

Q.1) Consider the following statements :

1. Species richness is a measure of the relative abundance of the species within a community.
  2. Species abundance is the number of diverse species in an area or a community. Which of the statements given above is/are **not** correct?
- (a) 1 only  
(b) 2 only  
(c) **Both 1 and 2**  
(d) Neither 1 nor 2

**EXPLANATION:**

Species evenness or Species Abundance is the number of individuals of each species in an ecosystem. It calculates the relative abundance of each species in a community. Species Evenness measures the proportion of species at a given site. Greater Species evenness indicates the region has more species with roughly equal in numbers whereas the low Species evenness indicates, the region is dominated by one or more species.

Note – Relative abundance is the measurement of proportion of each species in the ecosystem. It refers to the evenness of distribution of individuals among species in a community. Two communities may be equally rich in species but differ in relative abundance. **So, Statement 1 is not correct.**

Species richness refers to the number of various species in a defined area. Species richness may be measured by dividing the total number of species by the total area of the defined ecosystem. Unlike species diversity, species richness does not take species abundance into account. **So, Statement 2 is not correct.**

Q.2) Consider the following statements :

1. Dandeli Elephant Reserve is located in Karnataka
  2. Singphan Elephant Reserve is located in Manipur
  3. Lemru Elephant Reserve is located in Jharkhand
  4. Agasthyamalai Elephant Reserve is located in Tamil Nadu
- How many statements given above is/are correct?
- (a) Only one statement  
(b) **Only two statements**  
(c) Only three statements  
(d) All four statements

**EXPLANATION:**

As of now, India has 31 Elephant Reserves and this has brought the total area under Elephant Reserves in India to about 76,508 sq km across 14 states of the country. Few of them are,

- Dandeli Elephant Reserve is located in Karnataka. Karnataka state government officially notified the Dandeli Elephant Reserve under Project Elephant in 2015. This is the second elephant reserve in Karnataka after Mysuru Elephant Reserve, which was declared in 2002
- Singphan Elephant Reserve is located in Nagaland and not in Manipur. It is an important Reserve in the Northeastern states as it is a huge tract of forest, strategically located in contiguity with the Abhaypur Reserve Forest of Assam, frequented by the moving herds of elephants.
- Lemru Elephant Reserve is located in Chhattisgarh and not in Jharkhand. Lemru is one of two elephant reserves planned to prevent human-animal conflict in the region, with elephants

moving into Chhattisgarh from Odisha and Jharkhand. Its area was then proposed to be 450 sq km.

- Agasthyamalai Elephant Reserve is located in Tamil Nadu and will be established in Tirunelveli and Kanyakumari districts.

**So, Option (b) is correct.**

Q.3) Consider the following statements with reference to the Banni grasslands :

1. It is a Reserved Forest land under the Indian Forest Act, 1927
  2. It was a natural habitat of cheetah before it became extinct in India
  3. Prosopis Juliflora species covers nearly 30 per cent of the grassland
- Which of the statements given above are correct?

- (a) 1 and 3 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3**

**EXPLANATION:**

Banni Grassland forms a belt of arid grassland ecosystem on the outer southern edge of the desert of the marshy salt flats of Rann of Kutch in Kutch District. It accounts for almost 45 per cent of the pastures in Gujarat. It was declared a Reserved Forest in 1955, under the Indian Forest Act, 1927.

**So, Statement 1 is correct.**



Image – Banni Grassland

Besides having 40 species of grass and 99 species of flowering plants, Banni is also home to the Indian wolf, jackal, Indian fox, desert fox, desert cat, caracal, hyena, chinkara, Nilgai, wild boar, Indian hare, common monitor lizard — and the cheetah before it became extinct. Banni also has 273 bird species and in years of good rainfall, is home to thousands of migratory birds. Recently too, the Wildlife Institute of India (WII) classified Banni Grasslands as the last remaining habitat of the Cheetah in India. **So, Statement 2 is correct.**

Prosopis Juliflora is a non-native and invasive tree species that encroached on these grasslands. The Land Use Land Cover (LULC) assessment of the grassland over a 10 years interval revealed that grassland areas over the period gradually reduced while in the same period Prosopis Juliflora dominant area increased to say encroached to more than 30 per cent. Therefore, within a gap of 20 years, the Prosopis Juliflora dominant areas doubled in Banni and it is also found that it depletes groundwater availability, increases soil salinity and makes the grassland more susceptible to

wildfires. **So, Statement 3 is correct.**



Image - Prosopis Juliflora

- Q.4) Consider the following statements with respect to Biological oxygen demand (BOD) :
1. Biological oxygen demand is the standard criteria for computing oxygen levels in aquatic ecosystems.
  2. Higher the BOD, higher the water quality.
  3. It is the most accurate method to measure the quality of water. Which of the statements given above is/are correct?
- (a) 1 only  
(b) 2 only  
(c) 3 only  
(d) 1, 2 and 3

**EXPLANATION:**

The quantity of oxygen used up by microorganisms at 27°C and in darkness for 3 days in breaking down organic wastes in a water body is called its biological oxygen demand (BOD). Its value is a standard criterion for managing water pollution by computing oxygen levels in a water body. An evaluation is made by determining oxygen concentration in water before and after incubation at 20°C in dark for 5 days.

The B.O.D. value of an aquatic system depends upon the following,

- the type and amount of organic waste
- the organisms acting on it
- temperature and pH

**So, Statement 1 is correct.**

The BOD value is calculated from the depletion and the size of the sample used. The DO readings are usually in parts per million (ppm). Higher BOD indicates more oxygen is required, signifying lower water quality. Low BOD means less oxygen is being removed from the water, so the water is usually purer in quality. **So, Statement 2 is not correct.**

The chemical oxygen demand (COD) is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solution. It is the most accurate method to measure water and wastewater quality because it shows more accuracy than BOD (with a 5-10% relative standard deviation) and it offers a relatively short analysis time (2-hour digestion time), compared to the 5-

day BOD test. The COD test is also often used to monitor water treatment plant efficiency. **So, Statement 3 is not correct.**

Q.5) Which of the following statements are correct with reference to the Agro-biodiversity Hotspots of India?

1. Totally there are 30 Agro-biodiversity Hotspots in India.
2. Eastern Himalayan Hotspot covers all the districts of Arunachal Pradesh and Sikkim
3. Both Andaman and Nicobar Islands and Lakshadweep are covered under the Islands Hotspot

Select the correct answer using the code given below :

- (a) 1 and 2 only  
**(b) 2 and 3 only**  
(c) 1 and 3 only  
(d) 1, 2 and 3

**EXPLANATION:**

Agrobiodiversity is the result of natural selection processes and the careful selection and inventive developments of farmers, herders, and fishers over millennia. Agrobiodiversity is a vital sub-set of biodiversity. In India, there are only 22 Agro – Biodiversity Hotspots. **So, Statement 1 is not correct.**

Q.6) Consider the following statements :

1. Seagrass meadows are found all around the world including the polar regions
  2. A total of 14 species of seagrasses are reported in Indian waters
  3. Lakshadweep islands harbour the maximum number of species in India
- Which of the statements given above is/are correct?

- (a) **2 only**  
(b) 1 and 2 only  
(c) 1 and 3 only  
(d) 1, 2 and 3

**EXPLANATION:**

Seagrasses are marine flowering plants capable of completing their life cycle when they are submerged in seawater. The seagrass ecosystem is one of the most widespread coastal vegetation types when compared to coral and mangrove ecosystems. They occur in all the coastal areas of the world except the polar regions because of ice scouring. **So, Statement 1 is not correct.**

India, being in the Indo-Pacific region, has high seagrass diversity, it has 14 species of seagrass belonging to 7 genera. This plays a significant role in the processes and resources of near-shore coastal ecosystems, contributes substantially to carbon sequestration, and supports a high diversity of fauna. The health of seagrass meadows is closely tied to that of mangroves and coral reef ecosystems as many fish migrate between these habitats for food and shelter. **So, Statement 2 is correct.**

The seagrass flora occurs all along the coastal areas of India and it is represented widely, out of which the Gulf of Mannar and Palk Bay harbour the maximum number of species, followed by Andaman and Nicobar and Lakshadweep islands. **So, Statement 3 is not correct.**

Q.7) Which of the following causes threat to coral reefs and their biodiversity?

1. Cyanide fishing

2. Black-band disease
3. Fishing and tourist boats
4. Sedimentation

Select the correct answer using the code given below :

- (a) 1, 2 and 3 only
- (b) 1 and 2 only
- (c) 3 and 4 only
- (d) **1, 2, 3 and 4**

**EXPLANATION:**

Coral reefs are some of the most diverse ecosystems in the world. Coral polyps, the animals primarily responsible for building reefs, can take many forms: large reef-building colonies, graceful flowing fans, and even small, solitary organisms. Thousands of species of corals have been discovered - some live in warm, shallow, tropical seas, and others in the cold, dark depths of the ocean. The following are the main threats to the coral reefs and their biodiversity,

- The over-exploitation of shells and corals for trade and industrial use, as well as dynamite and cyanide fishing, cause serious threats to coral reefs and their biodiversity. Domestic wastes, industrial wastes, fertilizers, and other toxic chemicals when let into the oceans cause serious damage to coral reefs.
- Black-band disease (BBD) is one of the most easily identified coral diseases because of its distinctive appearance. The black band is a bacterial mat, consisting of cyanobacteria, sulfide-oxidizing, and sulfate-reducing bacteria. Coral reefs are also affected by coral diseases such as the black band and white band due to infectious microorganisms introduced by the human population that lives in the coastal regions.
- Sedimentation is on the rise due to the degradation of estuaries, salt marshes, and mangrove forests. It reaches the marine ecosystem, including coral reefs, and causes suffocation to coral reefs.
- They also get damaged due to the fishing and tourist boats anchored on them.
- When the ocean water becomes too warm, the corals bleach as the symbiotic algae (Zooxanthellae) leaves them. If the bleaching continues, its growth is obstructed or it eventually dies.

**So, Option (d) is correct.**

Q.8) Consider the following statements :

1. An ecological footprint measures the amount of biologically productive area of the earth needed to produce the required resources as well as to absorb the wastes produced from such resources use.
2. Ecological deficit is when a country's biocapacity is greater than its population's Ecological Footprint.
3. If the entire planet is running an ecological deficit, it is termed as "overshoot."

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only

(c) 1 and 3 only

(d) 1, 2 and 3

**EXPLANATION:**

Ecological footprint is a concept that denotes the per capita ecological damage/environment impact. It is a resource accounting tool that helps countries understand their ecological balance sheet and gives them the data necessary to manage their resources and secure their future. By measuring the footprint of a population, an individual, city, or a nation we can assess the pressures on our planet. This can help us to understand how we can manage our ecological assets more wisely.

It is expressed in global hectares (gha), or by number of planets, and it allows us to estimate the land surface needed by each individual to provide for their needs. **So, Statement 1 is correct.**

An ecological deficit occurs when the Footprint of a population exceeds the bio capacity of the area available to that population. **So, Statement 2 is not correct.**

Ecological overshoot is the phenomenon which occurs when the demands made on a natural ecosystem exceed its regenerative capacity. Currently it takes 1.5 years for the Earth to regenerate the renewable resources that people use, and absorb the CO<sub>2</sub> waste they produce, in that same year.

**So, Statement 3 is correct.**

Q.9) Which of the following are invasive alien species in India?

1. Carrot grass
2. Argemone
3. Lantana
4. *Mimosa pigra*
5. Opuntia
6. Cynodon
7. Water hyacinth
8. Gulmohar

Select the correct answer from the code given below :

(a) 3, 5, 6, 7 and 8 only

(b) **1, 2, 3, 4, 5 and 7 only**

(c) 2, 4, 6 and 8 only

(d) 1,2, 3, 4, 5, 6, 7 and 8

**EXPLANATION:**

Invasive or alien species are non-native species which when introduced into new ecosystem cause biological invasions. As they are non – native, these species have few or no natural predators to keep their populations in check. These species can also alter fire cycles, nutrient cycling and the hydrology and energy budgets in native ecosystems.

There are many invasive alien species which are introduced by humans intentionally or otherwise through human agency or accidentally from one region to another.

Q.10) Recently, the country's first 'Dugong Conservation Reserve' has been notified in Tamil Nadu. Which of the following statements are correct with reference to Dugong?

1. Dugongs are protected under Schedule I of the Wild Life (Protection) Act, 1972 and Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
  2. In India, they are seen only in the Gulf of Mannar.
  3. Dugongs are listed as endangered on the IUCN Red List of Threatened Species.
  4. They are herbivorous mammal with weigh about 300 kilograms.
- Select the correct answer using the code given below :

- (a) 1, 2 and 3 only  
**(b) 1 and 4 only**  
(c) 2, 3 and 4 only  
(d) 1, 2, 3 and 4

**EXPLANATION:**

Dugongs or sea cows are included in Schedule I of the Wild Life (Protection) Act, 1972, which confers the highest degree of protection under the Act and this act also provides punishment for offences violating its provisions.

Internationally, dugongs are listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which prohibits the trade of the species and its parts. **So, statement 1 is correct.**

In India, they can be found in the Andaman and Nicobar Islands, the Gulf of Mannar, Palk Bay, and the Gulf of Kutch.

The dugong population, which was once numerous in Indian seas, now decreased to about 200 individuals and is thought to be steadily diminishing in both quantity and range.

Q.11) Which of the following is/are the possible effects of Stubble Burning?

1. Formation of smog
2. Loss of soil microbes
3. Loss of soil moisture
4. Loss in soil nutrients
5. Increase in soil erosion

Select the correct answer using the code given below :

- (a) 1, 2, 3 and 4 only  
(b) 1, 2 and 5 only  
(c) 3, 4 and 5 only  
**(d) 1, 2, 3, 4 and 5**

**EXPLANATION:**

Stubble burning is a process of setting on fire the straw stubble, left after the harvesting of grains, like paddy, wheat, etc. The process of burning farm residue is one of the major causes of air pollution in parts of north India, deteriorating the air quality.

It emits toxic pollutants in the atmosphere containing harmful gases like Carbon Monoxide (CO), methane (CH<sub>4</sub>), carcinogenic polycyclic aromatic hydrocarbons, and volatile organic compounds (VOC). These pollutants disperse in the surroundings and eventually affect air quality and people's health by forming a thick blanket of smog. **So, Statement 1 is correct.**

During the process of stubble burning, the surface temperature of the land will increase. This will lead to the loss of micro-organisms like archaea, bacteria, fungi, protozoa, etc., which are present in the upper layer of the soil. **So, Statement 2 is correct.**

The heat produced during the stubble burning penetrates the soil and the moisture content present in the soil will evaporate. Thus it will lead to loss of moisture. **So, Statement 3 is correct.**

The three main nutrients are nitrogen (N), phosphorus (P), and potassium (K) which are essentially needed by the plants in the soil. During stubble burning these nutrients evaporates. This leads to the loss of soil nutrients. **So, Statement 4 is correct.**

During heavy rain events and wind, exposed soil is much more likely to be eroded away than soil that is protected by crop residue. After the stubble burns the land will be exposed a lot. This will increase soil erosion. **So, Statement 5 is correct.**

Q.12) Consider the following statements about Fishing cats :

1. World's first fishing cat census was held at Chilika Lake.
2. Habitat of fishing cat is primarily in wetland and mangrove habitats.
3. They are classified as Endangered under IUCN Red List of Threatened Species.
4. It is also considered to be the State Animal of Odisha.

Which of the statements given above are correct?

- (a) 1 and 2
- (b) 1, 2 and 4
- (c) 2, 3 and 4
- (d) 1 and 3

**EXPLANATION:**

The world's first population estimation of the fishing cat census was recently conducted by Chilika Development Authority (CDA).

