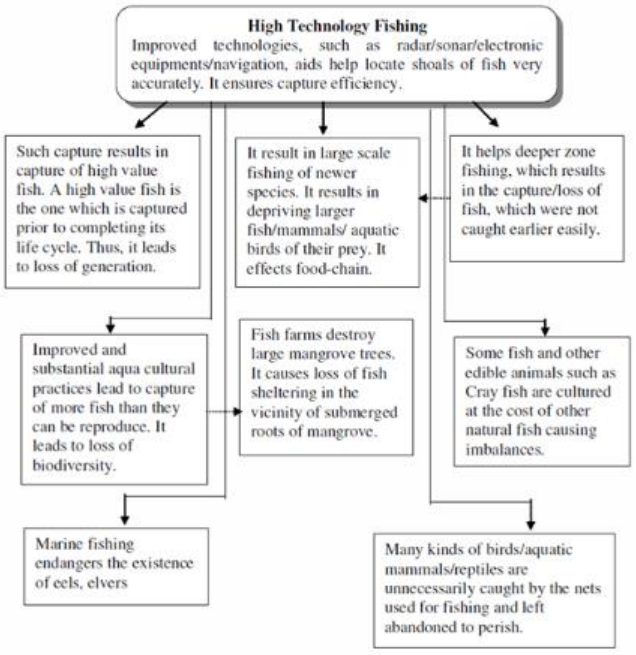
- Wildlife conservation education for local populations. Better sharing of information among the forest conservator stakeholders.

47. Correct Answer: (a)

High-Value Fish

- It is captured prior to completing its life cycle.
- Fish species of high value can be raised in fishponds at more profitable rates.
- For example, seabass which sells at Pounds 250 and above per kilo, which costs more than milkfish and tilapia.

48. Correct Answer: (d)



49. Correct Answer: (c)

Both statements are correct

- Factors determining the degree of diversity in an ecosystem
- The level of diversity in an ecosystem is determined by several factors:
- **Habitat Stress:** Diversity is low in areas under any stress like harsh climate or pollution.
- **Geographical Isolation:** Diversity is less in isolated regions like islands. If a species on an island disappears due to random events, it cannot be easily replaced.
- Organisms from the mainland have difficulties in reaching and colonizing the island.
- **Dominance by one species:** The dominant species consume a disproportionate share of resources which does not allow many species to evolve and flourish.
- **Availability of ecological niches:** A complex community offers a greater variety of niches than a simple community and promotes greater diversity.
- **Edge Effect:** There is always a greater diversity in ecotones or transition areas between ecosystems.
- **Geological History:** Old and stable ecosystems like rain forests that have not experienced many changes have high diversity. An ecosystem like the Arctic has undergone many changes and this does not allow many species to establish themselves.

50. Correct Answer: (c)

The Constraint in Biodiversity Conservation

- Low priority for the conservation of living natural resources
- The exploitation of living natural resources for monetary gain.
- Values and knowledge about the species and ecosystem are inadequate.
- Unplanned urbanization and uncontrolled industrialization.

51. Correct Answer: (c)

Critically Endangered Category

- A species is categorized as Critically Endangered when it meets any of the following criteria:
- Reduction in the population of more than 90% over the last 10 years.
- The population size is less than 50 mature individuals.
- Quantitative analysis showing the probability of extinction in the wild in at least 50% in their 10 years.

52. Correct Answer: (d)

Biosphere Reserve

- In order to undertake complementary activities of biodiversity conservation and development of sustainable management aspects, Biosphere Reserves are demarcated into three inter-related zones i.e., Core Zone, Buffer Zone, and Transition Zone.
- The core zone is to be kept free from the presence of all human activities.
- The core zone is the innermost zone of the area which is circumscribed by Buffer Zone and then Transition zone i.e. Transititon zone forms the outer most zone of the Biosphere Reserve.

53. Correct Answer: (b)

- The concept of a Vulture Safety Zone is unique for the Asian continent but similar VSZ is in operation in both Europe and Africa.
- Aim of developing Vulture Saftety Zone is to establish targeted awareness activities surrounding a 150 km radius of vultures' colonies so that no diclofenac or the veterinary toxic drugs are found in cattle carcasses, the main food of vultures (to provide safe food).
- The Vulture Safety Zone has spread around in several hundred kilometers covering the Jim Corbett in Uttarakhand, Dudhwa and Kartarniaghat forest reserves in Uttar

Pradesh which is adjoining the Indo-Nepal border.
- Nepal has already set up VSZ on the Indian borders.

54. Correct Answer: (a)

Pacific Ridley sea turtle

- These are medium-sized sea turtle species that are found in warm and tropical waters of the Pacific and the Indian Ocean.
- It is also known by the name of Olive Ridley Turtle.
- These are famous for their synchronized nesting in mass numbers.
- IUCN has categorized it in the Vulnerable category.

55. Correct Answer: (b)

Pygmy hog

- Pygmy hog is the world's smallest wild pig and its habitat lies in the grassland regions along the southern Himalayan foothills.
- Hence it also an important indicator of the management status of grassland habitats.
- It is categorized as 'Critically Endangered' in the IUCN Red List.
- The grasslands where the pygmy hog resides are crucial for the survival of other endangered species such as Indian Rhinoceros, Swamp Deer, Wild Buffalo, Hispid Hare, Bengal Florican, and Swamp Francolin.
- Formerly, the habitat of the species was more widely distributed but now is restricted to only a single remnant population in 'terai' grasslands of Manas Wildlife Sanctuary and its buffer reserves.
- Pygmy hog-sucking Louse is a parasite that feeds only on Pygmy Hogs.
- Hence it also falls in the same risk category of critically endangered as its survival is linked to that of the host species.
- It is mainly threatened by loss and degradation of grasslands, dry-season burning, livestock grazing and afforestation of grasslands along with hunting activities.

