



30 Days Revision Module Day 17 - Environment I (UPSC Prelims 2021)

1) Consider the following statements about Nitrogen Fixation

1. Urea based fertilizers are the source of Nitrogen for plant growth.
2. Denitrification is the process of fixation of Nitrogen from the air into the soil.
3. Denitrification similar to nitrogen fixation can be carried by bacteria.
4. The process of lightning can also help in fixing nitrogen.

Which of the statements given above is/are correct?

- a. 2 only
- b. 1, 3 and 4
- c. 1 and 4 only
- d. 2, 3 and 4

Answer : b

- Denitrification is the process of converting nitrates in the soil to gaseous nitrogen to be released into the air. It is a microbial reduction done by special denitrifying bacteria like pseudomonas and thiobacillus.
- The enormous energy of lightning breaks nitrogen atoms in the atmosphere. These broken atoms form nitrates when mixing with precipitation and reach the soil. Therefore, lightning helps in nitrogen fixation.

2) The rich growth of sea grasses along the Tamil Nadu coast and Lakshadweep islands is mainly due to

1. High salinity
2. Clarity of water
3. Sandy substratum

Select the correct answer using the codes given below.

- a. 1 and 2 only
- b. 2 and 3 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : d

- Seagrasses are marine flowering plants that resemble grass in appearance. Conditions for growth are sandy or muddy bottoms, calmer seas, shallow coastal waters along with high salinity.

3) Which of the following statement is correct regarding Tropical Rain forest?

1. Presence of Epiphytes and Climbers
2. High fertile soil
3. Reduced Wind pollination
4. Dark green coloured leaves in lower region

Select the correct answer using the codes given below

- a. 1 and 3 only
- b. 1, 2 and 3 only
- c. 1, 3 and 4
- d. 1, 2, 3 and 4

Answer : c

- Soils in tropical rainforests are typically deep but not very fertile, partly because large proportions of some mineral nutrients are bound up at any one time within the vegetation itself rather than free in the soil.

4) Consider the following statements

1. Greenhouse gas emissions
2. Activation of Pathogens
3. Damages to roads and building

Which of the above are **not possible consequences** of 'Permafrost Thawing' in higher latitude ecosystem?

- a. 2 only
- b. 3 only
- c. 2 and 3 only
- d. None of the above

Answer : d

- Permafrost is permanently frozen soil, and occurs mostly in high latitudes. Permafrost comprises 24% of the land in the Northern Hemisphere, and stores massive amounts of carbon. As a result of climate change, permafrost is at risk of melting, releasing the stored carbon in the form of carbon dioxide and methane, which are powerful heat-trapping gases.
- So thawing of permafrost will lead to increase in green house gases emission (as trapped CO₂ is released)
- The pathogens are activated because at very low temperatures they lie in a dormant state.
- Damages to infrastructure can happen due to inundation of low lying areas due to increase in sea level increase.

5) Consider the following statements with regard to biodiversity

1. Species diversity is more important than Genetic diversity.
2. Greater biodiversity can be seen when different ecosystem converges.
3. Genetic diversity of a species should not show much variation in a distributional range.
4. Tropical rain forest are rich in biodiversity but lacks niche specialisation.

Which of the following statements are **not correct**?

- a. 3 and 4 only
- b. 1 and 3 only
- c. 1, 3 and 4 only
- d. 1, 2, 3 and 4

Answer : c

- Species diversity indicates presence of different types of species of different family
- Genetic diversity describes how closely related the members of one species are in a given ecosystem
- Ecosystem diversity: A region may have several ecosystems, or it may have one. Wide expanses of oceans or deserts would be examples of regions with low ecological diversity. A

mountain area that has lakes, forests and grasslands would have higher biodiversity

- Generally greater is diversity; greater is species stability, species richness, stability of ecosystem.
- When there exists different ecosystems, there is greater diversity. Imagine a delta which is transition ecosystem between fresh water (river) and sea. Here there can be fresh water, salt water species. Instead imagine only a river – only fresh water species can exist
- Imagine feline family which has cat, lion, tiger. This indicates genetic diversity which contributes to its stability. So over a geography, there must be genetic diversity.
- A niche is the fit of a species living under specific environmental conditions. The ecological niche describes how an organism or population responds to the distribution of resources and competitors and how it in turn alters those same factors
- In tropical rain forest, there is definite niche specialisation. (eg) creepers can't spread on ground.
- Both species and genetic diversity is important.