The Chilika Lake, Asia's largest brackish water lagoon, has 176 fishing cats, according to a census conducted by Chilika Development Authority (CDA) in collaboration with The Fishing Cat Project (TFCP). **So, Statement 1 is correct.**

The fishing cat is a highly elusive (difficult to find) wild cat species primarily found in Wetlands and is the favourite habitat. In India, fishing cats are mainly found in the Sundarbans' mangrove forests, on the Himalayas' foothills along the Ganga and Brahmaputra River valleys and in the Western Ghats.

Bangladesh; Cambodia; Myanmar; Nepal; Pakistan; Sri Lanka; Thailand are some countries where fishing cats are found. **So, Statement 2 is correct.**

Q.13) Which of the following indicates Biomagnification in the environment?

1. Death of vulture due to kidney failure
2. Residue of pesticides in the milk of lactating mothers
3. Imbalance in calcium metabolism and thinning of eggshells of birds
4. Numbness in the feet and hand of human beings due to mercury poisoning

Select the correct answer using the code given below :

- (a) 1 only
- (b) 1, 2 and 3 only



(c) 2, 3 and 4 only

(d) **1, 2, 3 and 4**

**EXPLANATION:**

Biomagnification refers to an increase in the concentration of the toxicant at successive trophic levels due to the accumulation of a toxic substance by an organism

Farmers' use of insecticides and pesticides results in renal failure among vultures and the use of chemicals such as forate and colourfast by farmers is another factor responsible for the extinction of vultures.

According to non-steroidal anti-inflammatory drugs (NSAIDS) released report shows the deposition of white precipitate on the kidneys and heart of vultures in the postmortem report due to biomagnification. **So, Statement 1 is correct.**

Pesticide usage affects human health, biological interactions with non-target species, pesticide resistance, and alterations to and/or accumulation of pesticides in the environment.

Different toxic chemicals can be transferred from the body stores and/or from the blood into the breast milk of a nursing mother. Recent studies were conducted on pesticide residues in breastmilk of women (lactating mothers) and from whom dichlorodiphenyltrichloroethane (DDT) and dichlorodiphenyldichloroethylene (DDE) was detected. **So, Statement 2 is correct.**

High concentrations of DDT disturb calcium metabolism in birds, which causes thinning of eggshells and their premature breaking, which eventually results in the decline of the bird population. **So, Statement 3 is correct.**

Methylmercury from industrial wastewater gets into freshwater systems through the rain. As its concentration increases up the food web, it can reach dangerous levels for both fish and humans. It can cause Minamata disease which is a neurological disease caused by severe mercury poisoning, its symptoms include ataxia, numbness in the hands and feet, general muscle weakness, loss of peripheral vision, etc. **So, Statement 4 is correct.**

Q.14) Consider the following statements with reference to the Conservation Reserves :

1. Conservation Reserves were first introduced in 2002 under the Environment Protection Act of 1986.
2. Jammu and Kashmir has the highest number of Conservation Reserves in India.
3. In India, more than half of the States/UT have at least one Conservation Reserve. Which of the statements given above is/are correct?

- (a) 2 and 3 only  
(b) 1 and 3 only  
(c) **2 only**  
(d) 1, 2 and 3

**EXPLANATION:**

Conservation reserves and community reserves in India are terms denoting protected areas of India that typically act as buffer zones to connectors and migration corridors between established national parks, wildlife sanctuaries, and reserved and protected forests of India. These protected area categories were first introduced in 2002 by amending the Wildlife Protection Act of 1972. These categories were added because of reduced protection in and around existing or proposed protected areas due to private ownership of land, and land use. **So, Statement 1 is not correct.**

Q.15) Consider the following pairs :

Pollutant	Health effects
1. Nitrogen Oxides	- Inflammation of lungs
2. Carbon Monoxide	- Limits assimilation of Oxygen

- 3. Mercury - Gingivitis
- 4. Lead - Damage to kidneys

How many pairs given above is/are correctly matched?

- (a) Only one pair
- (b) Only two pairs
- (c) Only three pairs
- (d) All four pairs**

**EXPLANATION:**

- Nitrogen dioxide is not usually released directly into the air. Nitrogen oxide (NO) and other nitrogen oxides (NO<sub>x</sub>) react with other chemicals in the air to form nitrogen dioxide.
- The main source of nitrogen dioxide resulting from the combustion of fossil fuels (coal, gas, and oil).
- Elevated levels of nitrogen dioxide can cause damage to the human respiratory tract, respiratory infections, inflammation of the lungs, and asthma. Long-term exposure to high levels of nitrogen dioxide can cause chronic lung disease. **So, Pair 1 is correct.**

The Carbon monoxide gas is produced from sources such as Automobile exhaust, burning of wood and coal etc. This CO gas can disrupt the transport of oxygen by the blood (by binding to the hemoglobin in the blood, reducing the ability of blood to carry oxygen), leading to heart and health problems. **So, Pair 2 is correct.**

Gingivitis is a common and mild form of gum disease (periodontal disease) that causes irritation, redness, and swelling (inflammation) of your gingiva, the part of your gum around the base of your teeth. The effect of Mercury on the human body such as nervous disorders, insomnia, memory loss, excitability, irritation, tremor, gingivitis, and Minamata disease. **So, Pair 3 is correct.**

- Lead is a naturally occurring toxic metal found in the Earth's crust. Its widespread use has resulted in extensive environmental contamination.
- Lead causes long-term harm in adults, including increased risk of high blood pressure, impaired intelligence, and kidney damage. Exposure of pregnant women to high levels of lead can cause miscarriage, stillbirth, premature birth, and low birth weight. **So, Pair 4 is correct.**

Q.16) Consider the following statements :

1. Niche is the sum of all the activities and relationships of a species by which it uses the resources in its habitat for its survival and reproduction
2. Species can only develop limited niche in an ecosystem

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

**EXPLANATION:**

The functional characteristics of a species in its habitat are referred to as “niches” in that common habitat. While the habitat of a species is like its ‘address’ (i.e. where it lives), niche can be thought of as its “profession” (i.e. activities and responses specific to the species. And it also refers to the sum of all

the activities and relationships of a species by which it uses the resources in its habitat for its survival and reproduction. **So, Statement 1 is correct.**

- In the field of ecology, classifying a species as a generalist or a specialist is a way to identify what kinds of food and habitat resources it relies on to survive.
- Generalists can eat a variety of foods and thrive in a range of habitats, for example, Raccoons (*Procyon lotor*). They can live in a wide variety of environments, including forests, mountains, and large cities, which they do throughout North America.
- Whereas Specialists, on the other hand, have a limited diet and stricter habitat requirements. One example is those koalas (*Phascolarctos cinereus*) which are native to Australia, koalas are herbivorous marsupials that feed only on the leaves of the eucalyptus tree. Therefore, their range is restricted to habitats that support eucalyptus trees. Within this diet, some koalas specialize even further and eat leaves from only one or two specific trees. **So, Statement 2 is not correct.**

Q.17) Consider the following statements with reference to Black carbon emissions :

1. Black carbon is the key component of fine (Particulate Matter) PM10 air pollution
  2. It is a long-lived climate pollutant with a lifetime of few years
  3. Transport account for the most the of global black carbon emissions
  4. In India, the Indo-Gangetic plain has a high burden of black carbon
- How many statements given above is/are correct?

- a. **Only one statement**
- b. Only two statements
- c. Only three statements
- d. All four statements

**EXPLANATION:**

Particulate Matter consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. The pollutants with diameters that are generally 10 micrometers come under PM10 air pollutants and the particles having 2.5 micrometers and smaller are comes under PM2.5

Black carbon is the black material emitted from gas and diesel engines, coal-fired power plants, and other sources that burn fossil fuels. They may vary in size and can be much smaller than PM2.5. It is a major contributor to the fine particle (PM2.5) burden in the air and not (PM10). **So, Statement 1 is not correct.**

It is a short-lived climate pollutant with a lifetime of only days to weeks after release in the atmosphere. During this short period, black carbon can have significant direct and indirect impacts on the climate, the cryosphere (snow and ice), agriculture, and human health. **So, Statement 2 is not correct.**

Household energy production contributes the major source of black carbon with 51%, but the transport category accounts for only about 21% of black carbon emissions by being the second major contributor. **So, Statement 3 is not correct.**

Black carbon results from the incomplete burning of fossil fuels. It's a relatively short-lived pollutant in the atmosphere but influences cloud formation and atmospheric heat absorption processes.

The Indo-Gangetic plain is spread over North India in Haryana, Delhi, U.P., Bihar, partly Jharkhand, and West Bengal. These cities are mostly having a large dense population. Because of the large

amount of fossil fuel usage, this region has a high burden of Black carbon (BC) with serious implications for regional climate and human health. **So, Statement 4 is correct.**

Q.18) With reference to Forest Rights Act (FRA) in India, consider the following statements :

1. Under FRA, State Government can provide that persons holding Government jobs shall not be eligible as Other Traditional Forest Dwellers.
2. It provides community rights to tribal and forest dwellers living in forests for three generations.
3. FRA is applicable in National Parks, Wildlife Sanctuaries, and Tiger Reserves.
4. It defines critical wildlife habitats as areas that are “required to be kept inviolate for the purposes of wildlife conservation”.

Which of the statements given above is/are correct?

- (a) 1 and 2 only  
(b) **2, 3 and 4 only**  
(c) 1, 2 and 3 only  
(d) 4 only

**EXPLANATION:**

- The Forest Rights Act is an Act enacted to recognise and vest the forest rights and occupation in forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded.
- This act provides various rights including right of ownership, access to collect, use and dispose of minor forest produce, community rights such as nistar; habitat rights for primitive tribal groups and pre-agricultural communities; right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.
- According to Forest Rights Act, “other traditional forest dweller” means any member or community who has for at least three generations prior to the 13th day of December, 2005 primarily resided in and who depend on the forest or forests land for bona fide livelihood needs.
- Here a “generation” means a period comprising of twenty-five years.
- It contains no provision that State Government can provide that persons holding Government jobs shall not be eligible as Other Traditional Forest Dwellers.

**So, Statements 1 is not correct and Statement 2 is correct.**

The FRA defines “forest land” as land of any description falling within any forest area and includes unclassified forests, undemarcated forests, existing or deemed forests, protected forests, reserved forests, Sanctuaries and National Parks; for which the FRA is applicable. **So, Statement 3 is correct.** According to FRA, “critical wildlife habitat” means such areas of National Parks and Sanctuaries where it has been specifically and clearly established, where such areas are required to be kept as inviolate for the purposes of wildlife conservation as may be determined and notified by the Central Government. **So, Statement 4 is correct.**

Q.19) Consider the following statements with reference to “Nonylphenol” which sometimes seen in news recently :

1. It is a chemical present in detergents
2. At present, there are no standards exclusively for nonylphenols in drinking and surface

waters in India

3. It does not bio-accumulate and enter into food chain. Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only**
- (c) 2 and 3 only
- (d) 1, 2 and 3

**EXPLANATION:**

Nonylphenol is a toxic chemical that is commonly used in the production of Nonylphenol Ethoxylates (NPEs). They are used as surfactants as well as in day-to-day consumer products such as detergents, wetting agents, and dispersants. **So, Statement 1 is correct.**

In India, the Bureau of Indian Standards (BIS) has set standards for phenolic compounds in drinking water (1 part per billion) and surface water (5 parts per billion). But there are no standards exclusively for Nonylphenol in drinking water and surface water in India. **So, Statement 2 is correct.**

Nonylphenol ethoxylate generally breaks down to nonylphenol in natural environmental conditions, entering the ecosystem. It also enters into "the food chain, where it bio-accumulates and can pose serious environmental and health risks. It has been detected in human breast milk, blood and urine, and is associated with reproductive and developmental effects in rodents.

The process of accumulation of chemicals in an organism that takes place if the rate of intake exceeds the rate of excretion is called Bioaccumulation. **So, Statement 3 is not correct.**

Q.20) Consider the following statements with respect to Genetic Diversity :

1. Genetic diversity within a species will increase with the increasing number of individuals in a given species.
2. An ecosystem having higher diversity can be resilient to Pollution and Climate change.
3. In terms of sheer number alone, insects and micro-organisms are the most abundant life forms on earth.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3**

**EXPLANATION:**

Genetic diversity refers to the variety of genes contained within species of plants, animals and micro-organisms. New genetic variation in individuals occurs by gene and chromosomal mutation, and in organisms with sexual reproduction may be spread across the population by recombination. So, as the number of individuals in a species increases the genetic diversity also increases. **So, statement 1 is correct.**

Species diversity refers to the variety of species within a geographical area or in an ecosystem. When an ecosystem has high species diversity then number of species in the ecosystem is high.

The species in a high genetic diversity are capable of adapting to a wide variety of changing environmental conditions and are more likely to be resistant to weather disturbances, disease, pollution and climate change. **So, statement 2 is correct.**

Sheer Number is used to emphasize the large amount in a measurement. In terms of sheer number of population alone, insects and micro-organisms are the most abundant life forms on earth. **So, statement 3 is correct.**

Q.21) Why do tropical regions have more diversity of flora and fauna than temperate regions?

1. Species having longer time to evolve
2. Higher sun's angle of incidence
3. Less seasonal variation

Select the correct answer using the code given below :

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3**

**EXPLANATION:**

The diversity of plants and animals is not uniform throughout the world. Rather, a distribution with species diversity decreases as we move away from the equator towards the poles due to Latitudinal gradients.

Over the course of evolution, the tropical regions had gone only very few changes compared to temperate regions whose evolution has been interrupted by big freezes and other natural calamities. As, tropical latitudes have remained relatively undisturbed for millions of years they had a long evolutionary time which led to the high species diversification. **So, Statement 1 is correct.**

As there is more sunlight in the tropics the climate is combined with rainfall and soil nutrients, which led to more plant growth and better adaptation. This had contributed to higher productivity, which led to greater diversity of species. **So, Statement 2 is correct.**

Tropical environments are less seasonal, relatively more constant, and predictable. Such constant environments promote niche specialization and lead to greater species diversity. **So, Statement 3 is correct.**

Q.22) Which of the following are true?

1. Speciation is the formation of new distinct species during the process of evolution.
2. Facultative mutualists are ones whose populations go extinct in the absence of a mutualist.
3. Adaptation is the coordinated phenotypic response developed by an animal to a specific genotype only.

Select the correct answer from the code given below :

- (a) 1 only**
- (b) 2 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

**EXPLANATION:**

Speciation is the creation of new, unique species as a result of evolution. A single evolutionary



lineage can split into two or more lineages as a result of genetic changes brought on by natural selection, gene flow, mutations, and genetic drift. When a group within a species separates from other members of its species and develops its own distinct features. **So, statement 1 is correct.**

Mutualism is defined as an interaction between individuals of different in which both of them get benefitted. There are five types of mutualism:

1. Obligate mutualism is the interaction between different species where the interaction is essential for their survival, and thus the species are obligated or forced to depend on each other.
2. Facultative mutualism is the interaction between two or more species where the species benefit from the interaction but can also exist independently of each other.
3. Trophic mutualism is a type of ecological interaction that involves the transfer of energy and nutrients between two species.
4. Defensive mutualism is a type of service-resource relationship where one of the species provides nutrients whereas the other provides protection against predators or parasites.
5. Dispersive mutualism is the interaction between insects or animals and plants where animals acquire nectar from the flower while facilitating the transfer of pollen grains.

**So, statement 2 is not correct.**

Adaptation is the evolutionary response resulting from genetic changes in populations that compensate for the decline in performance caused by stress.

Acclimation is the temporary adaptations developed by the animal to a specific stress (e.g., temperature, humidity, and photoperiod) in the changing environment while acclimatization refers to the adaptation developed by the animals to several individual stressors simultaneously. **So, statement 3 is not correct.**

Q.23) In the context of biotechnology developments, which among the following are the applications of Nanozymes?