56. Correct Answer: (d)

The Malabar Civet (Viverra civettina)

- Malabar Civet is considered to be one of the world's rarest mammals.
- Wooded plains and hill slopes of evergreen rainforests are the main habitat area of it.
- It is endemic to India and was first reported from Travancore, Kerala.
- It is nocturnal in nature and is found exclusively in the Western Ghats.
- It is categorized as Critically Endangered as per IUCN red list.

57. Correct Answer: (a)

Monotreme

- It is a subdivision of mammal that lay eggs rather than giving birth to their young.

There are only five living Monotreme/ egg-laying Mammals species:

- The duck-billed platypus.
- Four species of spiny anteaters (also known as echidna).
- All of them are found only in Australia and New Guinea.

58. Correct Answer: (b)

Characteristics of Mangroves

- They are basically evergreen land plants growing on sheltered shores, typically on tidal flats, deltas, estuaries, bays, creeks and the barrier islands.
- The best locations are where abundant silt is brought down by rivers or on the backshore of accreting sandy beaches.
- Their physiological adaptation to salinity stress and to waterlogged anaerobic mud is high.
- They require high solar radiation and have the ability to absorb fresh water from saline/ brackish water.

59. Correct Answer: (d)

Features of Coral Reefs

- They occur in shallow tropical areas where the seawater is clean, clear and warm.

- Coral reefs are one of the most productive and complex coastal ecosystems with high biological diversity.
- Reef-building corals are a symbolic association of polyps (coral animals) and 'zooxanthellae' (the microscopic algae)
- The corals are generally slow-growing colonies of animals while zooxanthellae are fast-growing plants.
- Even though corals live in nutrient-poor waters, their capability to recycle the scarce nutrients (by the whole nutrient community) is enormous.

60. Correct Answer: (a)

Causes of Coral Bleaching

- As coral reef bleaching is a general response to stress, it can be induced by a variety of factors, alone or in combination.
- The following stressors have been implicated in coral reef bleaching events:

Temperature:

- Coral species live within a relatively narrow temperature margin and anomalously low and high sea temperatures can induce coral bleaching.

Solar Irradiance:

- Bleaching during the summer months, during seasonal temperature and irradiance maxima often occurs disproportionately in shallow- living corals and on the exposed summits of colonies.

Sub-aerial Exposure:

- Sudden exposure of reef flat corals to the atmosphere during events such as extremely low tides, ENSO-related sea level drops or tectonic uplift can potentially induce bleaching.

Xenobiotics:

- Zooxanthellae loss occurs during exposure of coral to elevated concentrations of various chemical contaminants, such as Cu, herbicides, and oil. Because high concentrations of xenobiotics are required to induce zooxanthellae loss, bleaching from such sources is usually extremely localized and / or transitory.

Epizootics:

- Pathogen induced bleaching is different from other sorts of bleaching. Most coral diseases cause patchy or whole colony death and sloughing of soft tissues, resulting in a white skeleton (not to be confused with bleached corals).
- Relatively few incidences of coral bleaching have been linked to sedimentation and freshwater dilution.

Inorganic Nutrients:

- Rather than causing coral reef bleaching, an increase in ambient elemental nutrient concentrations (e.g. ammonia and nitrate) actually increases zooxanthellae densities 2-3 times.
- Although eutrophication is not directly involved in zooxanthellae loss, it could cause secondary adverse effects such as lowering of coral resistance and greater susceptibility to diseases.

61. Correct Answer: (c)

Hydric Soils

- It is the characteristic soil of wetland ecosystems; thus these are found in waterlogged conditions.
- Due to waterlogged conditions, anaerobic conditions develop i.e. not enough oxygen is available for plants.
- The characteristic adopted plant life of this soil is called hydrophytes.

62. Correct Answer: (a)

Functions of Wetlands

- Wetlands perform a variety of functions that can support multiple ecosystem services.

Some of the functions performed by wetlands are as follows:

- Habitat to aquatic flora and fauna, as well as numerous species of birds, including migratory species
- Filtration of sediments and nutrients from surface water
- Nutrients recycling
- Water purification
- Floods mitigation
- Maintenance of streamflow
- Groundwater recharging (Wetland ecosystems help in groundwater replenishment i.e. they recharge the groundwater not discharge it.)
- Provide drinking water, fish, fodder, fuel, etc.
- Control rate of runoff in urban areas
- Buffer shorelines against erosion
- An important resource for sustainable tourism, recreation, and cultural heritage
- Stabilization of local climate
- Source of livelihood to local people
- Genetic reservoir for various species of plants (especially rice)
- Supporting species diversity

63. Correct Answer: (b)

Gross Cropped Area

- The net sown area represents an area in which total crops are grown only once in a year.
- Gross cropped area represents an area sown more than once in an agricultural year plus net sown area.

64. Correct Answer: (d)

Environmental Degradation from Mining

- Loss of vegetation
- Vegetation and soil are removed to get access to mineral deposits.
- The flora and fauna present in the area are lost.

Depletion of minerals

Earth is full of metals and mineral resources.