6) Consider the following statements

1. This place is located on both biodiversity hot spot and biosphere reserve
2. This region have moist deciduous forest
3. This place has largest population of lion-tailed macaque

Which of the following state has that place which mentioned in the above statements?

- a. Tamil Nadu
- b. Sikkim
- c. Mizoram
- d. Andaman and Nicobar

Answer : a

- Biodiversity hotspots are just 4 in India which is Himalayas, Indo Burma, Sundalands, Western Ghats and Sri Lanka.
- Conservation International a NGO designates Hotspots.
- In Biodiversity reserves, Tamil Nadu has Agasthiyamalai & Gulf of Mannar (which is also 1st Marine Biosphere reserve)
- Lion-tailed macaque is endemic to Western Ghats.

7) Consider the following statements with respect to Biochar

1. It is a type of charcoal that is produced by pyrolysis of biomass in the high presence of oxygen.
2. It may increase soil fertility of acidic soils (low pH soils), increase agricultural productivity.

Which of the statement(s) given above is/are **not correct**?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : a

Biochar

- It is a solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment or in absence of oxygen.
- It is used as a soil ameliorant for both carbon sequestration and soil health benefits.
 - Biochar may increase soil fertility of acidic soils (low pH soils), increase agricultural productivity, and provide protection against some foliar and soil-borne diseases.

8) Consider the following statements

1. Ocean accounts for the largest amount of Earth's primary production
2. Tropical Rain forest accounts for highest primary productivity per square meter

Which of the statements given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : c

- Primary production refers to the conversion of CO₂ and H₂O into organic substance. And in Ocean that's done by phytoplankton along the surface of the ocean. Since oceans occupy 79% of earth, primary production in oceans is maximum.
- Primary production is mainly taking in CO₂ and H₂O to produce food for which we need light and water. That's available in plenty around equator. And equator mostly hosts tropical rainforest

9) Consider the following characteristics:

1. High pressure
2. Low temperature
3. Absence of oxygen
4. Constant salinity

Which of the above characteristics are correct regarding Benthic Zone (Deep Ocean)?

- a. 1 only
- b. 1, 2 and 4 only
- c. 1 and 2 only
- d. 1, 2, 3 and 4



Answer : b

- The benthic zone is the ecological region at the lowest level of a body of water such as an ocean, lake, or stream, including the sediment surface and some sub-surface layers
- Since height of the water column at benthic layer is maximum, the pressure is invariably maximum at benthic layer.
- There exists an ecosystem at benthic layer which survives in minimum oxygen. So oxygen is lesser but not absent (as upwelling and down welling always happens)

10) Consider the following statements regarding food chain:

1. In an aquatic ecosystem, more energy flows through grazing food chain than detritus food chain.
2. In a terrestrial ecosystem, larger fraction of energy flow through detritus food chain than grazing food chain.

Which of the statements given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : c

- The main difference between both these types of the food chain is that grazing food chain

starts from the green plants, which are the primary producers, whereas detritus food chain begins from the dead organic matter or decomposed material, which is usually present in the soil.