1. Destruction multi-drug resistant bacteria
2. Detecting ions, molecules and organic compounds
3. Detection and treatment of environmental pollutants

Select the correct answer using the code given below :

- (a) 1 only  
(b) 2 and 3 only  
(c) 3 only  
**(d) 1, 2 and 3**

**EXPLANATION:**

New generation of artificial enzymes has been discovered from many nanomaterials with enzyme-like activities (Nanozymes) to perform catalytic antibacterial effects against the resistance of bacteria. Antibacterial potency of metal and metal oxide engineered nanomaterials (MMO ENMs) has been analysed especially pertaining to the mechanism of antimicrobial activity of Ag, Cu, CuO, TiO<sub>2</sub> and ZnO ENMs.

Though they are at experimental stage, they have also been applied for destruction multi-drug resistant bacteria. **So, Statement 1 is correct.**

Nanozymes are inorganic nanoparticles that mimic the enzyme-like properties in redox reactions, processing both unique properties of nanomaterials and a catalytic function.

Nanozymes can be used to detect ions, molecules and organic compounds both qualitatively and quantitatively. **So, Statement 2 is correct.**

In natural environment, it is found that nanozymes can be employed for the degradation of organic and persistent pollutants such as antibiotics, phenols, and textile dyes. Therefore, they are significantly used in the detection and treatment of environmental pollutants. **So, Statement 3 is correct.**

Q.24) Consider the following statements :

1. Alpha diversity is the diversity of habitats in the total landscape or geographical area.
2. Beta diversity is represented by the species diversity between any two patches and their communities.
3. Gamma diversity is a within community diversity that represents number of species in a given habitat.

Which of the statements given above is/are correct ?

- (a) 1 and 2 only
- (b) 2 only**
- (c) 1 and 3 only
- (d) 3 only

**EXPLANATION:**

Alpha diversity is the species diversity present within each forest or grassland patch of the slope. It refers to the diversity within a particular area or ecosystem, and is usually expressed by the number of species in that ecosystem. **So, Statement 1 is not correct.**

Beta diversity compares the species variety between two distinct entities that are frequently divided by an obvious geographic barrier, such as a river or a mountain crest. **So, Statement 2 is correct.**

Gamma diversity is defined as the habitats over the total landscape for the geographical area. It could range over areas like the entire slope of a mountain, or the entire littoral zone of a sea shore. It is a measure of the overall diversity for the different ecosystems within a region. **So, Statement 3 is not correct.**

Q.25) Which of the following are the possible impacts of the Silt pollution ?

1. Depletion of the size of the water body
2. Poor water quality
3. Road accidents
4. Decrease in dissolved oxygen
5. Death of aquatic plants and animals
6. Algal blooms

Select the correct answer using the code given below :

- (a) 1, 2, 3, 4 and 5 only
- (b) 1, 3, 5 and 6 only
- (c) 2, 4 and 6 only

(d) **1, 2, 3, 4, 5 and 6**

**EXPLANATION:**

Silt is the mud or soil that gets washed into water bodies as it gets loosened (soil erosion). Siltation is a common natural phenomenon in most water bodies, including soil, sand and mineral particles.

Siltation of rivers and lakes reduces their water retention capacity and lead to flooding. When large portions of lakes are filled with Silt and sand deposit, it depletes the size of the water body. **So, Statement 1 is correct.**

- Silt can also change the landscape of where it deposits. Silt deposits can harm the ecosystem where there are fewer or no trees.
- Fertilizers, chemicals and industrial waste that run off along with Silt becomes toxic. Toxic Silt is harmful to the river, lake and pond ecosystem. It affects plants, vegetation, and aquatic life by contaminating the water. It often creates an acidic condition, reducing the quality of water.
- These Fertilizers and chemicals which get deposited in the water bodies promotes the growth of algal blooms and supports the process of eutrophication.
- Aquatic organisms like fish and zooplankton, use dissolved oxygen in the water for their survival. If the water body is accumulated with Silt, the oxygen level in the water gets reduced when it is filled with Silt, thus makes not suitable for aquatic life to survive.

**So, Statements 2, 4, 5 and 6 are correct.**

Sometimes the silt gets accumulated on streets was a result of runoff water entering into residential streets due to the faulty storm drain. The surplus water is removed by the process of evaporation. But the Silt gets deposited on the roads itself which are capable of causing road accidents. **So, Statement 3 is correct.**

Q.26) With reference to India's area under the Forest consider the following statement :

1. India recorded a gain in the total forest and tree cover as compared to the last assessment.
  2. Arunachal Pradesh has maximum forest cover as a percentage of the total geographical area.
  3. Maximum increase in the total forest cover is recorded in Telangana.
- Which of the statements given above is/are correct ?

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 2 only

**EXPLANATION:**

As per the recent Forest Survey report 2021, the country's total forest and tree cover of the country is

80.9 million hectares which are 24.62 percent of the country's geographical area. As compared to the assessment of 2019, there is an increase of 2,261 sq km in the country's total forest and tree cover. Out of this, the increase in the forest cover has been observed as 1,540 sq km, and that in tree cover is 721 sq km. **So, Statement 1 is correct.**

In terms of forest cover as a percentage of total geographical area, Mizoram (84.53%) has the maximum forest cover, followed by Arunachal Pradesh (79.33%), Meghalaya (76.00%), Manipur (74.34%) and Nagaland (73.90%). Whereas area-wise Madhya Pradesh has the largest forest cover in the country followed by Arunachal Pradesh, Chhattisgarh, Odisha, and Maharashtra. **So, Statement 2 is not correct.**

An increase in forest cover has been observed in the open forest followed by very dense forest. A

maximum increase in forest cover was witnessed in Andhra Pradesh (647 sq km), followed by Telangana (632 sq km) and Odisha (537 sq km). **So, Statement 3 is not correct.**

Q.27) Arrange the following process of decomposition of organic matter in the correct manner :

- (a) Leaching - Fragmentation – Humification – Catabolism - Mineralization
- (b) Fragmentation – Leaching – Catabolism – Humification - Mineralisation**
- (c) Leaching – Humification – Fragmentation – catabolism - Mineralisation
- (d) Fragmentation – Humification – Leaching – Catabolism – Mineralisation

**EXPLANATION:**

The process of breaking down complex organic matter into inorganic substances like carbon dioxide, water, and nutrients by the decomposers is called decomposition. Dead plant remains like leaves, bark, flowers, and dead animals, including fecal matter, constitute detritus, the raw material for decomposition. The process of decomposition of organic matter includes,

- The process by which detritivores (e.g., earthworms) break down detritus into smaller particles is called fragmentation.
- Through the process of leaching, water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts.
- Catabolism is the process through which Bacterial and fungal enzymes degrade detritus into simpler inorganic substances.
- Humification leads to the accumulation of a dark-colored amorphous substance called humus which is highly resistant to microbial action and undergoes decomposition at a slow rate. Being colloidal in nature it serves as a reservoir of nutrients.

The humus is further degraded by some microbes and the release of inorganic nutrients occurs through the process known as mineralization. **So, Option (b) is correct.**

Q.28) With reference to the Biological Diversity act in India, consider the following statements :

1. It regulates access to biological resources and associated traditional knowledge.
2. It sets up a two-tier structure to regulate access to biological resources.
3. Application for intellectual property rights can be made without the approval of the National Biodiversity Authority.
4. The salaries and allowances payable to the members of the National Biodiversity Authority shall be appropriated out of the Consolidated Fund of India

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

- (a) 1 and 2
- (b) 2 and 3**
- (c) 1 and 4
- (d) 3 and 4

**EXPLANATION:**

The Biological Diversity Act provides the Procedure for access to biological resources and associated traditional knowledge. It states that, any person need for access to biological resources and associated knowledge for research or for commercial utilization must get prior approval from the National Biodiversity Authority. This application form must be disposed by the authority within a period of six months from the date of its receipt. **So, Statement 1 is correct.**

The Biological Diversity Act is implemented through a three-tiered institutional structure at the national, state and local levels.

- National Biodiversity Authority (NBA) as a statutory body at National level.
- State Biodiversity Boards (SBBs) at State level.
- Biodiversity Management Committees (BMCs) at local level.

**So, Statement 2 is not correct.**

According to the Act, No person shall apply for any intellectual property right in or outside India for any invention based on any research or information on a biological resource obtained from India without obtaining the previous approval of the National Biodiversity Authority. This application form must be disposed by the authority within a period of three months from the date of its receipt.

**So, Statement 3 is not correct.**

This act also provides that, the salaries and allowances payable to the members and the administrative expenses of the National Biodiversity Authority including salaries, allowances and pension payable to, or in respect of, the officers and other employees of the National Biodiversity Authority shall be defrayed out of the Consolidated Fund of India. **So, Statement 4 is correct.**

Q.29) Ecosystem services make human life possible which provide four types of services to the world. Which one of the following is provisioning service?

- (a) **Supply of food, water, fibers, wood and fuels**
- (b) Maintenance of genetic diversity
- (c) Recreation and mental and physical health
- (d) Spiritual experience and sense of place

**EXPLANATION:**

According to UN- FAO's Ecosystem Services & Biodiversity (ESB), Ecosystems provide four types of services to the world,

- Provisioning Services
- Regulating Services
- Supporting Services
- Cultural Services

Provisioning services are the tangible resources or goods that people obtain from ecosystems. These are finite, can be renewable, and can be directly consumed, appropriated, and traded.

Water, food, wood and other goods are some of the material benefits people obtain from ecosystems, and these are called 'provisioning services.

Whereas the Maintenance of genetic diversity is related to Supporting Services, the other options are related to Cultural Services provided by the Ecosystem. **So, Option (a) is correct.**

Q.30) Consider the following statements with respect to Ashgabat Agreement :

1. It is a comprehensive economic partnership agreement among Central Asian countries.
2. India is not a founding member of this agreement.
3. This agreement works in synchronization with the International North-South Transport Corridor. Which of the statements given above is/are correct?

- (a) 1 and 2
- (b) 2 and 3**
- (c) 1 and 3

(d) 1, 2 and 3

**EXPLANATION:**

The Ashgabat agreement is a multimodal transport agreement between the governments of Kazakhstan, Uzbekistan, Turkmenistan, Iran, India, Pakistan, and Oman for creating an international transport and transit corridor facilitating transportation of goods between Central Asia and the Persian Gulf. (Not a comprehensive economic partnership agreement.) **So, Statement 1 is not correct.**

The agreement was originally signed by Iran, Oman, Qatar, Turkmenistan and Uzbekistan on April 25, 2011. India formally joined only in February 2018. **So, Statement 2 is correct.**

Its objective is to enhance connectivity within the Eurasian region and synchronize it with other regional transport corridors, including the International North–South Transport Corridor (INSTC). **So, Statement 3 is correct.**

Q.31) With reference to Lion-tailed macaque consider the following statements:

1. It is categorized as vulnerable in the IUCN red data list.
2. It is one of the types of primate found in the Western Ghats of India.
3. In general, Macaques are called as 'Specialist Species' as they can adapt to any kind of habitat.

Which of the statement given above is/are correct?

- (a) 1 only  
(b) **2 only**  
(c) 2 and 3 only  
(d) 1, 2 and 3

**EXPLANATION:**

The International Union for Conservation of Nature - Red Data List of Threatened Species categorizes the Lion-tailed macaque as an endangered species, not as Vulnerable Species. **So, Statement 1 is not correct.**

Lion-tailed macaque (*Macaca silenus*), a primate endemic to small and severely fragmented rainforests of the Western Ghats in Karnataka, Kerala and Tamil Nadu, also performs a crucial function in the tropical ecosystem by distributing seeds. **So, Statement 2 is correct.**

Lion-tailed macaques are called "specialist species," meaning they can survive in only selected habitats with familiar flora and food sources. In contrast, Generalist species can survive in various landscapes and are very tolerant to vast temperature variations and adaptable to diverse habitats and climatic conditions. An example of Generalist Species is the Rhesus macaque. **So, Statement 3 is not correct.**

Q.32) Scientist predicts that the rate of species extinction in the 6<sup>th</sup> mass extinction is more than in previous episodes. Identify which of the following reasons are responsible for the high rate of species extinction :

1. Loss & fragmentation of habitat
2. Over exploitation of ecosystem
3. Coextinction of species
4. Biological invasion of species

Select the correct answer using the code given below:

- (a) 1, 2, and 3 only
- (b) 2, 3 and 4 only
- (c) 1, 2 and 4 only
- (d) **1, 2, 3 and 4**

**EXPLANATION:**

Unlike previous extinction events caused by natural phenomena, the sixth mass extinction is driven by human activity, primarily (but not limited to) the unsustainable use of land, water, and energy use, and climate change.

- Habitat loss and fragmentation is the most important cause driving animals and plants to extinction. For example, habitat loss comes from tropical rainforests that cover more than 14 percent of the earth's land surface. Still, it covers not more than 6 percent as they were destroyed fast, and the degradation of many habitats by pollution also threatens the survival of many species.
- The large habitats are broken up into fragments due to various human activities, mammals, and birds requiring large territories, and certain animals with migratory habits are badly affected, leading to population declines.

Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to the over-exploitation of natural resources. For example, Steller's Sea cow, passenger pigeon) were due to overexploitation by humans. Presently many marine fish populations worldwide are over-harvested and endangered, which are commercially important species.

When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. Another example is the case of a coevolved plant-pollinator mutualism where the extinction of one invariably leads to the extinction of the other.

When alien species are introduced unintentionally or deliberately for whatever purpose, some turn invasive and cause the decline or extinction of indigenous species. For instance, biological invasion of species causes ecological disturbances that threaten native biodiversities like invasive weed species like carrot grass (Parthenium), Lantana, and water hyacinth (Eichhornia). **So, Option (d) is correct.**

Q.33) What is the possible impact of 'colony collapse syndrome' on the environment :

1. Hamper the process of Pollination
2. Disturbance in the Food web
3. Economic loss to farmers

Select the correct answer using the code given below :

- (a) 1 only
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) **1, 2**

**and 3**

**EXPLANATION**

:

Colony Collapse Disorder is the phenomenon that occurs when the majority of worker bees in a



colony disappear and leave behind a queen, plenty of food, and a few nurse bees to care for the remaining immature bees and the queen. The possible impact of this disorder is,

- Honey bees provide a fundamental level of Pollination of crops and, with the help of Pollination, yield most crops with wild bees. Therefore, colony collapse hampers or stops the pollination process in the environment.
- They also play a critical role in many food webs that support wildlife but due to this disorder, disturbance in the food web will take place.
- Colony collapse disorder could cause significant economic losses to farmers because many crops worldwide depend on Pollination by western honey bees, where honey bees are the predominant pollinator

**So, Option (d) is correct.**

Q.34) Wetlands are considered as “biological supermarkets”. Which one of the following functions of wetlands best reflects the above statement?

- (a) Wetlands store and slowly release surface water, rain, snowmelt, groundwater, and floodwaters.
- (b) Wetlands are successful at removing bacteria and other harmful pathogens that run off the landsurface
- (c) Wetlands are comparable to rain forests and coral reefs in their diversity of food supply and wildlife species.**
- (d) The production of inland capture fisheries and most coastal fisheries is derived from wetlands

**EXPLANATION:**

A wetland is an area of land that is either covered by water or saturated with water. The main functions of wetlands are as follows,

- One acre of wetland can store up to one million gallons of water
- They store and slowly release surface water, rain, snowmelt, groundwater, and floodwaters Wetland vegetation slows the movement of flood waters and distributes them more gradually over floodplains.
- They are very successful at removing bacteria and other harmful pathogens that run off the landsurface. This helps to keep our waterways safer for recreation and other uses.
- It also supports the production of inland capture fisheries and coastal fisheries
- They are considered biological supermarkets because they are comparable to rainforests and coral reefs for their diversity of food supply and wildlife species. And also for having extensive food webs, rich biodiversity, and unique habitats.