- They are a very important non-renewable natural resource.
- India is very rich mineral resources.
- In the last two hundred years advancement in mining technology has progressively intensified mining of mineral resources.
- A large amount of lead, aluminium, copper, and iron ores have been used up.
- It is believed that in the next 20 years silver, tin, zinc, and mercury will be depleted to an alarming level if their exploitation continues at the present rate.

Dumping of debris

- The extraction of minerals from the earth also produces significant amounts of over burden or debris.
- Often it is much more as compared to the quantity of mineral obtained.
- The dugout loose waste material is dumped on the adjacent land.
- Dumping of mining waste not only occupies large land areas but the waste dumps also become a source of soil erosion.

Land subsidence

- Excessive mining especially underground mining may lead to land subsidence and may also cause landslides. The landscape too is spoilt.

65. Correct Answer: (c)

Multi-Purpose River Projects and Integrated Water Resources Management

- Dams are now referred to as multi-purpose projects where the many uses of the impounded water are integrated with one another.
- For example, in the Sutluj-Beas river basin, the Bhakra – Nangal project water is being used both for hydel power production and irrigation.

- Similarly, the Hirakud project in the Mahanadi basin integrates conservation of water with flood control.
- Multi-purpose projects, launched after Independence with their integrated water resources management approach, were thought of as the vehicle that would lead the nation to development and progress, overcoming the handicap of its colonial past.
- Extension of irrigation facilities is one of the important objectives and advantages of multipurpose projects.
- Another important objective of such projects is to control the occurrence of floods creating havocs on the economy.
- Multi-purpose projects help to generate hydro-electricity on a large scale basis, which is very much important for the development of the industry.
- Such projects can create navigation facilities in the country by developing ferrying services for transportation, raise fleet capacity and thereby can reduce the traffic load on rail and road transport.
- These projects can help to raise forestry on the banks of the canals.
- Moreover, it can also encourage the development of fisheries in the reservoirs. Such projects facilitate the development of safe drinking water projects for the adjoining areas.
- Such projects can create a favourable climate for the development of the industry by offering facilities like cheaper power, better water transport, availability of raw materials at cheaper rates for agro-based industries, etc.
- Moreover, by developing agriculture, industry and infrastructural services, these projects can generate an adequate volume of employment opportunities in the farm and non-farm sector.
- All these would help to raise the standard of living of the people of those adjoining regions reaping benefits from such projects.
- Multi-purpose projects can also facilitate to develop recreation facilities in the form of picnic resorts, holiday resorts, etc. which are having much commercial viability nowadays.

66. Correct Answer: (c)

Pollutants

- Pollutants are the materials or factors, which cause an adverse effect on the natural quality of any component of the environment.
- For example, smoke from industries and automobiles, chemicals from factories, radioactive substances from nuclear plants, sewage of houses and discarded household articles are common pollutants.

Classifications

- According to the form in which they persist after release into the environment.
- Primary pollutants: These persist in the form in which they are added to the environment e.g. DDT, plastic.
- Secondary Pollutants: These are formed by interaction among the primary pollutants.
- For example, peroxyacetyl nitrate (PAN) is formed by the interaction of nitrogen oxides and hydrocarbons.

67. Correct Answer: (c)

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Classifications

According to their nature of disposal, the pollutants are classified into:

- Biodegradable Pollutants: Waste products, which are degraded by microbial action. E.g. sewage.
- Non-biodegradable Pollutants: Pollutants, which are not decomposed by microbial action. E.g. plastics, glass, DDT, salts of heavy metals, radioactive substances, etc.,).

68. Correct Answer: (c)

Carbon Monoxide (CO)

- It is a colourless, odourless gas that is produced by the incomplete burning of carbon-based fuels including petrol, diesel, and wood.
- It is also produced from the combustion of natural and synthetic products such as cigarettes.
- It lowers the amount of oxygen that enters our blood.
- It can slow our reflexes and make us confused and sleepy.

69. Correct Answer: (a)

Photochemical Smog

- Photochemical smog (smog) is a term used to describe air pollution that is a result of the interaction of sunlight with certain chemicals in the atmosphere.
- Its occurrences are often linked to heavy traffic, high temperatures, and calm winds.
- During the winter, wind speeds are low and cause the smoke and fog to stagnate near the ground; hence pollution levels can increase near ground level.
- Smoke particles trapped in the fog gives it a yellow/ black color and this smog often settled over cities for many days.

70. Correct Answer: (c)

Fly Ash

- Ash is produced whenever the combustion of solid material takes place.
- Fly ash is one such residue that rises with the gases into the atmosphere.
- Fly ash is a very fine powder and tends to travel far in the air. The ash which does not rise is termed as bottom ash.
- Nearly 73% of India's total installed power generation capacity is thermal, of which 90% is coal-based generation, with diesel, wind, gas, and steam making up the rest.

Composition

- Aluminium silicate (in large amounts)
- Silicon dioxide (SiO_2) and
- Calcium oxide (CaO).
- Fly ash particles are oxide rich and consist of silica, alumina, oxides of iron, calcium, and magnesium and toxic heavy metals like lead, arsenic, cobalt, and copper.

71. Correct Answer: (b)

Buffering

- The practice of adding a neutralizing agent to the acidified water to increase the pH is one of the important control measures to eliminate the sources of pollution.
- This is known as Buffering. Usually, lime in the form of calcium oxide and calcium carbonate is used.