- The energy for the grazing food chain comes from the sun as the autotrophs (green plants) prepare their food (photosynthesis) amid the presence of the sunlight. On the other hand, the energy for the detritus food chain is taken from the detritus or the decomposed materials.
- As such, grazing food chain produces a less amount of energy to the atmosphere whereas grazing food chain produces more.
- Grazing food chain starts with producer then herbivores followed by primary carnivore and secondary carnivore.
- The energy flow rate is fast but magnitude/amount of energy is low because of various levels of organism.
- Detritus food chain begins with dead organic matter. When organisms die then their body form a source of energy and raw materials for other organisms. The amount of energy present is high in a dead organism.
- Now decomposers feed on them by degrading dead organic matter. The energy flow rate is very slow but amount of energy is high as it doesn't any other organisms in between decomposers and dead organic matter. Detritivores may be fed up upon by carnivores, thus building a food chain based on detritus.

11) Consider the following statements

1. Tundra regions have short and cool summers with a maximum temperature of 20 degree Celsius.
2. Taiga regions are treeless and have polar ice caps with winter extending for almost 10 months of the year.

Which of the above statements is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2



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Answer : d

- Tundra regions have extreme winters with temperatures dipping up to -50-degree Celsius, and short and cool summers with temperatures ranging from -10 to 20 degrees Fahrenheit (not Celsius).
- Taiga regions have coniferous trees which have cone shape to help snow slide off them so that branches wouldn't break. Therefore, they are known as evergreen forests as they remain throughout the year.
- Taiga regions have severe winters for a period of 6 months and summer is short, lasting from 50 to 100 days helping to thaw the frozen subsoil.

12) Arrange the following ecosystem in ascending order of their Net Primary Productivity?

1. The Arabian Sea
2. The Western Ghats
3. The Sundarbans forests
4. Savannahs
5. Kalahari Desert

Choose the correct answer using the codes given below

- a. 1-3-4-2-5
- b. 5-1-4-2-3
- c. 5-4-3-2-1
- d. 1-2-4-3-5

Answer : b

- Terrestrial net primary productivity in ascending order is:
- Extreme desert < desert < Tundra < temperate grassland < woodland and shrubs
- Aquatic net primary productivity in ascending order is:
- Open oceans < continental shelf < lakes and streams < estuaries.

13) Consider the following statements

1. High insolation
2. Less glacial disturbance
3. Temperature extremes
4. High Rainfall

Which of the given above factors are responsible for rich biodiversity in tropical latitudes?

- a. 1 and 4 only
- b. 1, 2 and 3 only
- c. 1, 2 and 4 only
- d. 1, 2, 3 and 4

Answer : c

- Temperature (or any climatic extreme) is not suitable for an ecosystem to survive. It is this extreme temperature because of which we don't find life in both cold and hot desert.
- Less glacial disturbance means lesser extremes of temperature which can help life to thrive.
- High insolation and high rainfall means that we have greater sunlight and water which are basic building blocks of life on earth.

14) With reference to Indian agriculture, consider the following statements

1. Phosphorus is required by plants for energy transfer and Photosynthetic activity.
2. The rate of cycling of phosphorus is slow compared to carbon and nitrogen.
3. Similar to carbon and nitrogen, Phosphorus also has a gaseous presence in hence is required to be fixed into the soil for plants absorption.

Which of the above statements is/are correct?

- a. 1 and 2 only
- b. 2 and 3 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : a

- The presence of phosphorus is essential for the production and functioning of photosynthetic activity in plants. A small deficiency or increased toxicity of phosphorus in plants can result in major impacts on plant growth or photosynthetic machinery.
- The depletion of phosphorus from the exchange pool is compensated very slowly by the release of the element from the phosphate rocks of the reservoir pool. This occurs by the process of erosion and weathering and therefore it is slow compared to nitrogen and carbon cycles.
- Phosphorus and Sulphur cycles are sedimentary and do not transit between the gaseous phase and sedimentary state, like the nitrogen and carbon cycles.

15) With reference to Ecological Pyramids consider the following statements:

1. Ecological pyramids highlight spatial diversity of an ecosystem.
2. Pyramid of number in grassland and the pyramid of biomass in oceans is always upright.
3. Pyramid of energy includes humans as well.

Which of the above statements is/are correct?