**So, Option (c) is correct.**

Q.35) Consider the following statements

1. Estuarine water is moderately variable in its salinity
2. There is a lack of uniformity among tropical estuaries in terms of depth, physical and chemical features
3. Estuaries of Mahanadi and Godavari are never isolated from the sea
4. A number of estuaries in Tamil Nadu and Karnataka coasts are usually relatively small, both in length and catchment areas.

Which of the statements given above are correct?

- (a) 1, 2 and 3 only

(b) 2, 3 and 4 only

(c) 1 and 2 only

(d) 3 and 4 only

**EXPLANATION:**

Estuaries are the transitional zones between the rivers and sea and have specific ecological properties and biological composition. The salinity of fresh water is nearly zero, and the ocean water is 35 ppt. The mixture of seawater and fresh water in estuaries is called brackish water and the salinity of estuarine water can range from 0.5 to 35 ppt. And also the salinity of estuarine water varies from estuary to estuary and can change from one day to the next depending on the tides, weather, or other factors. Thus, Estuarine water is extremely variable in its salinity, while marine and freshwater have distinct stable salinities. **So, Statement 1 is not correct.**

The characteristics of each estuary depend upon the local climate, freshwater input, tidal patterns, and currents. The tropical estuaries vary in terms of size, depth, physical and chemical features, and other environmental factors such as the nature of the adjacent marine and freshwater habitats. The tropical estuarine environment can be divided into four broad categories, viz. (1) open estuary, (ii) estuarine coastal waters, (iii) blind estuary, and (iv) coastal lake. **So, Statement 2 is correct.**

Mahanadi and Godavari estuaries are open-water estuaries, which are never isolated from the sea. In Open estuaries, the mouth is open to the sea, allowing seawater intrusion during flood tides, with river inflow continuing to introduce freshwater into the system under all tidal regimes. **So, Statement 3 is correct.**

The blind estuaries are usually relatively small, both in length and catchment areas. During summer these estuaries are temporarily closed by a sand bar across the sea mouth and during this period there is no tidal range and thus no tidal currents. The mouth opens only during the rainy season and at that time a normal estuarine salinity gradient is established. A number of these types of estuaries are located in Tamil Nadu and Karnataka coasts. **So, Statement 4 is correct.**

Q.36) Which of the following species are the examples of Phytoplankton?

1. Cyanobacteria
2. Cladocera
3. Diatoms
4. Noctiluca
5. Coccolithophores
6. Pistia

Select the correct answer using the code given below :

(a) 1, 3, 4 and 5 only

(b) 1, 2, 3 and 4 only

(c) 3 and 4 only

(d) 1, 3 and 6 only

**EXPLANATION:**

Phytoplankton is microscopic organisms that live in both salty and fresh watery environments. Some phytoplankton are bacteria and some are protists, and most are single-celled plants. Among the common kinds are cyanobacteria, silica-encased diatoms, dinoflagellates (Noctiluca), green algae, and chalk-coated coccolithophores.

Whereas Cladocera is a zooplankton and Pistia is a floating plant. **So, Option (a) is correct.**

Q.37) Consider the following statements.

1. All nutrient cycles operate as closed systems.
  2. The rate of movement of nutrients between two reservoirs along these pathways is called flux rate.
  3. In Phosphorous cycle the pyrite rocks are the important reservoirs of phosphorus. Which of the statements given above is/are correct?
- (a) **1 and 2 only**  
(b) 2 only  
(c) 2 and 3 only  
(d) All of the above

**EXPLANATION:**

A nutrient Cycle also known as biogeochemical cycle is the cycle in which nitrogen, carbon, and other inorganic elements of the soil, atmosphere, etc. of a region are converted into the organic substances of animals or plants and released back into the environment.

The movement of nutrients within the biosphere occurs in a cyclic manner, from environment to organisms and back to the environment. Therefore, the system as a whole does not lose nutrients. This makes all nutrient cycles to operate as a closed system. **So, Statement 1 is correct.**

Reservoir is a body which stores large amounts of nutrients. The reservoirs are of two types: non-biological and biological reservoirs. The non-biological reservoirs include air (atmosphere), water (hydrosphere) and soil (lithosphere). The biological reservoirs are the living organisms.

The rate of movement of nutrients between two reservoirs along these pathways is called the flow rate or flux rate. The speed of movement depends on the physical and chemical properties of each nutrient. **So, Statement 2 is correct.**

The sulphur cycle has both sedimentary and gaseous phases. It provides nutrients for the plants in the form of sulphate. In the sedimentary phase of sulphur cycle, sulphur is tied up in organic and inorganic deposits and is released by decomposition and weathering, respectively. The pyrite rocks are one such example of a sulphur deposit. As a result, sulphur is made available for the use of plants. The gaseous phase of the cycle allows the circulation of sulphur in the atmosphere.

Q.38) With reference to the ecological pyramid consider the following statements :

1. Pyramid of Biomass of the ocean and the grassland are generally inverted in shape.
  2. Pyramid of Energy of the forest ecosystem is always upright.
  3. Pyramid of Energy is directly proportional to the inverted Pyramid of numbers. Which of the statement given above is/are **not** correct ?
- (a) 1 and 2  
(b) 2 and 3  
(c) **1 and 3**  
(d) 1, 2 and 3

**EXPLANATION:**

- The aquatic ecosystem's biomass pyramid is inverted. The biomass of primary producers in this area is significantly lower than that of zooplankton, which is lower than that of small fish and large fish, which have the highest biomass.

- In a grassland ecosystem, the biomass pyramid is upright. The base has the highest biomass, which is occupied by grasses, followed by herbivores like rabbits, rats, etc. The primary consumers are followed by secondary consumers (owl, lizards, snakes, etc.) and then tertiary consumers (eagle, etc.) **So, Statement 1 is not correct.**
- An inverted pyramid of numbers can be found in an ecosystem where the community contains a few producers with a very large biomass that support a larger number of smaller consumers. An inverted pyramid of numbers can also be found in an ecosystem where the community contains parasites.
- The energy pyramid is always upright. Each trophic level experiences some energy loss in the form of heat as energy moves from one trophic level to the next. The pyramid of energy can never be inverted since it is always upright.

Pyramid of Energy is not directly proportional to the inverted Pyramid of numbers. Pyramid of Energy is inversely proportional to the inverted Pyramid of numbers

**So, Statement 2 is correct and Statement 3 is not correct.**

Q.39) Consider the following statements :

1. At Present, the use of leaded petrol has been eradicated from the globe.
2. Lead in the body can be distributed to the brain, liver and kidney but not bones.
3. Lead is widely used in paints, solder, stained glass, lead crystal glassware, ammunition, ceramic glazes, jewellery, and toys.
4. In general, young children absorb nearly four times as much ingested lead as adults from a given source.

How many statements given above are correct?

- (a) Only one statement
- (b) Only two statements
- (c) Only three statements**
- (d) All four statements

**EXPLANATION:**

When a Gasoline/Petrol added with an additive called tetraethyl lead, it is called as leaded petrol. Since 1922, the use of tetraethyl lead as a petrol additive to improve engine performance has been a catastrophe for the environment and public health. By the 1970s, almost all petrol produced around the world contained lead. The combustion of leaded petrol causes the lead to be released into the air whereas lead is a heavy pollutant that does damage not only to the environment but also to the people who are exposed to it.

The UN Environment Programme (UNEP) began its campaign to eliminate lead in petrol in 2002. After 19-year campaign led by UNEP, the usage of leaded petrol has been ended in the year 2021. Algeria was the last country to end the use of Leaded petrol in the world. **So, Statement 1 is correct.**

Lead is a cumulative toxicant that affects multiple body systems. It affects the development of the human brain, which is particularly harmful to young children, with studies suggesting it reduces 5-10 IQ points.

Once lead enters the body, it is distributed to the brain, liver, kidney and bones. It is stored in the teeth and bones, accumulating over time. Lead stored in bone may be released into the blood during pregnancy, thus exposing the fetus. Thus Lead is stored in Bones also. **So,**

**Statement 2 is not correct.** Lead is a naturally occurring toxic metal found in the Earth's crust. Lead is used in many products like pigments, paints, solder, stained glass, lead crystal glassware, ammunition, ceramic glazes, jewellery, toys, cosmetics such as kohl and sindoor, and used in traditional medicines in countries like India, Mexico and Vietnam. **So, Statement 3 is correct.** In general, young children are particularly vulnerable to the toxic effects of lead. They absorb 4–5 times as much ingested lead as adults from a given source. Exposure to lead-contaminated soil and dust resulting from battery recycling and mining has caused mass lead poisoning and multiple deaths in young children in Nigeria, Senegal and other countries. **So, Statement 4 is correct.**

Q.40) Consider the following statements :

1. Arsenic is highly toxic in its inorganic form.
2. Arsenic is widely distributed throughout the environment in the air, water and land.
3. As per Bureau of Indian Standards the maximum permissible limit of Arsenic in drinking water is 1 mg/l.
4. In India, the Ganga Basin is the most affected zone in terms of arsenic contamination in groundwater.

Which of the statements given above are correct?

- (a) 2 and 3 only  
**(b) 1, 2 and 4 only**  
(c) 1, 3 and 4 only  
(d) 1, 2, 3 and 4

**EXPLANATION:**

Arsenic (Symbol - As) is a chemical element with atomic number 33. It is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. Arsenic is highly toxic in its inorganic form whereas these are found in soils, sediments, and groundwater which occur naturally or as a result of mining, ore smelting, and industrial use of Arsenic.

Arsenic and its compounds, especially the trioxide, are used in the production of pesticides, treated wood products, herbicides, and insecticides. These applications are declining due to the toxicity of arsenic and its compounds. **So, Statements 1 and 2 are correct.**

As per Bureau of Indian Standards (BIS) (IS 10500: 2012) the maximum permissible limit of Arsenic in drinking water is 0.01 mg/L (ppm) or 10 µg/L (ppb) and not 1 mg/L. If consumed in greater amount than the permissible limits, Arsenic can cause several skin problems including Arsenicosis characterised by dark spots on body and limbs, thickening of palms and soles etc, **So, Statement 3 is not correct.**

In India, the Arsenic contamination in groundwater in the Ganga and Brahmaputra fluvial plains is reported as one of the world's biggest natural groundwater calamities to the mankind.

West Bengal, Jharkhand, Bihar, Uttar Pradesh in the flood plain of the Ganga River; Assam and Manipur in the flood plain of the Brahmaputra and Imphal rivers and Rajnandgaon village in Chhattisgarh state have so far been reported affected zone by Arsenic contamination in groundwater above the permissible limit of 10 µg/L. **So, Statement 4 is correct.**

Q.41) With reference to bioprospecting, consider the following statements:

1. Bioprospecting is the systematic search for unique genes or organisms from the environment which could be useful to society.

2. Antarctic black yeast with anti-tumor properties was patented in Russia.
3. The Cartagena protocol aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only**
- (c) 1, 2 and 3
- (d) 3 only

**EXPLANATION:**

Bioprospecting is a systematic and organized search for unique genes, molecules, and organisms from the environment, which derives useful products from bioresources, including plants, microorganisms, animals, etc., that can be developed further for commercialization and overall benefits of society. **So, Statement 1 is correct.**

In 1997, an extract of a strain of Antarctic black yeast with anti-tumor properties was patented in Russia, and in 2002 an extract from a species of Antarctic green algae was patented in Germany for use in cosmetic skin treatment. **So, Statement 2 is correct.**

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (supplementary agreement to the Convention on Biological Diversity) is an international agreement that aims at sharing the benefits arising from the Utilization of genetic resources fairly and equitably.

Whereas the Cartagena Protocol on Biosafety to the Convention on Biological Diversity is an international agreement that aims to ensure the safe handling, transport, and use of living-modified organisms (LMOs). **So, Statement 3 is not correct.**

Q.42) With reference to the Photochemical smog, consider the following statements :

1. It is the air contaminated with ozone, nitrogen oxides, and hydrocarbons, with or without natural fog in the presence of sunlight.
2. A strong temperature inversion decreases the intensity of photochemical smog.
3. The Madrid protocol deals with limits of air pollutants like sulphur dioxide, nitrogen oxide, ammonia and volatile organic

compounds. Which of the statements given

above is/are correct ?

- (a) 1 and 2 only
- (b) 1 only**
- (c) 2 and 3 only
- (d) 3 only

**EXPLANATION:**

Photochemical smog is air contaminated with ozone, nitrogen oxides, and hydrocarbons, with or without natural fog, in the presence of sunlight, hydrocarbons, and nitrogen oxides. It tends to occur more in summer because due to more sunlight. In the presence of sunlight and heat, nitrogen oxides and volatile organic compounds undergo what's called a photochemical reaction to form smog. **So, Statement 1 is correct.**

Temperature inversions occur when cold air is trapped under warm air. Cold air does not move or sink in from surrounding hills. Photochemical smog is impacted by inversion layers because it is in essence, trapped when the warm air masses move over the valleys. The most severe episodes of

photochemical smog occur when a strong temperature inversion caps the location and traps the pollutants. Hence temperature inversion increases the intensity of photochemical smog and not decreases it. **So, Statement 2 is not correct.**

Gothenburg Protocol is to Abate Acidification, Eutrophication, and Ground-level Ozone.

The Protocol sets national emissions for four air pollutants like sulphur (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOCs), and ammonia (NH<sub>3</sub>).

Whereas the Madrid Protocol is an international registration that deals with Intellectual Property Rights and trademark-related matters. **So, Statement 3 is not correct.**

Q.43) Consider the following statements :

1. A short vegetation period of generally less than 50 days
  2. A very low precipitation of less than 400 mm per year
  3. Typical vegetation is cotton grass, sedges, dwarf heath, willows birches and lichens
- The above statements are about which type of ecosystem ?

- (a) Grasslands
- (b) Boreal forests
- (c) Deserts
- (d) Tundr**

**a**

#### **EXPLANATIO**

**N:**

Tundra means a “barren land” and they are found in regions of very severe environmental conditions. There are two types of tundra such as the arctic tundra and the alpine tundra. The climate and the vegetation which support this system are,

- There is a permanently frozen subsoil called permafrost in the arctic and antarctic tundra region. The summer temperature may be around 15°C, and in winter, it may be as low as – 57°C in the arctic tundra region.
- It has very low precipitation of less than 400 mm per year, and there is a short vegetation period of generally less than 50 days between spring and autumn frost. Thus, productivity is low in this region.
- There are no deep root systems in the vegetation of the arctic tundra. However, there are still a wide variety of plants that can resist the cold climate. Typical arctic tundra vegetation is cotton grass, sedges, dwarf heath, willows, birches, and lichens. **So, Option (d) is correct.**

Q.44) Consider the following statements with reference to the Taiga Biome :

1. They are characterized by gymnosperms.
  2. They are deciduous, drought resistant and woody.
  3. Their productivity is lesser than Temperate Grasslands.
  4. There are very few amphibians and reptiles in these forests.
- How many statements given above is/are correct ?

- ?
- (a) Only one statement
  - (b) Only two statements**
  - (c) Only three statements

(d) All four statements

**EXPLANATION:**

Coniferous forests are also known as Taiga or Boreal forests. They extend as a continuous belt across north America and north Eurasia below the arctic tundra. These are characterized by conifers (gymnosperms), as trees that grow needles instead of leaves and cones instead of flowers. **So, Statement 1 is correct.**

Conifers or Taiga tend to be evergreen (not deciduous) they bear needles all year long, and they are evergreen, drought resistant, and woody in nature. In many species, the canopy is cone-shaped. These adaptations help conifers survive in areas that are very cold or dry. Some of the more common conifers are spruces, pines, and firs. **So, Statement 2 is not correct.**

Productivity is defined as the total accumulated amount of energy stored by the autotrophic primary producers per unit area per unit time. The productivity of the tropical rainforest biome is the highest of all biome types of the world. Productivity of tundra biome is the least.