72. Correct Answer: (b)

Sources of Water Pollution

Type of Industry	Inorganic pollutants	Organic pollutant
Mining	Mine 11Arastesz Chtorides, various metal ferrus sulphate., sulphuric acid, hydrogen sulphide, ferric hydroxicte. surface wash offs. Suspended Solids, chloride& and heavy metals.	

Iron and Steel	Suspended solids, iron cyanide, thiocyariate, sulphides, oxides of copper, chromium, cadmium, arid mercury,	Oil, phenol and neptha
Chemical Plants	Various adds and alkalies, chlorides. sulphates, nitrates of metals, phosphorus, fluorine, silica and suspended particles,.	Aromatic compounds solvents, organic acids, nitro compound dyes, etc.
Pharma-ceutical		Proteins, carbohydrate, organic solvent intermediate products. Drugs and antibiotics
Soap and Detergent	Tertiary ammonium compounds alkalies	Flats and fatty acids, glycerol, plyphosphams, sullphonated hydrocarbons
Food processin g		- Highly putrescible organic matter arid pathogens
Paper and Pulp	Sulphides, bleachint, liquors.	Cellulose fibres, bark, woods sugars organic acids

73. Correct Answer: (d)

Eutrophication

- 'Eu' means well or healthy and 'trophy' means nutrition. The enrichment of water bodies
- Discharge of domestic waste, agricultural surface runoff, land drainage and industrial effluents in a water body leads to rapid nutrients enrichment in a water body.
- The excessive nutrient enrichment in a water body encourages the growth of algae duckweed, water hyacinth, phytoplankton, and other aquatic plants.
- The biological demand for oxygen (BOD) increases with the increase in aquatic organisms.
- As more plants grow and die, the dead and decaying plants and organic matter acted upon by heterotrophic protozoans and bacteria, deplete the water of dissolved oxygen (DO).
- The decrease in DO results in the sudden death of a large population of fish and other aquatic organisms including plants, releasing the offensive smell and makes the water unfit for human use.
- The sudden and explosive growth of phytoplankton and algae impart green color to the water is known as water bloom, or "algal blooms".
- These phytoplankton releases toxic substances in water that causes sudden death of the large population of fishes.
- This phenomenon of nutrient enrichment of a water body is called eutrophication.
- Human activities are mainly responsible for the eutrophication of a growing number of lakes and water bodies in the country.

74. Correct Answer: (b)

Biochemical Oxygen Demand (BOD)

- Water pollution by organic wastes is measured in terms of Biochemical Oxygen Demand (BOD).
- BOD is the amount of dissolved oxygen needed by bacteria in decomposing the organic wastes present in water.
- It is expressed in milligrams of oxygen per liter of water.
- The higher value of BOD indicates the low DO content of water.
- Since BOD is limited to biodegradable materials only. Therefore, it is not a reliable method of measuring the pollution load in the water.

Chemical Oxygen Demand (COD)

- It is a slightly better mode used to measure pollution load in the water.
- It is the measure of oxygen equivalent to the requirement of oxidation of total organic matter (i.e. biodegradable and non-biodegradable) present in water.

75. Correct Answer: (b)

Eutrophication

- It refers to the addition of artificial or non-artificial substances, such as nitrates and phosphates, through fertilizers or sewage, to a freshwater system.
- It can be anthropogenic or natural. It leads to an increase in the primary productivity of the water body or "bloom" of phytoplankton.
- The overgrowth causes the loss of oxygen in the water leading to severe reductions in fish and other animal populations.
- Nomurai Jellyfish show an increase in population that negatively affects other species in the local ecosystem.
- Eutrophication escalates rapidly when high nutrients from fertilizers, domestic and industrial wastes, urban drainage, detergents and animal, sediments enter water streams.

76. Correct Answer: (a)

E-Waste Pollutants

- E-Waste or electronic waste includes discarded and end-of-life electronic products ranging from computers, equipment used in Information and Communication Technology (ICT), home appliances, audio, and video products and all of their peripherals.
- E-Waste can be hazardous if it is recycled in primitive ways.

The related e-waste metals and their sources are:

- **Beryllium –** It is commonly found on motherboards and finger clip and is used as a copper-beryllium alloy to strengthen connectors.
- **Mercury –** It is estimated that 22% of the yearly world consumption of mercury is used in electrical and electronic equipment is used in thermostats, sensors, relays, switches, medical equipment, lamps, mobile phones, and batteries.
- **Hexavalent Chromium (Chromium VI) -** It is used as a corrosion protector of untreated and galvanized steel plates and as a decorative or hardener for steel housings Plastics (including PVC).
- **Barium –** It is a soft silvery-white metal that is used in computers in the front panel of a Cathode Ray Tube, to protect users from radiation.
- **Lead –** It is used in glass panels and gaskets in computer monitors.

77. Correct Answer: (a)

Composting

- Composting is a biological process in which micro-organisms, mainly fungi, and bacteria, decompose degradable organic waste into humus like substance in the presence of oxygen.
- This finished product, which looks like soil, is high in carbon and nitrogen and is an excellent medium for growing plants.
- It increases the soil's ability to hold water and makes the soil easier to cultivate.
- It helps the soil retain more plant nutrients.
- It recycles the nutrients and returns them back to the soil as nutrients.
- Apart from being clean, cheap, and safe, composting can significantly reduce the amount of disposable garbage.

Vermiculture

- It is also known as earthworm farming. In this method, Earthworms are added to the compost.
- These worms break the waste and the added excreta of the worms makes the compost very rich in nutrients.

