Q.6)

Exp) Option b is the correct answer.

Biomagnification is the phenomenon where pollutants tend to accumulate at higher concentrations as they progress through successive trophic levels. For example, the increasing concentration of DDT (dichloro-diphenyl-trichloroethane) in organisms as they move up the trophic levels in a food chain.

Option 1 is correct: For biomagnification to occur, a pollutant must be long lived. Pollutants with longer life spans have more time to accumulate in organisms and move up the food chain e.g. DDT, a biomagnifying pollutant, has a life of more than 15 years. If a pollutant is short-lived, it will be broken down before it can become dangerous.

Option 2 is incorrect: If the pollutant is soluble in water it will be easily excreted by the organism. For biomagnification to occur, pollutants must be soluble in fats as pollutants that dissolve in fats may be retained for a long time.

Option 3 is correct: For biomagnification to occur a pollutant must be biologically active otherwise it cannot be passed onto the next level of food chains.

Option 4 is incorrect: A pollutant must be mobile for biomagnification to occur. If it is not mobile, it will stay in one place and is unlikely to be taken up by organisms.

Q.10)

Exp) Option a is the correct answer.

Coral reefs are underwater ecosystems made up of coral **polyps** (marine invertebrate animals) and calcium carbonate. These ecosystems generally thrive in **warm, shallow waters**, forming some of the most vibrant and productive habitats in the world. Two major types of corals found in these ecosystems are **hard corals (scleractinians) and soft corals (octocorals).**

Statement 1 is correct: Hard corals, are responsible for **building reef structures due to their ability to secrete calcium carbonate skeletons**. **Soft corals lack this capacity**, and while they are essential components of coral reefs, they do not actively contribute to the physical framework of reef formations.

Statement 2 is incorrect: **Similar to hard corals, soft corals can host zooxanthellae algae,** which contribute to their coloration. Zooxanthellae are photosynthetic algae that live within the coral tissues, providing energy to the coral through photosynthesis. The presence of zooxanthellae is crucial for both hard and soft corals and significantly influences their vibrant colors.

Q.12)

Exp) Option d is the correct answer.

Net primary productivity (NPP) refers to the rate at which **plants and other primary producers accumulate energy as biomass**. This is determined by assessing the growth in **biomass per unit area** within a **specified time frame.**

Option 2 - With **shallow waters, rich nutrients, and abundant plant life**, wetlands boast this group's highest net primary productivity (NPP).

Option 3- While less productive than wetlands, savannahs still have significant NPP due to **efficient energy capture by grasses**. Savannah, unlike Steppe, is categorized as a **transitional grassland** which has **higher NPP** as compared to the **non-transitional grasslands.**

Option 1- Freshwater lakes typically have **lower NPPs than wetlands and savannahs** due to factors like **water depth, nutrient levels, and temperature**.

Option 4- The open ocean has a comparatively lower NPP due to **limited light penetration and nutrient availability in deeper waters.** However, coastal areas and upwelling zones can be much more productive.

Option 5- Arid ecosystems with **limited rainfall and scarce vegetation**, deserts naturally exhibit the **lowest NPP** among these ecosystems

Q.19)

Exp) Option a is the correct answer.

Statements 1 is incorrect. Eutrophic lakes are rich in nutrients like nitrogen and phosphorus, often due to factors like agricultural runoff or sewage discharge. Whereas, Oligotrophic lakes are naturally low in nutrients, limiting plant and algae growth.

Statements 2 is incorrect. When the algae and plants die, they decompose, consuming oxygen in the water **creating hypoxic (low oxygen)** conditions harmful to aquatic life in the **eutrophic lake. Whereas in oligotrophic lake, there is abundant oxygen** due to low organic matter decomposition and the absence of hypoxic conditions.

Statements 3 is correct. Eutrophic lakes often exhibit **reduced water clarity** due to the presence of algae and other suspended particles. Algal blooms can cause water discoloration. **Oligotrophic lakes typically have clearer water**, allowing sunlight to penetrate deeper into the water column. This is because of lower algal concentrations.

Q.31)

Exp) Option d is the correct answer.

The standing crop of an ecosystem includes all living organisms, regardless of their position in the food chain. Standing crop can be measured for different levels of organization within an ecosystem, from individual organisms to populations, communities, and entire ecosystems.

Option d is correct: In ecology, standing crop refers to the total amount of living biomass present in a given area at a specific moment in time. This includes all organisms, from producers like plants and algae to consumers like animals and bacteria. Standing crop is an important metric for understanding the productivity and functioning of an ecosystem. It can be used to assess the carrying capacity of an environment, track changes over time, and compare different ecosystems. The biomass of a species is expressed in terms of fresh or dry weight.

Q.34)

Exp) Option c is the correct answer.

Statement 1 is correct: In ecology, the term "niche" describes the functional role an organism plays in a community. A species' niche encompasses both the physical and environmental conditions it requires (like temperature or terrain) and the interactions it has with other species (like predation or competition).

Statement 2 is correct: In general, species that have narrow or limited niches are considered to be **specialist species**. Species with broader niches are considered **generalists**. **No two species can have the exact same niche, otherwise, they would be in direct competition for resources with one another.** If this occurs, then one species will outcompete the other.