The productivity of the Taiga biome is 3500 kilocalories/square meter/year and productivity of temperate grasslands is 2000 kilocalories/square meter/year. Hence, the productivity of Taiga Biome is greater than Temperate Grassland. **So, Statement 3 is not correct.**

The cold winters (and short summers) make the taiga a challenging biome for reptiles and amphibians, which depend on environmental conditions to regulate their body temperatures. There are only a few species in the boreal forest, including red-sided garter snake, common European adder, blue-spotted salamander, northern two-lined salamander, Siberian salamander, wood frog, northern leopard frog, boreal chorus frog, American toad, and Canadian toad. Most hibernate underground in winter. **So, Statement 4 is correct.**

Q.45) With reference to the desert ecosystem which one of the following statements is **not** correct ?

- (a) They occupy about one-seventh of the land on earth's surface
- (b) They occur in two belts that encircle the northern and southern hemispheres roughly centered over the tropics of Cancer and Capricorn
- (c) Acacia, Euphorbia and prickly pears are the common desert plants
- (d) The temperature is very high in all desert ecosystems**

**EXPLANATION:**

Deserts are waterless barren regions of the earth. They occupy about one-seventh of the land on the earth's surface. Deserts form an extreme condition in a sequence of ecosystems with respect to climatic conditions. They occur in two belts that encircle the northern and southern hemispheres, roughly centered over the tropics of Cancer and Capricorn. **So, Options (a) and (b) are correct.**

Cacti, Acacia, Euphorbia, and prickly pears are some of the most common desert plants. Desert animals are insects, reptiles, and burrowing rodents. Desert shrews, foxes, kangaroos, wood rats, rabbits, and armadillos are common mammals in deserts. Camel is known as the ship of the desert as it can travel long distances without drinking water for several days. **So, Option (c) is correct.**

In the Desert ecosystem, annual rainfall is very little. It may be less than 25 cm per annum. In some places, if it is high, it is unevenly distributed. The temperature may be very high in subtropical deserts and very low in cold deserts e.g. Ladakh. The winds here have high velocity. Thus, the Temperature is not very high in all deserts. **So, Option (d) is not correct.**



Q.46) Consider the following statements with reference to the Grasslands Biome :

1. They occupy the largest portion of the land on earth's surface compared to the other biomes.
  2. They represent a zone in between two ecosystems.
  3. They are very rich in reptilian and insect fauna.
  4. They are subjected to lesser variation of temperature, moisture, wind and light intensity of the sun.
  5. They occur in both tropical and temperate regions.
- Which of the statements given above are correct?

(a) **2, 3 and 5 only**

(b) 1, 3 and 4 only

(c) 2, 3, 4 and 5 only

(d) 1, 2, 4 and 5 only

**EXPLANATION:**

Grasslands and other grass- and graminoid-dominated habitats (e.g., savanna, open and closed shrubland, and tundra) occur on every continent except Antarctica (though some grasses occur there) and occupy only about 20 % of Earth's land surface. Whereas for example, forests itself cover above 30 percent of the Earth's surface. **So, Statement 1 is not correct.**

Grasslands are found where there is regular rainfall to support the growth of a forest, but not so little were a desert forms. Thus, grasslands act as ecotone (a zone in between two ecosystems) that often lie between forests and deserts. **So, Statement 2 is correct.**

Grasses are the dominating plants with scattered drought-resistant trees in tropical grasslands. Trees are less than 10 m in height. Animals are much reduced in grasslands because there is no shelter. The large herbivores of this biome are bison, proghorn (North America) wild horse, ass, saiga (Eurasia), zebra, and antelope (South Africa). Carnivores are quite small in number and size They are coyotes, weasels, badgers foxes, and ferrets. Hawks, lark sparrows, warblers, Great Indian Bustard, and peafowl are the common birds found in grassland. They are very rich in reptilian and insect fauna. **So, Statement 3 is correct.**

Grasslands often experience very high intra- and interannual variability in rainfall, and comparisons with other biomes indicate that grasslands are more responsive to variation in rainfall amounts than most other biomes. This may occur because the relatively high density of plants and associated meristematic tissue (growing points) in grasslands results in greater growth potential when water is available relative to more arid regions. Thus, the grasslands have a higher variation of temperature, moisture, wind, and light intensity of the sun. **So, Statement 4 is not correct.**

Grasslands occur in tropical and temperate regions and are called tropical grasslands and temperate grasslands. Tropical grasslands include the hot savannas of sub-Saharan Africa and northern Australia. The important temperate grasslands include the steppe in Eurasia, the prairies of North America, the downs of Australia and New Zealand, and the pampa of Argentina. **So, Statement 5 is correct.**

Q.47) Consider the following fauna of India:

1. Indian crocodile

2. Hawksbill turtle
3. Pygmy hog
4. Jerdon's courser
5. Indian Myna
6. Monarch Butterfly
7. Sociable Lapwing

Which of the above given species are critically endangered ?

- (a) 2, 3, 4 and 5 only
- (b) 1, 2, 3, 4, 5 and 6 only
- (c) **2, 3, 4 and 7 only**
- (d) 1, 2, 3, 4, 5, 6 and 7

**EXPLANATION:**

India is home to three crocodile species they are :

- Gharial - Critically Endangered on IUCN Red List
- Mugger is also called a Broad-snouted Crocodile or Marsh Crocodile - IUCN: Vulnerable
- Saltwater Crocodile- Critically Endangered on IUCN Red List

The Hawksbill turtle is listed as 'Critically Endangered' on IUCN Red List.

Pygmy hog is listed as Critically Endangered on IUCN Red List.

Jerdon's Courser *Rhinoptilus bitorquatus* is listed as Critically Endangered.

The common myna or Indian myna (*Acridotheres tristis*) is native to India, Asia and the Middle East; the Indian myna is a medium-sized bird with a yellow bill and brown and black feathers. It is placed under Least Concern in the IUCN Red List.

Recently, the IUCN declared the common myna one of only three birds among the world's 100 worst invasive species.

Monarch Butterfly *Danaus plexippus* is listed as Least Concern.

Sociable Lapwing *Vanellus gregarius* is listed as Critically Endangered.

**So, Option (c) is correct.**

Q.48) Consider the following statements with regards to Wetland Conservation :

1. India has the highest number of Ramsar sites among Asian countries.
2. In India, Uttar Pradesh has the highest number of Ramsar sites.
3. The Convention on Wetlands of International Importance is the only global conventions with a focus on site-based conservation.

Which of the statements given above is/are correct ?

- (a) **1 only**
- (b) 2 only
- (c) 2 and 3 only
- (d) 3 only

**EXPLANATION:**

The Ramsar Convention is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Among Asian countries, India has highest number with 75 sites and china has 64 sites and other Asian countries has less sites.

**So, Statement 1 is correct.**

India has 75 sites, in which Tamil Nadu has the most Ramsar sites with 14, followed by Uttar Pradesh with 10.

Karikili Bird Sanctuary, Pallikaranai Marsh Reserve Forest, Pichavaram Mangrove, Chitrangudi Bird Sanctuary, Kanjirankulam Bird Sanctuary are some of the recently added Ramsar sites in Tamilnadu. **So, Statement 2 is not correct.**

The Convention on Wetlands of International Importance and the World Heritage Convention are the only two international convention with a focus on site-based conservation adopted in 1972 and 1971, respectively. **So, Statement 3 is not correct.**

Q.49) Consider the following pollutants :

1. CFCs
2. Ozone
3. Ammonia
4. Nitrogen dioxide
5. Oxides of carbon
6. Peroxyacyl nitrates

Which of the above are not secondary pollutants ?

- (a) 1, 2, 3, 4 and 5 only  
**(b) 1, 3, 4 and 5 only**  
(c) 3, 4, and 5 only  
(d) 1, 3, 4, 5 and 6 only

**EXPLANATION:**

Primary pollutants are directly emitted from the source, whereas secondary pollutants are not directly emitted but form when other pollutants (primary pollutants) react in the atmosphere.

- Chlorofluorocarbons (CFCs) are noninflammable and long-lived compounds released into the atmosphere by refrigerators, air conditioners, sprays, fire extinguishers, and paints. So, it's called primary pollutants.
- Ammonia is the most abundant alkaline gas in the atmosphere. The largest source of NH<sub>3</sub> emissions is agriculture, including animal husbandry and NH<sub>3</sub>-based fertilizer applications, Which is a primary pollutant.
- Nitrogen dioxide is the primary pollutant because it is directly released into the atmosphere from human activities like the combustion of fossil fuels (coal, gas and oil), especially fuel used in cars.
- Carbon Oxides are the primary pollutant directly released into the atmosphere from human and Natural sources.

Some secondary pollutants are:

- Ozone (O<sub>3</sub>)
- Sulfuric acid and nitric acid (a component of acid rain)
- Particulate matter
- Peroxyacyl nitrates (PANs)- Peroxyacyl nitrate is a secondary pollutant in photochemical smog. It is thermally unstable and breaks down into nitrogen dioxide gas and peroxyethanoyl radicals. It irritates the lungs and eyes because it is a lachrymatory chemical.

**So, option (b) is correct.**

Q.50) With reference to Green Bonds, consider the following statements:

1. A green bond is a type of fixed-income instrument that is specifically earmarked to raise

money for climate and environmental projects

2. Green bonds may come with tax incentives to enhance their attractiveness to investors.

3. The Asian Development Bank is a major issuer of green

bonds. Which of the statements given above is/are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

**EXPLANATION:**

Green bonds are fixed-income instruments issued for the specific purpose of funding projects that have constructive environmental and or climate benefits.

It is like any typical coupon-bearing debt instrument, they have a specified end objective for using the funds raised. **So, Statement 1 is correct.**

Green bonds may come with tax incentives such as tax exemption and tax credits, making them a more attractive investment to investors when compared to a comparable taxable bond. These tax advantages provide a monetary incentive to tackle prominent social issues such as climate change and a movement toward renewable sources of energy. **So, Statement 2 is correct.**

Since 2008, the World Bank issued approximately USD 18 billion equivalent in Green Bonds through over 200 bonds in 25 currencies and it is the major issuer (not Asian Development Bank). These funds have been used to support projects around the world, largely in renewable energy and efficiency, clean transportation, and agriculture and land use. **So, Statement 3 is not correct.**

Q.51) Consider the following statements :

1. They are small nocturnal mammals

2. It acts as a biological predator of pests in agricultural crops

3. India's only sanctuary specifically to protect this species is located in Tamil Nadu

The above statements are about which species?

(a) Malabar Civet

(b) Grizzled giant squirrel

(c) **Slender loris**

(d) Nilgiri tahr.

**EXPLANATION:**

- Commonly found in the tropical scrub and deciduous forests as well as the dense hedgerow plantations bordering farmlands of Southern India and Sri Lanka, the Slender Loris is a small, nocturnal primate. It prefers to inhabit thick, thorny bushes and bamboo clumps where it can evade predators and also find insects, which is its main diet.
- They are arboreal (living in trees) in nature as they spend most of their lives on trees. This species acts as a biological predator of pests in agricultural crops and benefits farmers.
- Recently, Tamil Nadu notified India's first slender loris sanctuary called Kaduvur slender loris sanctuary covering 11,806 hectares in Karur and Dindigul districts. **So, Option (c) is correct.**

52.

Answer: a Explanation:

- Harmful algal blooms (HABs) commonly known as **Red tides** occur when algae production goes out of control and produces harmful and toxic effects on people and other organisms.
- They are caused by diverse organisms, including toxic and noxious phytoplankton, **cyanobacteria**, benthic algae, and macroalgae. **Dinoflagellates and diatoms** are two different types of phytoplankton and are most often found in salt water or brackish water, including in estuaries. Dinoflagellates are the most common cause of algal blooms in salt water. **So, statement 1 is correct.**
- The duration of a HAB event can range from a **few weeks to longer than a year**. The duration of a bloom depends on physical and biological conditions that influence its growth and persistence. **So, statement 2 is correct.**
- Shellfish being filter feeders are more prone to **Bioaccumulation** and are one of the most affected by Harmful Algal Blooms.
- They can cause **oxygen (not carbon dioxide) in the water to deplete** leading to hypoxia. **So, statement 3 is not correct.**
  - o Algae need carbon dioxide to survive. Higher levels of carbon dioxide in the air and water can lead to rapid growth of algae, especially toxic blue-green algae that can float to the surface of the water.

Therefore, option (a) is the correct answer.

**Relevance:** Recently, algal bloom posed threat to Kabani river ecosystem in southern India.

53.

Answer: d Explanation:

- **Mangrove forests, or mangals**, grow at tropical and subtropical latitudes near the equator where the sea surface temperatures never fall below 16°C. Mangals line about two-thirds of the coastlines in tropical areas of the world.
- Some mangroves remove salt from brackish estuarine waters through **ultra-filtration** in their roots. Other species have special glands on their leaves that actively **secrete salt**, a process that leaves visible salt crystals on the upper surface of the leaves. **So, point 1 is correct.**
- Mangrove seeds begin growing while still attached to the parent plant. These seedlings, called **propagules**, even grow roots. After a period of growth, these seedlings **drop to the water below and float upright** until they reach water that is shallow enough for their roots to take hold in the mud. **So, point 2 is correct.**
- Many species of mangrove trees have aerial roots called pneumatophores **that take up oxygen** from the air for the roots. **So, point 3 is correct.**
- All mangrove species have **laterally spreading roots** with attached vertical anchor roots. These roots are very shallow. **So, point 4 is correct.**

Therefore, option (d) is the correct answer.

54.

Answer: b Explanation:

- Estuaries are often called the “nurseries of the sea,” **because so many animals reproduce and spend the early part of their lives there**. Salty seawater mixes with fresh water draining from the land to create habitats with unique conditions that are not found elsewhere.
- As the tide rises and falls, water depth and chemistry change, creating a wide range of habitats. In some parts of estuaries, moving water becomes still, allowing mud and food particles to settle at the bottom. These safe conditions make estuaries ideal homes for the plants and animals who feed, grow, and reproduce there.

Therefore, option (b) is the correct answer.

55.

Answer: b

**Explanation:**

- The carbonate compensation depth, or CCD, is defined as the **water depth** at which the rate of supply of calcium carbonate from the surface is **equal to the rate of dissolution**.
- As long as the ocean floor lies above the CCD, **carbonate particles will accumulate in bottom sediments**, but below, there is no net accumulation.
- The **seafloor near ocean ridges is typically above the CCD** and carbonates are important sediment constituents, but with spreading and cooling, the sea floor descends below the CCD and deep sea clays become predominant.

Therefore, option (b) is the correct answer.

56.

Answer: a Explanation:

- **Eutrophication** is a **natural process** that results from **accumulation of nutrients** in lakes or other bodies of water. **Human activities can accelerate** eutrophication by increasing the rate at which nutrients enter the water.
- Eutrophication is **characterized by excessive plant and algal growth** due to the increased availability of one or more limiting growth factors needed for photosynthesis, such as sunlight, carbon dioxide, and nutrient fertilizers. Eutrophication **occurs naturally over centuries as lakes age** and are filled in with sediments. **So, point 1 is correct.**
- High rates of photosynthesis associated with eutrophication can **deplete dissolved inorganic carbon and raise pH to extreme levels** during the day. Elevated pH can turn some organisms 'blind' that rely on perception of dissolved chemical cues for their survival by impairing their chemosensory abilities. **So, point 2 is correct and point 3 is not correct.**

Therefore, option (a) is the correct answer.

57.

Answer: a Explanation:

- **Ephemeral plant** is any **short-lived plant**, usually one that has **one or more generations per year**, growing only during favourable periods (as when adequate moisture is available) and **passing the unfavourable periods in the form of seeds**.
- The seed coats of some species **contain a growth inhibitor** that can be washed off only by a copious quantity of water, thus **preventing germination** after only a brief shower.
- The most common types of ephemeral species are **desert annuals, plants whose seeds remain dormant for months or years** but which quickly germinate, grow, and flower when rain does fall.

Therefore, option (a) is the correct answer.

58.