78. Correct Answer: (b)

Ecological Effects — Warm Water

- The change in temperature impacts organisms by decreasing oxygen supply affecting ecosystem composition
- Warm water contains less oxygen.
- The elevated temperature typically decreases the level of dissolved oxygen (DO) in water. So there is decrease in rate of decomposition of organic matter.
- Green algae are replaced by less desirable blue-green algae. Many animals fail to multiply.
- It also increases the metabolic rate of aquatic animals results in the consumption of more food in a shorter time than if their environment were not changed.
- An increased metabolic rate may result in food source shortages, causing a sharp decrease in the population.
- Changes in the environment may also result in a migration of organisms to another, more suitable environment and to in-migration of fishes that normally only live in warmer waters elsewhere.
- This leads to competition for fewer resources; the more adapted organisms moving in may have an advantage over organisms that are not used to the warmer temperature.
- As a result, one has the problem of compromising the food chains of the old and new environments. Biodiversity can be decreased as a result.
- Temperature changes of even one to two degrees Celsius can cause significant changes in organism metabolism and other adverse cellular biology effects.
- Principal adverse changes can include rendering cell walls less permeable to necessary osmosis, coagulation of cell proteins, and alteration of enzyme metabolism.
- These cellular-level effects can adversely affect mortality and reproduction.

79. Correct Answer: (b)

Mycoremediation

- It is a form of bioremediation in which fungi are used to decontaminate the area.

80. Correct Answer: (b)

Greenhouse Effect

- The greenhouse effect is a naturally occurring phenomenon that blankets the earth's lower atmosphere and warms it, maintaining the temperature suitable for living things to survive.
- The greenhouse effect is a process (similar to greenhouse) caused by greenhouse gases, which occur naturally in the atmosphere.
- This process plays a crucial role in warming the Earth's surface, making it habitable.
- However, human-generated greenhouse gas emissions upset the natural balance and lead to increased warmth.

81. Correct Answer: (b)

Ozone Layer:

- The ozone layer, also called ozonosphere, a region of the upper atmosphere, containing relatively high concentrations of ozone molecules (O3).
- Approximately 90 percent of the atmosphere's ozone occurs in the stratosphere, the region extending from 10–18 km (6–11 miles) to approximately 50 km (about 30 miles) above Earth's surface.
- The ozone layer is concentrated in the stratosphere between altitudes of 12 km to 35 km from the earth's surface.
- In the stratosphere, the temperature of the atmosphere rises with increasing height, a phenomenon created by the absorption of solar radiation by the ozone layer.
- The ozone layer effectively blocks almost all solar radiation of wavelengths less than 290 nanometers from reaching Earth's surface, including certain types of ultraviolet (UV) radiation. It is considered a protective shield and earth's umbrella.

82. Correct Answer: (b)

Urban Heat Island

- The urban heat island is a phenomenon when the heat gets trapped near the earth's surface as a result of a decline in green cover, rapid urbanisation, energy-intensive activities, and concrete structures.
- The phenomenon, 'Urban Heat Island' was first investigated and described by Luke Howard in the 1810s.
- It is highly noticeable during winter and summer periods, and the temperature difference is often greater at night than in the daytime.
- Heat islands form in urban and suburban areas because many common construction materials absorb and retain more of the sun's heat than natural materials in less developed rural areas.
- Temperatures of dark, dry surfaces in direct sun can reach 88°C during the day, while vegetated surfaces with moist soil under the same conditions might reach only 18°C.
- Concrete, cement, and metal surfaces in urban areas tend to absorb heat energy rather than reflect it, contributing to higher urban temperatures.
- Cities have a low albedo, the reflecting power of a surface. The increased surface area of buildings results in more solar radiation absorption than reflection.
- The urban heat island effect is so strong in Delhi, that it saw 50% less fog than surrounding areas. In Delhi, the heat island effect also appears to be suppressing the very formation of fog.
- Population size has been shown to be related to the intensity of urban heat islands since they are an indicator of urban growth.

83. Correct Answer: (a)

Impact of Climate Change on Agriculture

- Climate Change can affect crop yield as well as the types of crops that can be grown in certain areas, by impacting agricultural inputs such as water for irrigation, amounts of solar radiation that affect plant growth, as well as the prevalence of pests.
- A rise in temperatures caused by increasing greenhouse gases is likely to affect crops differently from region to region.
- For example, moderate warming (an increase of 1 to 3°C in mean temperature) is expected to benefit crop yields in temperate regions, while in lower latitudes especially seasonally dry tropics, even moderate temperature increases (1 to 2°C) are likely to have negative impacts for major cereal crops.
- Warming of more than 3°C is expected to have a negative effect on production in all regions.
- As a result of the thawing of snow, the amount of arable land in the high-latitude region is likely to increase by reduction of the number of frozen lands.
- At the same time, arable land along the coastlines is bound to be reduced as a result of rising sea levels.
- Erosion, submergence of shorelines, the salinity of the water table due to the increased sea levels, could mainly affect agriculture through the inundation of low lying lands.
- The rising temperature would increase fertilizer requirement for the same production targets and result in higher GHG emissions, ammonia volatilization and cost of crop production.
- Increased frequencies of droughts, floods, storms, and cyclones are likely to increase agricultural production variability.

84. Correct Answer: (d)

Water (Prevention and Control of Pollution) Act, 1974

- Water (Prevention and Control of Pollution) Act, 1974 represents India's one of the first attempts to comprehensively deal with environmental issues and to provide for the prevention and control of water pollution,

and for the maintaining or restoring of wholesomeness of water in the country.

