

Ecology & Environment

Self Assessment Test - 1

Answers

1. (a)

Exp: Prairies are mostly devoid of trees and shrubs; High altitude mountain vegetation consists of treeless alpine vegetation.

2. (c)

Exp: Amensalism: One is inhibited or destroyed and other is unaffected. Example - A large tree shades a small plant and retard its growth.

3. (b)

Exp: Niche construction is the process in which an organism alters its own (or other species') environment. For example, through a process of modification, earthworms chemically alter the soil in which they live. The ecological niche describes how an organism or population responds to the distribution of resources and competitors (for example, by growing when resources are abundant, and when predators, parasites and pathogens are scarce) and how it in turn alters those same factors. It is advantageous for a species to occupy a unique niche in an ecosystem because it reduces the amount of competition for resources that species will encounter.

4. (c)

Exp: It is a process by which an ecological community undergoes more or less orderly and predictable changes following a disturbance or the initial colonization of a new habitat. Succession may be initiated

either by formation of new, unoccupied habitat, such as from a lava flow or a severe landslide, or by some form of disturbance of a community. The state of equilibrium, called the climax community, is thought to result when the web of biotic interactions becomes so intricate that no other species can be admitted. The newer species are superseded, in turn, by still newer species.

5. (c)

Exp: Umbrella species are species selected for making conservation-related decisions, typically because protecting these species indirectly protects the many other species that make up the ecological community of its habitat. Umbrella species generally have the following characteristics: their biology is well known, they are easily observed or sampled, they have large home ranges, they are migratory, and have a long lifespan.

6. (d)

Exp: A mutualistic relationship is when two organisms of different species "work together," each benefiting from the relationship. In mycorrhizal associations between plant roots and fungi with the plant providing carbohydrates to the fungus in return for primarily phosphate but also nitrogenous compounds. Other examples include rhizobia bacteria that fix nitrogen for leguminous plants in return for energy-containing carbohydrates. Pollination in which nectar or pollen (food resources) are traded for pollen dispersal (a service) or ant protection of aphids,

where the aphids trade sugar-rich honeydew (a byproduct of their mode of feeding on plant sap) in return for defense against predators such as ladybugs. Zoochory is an example where animals disperse the seeds of plants. This is similar to pollination in that the plant produces food resources (for example, fleshy fruit, overabundance of seeds) for animals that disperse the seeds (service). The bacteria and the human. A certain kind of bacteria lives in the intestines of humans and many other animals. The human cannot digest all of the food that it eats. The bacteria eat the food that the human cannot digest and partially digest it, allowing the human to finish the job. The bacteria benefit by getting food, and the human benefits by being able to digest the food it eats

7. (c)

Exp: It is also called double channel model, given by H. T. Odum. In nature, both grazing and detritus food chains operate in the same ecosystem. However, sometimes grazing food chain (open sea ecosystem) or detritus food chain (in forest ecosystem) predominates. In nature, these two chains seem to be separated, but are not so. Some dead animals which were a part of grazing food chain become incorporated in the detritus food chain like the feces of grazing animals. When shown in the form of diagram, this interdependence looks like the letter Y. This double channel model shows the passage of energy through these two food chains.

8. (d)

Exp: There are different kinds or categories of food webs:

- **Source web** - one or more node(s), all of their predators, all the food these predators eat, and so on.
- **Sink web** - one or more node(s), all of their prey, all the food that these prey eat, and so on.
- **Community (or connectedness) web** - a group of nodes and all the connections of who eats whom.

- **Energy flow web** - quantified fluxes of energy between nodes along links between a resource and a consumer.
- **Paleoecological web** - a web that reconstructs ecosystems from the fossil record.
- **Functional web** - emphasizes the functional significance of certain connections having strong interaction strength and greater bearing on community organization, more so than energy flow pathways.

9. (a)

Exp: A large gene pool indicates extensive genetic diversity, which is associated with robust populations that can survive bouts of intense selection. Genetic drift that may cause an increase in the fitness of organisms, are more likely to fix in the population from extinction if it is rather small. Genetic drift is a random, directionless process; it acts to eliminate genetic variation over time.

10. (d)

Exp: Biogeochemical cycle is a pathway by which a chemical substance moves through both the biotic (biosphere) and abiotic (lithosphere, atmosphere, and hydrosphere) components of Earth.

In phosphorus Cycle phosphorus moves in a cycle through rocks, water, soil and sediments and organisms.