Answer: d Explanation:

- Wildlife sanctuaries refer to an area that provides protection and living conditions favourable to wild animals. On the other hand, the National Park provides protection to the entire ecosystem, which includes flora, fauna, landscape, etc. of that region.
  - Both the Central Government and State governments can declare National Parks.
- If it appears to the State Government that an area, whether within a sanctuary or not, is needed to be constituted as a National Park for the purpose of protecting, propagating or developing wild life therein or its environment, it may, by notification, declare its intention to constitute such an area as a National Park.
- The Central Government can declare an area as National Park if it is satisfied that the conditions specified in section 35 of the Wildlife (Protection) Act, 1972 are fulfilled. **So, statement 1 is correct.**
- In National Parks, human activity is not allowed. Also, the **grazing of livestock and private tenurial rights are not permitted**. No person can remove, exploit, or destroy any wildlife from a National Park. No person shall allow to damage or destroy the habitat of any wild animal or deprive any wild animal

of its habitat within a National Park. In contrast, limited human activities and **limited amount of grazing by cattle are permitted in Wildlife Sanctuaries. So, statement 2 is correct.**

- No alteration of the boundaries of a National Park by the State Government shall be made except on a recommendation of the **National Board for Wild Life. So, statement 3 is correct.**

Therefore, option (d) is the correct answer.

59.

Answer: d Explanation:

- The term “cryosphere” traces its origins to the Greek word ‘**kryos**’ for frost or ice cold. The **cryosphere** is the part of the Earth’s climate system that includes **solid precipitation**, snow, sea ice, **lake and river ice**, **icebergs**, glaciers and ice caps, ice sheets, ice shelves, permafrost, and **seasonally frozen ground. So, points 1, 2, 3 and 4 are correct.**
- This sphere helps **maintain Earth’s climate** by reflecting incoming solar radiation back into space. As the world warms due to increasing greenhouse gases being added to the atmosphere by humans, the snow and ice are melting. At sea, this **exposes more of the dark ocean below the ice**, and on land, the dark vegetation below. These dark surfaces then absorb the solar radiation causing more melting. This creates a **positive feedback loop**, which exacerbates the impacts of climate change.

Therefore, option (d) is the correct answer.

60.

Answer: c Explanation:

- Schedule VI of the Wildlife Protection Act, 1972 consists of **plants prohibited for cultivation, collection, extraction and trade.**
- They cover only Beedoome’s Cycad, Blue vanda, Kuth, Ladies slipper orchids, Pitcher plant and Red vanda.
- Cycas beedoomei is native to India, where it is confined to a small area of Andhra Pradesh state in the Tirumala Hills in scrubland and brush covered hills.
- One of the most popular asiatic orchids, Vandas are very demanded by its big, blue/purple, long lived flowers. Blue orchid is native to North East India where it grows at elevations ranging from 2500 to 4000 feet in the Himalayan foothills.
- Kuth or Kustha is a potent plant which is known for its medicinal uses. It helps to improve digestion by preventing the growth of bacteria in the large intestine due to its antimicrobial and antibacterial properties.
- Lady slipper or slipper orchid are found throughout Eurasia and the Americas, and some species are cultivated.
- Pitcher plants are several different carnivorous plants which have modified leaves known as pitfall traps—a prey-trapping mechanism featuring a deep cavity filled with digestive liquid.
- Red Vanda is a species of orchid occurring from the eastern Himalaya to China and Vietnam.

Therefore, option (c) is the correct answer.

61.

Answer: d Explanation:

- **The Wildlife (Protection) Act 1972 does not define the term ‘vermin’.** However, its **Schedule V** contains a list of animals designated ‘vermin’. Section 62 of the Act empowers the Centre to declare wild animals of any species as ‘vermin’ in any area and for a specified period of time. These animals are deemed to be included in Schedule V, opening them up to be hunted. **So, statement 1 and Statement 2 are not correct.**
- Vermins are any animals that are usually considered a **problem or nuisance for attacking** humans, crops, livestock or property. For example: common crows, and fruit bats.
- **Section 62** of the Wildlife (Protection) Act, 1972 states that the Central Government may, by notification, declare **any wild animal other than those specified in Schedule I and Part II of Schedule II** to be vermin for any area. **So, statement 3 is not correct.**

Therefore, option (d) is the correct answer.

62.

Answer: b Explanation:

**Allen's rule:**

- This refers to an eco-geographical rule which states that **significant differences exist in the size of limbs and other external organs of animals**, even within the same species, depending on the geographical region in which they live.
- Animals living in colder regions of the world, for instance, have **shorter limbs than those living in warmer regions** as an **adaptation to control the dissipation of heat**. A smaller body surface area helps animals in colder regions stay warm by slowing down the loss of body heat.
- It is named after American biologist **Joel Asaph Allen** who proposed it in his 1877 paper "The influence of physical conditions in the genesis of species".

Therefore, option (b) is the correct answer.

63.

Answer: a

**Explanation:**

- **Eurythermal animals** are those which can tolerate and thrive in a **wide range of temperatures**. They show less sensitivity to temperature. In contrast, **stenothermal animals** are those who are able to tolerate a narrow range of temperatures. **So, statement 1 is correct.**
- **Eurythermal animals** include goat, man, cat, **dog, tiger, cow, sheep, monkey**, greencrab, etc. Since estuarine environments are constantly subject to a wide range of temperature fluctuation, species that survive in **estuarine environments are mostly eurythermal** organisms. On the other hand, **marine and soil organisms are mostly stenothermal**. Other stenothermal animals include reptiles, crustaceans, insects, salmon, penguin, python, crocodile, etc. **So, statement 2 is not correct.**

Therefore, option (a) is the correct answer.

64.

Answer: b

**Explanation:**

Temperate deciduous forests:

- These are located in the **mid-latitude areas** which means that they are found between the polar regions and the tropics. The deciduous forest regions are **exposed to warm and cold air masses**, which cause this area to have **four seasons**.
- During the fall, trees change colour and then lose their leaves. This is in preparation for the winter season. They also have **thick bark to protect them from the cold weather**. Trees flower and grow during the **spring and summer growing season**.
- Most of the trees are broadleaf trees such as **oak, maple, beech, hickory and chestnut**. There are also several different kinds of plants like **mountain laurel, azaleas and mosses** that live on the shady forest floor where only small amounts of sunlight get through.

Therefore, option (b) is the correct answer.

**Relevance:** Recent a report has provided that in the higher latitudes up particularly Kazakhstan, the needleleaf evergreen/deciduous forests have expanded both North and South, making the area wetter.

65.

Answer: b Explanation:

- **Aestivation or estivation** is a survival strategy used by many vertebrates and invertebrates to **endure arid environmental conditions**. It is experienced by animals in **response to heat stress**. Stimulus for estivation is usually a combination of **high temperatures and water shortage**. Key features of aestivation include strong metabolic rate suppression, strategies to retain body water, conservation of energy and body fuel reserves, altered nitrogen metabolism, and mechanisms to preserve and



stabilize organs, cells and macromolecules over many weeks or months of dormancy. **So, statement 1 is correct.**

- Hibernation is an **extended form of torpor**, a state where **metabolism is depressed to less than five percent of normal**. Most of the physiological functions are extremely slowed down or completely halted during hibernation.
- While hibernation is most often seen as a seasonal behaviour, it's **not exclusive to cold-weather critters**. There are tropical hibernators that may do so to stay cool in the heat. **Temperature isn't always a factor**. Some species hibernate in response to **food shortages**. For example, **echidnas in Australia will hibernate after fires**, waiting until food resources rebound to resume normal activities. **So, statement 2 is not correct.**
- **Torpor is a temporary drop in body temperature and metabolic rate often accompanied by failure to eat or micturate/defecate**. It is an adaptation of endothermic vertebrates that enables them to survive the energetic demands of cold ambient temperature. To decrease the energy expenditure of producing body heat while resources are also limited, some vertebrates can significantly decrease their body temperature and metabolic rate. This behaviour is under environmental control via the endocrine system. **So, statement 3 is correct.**

Therefore, option (b) is the correct answer.

66.

Answer: c Explanation:

- **Trophic pyramid** is the basic structure of interaction in all biological communities **characterized by the manner in which food energy is passed** from one trophic level to the next along the food chain. The base of the pyramid is composed of species called **autotrophs**. All other organisms in the ecosystem are **heterotrophs**, which either directly or indirectly depend on the primary producers for food energy. **So, statement 1 is correct.**
- A **pyramid of numbers** shows the **total number of individual organisms** at each level in the food chain of an ecosystem. A pyramid of numbers does **not always have a regular pyramid shape** because it does not take into account the biomass of the organisms. An **inverted pyramid of numbers** can be found in an ecosystem where the community contains a few producers with very large biomass that supports a large number of smaller consumers. **So, statement 2 is not correct.**
- A pyramid of energy shows the **total quantity of available energy stored** in the biomass of organisms at each level in the food chain of an ecosystem per year. Pyramids of energy show that the **producers store the highest quantity of energy** and the energy stored then decreases at each level in the food chain of the ecosystem. **So, statement 3 is correct.**

Therefore, option (c) is the correct answer.

67.

Answer: d Explanation:

- **Global Conservation Assured | Tiger Standards (CA|TS)** is a set of criteria which allows tiger sites to check if their management will lead to successful tiger conservation.
- Sites taking part will initially be 'registered' (standards not yet attained). Later when all required standards are met, it is considered as 'approved' (standards achieved). Sites are evaluated through an assessment and independent review process.
- CA|TS has been agreed upon as an accreditation tool by the **global coalition of Tiger Range Countries (TRCs)** and has been developed by tiger and protected area experts. **So, statement 1 is not correct.**
- CA|TS is being adopted for **use beyond tigers**, including jaguars, lions and freshwater dolphins.
- **14 Tiger Reserves (not all) in India have received the accreditation of CA|TS**. The 14 tiger reserves which have been accredited are Manas, Kaziranga and Orang in Assam, Satpura, Kanha and Panna in Madhya Pradesh, Pench in Maharashtra, Valmiki Tiger Reserve in Bihar, Dudhwa in Uttar Pradesh, Sunderbans in West Bengal, Parambikulam in Kerala, Bandipur Tiger Reserve of Karnataka and Mudumalai and Anamalai Tiger Reserve in Tamil Nadu. **So, statement 2 is not correct.**

Therefore, option (d) is the correct answer.

68.

Answer: c Explanation:

**Adaptations by plants to cope with arid conditions:**

- Thick, waxy skin to reduce loss of water and to reflect heat.
  - Large, fleshy stems to store water.
  - Thorns and thin, **spiky or glossy leaves** to reduce water loss. **So, point 1 is correct.**
  - Spikes protect cacti from animals wishing to use stored water.
  - Deep roots to tap groundwater.
- Long shallow roots which spread over a wide area. So, point 2 is not correct.
    - Plants lie dormant for years until rain falls.

Adaptations by animals to cope with arid conditions:

- They are fast runners.
- They are **nocturnal in habit to avoid the sun's heat** during day time. **So, point 3 is incorrect.**
- They conserve water by excreting concentrated urine.
- Animals and birds usually **have long legs to keep their body away from the hotground. So, point 4 is correct.**
- Lizards are mostly insectivorous and can live without drinking water for several days.
- Herbivorous animals get sufficient water from the seeds which they eat.

Therefore, option (c) is the correct answer.

69.

Answer: a Explanation:

- The **Monotreme species** are a group of highly specialised **egg-laying predatory mammals**. There are only five living monotreme species: the **duck-billed platypus** and **four species of echidna** (also known as spiny anteaters). All of them are **found only in Australia and New Guinea. Like the other extant monotremes, the short-beaked echidna lays eggs.** As with reptiles and birds, monotremes are more primitive than mammals because they lay eggs rather than giving birth to live young.
- **Kangaroos, koalas, and wombats are Diprotodonts.** Diprotodonts are an order of **marsupial** (not egg laying) mammals that live in **Australia, New Guinea, and parts of Indonesia.**

**Therefore, option (a) is the correct answer.**

70.

Answer: a Explanation:

- Fertilizers can be classified as mineral or organic. Mineral fertilizers, also known as chemical fertilizers since they are manufactured by the chemical fertilizer industry, are mainly nitrogen (N), phosphate, and potash.

Disadvantages of using chemical fertilizers:

- **Greenhouse gases:** Some soil microorganisms can **transform nitrogen provided in fertilizers into nitrogen-containing gases**, which get released into the atmosphere like the **greenhouse gas nitrous oxide (N<sub>2</sub>O)**. Nitrous oxide has a warming potential ~300 times greater than carbon dioxide. **So, point 1 is correct.**
- **Eutrophication:** Fertilizers can **runoff into waterways** from the soil. Eutrophication is the **unwanted fertilization of a waterway** and it promotes the growth of microorganisms, algae, and plants, just like the fertilization of the soil. **So, point 2 is incorrect.**
- **Groundwater contamination:** Applying excessive doses of fertilizer **may leak into the area below the root zone** and reach the groundwater. **So, point 3 is correct.**
- **Soil degradation:** Excessive use of fertilizers can significantly **raise acidity levels**, create **macronutrient saturation**, or change it to the point where the soil **loses sensitivity and absorbency** to various nutrients. Nitrogen sources — fertilizers, manures, legumes — contain or form ammonium. This increases soil acidity unless the plant directly absorbs the ammonium ions. The greater the nitrogen fertilization rate, the greater the soil acidification. **So, point 4 is not correct.**
- **Excessive growth:** Because of the excessive and uncontrolled application of chemical fertilizers, the

proportions and growth of the plants may exceed typical criteria.

Therefore, option (a) is the correct answer.

71.

Answer: c Explanation:

- The **Project Snow Leopard** is an Indian initiative for strengthening wildlife conservation in the Himalayan high altitudes. It was launched by the **Ministry of Environment, Forests and Climate Change**, Government of India, **2008-09**. It was not launched as part of **Global Snow Leopard and Ecosystem Protection (GSLEP) Programme**. **So, statement 1 is not correct.**
- **LOCATION:** All biologically important landscapes in the Himalayan high altitudes in the states and union territories of **Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh**. **So, statement 2 is not correct.**
- It aims to promote a knowledge-based and adaptive conservation framework that **fully involves the local communities**, who share the snow leopard's range, in conservation efforts. **So, statement 3 is correct.**

Therefore, option (c) is the correct answer.

72.

Answer: c Explanation:

- **Photosynthetically Active Radiation (PAR)** is light of wavelengths 400–700 nm and is the **portion of the light spectrum utilised by plants for photosynthesis**.
- Of the incident solar radiation less than 50 per cent of it is photosynthetically active radiation (PAR). Plants capture only **2-10 percent** of the PAR and this small amount of energy sustains the entire living world.
- Photosynthetic photon flux density (PPFD) is defined as the photon **flux density** of PAR.

Therefore, option (c) is the correct answer.

73.

Answer: d Explanation:

- **Karakoram Range** is a mountain system extending some 500 km from the **easternmost extension of Afghanistan** in a south-easterly direction along the watershed between Central and South Asia.
- Karakoram anomaly is the mystery of **why few pockets of glaciers in the Karakoram Range are resisting glacial melt due to global warming**, defying the trend of glaciers losing mass across the globe, with the Himalayas being no exception. It remains an intriguing scientific question to the researchers.
- Some researchers have attributed this phenomenon to the **recent revival of western disturbances (WDs)**.

Therefore, option (d) is the correct answer.

74.

Answer: b Explanation:

A.W. Eichler, in 1883, classified the whole plant kingdom into two sub-kingdoms: **cryptogams and phanerogams**. Cryptogams consist of seedless plants and plant-like organisms whereas phanerogams consist of seed-bearing plants.