- The Act was amended in 1988 and last in 2003.
- The Act prohibits the discharge of pollutants into water bodies beyond a given standard and lays down penalties for non-compliance.
- Whoever fails to comply with any provision of this Act is punishable with imprisonment, fine or with both.
- The Government has the power to restrict any unit and to take samples of effluents and get them analyzed in Central or State laboratories.
- Water (Prevention and Control of Pollution) Cess Act, 1977 provides for a levy and collection of cess on water consumed by industries and local authorities.
- It further aims at augmenting the resources of the central and state boards for the prevention and control of water pollution.

85. Correct Answer: (d)

Forest Conservation Act, 1980

- The Forest Conservation Act was passed in 1980 to provide for the conservation of forests and/or matters connected therewith.
- The Forest Conservation Act was enacted with a view to check further deforestation, which ultimately results in ecological imbalances, accordingly the provisions made therewith must apply to all forests irrespective of the nature of ownership for classification thereof.
- Under the provisions of this Act, prior approval of the Central Government is essential for diversion of forest lands for non- forestry purposes.
- In the national interest and in the interest of future generations, this Act, therefore, regulates the diversion of forest lands to non-forestry purposes.
- The basic objective of the Act is, to regulate the indiscriminate diversion of forest lands for non-forestry uses and to maintain a logical balance between the developmental needs of the country and the conservation of natural heritage.
- The guidelines have been issued under the Act from time to time, to simplify the procedures, to cut down delays and to make the Act more user-friendly. The act thus places restrictions on the power of the State Government concerning the preservation of forests or the use of forest land for non forest purposes.
- The Act provides for the constitution of the advisory committee to advise the Government with regard to the grant of approved by the Central Government or any other matter connected with the conservation of forests which may be referred to it by the Central Government.
- The State Advisory Groups (SAGs) constituted by the Ministry of Environment & Forests, Government of India, under the Forest (Conservation) Act, 1980 shall meet according to the timetable.
- The senior-most Conservator of Forests/Deputy Conservator of Forests of the Regional Office shall act as the Chairperson of the concerned SAG in the absence of the Chief Conservator of Forests/ Conservator of Forests.
- Nodal Officer of the State shall act as the Member-Secretary of the concerned SAG.

86. Correct Answer: (a)

- **Wildlife Protection Act, 1972**
- The Wildlife Protection Act, 1972 is an Act of the Parliament of India enacted for the protection of plants and animal species.
- The Act has various schedules of protected plant and animal species; hunting or harvesting these species is largely outlawed.
- It extends to the whole of India, except the State of Jammu and Kashmir which has its own wildlife act.
- It has Six Schedules which give varying degrees of protection.

- Schedule I and Schedule II provide absolute protection - offences under these are prescribed the highest penalties.

Commonly known important Schedule I animals:

- Black Buck
- Indian Elephant
- Indian Lion
- Indian Wild Ass
- Indian Wolf
- Kashmir Stag
- Leopard or Panther
- Musk Deer
- Nilgiri Langur
- Nilgiri Tahr
- Pygmy Hog
- Rhinoceros

Species listed in Schedule III and Schedule IV are also protected, but the penalties are much lower.

Schedule V includes the animals which may be hunted.

The specified endemic plants in Schedule VI are prohibited from cultivation and planting.

Common known Schedule III animals are:

- Barking deer
- Chital
- Nilgai
- Sambar
- Wild pig
- Sponges

87. Correct Answer: (d)

Plastic Waste Management Rules, 2016

- Plastic pollution is when plastic has gathered in an area and has begun to negatively impact the natural environment and create problems for plants, wildlife, and even the human population.
- Often this includes killing plant life and posing dangers to local animals.
- Plastic is an incredibly useful material, but it is also made from toxic compounds known to cause illness, and because it is meant for durability, it is not biodegradable.
- Plastic Waste Management Rules, 2016 replaces the earlier rules.

It's aims are:

- Increase the minimum thickness of plastic carry bags from 40 to 50 microns and stipulate minimum thickness of 50 microns for plastic sheets also to facilitate collection and recycle of plastic waste,
- Expand the jurisdiction of applicability from the municipal area to rural areas, because plastic has reached rural areas also;
- To bring in the responsibilities of producers and generators, both in the plastic waste management system and to introduce collect back system of plastic waste by the producers/ brand owners, as per extended producers responsibility;
- To introduce the collection of plastic waste management fee through pre-registration of the producers, importers of plastic carry bags/multilayered packaging and vendors selling the same for establishing the waste management system;
- To promote use of plastic waste for road construction as per Indian Road Congress guidelines or energy recovery, or waste to oil, etc. for gainful utilization of waste and also address the waste disposal issue; to entrust more responsibility on waste generators, namely payment of user charge as prescribed by local authority, collection and handing over of waste by the institutional generator, event organizers.

88. Correct Answer: (c)

United Nations Framework Convention on Climate Change (UNFCCC)

- In 1992, countries joined an international treaty, the United Nations Framework

Convention on Climate Change (UNFCCC), as a framework for international cooperation to combat climate change by limiting average global temperature increases and the resulting climate change, and coping with impacts that were, by then, inevitable.

- The Parties to this Convention acknowledges that Change in the Earth's climate and its adverse effects are a common concern for humankind.
- Human activities have been substantially increasing the atmospheric concentrations of greenhouse gases, that these increases enhance the natural greenhouse effect, and that this will result on average in an additional warming of the Earth's surface and atmosphere and may adversely affect natural ecosystems and humankind.
- The largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs, Kyoto Protocol implemented the objective of the UNFCCC to fight global warming by reducing greenhouse gas concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interferences with the climate system.