The phosphorus cycle differs from the other major biogeochemical cycles in that it does not include a gas phase; although small amounts of phosphoric acid (H_3PO_4) may make their way into the atmosphere, contributing-in some cases-to acid rain.

Very little phosphorus circulates in the atmosphere because at Earth's normal temperatures and pressures, phosphorus and its various compounds are not gases. The largest reservoir of phosphorus is in sedimentary rock.

It is in these rocks where the phosphorus cycle begins. When it rains, phosphates are removed from the rocks (via weathering)

and are distributed throughout both soils and water. Plants take up the phosphate ions from the soil. The phosphates then moves from plants to animals when herbivores eat plants and carnivores eat plants or herbivores. The phosphates absorbed by animal tissue through consumption eventually returns to the soil through the excretion of urine and feces, as well as from the final decomposition of plants and animals after death.

It does not have losses due to respiration. The atmosphere does not play a significant role in the movement of the phosphorous therefore it is one of the slowest biogeochemical cycles.

11. (c)

Exp: Allelopathy is a biological phenomenon where one plant inhibits the growth of another. Through the release of allelochemicals, certain plants can greatly affect the growth of other plants either in a good or bad way by leaching, decomposition, etc. In essence, plant allelopathy is used as a means of survival in nature, reducing competition from plants nearby.

12. (b)

Exp: The element involved in the sedimentary cycle normally does not follow through atmosphere but follows a basic pattern flow through erosion, sedimentation, mountain building, volcanic activity and biological transport through the excreta of marine birds. Phosphorus, Sulphur, calcium and magnesium circulate by means of the sedimentary cycle.

13. (a)

Exp: A species is defined as; "a group of similar populations of organisms whose members are capable of interbreeding, and to produce fertile offspring (children)". Only members of the same species can interbreed to produce fertile offspring. Every species has its own set of genetic characteristics that makes the species unique and different from other species.

14. (b)

Exp: The edge effects are changes in population or community structures that occur at the boundary of two habitats. Areas with small habitat fragments exhibit especially pronounced edge effects that may extend throughout the range. As the edge effects increase, the boundary habitat allows for greater biodiversity. It is not related to the territorial size.

15. (c)

Exp: Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of weight ($g\ m^{-2}$) or energy ($kcal\ m^{-2}$). The rate of biomass production is called productivity.

Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP).

Secondary productivity is defined as the rate of formation of new organic matter by consumers.

16. (c)

Exp: The energy always flow from lower to higher trophic levels.

In an ecosystem there is always a very low chance of having more than six trophic levels as hardly any energy is left to support the number of organism.

17. (c)

Exp: Community - An aggregation of populations of different species living together (in inter dependence) in a specific area, having a specific set of environmental conditions constitute a biotic community. Examples of major communities are: a pond, a lake, a forest, a desert, a meadow and grassland. Each of these major communities includes several minor communities. The major community exemplified by a forest has many minor

communities namely the plant community (the plant population of the forest), the animal community (the animal population of the forest) and the microbial community (bacteria and fungi population).

18. (b)

Exp: In this type of food chain either the producer or the consumer is parasitized and therefore the food passes to the smaller organism. The energy transfer through this kind of food chain is not significant.

Example: Trees → Fruit eating birds → Lice and bugs → Bacteria and fungi.

Zebra - Nematode - Filamentous bacteri.

Radiant energy of the sun → Green Plants → Sheep → Liver fluke.

19. (d)

20. (b)

Exp: In biomagnification, there is an increase in concentration of a pollutant from one link in a food chain to another. The omnivorous are most affected

21. (a)

Exp: Flagship species are popular, charismatic species that serve as symbols and rallying points to stimulate conservation awareness and action. Examples of flagship species include the Bengal tiger, the giant panda, Asian elephant (*Elephas maximus*), etc. Flagship species can represent an environmental feature (e.g. a species or ecosystem), cause (e.g. climate change or ocean acidification), organization (e.g. NGO or government department) or geographic region (e.g. state or protected area).

Indicator species can signal a change in the biological condition of a particular ecosystem, and thus may be used as a proxy to diagnose the health of an ecosystem.

22. (d)

Exp: First the pioneer community gets developed and later on at last stage climax community gets developed.