- A cryptogam is a plant that **reproduces by spores, without flowers or seeds**. "Cryptogamae" means hidden reproduction, referring to the fact that no seed is produced, thus cryptogams represent the **non-seed bearing plants**. **So, statement 1 is correct.**
- Cryptogams are divided into 3 groups such as: Thallophyta, Bryophyta (Bryophytes) and Pteridophytes.
  - **Thallophyta includes algae, fungi, bacteria, and lichens**. These are the simplest plants where the body is not differentiated into roots, leaves, and stems. The simplest thallophytes are bacteria. These are aquatic plants that can grow in fresh as well as marine water. These lack a vascular system.

- o **Bryophyta includes liverworts, horned liverworts, and mosses.** These are also undifferentiated plants with no vascular tissues. These can grow both on land and in water.
- o **Pteridophytes include all kinds of ferns.** These have well-differentiated plant body and vascular system is also present in them. These are also known as vascular cryptogams. These are most advanced of all cryptogams. **So, statement 2 is not correct.**

Therefore, option (b) is the correct answer.

75.

Answer: c Explanation:

- Epiphytes and parasites are two types of organisms that depend on another organism for their living.
- Epiphytes are organisms, especially plant that **live on other plants**. They are sometimes called *epibionts and air plants*. They add diversity and biomass to the ecosystems while providing rich and diverse habitats for other animals, fungi, and bacteria. They also take part in nutrient cycles. In contrast, **parasites are the organisms that depend on the expenses of another organism** called the host. **So, statement 1 is correct.**
- Generally, epiphytes require physical support from other plants. However, they **obtain water and nutrients from air, rain, other debris** accumulating around the epiphyte. Epiphytes are essentially photosynthetic. On the other hand, **parasites depend on the host for nutrients**. Parasites also reduce the fitness of the host by depending on its energy. Parasitism can cause diseases in the host as well as the death of the host.
- Some temperate zone epiphytes are **mosses, liverworts, lichens, and algae**. Some tropical epiphytes include many ferns, cacti, orchids, and bromeliads. Generally, annelids, arthropods, mollusks, nematodes, flatworms, and cnidarians are the major types of parasites. Moreover, plants, **fungi, protozoa, bacteria, and viruses can also become parasites**. **So, statement 2 is correct.**

Therefore, option (c) is the correct answer.

76.

Answer: a Explanation:

- Mangroves are ecotone species that are mainly found near the coast of rivers, oceans etc. In India, they are found along the coast areas of Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha and West Bengal. They are also found along the Lakshadweep Islands and Andaman & Nicobar Islands.
- **Pichavaram** in Tamil Nadu, **Vembanad** in Kerala and **Bhitarkanika** in Odisha are located in coastal regions. These are few of the largest mangrove forest sites in India. **So, point 1, point 2 and point 4 are correct.**
- **Rayalseema** is a **rain shadow region** in Andhra Pradesh. It doesn't contain mangrove forests. **So, point 3 is not correct.**

Therefore, option (a) is the correct answer.

77.

Answer: d Explanation:

- In the field of ecology, classifying a species as a generalist or a specialist is a way to identify what kinds of food and habitat resources it relies on to survive. **Generalist species** can eat a variety of foods and thrive in a range of habitats. **Specialist species**, on the other hand, **have a limited diet and stricter habitat requirements**. **So, statement 1 is correct.**
- An **example of a specialist species is the koala**. Native to Australia, koalas are **herbivorous marsupials** that feed only on the leaves of the eucalyptus tree. Therefore, their range is restricted to habitats that support eucalyptus trees. **So, statement 2 is incorrect.**
- Raccoons (*Procyon lotor*) are an example of a generalist species. They can live in a wide variety of environments, including forests, mountains, and large cities, which they do throughout North America. Raccoons are omnivores and can feast on everything from fruit and nuts to insects, frogs,

eggs, and human trash. Other examples of generalist species include bobcats and coyotes.

- **Specialist species are more likely to suffer from habitat loss and disruption** than generalist species. As a result, many specialist species are becoming threatened, endangered, and extinct due to human activities. In contrast, generalist species are becoming more common. **So, statement 3 is correct.**

Therefore, option (d) is the correct answer.

78.

Answer: c Explanation:

- **Clam:** It is a member of the invertebrate class Bivalvia, mollusks with a bivalved shell (i.e., one with two separate sections). True clams, in the strict sense, are bivalves with **equal shells closed by two adductor muscles** situated at opposite ends of the **shell**, and with a powerful, muscular, burrowing foot. **So, point 1 is correct.**
- **Sea trout:** It is a fish with **no shell**. While trout is considered a freshwater species they are also found in saltwater. Sea trout were originally a **European species**, but have been **introduced to environments all over the world** to the extent that they are now considered to be found on a worldwide basis. **So, point 2 is not correct.**
- **Mussels:** Mussel, is any of numerous bivalve mollusks belonging to the **marine family Mytilidae** and to the freshwater family Unionidae. Worldwide in distribution, they are most common in cool seas. Marine mussels are **usually wedge-shaped or pear-shaped** and range in size from about 5 to 15 centimetres. They may be smooth or ribbed and often have a hairy covering. The **shells of many species are dark blue or dark greenish brown** on the outside; on the inside they are often pearly. **So, point 3 is correct.**
- **Oyster:** They are the members of the families Ostreidae (true oysters) or Aviculidae (pearl oysters). **Oyster shells are usually oval or pear-shaped**, but will vary widely in form depending on what they attach to. They are generally **whitish-grey in outer shell color**, and their inside shell is usually a porcelain white. They have **extremely strong adductor muscles** to close their shells when threatened. Oysters feed by **extracting algae and other food particles** from the water they are almost constantly drawing over their gills. **So, point 4 is correct.**

Therefore, option (c) is the correct answer.

79.

Answer: a Explanation:

- ☐ The oceans are divided into various layers, known as "zones", which extend from the surface to the most extreme depths where light can no longer penetrate.
- ☐ The **benthic zone is the lowest level of the ocean**, starting from the shoreline and expanding to the deepest part of the ocean floor. Out of all marine species, **98% of them can be found on the ocean floor**, making the benthic zone the lifeblood of diversity in the ocean. **So, statement 1 is correct.**
- The **bathypelagic zone** is known as the **"midnight" zone** for its **characteristically lightless waters**. At 1,000–4,000 meters below, no light is able to penetrate the ocean water this deep, **preventing any primary production**. The only source of light in this zone comes from organisms using bioluminescence. The organisms that live in the midnight zone **survive off of fallen organic matter** from the zones above. At this depth, the animals most commonly found are **fish, mollusks, crustaceans, and jellyfish**. **So, statement 2 is not correct.**
- Below the epipelagic zone is the **mesopelagic zone**, extending from 200 meters to 1,000 meters. It is also referred to as the **twilight zone or the midwater zone**. **Temperature changes are the greatest in this zone** as this is the zone with contains the thermocline. **So, statement 3 is correct.**
- Extending from roughly 4,000–6,000 meters, the **abyssopelagic zone** is **pitch-black** and home to many organisms that are specialized to live in **high pressure, cold, and lightless conditions**. In contrast to the epipelagic zone where photosynthesis provides the main food resources for many ocean organisms, the **abyssopelagic marine life rely on detritus (dead marine organisms)** to sink towards this deep layer for resources. **So, statement 4 is not correct.**
- The epipelagic zone (or upper open ocean) is the part of the ocean where there is enough sunlight for algae to utilize photosynthesis (the process by which organisms use sunlight to convert carbon dioxide into food).

Therefore, option (a) is the correct answer.

80.

Answer: c Explanation:

- **The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area at a particular time.** It is expressed as biomass (standing biomass) or its equivalent in terms of energy. The standing crop may vary at different times of the year; for example, in a population of deciduous trees between summer and winter.

Therefore, option (c) is the correct answer.

81.

Answer: d Explanation:

- **Biotic potential** is the **maximum reproductive capacity of an organism** under optimum environmental conditions. It is often expressed as a proportional or percentage increase per year.
- It can also be defined as the number of offspring of an individual organism that would **survive to reproductive age** under ideal conditions. It is a measure of an individual's reproductive potential, although this is **seldom fully realized under natural conditions.**
- Full expression of the biotic potential of an organism is **restricted by environmental resistance**, any factor that inhibits the increase in the population. These factors include unfavourable climatic conditions; **lack of space**, light, or a suitable substrate; **deficiencies of necessary chemical compounds** or minerals; and the **inhibiting effects of predators**, parasites, disease organisms, or **unfavourable genetic changes. So, points 1, 2, 3 and 4 are correct.**

Therefore, option (d) is the correct answer.

82.

Answer: d Explanation:

- Environmental gradients, defined as **gradual changes in biotic or abiotic environmental factors**, are essential determinants of the structure and functioning of ecological systems and their components. **So, statement 1 is correct.**
- Traits whose values vary predictably in response to such gradients are called '**response traits**'; these **differ according to the gradient** considered. Understanding the ecological significance of this response requires an explicit identification of the variables underlying the gradient considered. **So, statement 2 is correct.**
- Along environmental gradients, changes in trait values result from a **combination of intraspecific variation** and species' intrinsic differences. Beyond species, studies have also shown that the **responses of dominant species to environmental factors are more consistent** than those of less abundant species. **So, statement 3 is correct.**

Therefore, option (d) is the correct answer.

83.

Answer: b

Explanation:

No Explanation

84.

Answer: a Explanation:

- **IUCN Red List** provides an explicit, objective framework for the classification of species based on their risk.
- **Critically Endangered:** Population size estimated to number **fewer than 50 mature individuals** is one of the criteria for Critically Endangered species.

- **Vulnerable:** Quantitative analysis should show the probability of extinction in the wild is at **least 10% within 100 years** for a species to be considered Vulnerable.
- **Endangered:** There should be a reduction in population size by more than 70 percent over the last 10 years or three generations, whichever is longer for a species to be considered Endangered.
- **Extinct:** A taxon is presumed **Extinct** when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have **failed to record an individual**.
- **Extinct in the Wild:** A taxon is **Extinct in the Wild** when it is known **only to survive incultivation**, in captivity or as a naturalized population (or populations) well outside the past range.
- **Near Threatened:** A taxon is **Near Threatened** when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is **close to qualifying** for or is likely to qualify for a threatened category in the near future
- **Least Concern:** A taxon is **Least Concern** when it has been evaluated against the criteria and **does not qualify** for Critically Endangered, Endangered, Vulnerable or Near Threatened.
- **Data Deficient:** A taxon is Data Deficient when there is **inadequate information** to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
- **Not Evaluated:** A taxon is **Not Evaluated** when it is has **not yet been evaluated** against the criteria.

Therefore, option (a) is the correct answer.

85.

Answer: b Explanation:

- The **Oriental white-backed vultures** are listed as **Critically Endangered** on the IUCN Red List of Threatened Species. These are **resident birds and not migratory**, so they largely stay within a radius of 50–100 km of the breeding centre. **So, point 1 is correct.**
- The **Gharial** is listed as **Critically Endangered** by the IUCN Red List as a result of catastrophic population declines by up to 98% since the 1940s. The only viable population of gharial is found in the **National Chambal Sanctuary**. Small non-breeding populations exist in **Son, Gandak, Hoogly and Ghagra rivers**. **So, point 2 is correct.**
- The **Pygmy hog** is listed as **Endangered** in the IUCN Red List of Threatened Species. It is one of the very few mammals that build its own home, or nest, complete with a 'roof'. It is **an indicator species**. **So, point 3 is not correct.**
- There are six species of river sharks found in the world, out of which the Ganges shark (*Glyphis gangeticus*) is **endemic to India**. It inhabits the **River Hooghly in West Bengal**, as well as the rivers **Ganges, Brahmaputra, Mahanadi** in the states of Bihar, Assam and Orissa. It is listed as a **Critically Endangered species** in the IUCN Red list. **So, point 4 is correct.**
- The **Amur leopard** is native to the southeastern Russia and northern China. It is listed as **Critically Endangered on the IUCN Red List**. **So, point 5 is correct.**

Therefore, option (b) is the correct answer.

86.

Answer: c Explanation:

- Xylem and phloem constitute the complex tissues in plants.
- Xylem functions as a conducting tissue for **water and minerals from roots to the stem and leaves**. It also provides mechanical strength to the plant parts. In contrast, **phloem transports food materials**, usually from leaves to other parts of the plant. **So, statement 1 is correct.**
- Phloem is responsible for transport of food (primarily) sucrose from the source to the sink. Since the source-sink relationship is variable, the **direction of movement in the phloem can be upwards or downwards, i.e., bi-directional**. This contrasts with that of the **xylem where the movement is always unidirectional, i.e., upwards**. Hence, unlike one-way flow of water in transpiration, food in phloem sap can be transported in any required direction so long as there is a source of sugar and a sink able to use, store or remove the sugar. **So, statement 2 is not correct.**
- Xylem is composed of four different kinds of elements, namely, tracheids, vessels, xylem fibres and xylem parenchyma. Xylem vessels are long hollow chains of **tough long dead xylem cells**. Tracheids are elongated or tube like cells with thick and lignified walls and tapering ends. These are dead and

are without protoplasm. The **vessel cells are also devoid of protoplasm**. On the contrary, **phloem consists of living cells** arranged end to end. The cells that make up the phloem tissues need to be alive **to facilitate the active transport of sucrose** throughout the plant. **So, statement 3 is incorrect.**

Therefore, option (c) is the correct answer.

87.

Answer: c

Explanation:

- Hydroponics is a popular method of growing plants that uses only chemical nutrients and water, which means that this method grows plants without using soil. Aquaponics is a growing method that involves fishes and plants being grown in the same environment.
- Both in hydroponics and aquaponics, plants are grown in **a soilless environment**. Instead of plants getting their nutrients from sources in the soil, an aquatic solution provides the essential nutrients needed for plant growth directly to the roots, where efficient nutrient uptake can occur. **So, statement 1 is not correct.**
- **Hydroponics requires adding fertilizers** to the water to provide nutrients. However, in aquaponics, fish are grown simultaneously in the aquatic environment to provide a natural source of organic nutrients through their excreted waste. **So, statement 2 is incorrect.**
- Hydroponics growing systems can be used for **plants with high nutrient needs** because the nutrient solution can be adapted to meet plant needs; **aquaponics systems** typically work best to **support plants that have lower nutrient needs** such as lettuce, other leafy greens, and herbs. **So, statement 3 is correct.**

Therefore, option (c) is the correct answer.

88.

Answer: d

Explanation:

- Nitrogen is a common limiting nutrient in **nature, and agriculture**. A limiting nutrient is the nutrient that's in shortest supply and limits growth. **So, statement 1 is correct.**
- For nitrogen to be available to make **proteins, DNA, and other biologically important compounds**, it must first be converted into a different chemical form. The process of converting nitrogen into biologically available nitrogen is called **nitrogen fixation**.
- **Nitrification**: It is the process that **converts ammonia to nitrite** and then to nitrate and is an important step in the global nitrogen cycle. Most nitrification occurs aerobically and is **carried out exclusively by prokaryotes**. **So, statement 2 is correct.**
- **Denitrification**: It is the process that **converts nitrate to nitrogen gas**, thus removing bioavailable nitrogen and returning it to the atmosphere. Unlike nitrification, denitrification is an **anaerobic process**, occurring mostly in soils and sediments and **anoxic zones** in lakes and oceans. **So, statement 3 is correct.**
- **Ammonification**: When an organism excretes waste or dies, the **nitrogen in its tissues is in the form of organic nitrogen** (e.g. amino acids, DNA). Various fungi and prokaryotes then decompose the tissue and release inorganic nitrogen back into the ecosystem as **ammonia** in the process known as ammonification.

Therefore, option (d) is the correct answer.

89.

Answer: a

Explanation:

- **Conformer organism: Conformers engage in behavior to regulate their temperature, such as basking**



in the sun for warmth or retreating underground or into water to cool. Some aquatic animals even alter their salinity to match that of the environment around them. An overwhelming majority of animals and nearly all plants cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature. In aquatic animals, the osmotic concentration of the body fluids changes with that of the ambient air, and water osmotic concentration.