89. Correct Answer: (a)

Rotterdam Convention

- Rotterdam Convention is also called the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

What it does?

- The convention promotes an open exchange of information between importers-exporters of hazardous chemicals.
- Calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers of any known restrictions or bans.
- Signatory nations can decide whether to allow or ban the importation of chemicals listed in the treaty.
- Exporting countries are obliged to make sure that producers within their jurisdiction comply.
- It is jointly administered by the United Nations Food and Agriculture Organization (FAO) and the United Nations Environment Programme (UNEP).

90. Correct Answer: (d)

Black Carbon Research Initiative

- ISRO-GBP (Indian Space Research Organization's Geosphere-Biosphere Programme) recognized the importance of Black Carbon aerosols on the climate system and decided to pursue studies of Black Carbon in subsequent years.
- In view of this, a multi-institutional and multi-agency Science Plan has been launched in the Ministry of Environment in association with the Ministry of Earth Sciences, Indian Space Research Organization, Ministry of Science and Technology and other associated agencies, to monitor aerosols and assess its impacts through various modeling techniques.
- It is an Indian initiative launched as a part of the National Carbonaceous Aerosols Program (NCAP) under the aegis of the Indian Network for Climate Change Assessment, INCCA.

91. Correct Answer: (a)

- **Katowice Rulebook**
- It is a precise and detailed agreement according to which the Paris Agreement will be implemented in a manner that would be transparent and fair for all parties.
- The Katowice outcome is a complex package, achieved through in-depth technical discussions and political

compromise and containing operational guidance on:

- The information about domestic mitigation and other climate goals and activities that governments will provide in their Nationally Determined Contributions (NDCs) How to communicate about efforts to adapt to climate impacts.
- The rules for the functioning of the Transparency Framework, which will show to the world what countries are doing about climate change.
- Establishment of a committee to facilitate the implementation of the Paris Agreement and promote compliance with the obligations undertaken under the Agreement.
- How to conduct the Global Stocktake of overall progress towards the aims of the Paris Agreement;
- How to assess progress on the development and transfer of technology
- How to provide advance information on financial support to developing countries and the process for establishing new targets on finance from 2025 onwards
- However, the rulebook agreed at Katowice dilutes the Paris agreement. At Paris, the developed nations were allowed to make voluntary commitments to climate mitigation, on par with the developing nations.
- At Katowice, this process went further, with uniform standards of reporting, monitoring and evaluation for all countries. The real targets of this uniformity are not the poorest nations, who have been provided but the larger developing nations.
- These reporting requirements, in their uniformity, are intended as much for the Maldives as the U.S.
- At Katowice, certain flexibility was given to developing countries—which have a lower capacity to collect and analyze information—to provide less rigorous information about their progress on NDCs.
- But developing countries will have to provide "self-determined" time frames to improve the quality and quantity of reporting.
- At Katowice, rules on finance were significantly diluted. Firstly, developed countries have the choice to include all kinds of financial instruments—concessional and non-concessional loans, grants and aids from various public and private sources—to meet their commitments.
- Also developed countries now have the freedom to "self determine" the kind of financial resources they want to give and do this without any strong mechanism of accountability.
- Global Stock Take (GST) was supposed to measure global progress, identify barriers and give recommendations. However, this process will neither give any recommendations to individual countries or a group of countries nor will it give any prescriptive policy as per the rulebook.
- In Katowice, there was virtually no progress made on non-market mechanisms, while all big countries, developed and developing, seemed to have a great interest in trading carbon credits.
- (There was no progress made regarding carbon markets and the discussions have been postponed)
- The special report on the impacts of 1.5C global warming, published by the Intergovernmental Panel on Climate Change (IPCC) in October, became a major source of tension at the talks.
- Four countries – the US, Saudi Arabia, Russia, and Kuwait refused to welcome the report.

92. Correct Answer: (c)

Environment Impact Assessment (EIA)

- In India, the Environment Impact Assessment is governed by the Environment (Protection) Act, 1986, which is enacted by

the Ministry of Environment, Forests and Climate Change (MoEF&CC).

- Coastal Zone Management Plans (CZMPs) are prepared by coastal states or Union Territories as per rules set by CRZ notification 1991.
- CZMPs are prepared based on the identification and categorization of coastal areas for different activities and then submitted to the MoEF&CC for approval.

93. Correct Answer: (a)

National Board for Wildlife

- National Board for Wild Life is a statutory organization constituted under the Wildlife Protection Act, 1972.
- The board is advisory in nature and advises the Central Government on framing policies and measures for conservation of wildlife in the country.
- It serves as an apex body to review all wildlife- related matters, approve projects in and around national parks and sanctuaries and promote the conservation and development of wildlife and forests.
- No alternation of boundaries in national parks and wildlife sanctuaries can be done without approval of the NBWL.
- The NBWL is chaired by the Prime Minister. It has 47 members including the Prime Minister.
- Among these, 19 members are ex-officio members.
- Other members include three Members of Parliament (two from Lok Sabha and one from Rajya Sabha), five NGOs and 10 eminent ecologists, conservationists and environmentalists.