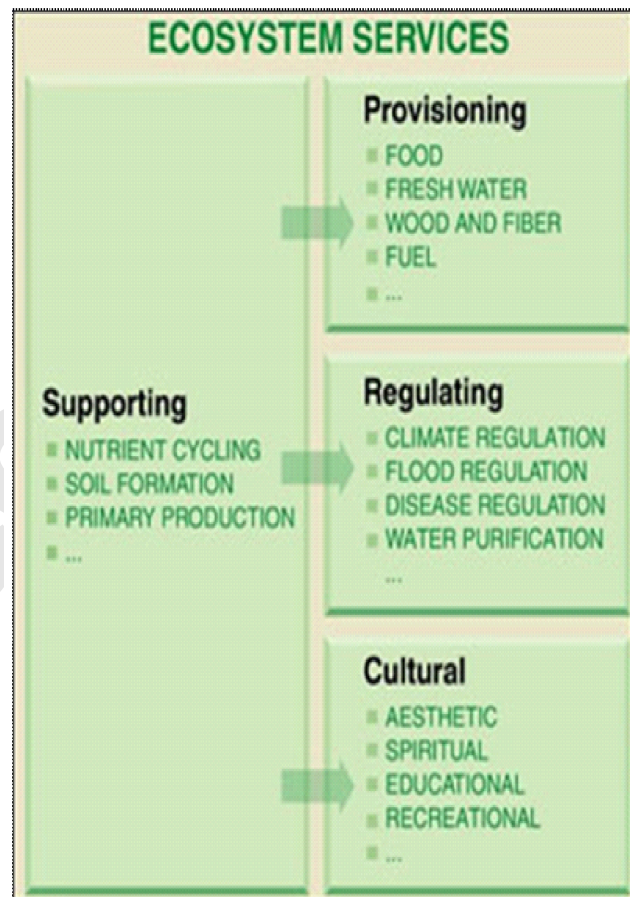
23. (b)

Exp: Emigration and Mortality will decrease the population. Rest will increase.

24. (a)

Exp: Supporting Services: nutrient recycling.

Regulating Services: carbon sequestration.



25. (b)

Exp: Only materials flow are represented in these cycles. Energy flow is represented in pyramids.

26. (d)

Exp: An ecosystem can be described simply as the collection of all living and non-living components in a particular area. The living components of the environment are known as biotic factors. Biotic factors include plants, animals, and micro-organisms.

An ecosystem is a self sustaining structural and functional unit of the biosphere. The ecosystem may be large or small.

Biomes are refers to the large regional and sub continental ecosystem characterized by the similarity in vegetation and climate.

Energy cycles through the abiotic and biotic organisms to maintain balance within the ecosystem. The abiotic parts of an ecosystem include the non-living components, such as air, water and the basic compounds of the environment. Climatic and edaphic factors are several abiotic components of an ecosystem.

27. (b)

Exp: Characteristics of human modified ecosystems (1) Highly simplified. (2) Species diversity is very low. (3) Food chains are simple and small. (4) Depend on human (anthropogenic) support for survival; need for fossil fuel energy, fertilizers, irrigation etc. (5) Attract large number of weeds. (6) More susceptible to epidemic diseases. (7) Suffer from soil erosion. (8) Highly unstable.

28. (c)

Exp: Energy is used for metabolism as well as a part of it is lost as heat to the surroundings.

29. (a)

Exp: It is relationships between organisms and the components of the environment namely abiotic(non-living) and biotic (living). Ecology not only deals with the study of the relationship of individual organisms with their environment, but also with the study of populations, communities, ecosystems, biomes, and biosphere as a whole.

30. (c)

Exp: *Range of tolerance* is the range between critical minimum and critical maximum limits of environmental factors influencing an organism.

Limiting Factor is the single factor that limits the growth, abundance, or distribution of the population of a species in an ecosystem.

Ecological amplitude are the limits of environmental conditions within which an organism can live and function.

Threshold effect is the harmful effect on organism even due to small change which exceeds the limit of tolerance.

Organism with wide range of tolerance is called Eurytopic while the one with narrow range of tolerance are called Stenotopic.

31. (d)

Exp: An increase in Phosphorous due to waste disposal rerouting affect the trophic food web of a lake as:

- Cause an algal bloom,
- Cause increase in biomass and possible shading. That could either cause decrease in phyto or possible increase due to added nutrient
- If assume shading does not affect biomass, the increase in turbidity and loss of water clarity makes is hard for visual hunting predatory piscivorous fish to catch food, so they would decrease.
- Big zooplankton would increase because a lot of phyto available and so small would decrease
- Planktivorous fish would increase because not preyed upon and have a lot of zooplankton to eat

32. (d)

Exp: Bioaccumulation is the accumulation of substances, such as pesticides, or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost by catabolism and excretion.