Q.36)

Exp) Option b is the correct answer.

Statement 1 is incorrect: **Keystone species** is a species whose **addition to or loss from an ecosystem leads to major changes in abundance or occurrence of at least one other species**. Certain species in an ecosystem are considered more important in determining the presence of many other species in that ecosystem. **Sentinel species are organisms selected to monitor environmental health, serving as indicators of potential hazards.** Their sensitivity to changes helps detect and assess threats, providing insights into ecosystem well-being.

Statement 2 is correct: Most of the top predators (Tiger, Lion, Crocodile, Elephant) **are considered as keystone species** because it regulates all other animals' population indirectly. Hence top predators are given much consideration in conservation. Key stone species deserve special attention from the

conservation point of view. Conservation of keystone species encourages conservation of all other relevant species associated with this.

Statement 3 is correct: If **keystone species is lost, it will result in the degradation of the whole ecosystem.** For example, certain plant species (ebony tree, Indian laurel) exclusively depend upon bats for their pollination. If the bat population is reduced, then regeneration of particular plants becomes more difficult. This changes the vegetation structure which adversely influences the dependent animals.

Q.39)

Exp) Option a is the correct answer.

Option a is correct: Seral stage (Sere) is the in**termediate community stage in succession** in an ecosystem which is **progressing towards its climax community**. Ecosystem succession occurs when a series of communities (each community is called a seres) replace one another. Each community changes the environment to make conditions favourable for a subsequent community and unfavourable for it till the climax community is established.

Option b is incorrect: Ecotone is a **zone of junction** between two or more diverse ecosystems. E.g., the mangrove forests are an ecotone between marine and terrestrial ecosystems while grasslands represent an ecotone between forest and desert. Other ecotones are estuary and riverbank.

Option c is incorrect: Niche refers to the u**nique functional role or place of a species** in an ecosystem. A niche is unique for a species and no two species in a habitat can have the same niche. Niche is important for the conservation of organisms.

Option d is incorrect: This describes the term Ecological succession. Ecological succession is the pr**ocess of change in the species structure of an ecological community over time**. One community replaces another until a stable and mature climax community develops.

Q.40)

Exp) Option b is correct

The biological community of an area or ecosystem is a complex network of interactions. It refers to the interaction taking place between individuals belonging to the same species (intra specific) or different species (interspecific). Some of the examples are:

Option a is incorrect – Amensalism is a negative association between two species in which one species harm or restricts the other species without itself being adversely affected or harmed by the presence of the other species. Organisms that secrete antibiotics and the species that get inhibited by the antibiotics are examples of amensalism. For example the bread mould fungi Pencillium produce penicillin an antibiotic substance which inhibits the growth of a variety of bacteria.

Option b is correct – Symbiosis is the extreme form of mutualism. In mutualism there is close interaction between the organisms where both benefits from each other. **However, symbiosis is intimate form of mutualism where one has survival threats without the other species.**

For example – Termites and their intestinal flagellates. Termites can eat wood but have no enzymes to digest it. However, their intestine contains certain flagellate protists (protozoans) that have the necessary enzymes to digest. Similar is the relation between Bees and pollinating flowers where flowering plants are cross pollinated by the bees which benefit by getting nectar from the plants and both cannot survive without the other

Option c is incorrect - In Commensalism one of the species benefits while the other is neither harmed nor benefited. However as given in the paragraph, both of the species are getting benefitted. Some species obtain the benefit of shelter or transport from another species. For example, Epiphytes live on the surface of other plants like ferns, mosses and orchids and use the surface of trees for support and for obtaining sunlight and moisture. The tree gets no benefit from this relationship nor are they harmed.

Option d is incorrect - In Parasitism, one species is harmed and the other benefits. However, in the paragraph, none of the species is getting harmed. Parasitism involves parasite usually a small size organism living in or on another living species called the host from which the parasite gets its nourishment and often shelter. The parasite is benefited and the host is harmed. Plants like dodder plant (Cuscuta) and mistletoe (Loranthus) are parasites that live on flowering plants. Tap worm, round worm, malarial parasite, many bacteria, fungi, and viruses are common parasites of humans.

Q.41)

Exp) Option b is correct.

Coral reefs are large underwater structures composed of the skeletons of colonial marine invertebrates called coral. Zooxanthellae assist the coral in nutrient production through its photosynthetic activities. These activities provide the coral with fixed carbon compounds for energy, enhance calcification, and mediate elemental nutrient flux. Deep-sea corals, like their warm-water cousins, are actually **colonies of small animals** that build a common skeleton, which grows into many shapes and colours.

Statement 1 is incorrect. Deep sea corals do not form rock life reefs. Instead of forming rock-like reefs, these cold-water corals form **groves of tree, feather, column, or fan shapes**, sometimes reaching dozens of feet tall.