- a. 3 only
- b. 1 and 2 only
- c. 2 and 3 only
- d. None of the above

Answer : a

- Ecological pyramids emphasize the energy transfer and feeding patterns of an ecosystem but don't account for multiple species present in one or more trophic levels. Therefore, they don't highlight the spatial diversity of an ecosystem.
- The pyramid of biomass in oceans is not always upright because the top species like a blue whale has more dry mass than the dry mass of all the phytoplankton put together. The pyramid of numbers in the grassland ecosystem is always upright because the number of producers (grass) will always be more than the number of herbivores.
- Humans are omnivorous and can be placed on the third or fourth level in the pyramid of energy. Therefore, the pyramid of energy includes humans as well.

16) With reference to biotic interactions among organisms, consider the following statements:

1. Biotic interactions are always negative.
2. Two species with exactly same function difficult to coexist in the same habitat.
3. Biotic interactions impact the evolution and spatial diversity in an ecosystem.

Which of the above statements is/are **not correct**?

- a. 1 and 2 only
- b. 1 only
- c. 2 and 3 only
- d. 3 only



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Answer : b

- Not all biotic interactions are negative. Interactions like commensalism and mutualism are positive interactions where either one or both participating species get benefitted.
- When two species with the same functional role or niche exist in an ecosystem, they tend to compete, and conflict of survival arises. Therefore, two species with the same function have difficulty coexisting in the same habitat.
- Biotic interactions help in eliminating a weaker species due to competition and helps in developing an interdependence between organisms through a symbiotic relationship. Elimination and interdependence help in the process of evolution, thereby increasing the spatial diversity in an ecosystem.

17) Consider the following statements regarding Energy Flow through Trophic Levels in a Food Chain.

1. Energy always decreases from one trophic level to the next due to the decreased number of organisms in each subsequent level.
2. The decrease in energy through trophic levels restricts the maximum number of trophic levels in a food chain.

Which of the statements given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : b

- The energy flow decreases not because decrease (or increase) in number of organisms but it happens because of at each level that organisms take certain amount of energy for its survival.
- Yes, as energy transfer (quantity) decreases from one level to another, there can be a situation where terminal state is devoid of energy for its survival itself. At this stage, energy flow stops as well.

18) 'Resource Partitioning' occurs in which of the following biotic interaction?

- Mutualism
- Competition
- Commensalism
- Neutralism

Answer : b

- Mutualism: Same resource is shared by two species and thus there is no partitioning.
- Competition: This is where each organism tries to carve out a compartment of resource exclusively for itself such that it affects the other.

19) 'They are species that have a disproportionately large effect on their environment relative to their abundance. Such species are important in determining the ability of a large number of other species to persist in the community.'

The above paragraph describes which of the following type of species?

- Threatened species
- Indicator species
- Keystone species
- Flagship species

Answer : c

- Threatened Species: Any species that is likely to become extinct within the foreseeable future throughout all or part of its range and whose survival is unlikely if the factors causing numerical decline or habitat degradation continue to operate.
- Indicator species: A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.
- Keystone species: Species that has a disproportionate effect on its environment relative to its biomass and whose removal initiates significant changes in ecosystem structure and loss of biodiversity.
- Flagship species: A species used as the focus of a broader conservation marketing campaign based on its possession of one or more traits that appeal to the target audience.

20) Arrange the following in the correct sequence of their occurrence during primary succession on land:

- Shrubs
- Forest
- Lichens
- Bryophytes

Select the correct answer using the codes given below.

- 1-2-3-4
- 2-1-4-3
- 4-3-1-2
- 3-4-1-2

Answer : d

- Such questions can be addressed with elimination various options.

- Easily it is that forest is mature state of succession and that eliminates options (a) & (b)
- Bryophytes (Statement 4) are small, non-vascular plants, such as mosses, liverworts and hornworts.
- Lichens (Statement 3) are a complex life form that is a symbiotic partnership of two separate organisms, a fungus and an alga
- So lichens must precede bryophyte as lichen is a type of fungi which helps biological generation from the barren ecosystem.



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