94. Correct Answer: (a)

World Nature Organization (WNO)

- Formed in 2010 (Established in 2014). It is an intergovernmental organisation which promotes global environmental protection.
- The initiative was started by countries surrounding the Pacific ocean, the Caribbean, and by emerging African countries, which are the primary nations threatened by climate change through increasing droughts and rising sea levels.
- The organization was established by the intergovernmental WNO-Treaty, which enters into force on May 1, 2014 Location: Geneva
- The membership is open for all governments and intergovernmental organizations (IGO). India is not a member.
- The organization is focused on promoting activities, technologies.

95. Correct Answer: (a)

Comprehensive Environmental Pollution Index

- The Central Pollution Control Board (CPCB) has developed a Comprehensive Environmental Pollution Index (CEPI).
- As per the CPCB; Comprehensive Environmental Pollution Index (CEPI), is a rational number to characterize the environmental quality at a given location following the algorithm of source, pathway and receptor.
- The data refers to the Comprehensive Environmental Pollution Index (CEPI) scores of the critically polluted industrial clusters/ areas.
- The index captures the various dimensions of environment including air, water and land.
- CPCB has done a nationwide environmental assessment of Industrial Clusters based on CEPI and 43 such industrial clusters having CEPI greater than 70, on a scale of 0 to 100, has been identified as critically polluted.
- The concept can be applied to locations also other than industrial clusters Changes in an industry which make it less polluting shall be permitted.
- The outcome of the CEPI assessment shall not be used by the Bankers for any sort of financial freezing decisions on industry funding.

96. Correct Answer: (c)

Integrated Development of Wildlife Habitats

- The Government of India provides financial and technical assistance to the state/UT government for activities aimed at wildlife conservation through the Centrally Sponsored Scheme viz., 'Integrated Development of Wildlife Habitats'.
- The scheme has the following three components;
- support to Protected Areas (national parks, wildlife sanctuaries, conservation reserves and community reserves);
- protection of wildlife outside protected areas;
- and recovery programmes for saving critically endangered species and habitats.

97. Correct Answer: (c)

Green Muffler Scheme

- Green Muffler is a technique of reducing noise pollution by planting 4-6 rows around the populated areas or noisy places like along roadsides, industrial areas, societies near highways, etc.
- so that dense trees filter out the noise and obstruct reaching the citizens.
- It is also a device for decreasing the amount of noise emitted by the exhaust of an internal combustion engine.
- Under the Green Muffler scheme, Asoka and Neem plants are planted near the house or resident localities to reduce noise pollution.
- Trees are known as noise buffers as they control noise pollution by absorbing high-frequency noise.
- Even urban noises are muffled by trees just like stone walls. Evergreen shrubs that too with broader leaves provide year-round noise protection so, they are best to plant.
- Trees absorb sound waves with their branches and foliage.
- Plant trees with no space or less space are better efficient to reduce noise pollution.

98. Correct Answer: (b)

Solar Geo-Engineering/Solar Radiation Management (SRM)

- It is a process through which the reflectivity (albedo) of the Earth's atmosphere or surface is increased, in an attempt to offset some of the effects of GHG-induced climate change through anthropogenic intervention.
- The technique mimics big volcanic eruptions that can cool the Earth by masking the sun with a veil of ash or similar other things.
- Solar Radiation Management Governance Initiative (SRMGI) is an international, NGO-driven project, financed by Dustin Moskovitz (co-founder of Facebook) for expanding the discussion of SRM climate engineering research governance to developing countries.
- The Royal Society, The academy of sciences for the developing world) and Environmental Defence Fund (EDF) are its partners.

The methods include:

- Space-Based Options/Space Sunshades e.g. using mirrors in space, placing vast satellites at Lagrange Point 1, space parasol, etc.
- Stratosphere-Based Options such as the injection of sulphate aerosols into the stratosphere.
- Cloud-Based Options/Cloud Seeding e.g. Marine Cloud Brightening (by spraying a fine seawater spray in the air), seeding of high cirrus clouds with heterogeneous ice nuclei.
- Surface-Based Options e.g. whitening roofs, growing more reflective crops, etc.

99. Correct Answer: (a)

Strengthening Forest Fire Management in India

- The report, "Strengthening Forest Fire Management in India" is jointly prepared by the Ministry of Environment, Forest, and Climate Change (MoEFCC) and the World Bank says forest fires are today a leading cause of forest degradation in India.

- The report discusses policies on forest fire prevention and management (FFPM) at the national, state and local levels, underscoring the need for a comprehensive national policy and guidelines.
- It provides recommendations on five broad themes – policy, institutions and capacity, community engagement, technology, and data and information and looks at national and international best practices in FFPM.
- The report analyses patterns and trends of forest fires in India. While the findings of this study indicate that forest fires occur every year in almost every state in India, some districts have been found to be more vulnerable than others. Just 20 districts (mostly located in the Northeast) account for over 40 percent of all forest fires detected between 2003 and 2016.
- Similarly, the top-20 districts (mainly in Central India) account for about 48 percent of the total fire-affected area, while having just 12 percent of the country's forest cover in the year 2000 and 7 percent of its land area.
- Central India thus has the largest area affected by the forest fire.

India INDC's:

- To reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level.
- To achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030, with the help of the transfer of technology and low-cost international finance, including from Green Climate Fund.
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.

100. Correct Answer: (b)

Extended Producer Responsibility

- It is a term under which producers will be responsible for the collection and channelization of e-waste generated from the 'end of life' of their products to registered dismantler or recycler.
- It is defined under e-waste (Management and Handling) Rules, 2016 as notified by the Ministry of Environment & Forests.