Statement 2 is correct. Deep sea corals live **without sunlight** and they **contain no zooxanthellae**. This means these corals must obtain their energy and nutrients elsewhere. They do this by **trapping tiny organisms in passing currents.**

Statement 3 is correct. Deep sea corals can exist as **single polyps or multiple, living in complex colonies** made up of different species. Since these species do not require sunlight or warm water, they are able to grow in a vast array of waters around the world. They have even been found in waters as cold as -1-degree Celsius.

Statement 4 is incorrect. Scientists have **identified nearly as many deep-sea corals as shallow-water species.** The main reason many scientists had no idea of the existence of these deep-sea corals, is because, for many years, the oceans deep depths were inaccessible. In addition to being surprisingly diverse, scientists have also discovered that deep-sea corals are amongst the oldest marine organisms on record. Since corals are constantly growing, regenerating new polyps, some coral reefs have been actively growing for almost 40,000 years.

Q.44)

Exp) Option b is correct

The key difference between biomes, ecosystems, and habitats **is scale.**

Option b is correct. A biome refers to a region of the world characterized by its **similar resident life, environment, and climate.** Temperature, precipitation, and amount of sunlight all affect what type of life resides in a particular biome and help define each biome. There are a number of biomes around the world, including savannah, rainforest, desert, taiga, and marine biomes. **No two biomes are alike.** On the other hand, **habitat describes the physical environment a species lives** in whereas a **biome is comprised of multiple habitats** with similar features. A habitat is specific to a species or population of organisms. A biome is a more inclusive term than a habitat. Within the tropical rainforest biome, the habitat used by spider monkeys and the habitat used by leaf cutter ants can be characterised.

Knowledge Base:

Ecosystem refers to the interaction between organisms living together in a particular environment, habitat is interaction between similar species. It is the structural and functional unit of biosphere.

Community refers to all populations of different species that live in the same area and interact with one another.

Q.45)

Exp) Option c is the correct answer.

The energy is transferred from one organism to another and a part of it is stored in living tissue. This contributes to the production of organisms. It is usually **expressed as the energy or the biomass accumulation over a period of time and designated as kilocalories per square metre** (kcal/m2).

Statement 1 is correct: The rate of production over time is called productivity and its units are g/m2 /year or kcal/m2 /year. **The term productivity refers to the productivity of any one trophic level of the ecosystem or the productivity of the ecosystem as a whole. In ecology, productivity is the rate at which energy is added to the bodies of organisms in the form of biomass. Biomass is simply the amount of matter that's stored in the bodies of a group of organisms.**

Statement 2 is correct: Upwelling is a process in which deep, cold water rises toward the surface.

Water that rises to the surface as a result of upwelling is typically colder and is rich in nutrients. **These nutrients "fertilize" surface waters, meaning that these surface waters often have high biological productivity.** Therefore, good fishing grounds typically are found where upwelling is common.

Statement 3 is correct: The productivity of terrestrial ecosystems is influenced by the climate. Thus, the production would vary in different global ecosystems having different climates. **In contrast to terrestrial ecosystems, in aquatic ecosystems, mainly in oceans, the primary productivity is limited by nutrient availability.** In most ecosystems there is a degree of vertical separation between the zone where primary productivity occurs and the zone in which decomposition and release of nutrients occur.

Q.49)

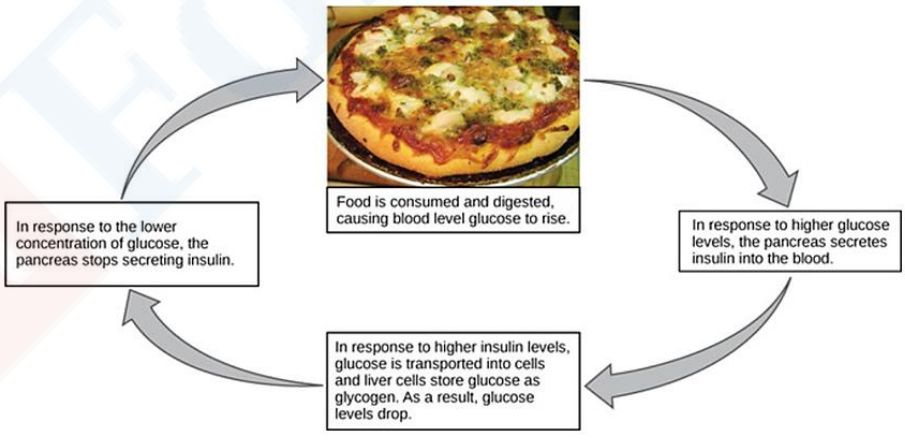
Exp) Option a is correct.

Homeostasis, any self-regulating process by which biological systems tend to maintain stability while adjusting to conditions that are optimal for survival.

If homeostasis is successful, life continues; if unsuccessful, disaster or death ensues.

The stability attained is actually a dynamic equilibrium, in which continuous change occurs yet relatively uniform conditions prevail.

The Human body maintains homeostasis by controlling a host of variables ranging from body temperature, blood pH, Sweating, blood glucose levels to fluid balance, sodium, potassium and calcium ion concentrations.



Blood glucose homeostasis: An example of how homeostasis is achieved by controlling blood sugar levels after a meal.

Similar processes dynamically maintain steady-state conditions in the Earth's environment. Eg Water cycle on earth.