Biomagnifications - increase in concentration of a pollutant from one link in a food chain to another.

Bioconcentration is the specific bioaccumulation process by which the concentration of a chemical in an organism becomes higher than its concentration in the air or water around the organism. Although the process is the same for both natural and manmade chemicals, the term bio-concentration usually refers to

chemicals foreign to the organism. For fish and other aquatic animals, bioconcentration after uptake through the gills (or sometimes the skin) is usually the most important bioaccumulation process.

33. (a)

Exp: Difference between food chain and food web:

- A food web indicates all possible transfer of energy and nutrients among the organisms in an ecosystem whereas a food chain traces only one pathway of the food.
- Food web increases the stability of the ecosystem where as separate food chain increases the instability of the ecosystem.
- Food chain does not have any effect on improving the adaptability and competitiveness of the organism but food web has an effect on improving the adaptability and competitiveness of the organism.

34. (d)

Exp: Photosynthesis is the processes of assimilation of carbon dioxide and water into carbohydrate (Glucose) and oxygen in presence of sunlight. Birds of colder areas of northern hemisphere begin their southward migration as the day lengths begin to shorten. Leaf Fall and Dormancy occur in temperate and subtropical areas in response to shortening day length. Most plants flower at a particular season in response to a particular photoperiod. e.g., spring, summer, autumn or winter.

35. (a)

Exp: Decomposition is the natural process of dead animal or plant tissue being rotted or broken down. The important steps in the process of decomposition are fragmentation, leaching, Catabolism and, Humification and Mineralization. Decomposition is largely an oxygen requiring process. Humification leads to accumulation of a dark colored amorphous substance called humus that is highly chemical resistant to microbial action and undergoes at an extremely slow rate.

The humus is further degraded by some microbes and release of inorganic nutrients occurs by the process known as mineralization.

Humification and mineralization occur during decomposition in the soil.

Bio-magnification is the process by which substance become more concentrated in the bodies of consumers as one moves up the food chain . when chemicals or pesticide are let into rivers or lakes they are consumed by aquatic organism like fish, which in turn are consumed by large birds, animals and humans.

36. (c)

Exp: Allogenic succession is succession driven by the Abiotic (Non living) components of an ecosystem. In contrast, autogenic succession is driven by the biotic components of the ecosystem. An allogenic succession can be brought about in a number of ways which can include v, Meteor or comet strike, Flooding, Drought, Earthquakes etc.

Autogenic succession is the succession in which organisms (living inhabitants) themselves bring change in the environment.

Autotrophic succession is the succession in which initially the green plants are much greater in quantity.

Secondary succession occurs when plants recognize an area in which the climax community has been disturbed.

37. (d)

38. (a)

Exp: The promotion of a few favoured species in many parts of India has been carried through the ironical termed 'Enrichment plantation' in which single commercially valuable species was extensively planted and other species eliminated. Teak monoculture has damaged the natural forest in south India and Chir Pine plantations in the Himalayas have replaced the Himalayan oak.

39. (a)

40. (c)

Exp: Water undergoes a cycle from the ocean to land and land to ocean. The hydrological cycle describes the movement of water on, in, and above the earth. The distribution of water on earth is quite uneven. Many locations have plenty of water while others have very limited quantity. The hydrological cycle is the circulation of water within the earth's hydrosphere in different forms i.e. the liquid, solid and the gaseous phases. During colder climatic periods more ice caps and glaciers form, and enough of the global water supply accumulates as ice to lessen the amounts in other parts of the water cycle. The reverse is true during warm periods. During the last ice age glaciers covered almost one-third of Earth's land mass, with the result being that the

oceans were about 122 m (400 ft) lower than today.

Ocean waters and waters trapped in the pore spaces of sediments make up most of the present-day hydrosphere. The total mass of water in the oceans equals about 50 percent of the mass of sedimentary rocks now in existence and about 5 percent of the mass of Earth's crust as a whole. Deep and shallow groundwaters constitute a small percentage of the total water locked in the pores of sedimentary rocks-on the order of 3 to 15 percent.

Human activity such as the burning of fossil fuels has an effect on the overall increase of the Earth's temperature. Raising the Earth's temperature may mean that there is an increase of evaporation, melting of ice or other processes of the water cycle that adversely affect the climate on Earth.