- Many simply 'sweat it out and resign themselves to suboptimal performance in hot summer months. Thermoregulation is energetically expensive for many organisms. This is particularly true for small animals like shrews and hummingbirds. At night, hummingbirds lower their body temperature and metabolism drastically by dropping into an energy-saving state of inactivity called torpor.
- Heat loss or heat gain is a function of surface area. Since small animals have a larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside; then they have to expend much energy to generate body heat through metabolism. This is the main reason why very small animals are rarely found in polar regions.
- During the course of evolution, the costs and benefits of maintaining a constant internal environment are taken into consideration. Some species have evolved the ability to regulate, but only over a limited range of environmental conditions, beyond which they simply conform.
- Regulators are often referred to as warm-blooded animals. Examples of this class – Mammals and birds (peacock).
- Hence option (a) is the correct answer.

90.

Answer: c

Explanation:

- **Green chemistry:** It is also called as sustainable chemistry, is an area of chemistry and chemical engineering focused on the design of products and processes that minimize or eliminate the use and generation of hazardous substances.
- Green Chemistry in day-to-day Life:
  - **Dry Cleaning of Clothes: Tetrachloroethene** ( $\text{Cl}_2\text{C}=\text{CCl}_2$ ) was earlier used as solvent for dry cleaning. The compound contaminates the ground water and is also a suspected carcinogen. The process using this compound is now being replaced by a process, where liquefied carbon dioxide, with a suitable detergent is used. Replacement of halogenated solvent by liquid  $\text{CO}_2$  will result in less harm to ground water. These days **hydrogen peroxide ( $\text{H}_2\text{O}_2$ )** is used for the purpose of bleaching clothes in the process of laundry, which gives better results and makes use of lesser amount of water.
  - Bleaching of Paper: Chlorine gas was used earlier for bleaching paper. These days, hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) with suitable catalyst, which promotes the bleaching action of hydrogen peroxide, is used. Hence statement 2 is correct.
  - **'Green Solution' to Clean Turbid Water: Powder of kernel of tamarind seeds** has been found to be an effective material to make municipal and industrial waste water clean. It is non-toxic, biodegradable and cost-effective material. This powder is usually discarded as agricultural waste. The present practice is to use alum to treat such water. **It has been found that alum increases toxic ions in treated water and can cause diseases. Hence statement 1 is correct.**

91.

Answer: c

Explanation:

- Radioactive wastes are the most hazardous of all. For example, some of the components can retain half of their dangerous levels even one million years later after production. The storing and reprocessing are further complicated by the long half-life of the radioactive materials in the nuclear waste.
- Radioactive materials such as uranium and radium possess highly unstable atomic nuclei whose disintegration results in radiation emission which may be highly injurious. **During nuclear tests, radioactive dust may encircle the globe at altitudes of 3000 meters or more.** This dust often comes down to earth as rain. Some of it percolates down through the soil into ground, water reservoirs or is carried into rivers and streams. **Hence statement 1 is correct.**

- Radioactive wastes are generated from X-ray machines in hospitals and airports, nuclear energy industry which include substances used in cooling and storing nuclear fuel from reactors in power stations and submarines. Hence statement 2 is correct.

92.

Answer: d

Explanation:

- **Major abiotic factors influencing the life of organisms include:**
  - **Temperature:** Temperature is the most important ecologically relevant environmental factor. **A few organisms can tolerate and thrive in a wide range of temperatures (they are called eurythermal), but, a vast majority of them are restricted to a narrow range of temperatures (such organisms are called stenothermal).** The levels of thermal tolerance of different species determine to a large extent their geographical distribution.
    - A poikilotherm is an animal whose internal temperature varies considerably. Poikilotherms have to survive and adapt to environmental stress. They are organisms (such as a frog) with a variable body temperature that tends to fluctuate with and is similar to or slightly higher than the temperature of its environment. Hence option (d) is the correct answer.
  - **Water:** Water is another the most important factor influencing the life of organisms. The productivity and distribution of plants are also heavily dependent on water. For aquatic organisms the quality (chemical composition, pH) of water becomes important. The salt concentration (measured as salinity in parts per thousand), is less than 5 in inland waters, 30-35 in the sea, and > 100 in some hypersaline lagoons. Some organisms **are tolerant of a wide range of salinities (euryhaline) but others are restricted to a narrow range (stenohaline).** Many freshwater animals cannot live for long in seawater and vice versa because of the osmotic problems, they would face.
  - **NOTE:** Ecosystems are capable of maintaining their state of equilibrium. They can regulate their own species structure and functional processes. This capacity of the ecosystem of self-regulation is known as **homeostasis**. When an organism tries to maintain a constant internal (within the body) environment that permits all biochemical reactions and physiological functions to proceed with maximal efficiency and thus, enhance the overall 'fitness' of the species. This process is known as Homeostasis.
    - Hence option (d) is the correct answer.

93.

Answer: a

Explanation:

- **Recently, scientists at the US Lawrence-Berkeley Lab have developed a fuel from a bacterium that packs more energy than even the rocket fuels in use today.** Data from simulation show that the fuel has energy density values exceeding 50 megajoules a litre, compared with 32 MJ for petrol and 35 MJ for RP-1, a kerosene-based rocket fuel. **The scientists have named the new fuel 'POP-FAME', for polycyclopropanated fatty acid methyl ester.**
- **POP-FAME's molecular structure closely resembles Syntin's.** At the heart of the fuel's structure is the 'three-carbon' ring — a triangle with a carbon atom at each vertex. (Each carbon atom combines with two other carbon atoms and two other elements, mostly hydrogen.) This structure is called cyclopropane; they hold potential energy in their bonds.
- **Syntin Fuel:** During the 1960s, a petroleum-based rocket fuel Syntin was developed by the Soviet Union. This fuel was used to launch several Soyuz rockets, successfully in the 1970s. however, its manufacturing was stopped due to high costs and the unpleasant process involved. It was produced through a series of synthetic reactions with toxic by-products and explosive & unstable intermediate.
- POP-FAME is said to have higher energy densities than Syntin, which means even a small quantity of the fuel can pack considerable energy, making it ideal rocket fuel.
  - Hence option (a) is the correct answer.

94.

Answer: b

Explanation:

- **KINGDOM FUNGI**
  - The fungi constitute a unique kingdom of **heterotrophic organisms**. They show a great diversity in

morphology and habitat. One must have seen fungi on moist bread and rotten fruits. White spots seen on mustard leaves are due to a parasitic fungus.

- **Some unicellular fungi, e.g., yeast** are used to make bread and beer. Other fungi cause diseases in plants and animals; wheat rust-causing *Puccinia* is an important example. **Some are the source of antibiotics, e.g., *Penicillium*. Hence, option (b) is the correct answer.**
- **Fungi are cosmopolitan and occur in air, water, soil, and on animals and plants.** They prefer to grow in warm and humid places. With the exception of yeasts which are unicellular, fungi are filamentous. Their bodies consist of long, slender thread-like structures called hyphae.
- **The network of hyphae is known as mycelium.** Some hyphae are continuous tubes filled with multinucleated cytoplasm – these are called coenocytic hyphae. Others have septae or cross walls in their hyphae.
- **The cell walls of fungi are composed of chitin and polysaccharides.** Most fungi are heterotrophic and absorb soluble organic matter from dead substrates and hence are called saprophytes. Those that depend on living plants and animals are called parasites.
- **They can also live as symbionts** – in association with algae as lichens and with roots of higher plants as mycorrhiza. Reproduction in fungi can take place by vegetative means – fragmentation, fission, and budding.
- **Asexual reproduction is by spores called conidia** or sporangiospores or zoospores, and sexual reproduction is by oospores, ascospores, and basidiospores. The various spores are produced in distinct structures called fruiting bodies.
- The sexual cycle involves the following three steps:
  - The fusion of protoplasts between two motile or non-motile gametes is called plasmogamy.
  - The fusion of two nuclei is called karyogamy.
  - Meiosis in zygotes results in haploid spores.
- When a fungus reproduces sexually, **two haploid hyphae of compatible mating types come together and fuse.** In some fungi, the fusion of two haploid cells immediately results in diploid cells ( $2n$ ).
- However, **in other fungi (ascomycetes and basidiomycetes), an intervening dikaryotic stage ( $n+n$ , i.e., two nuclei per cell) occurs;** such a condition is called a dikaryon and the phase is called dikaryophase of fungus. Later, the parental nuclei fuse, and the cells become diploid. The fungi form fruiting bodies in which reduction division occurs, leading to the formation of haploid spores.

95.

Answer: b

Explanation:

- 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.
- **Habitat loss and fragmentation:** This is the most important cause driving animals and plants to extinction. The most dramatic examples of habitat loss come from tropical rainforests. Besides total loss, the degradation of many habitats by pollution also threatens the survival of many species. When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to population declines.
- **Ove-exploitation:** Many species extinctions in the last 500 years were due to overexploitation by humans. Presently many marine fish populations around the world are overharvested, endangering the continued existence of some commercially important species.
- **Alien species invasions:** When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause the decline or extinction of indigenous species. The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.
- **Co-extinctions:** When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. Another example is the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other.
- Hence, option (b) is the correct answer.

96.

Answer: c

Explanation:

- **Green House Gases (GHGs):** Gases that help in causing greenhouse effect are called greenhouse gases (GHGs). These gases either occur naturally or are produced on earth due to human activities of burning fossil fuel and biomass. One of the most abundant naturally occurring greenhouse gases is water vapour. Other greenhouse gases are carbon dioxide, Methane, Nitrous oxide, Trifluoromethyl sulphur pentafluoride and hydrochlorofluorocarbons. It is since the 1700s, that a substantial increase in the concentration of greenhouse gases has occurred in the atmosphere.
- **Water Vapour:** It accounts for about 60 to 70 per cent of the natural greenhouse effect. Its level in the atmosphere rises with the increasing global warming adding up further to the greenhouse effect. **Hence, statement 1 is not correct.**
- **Carbon dioxide:** In the modern age of industrialization and increasing automobile exhausts the concentration of carbon dioxide is increasing faster than the earth's natural capacity of assimilation. Currently, the CO<sub>2</sub> concentration in the atmosphere is about 370 parts per million (ppm). It accounts for more than 60 per cent of the additional greenhouse effect.
- **Methane:** This gas is produced through various sources like **decomposing organic substances, coal mining, paddy fields, production and transport of other fossil fuels etc.** Its concentration in the atmosphere has become more than double since 1750. Scientists are of the opinion that it is an extremely effective heat trapping gas. One molecule of methane is 20 times more efficient in terms of trapping infrared radiation than a molecule of carbon dioxide. **Hence, statement 3 is correct.**
- **Nitrous Oxide:** This gas is released into the atmosphere by burning of fossil fuels, automobile exhaust, decomposition of nitrogenous fertilizers in the soil etc. This gas **has a capacity of trapping heat 300 times more effectively than carbon dioxide.** It can stay in the atmosphere for about 100 years. **Hence, statement 2 is correct.**
- **Fluorinated Compounds: Compounds comprising CFCs (chlorofluoro-carbons), HCFCs (hydrochlorofluorocarbons) and HFCs (hydrofluorocarbons) are man-made compounds** called as fluorinated compounds. These compounds are used in a variety of manufacturing processes. Each molecule of these synthetic compounds is many thousand times more effective in trapping infrared radiations than a single molecule of carbon dioxide.
- **Trifluoromethyl sulphur pentafluoride:** Each molecule of this industrially produced compound **can trap heat more effectively than all the other gases known to cause green house effect.**

97.

Answer: b

Explanation:

- Bioprospecting is defined as a systematic and organized search for useful products derived from bioresources including plants, microorganisms, animals, etc., that can be developed further for commercialization and overall benefits of the society.
  - It means exploring molecular, genetic and species-level diversity for products of economic importance.
- Bioprospecting activities must comply with the definition of the utilization of genetic resources of the **Nagoya Protocol** or as stated in the national law or policy.
  - The **Nagoya Protocol applies to the utilization of genetic resources and their derivatives.** The rationale is to extract the maximum commercial value from genetic resources and indigenous knowledge, while creating a fair compensation system that can benefit all. The phases of bioprospecting start with sample collection, isolation, characterization and move to product development and commercialization. Bioprospecting is possible both in terrestrial and marine environments. Many molecules, such as **trabectedin (an antitumor agent) and eribulin (used to treat breast cancer),** were discovered from marine organisms.
- Bioprospecting, when properly regulated, generates revenues that can be directly linked to the conservation of biodiversity and to the benefit of local communities.
  - Hence, option (b) is the correct answer.

98.

Answer: b

Explanation:

- Acid Rain – Acidification
- Acid rain refers to any precipitation (rain, fog, mist, snow) that is more acidic than normal (pH of less than 5.6. pH below 7 is acidic).
- Acid rain is caused by atmospheric pollution from acidic gases such as sulphur dioxide and oxides of nitrogen emitted from the burning of fossil fuels.
- It is also recognized that acidic smog, fog, and mist, move out of the atmosphere and settle on dust particles which in turn accumulate on vegetation as acid depositions.
- When rain falls, the acid from these depositions leaks and forms acid dews.
  
- ‘Spring shock’ or ‘Acid shock’
- Snow and ice formed over lakes and rivers have much sulphuric acid. In spring when the snow melts, water enters lakes and rivers, and the sulphuric acid gets mingled into the water bodies making them highly acidic. This condition is commonly referred to as ‘Spring shock’ or ‘Acid shock’. **Hence option (b) is the correct answer.**
  
- Gases that cause acid rain
- SO<sub>x</sub> (Sulphur oxides): Fossil fuel burning, power plants, smelting of metal sulphide ores, industrial sources, industrial production of sulfuric acid in metallurgical, chemical and fertilizer industries volcanoes, seas and oceans, and decomposition of organic matter are the sources of acid rain.
- NO<sub>x</sub> (Nitrogen oxides – NO, NO<sub>2</sub> and N<sub>2</sub>O): Fossil fuel burning, lightning, biomass burning, forest fires, oceans, and power plants are sources of nitrogen oxides.
  
- Harmful effects of acid rain
- Acid precipitation affects both aquatic and terrestrial organisms.
- It also damages buildings and monuments.
- Effects on humans
- Bad smells, reduced visibility; irritation of the skin, eyes and the respiratory tract.
- Some direct effects include chronic bronchitis, pulmonary emphysema and cancer.
  
- Effects on soil
- The exchange between hydrogen ions and the nutrient cations like potassium and magnesium in the soil cause leaching of the nutrients, making the soil infertile.
- An increase in ammonia in the soil due to a decrease in other nutrients decreases the rate of decomposition. The nitrate level of the soil is also found to decrease.
- The impact of acid rain on soil is less in India; because Indian soils are mostly alkaline, with good buffering ability.
  
- Impact on agriculture
- Acid precipitation on vegetation shows a reduced rate of photosynthesis.
- Acid rain retards the growth of crops such as pea, beans, radish, potato, spinach, broccoli and carrots, etc.
- Plants can absorb cadmium from the acidified soil. High levels of cadmium in plants are injurious for animals and human beings.
  
- Effects on aquatic life
- Eggs or sperms of fish, frogs and other aquatic organisms are sensitive to pH changes.
- Acid rain kills their gametes affecting their life cycles and productivity (ecosystem imbalances).
- Acidic lake waters may kill microbes and turn them unproductive.
- Acid rain can make metals bound on soils to be released into the aquatic environment.
  
- Effect on terrestrial life
- Acid rain damages the cuticle of plant leaves and reduces photosynthesis.
- Acidic medium promotes the leaching of heavy metals like aluminium, lead and mercury. Such metals when percolating into groundwater affect soil microflora/fauna.
- Other indirect effects of acid rain on wildlife are loss or alteration of food and habitat resources.
  
- Effects on microorganisms
- pH determines the proliferation of any microbial species.
- The optimum pH of most bacteria and protozoa is near neutrality.

- Most fungi prefer an acidic environment.
  - Most blue-green bacteria prefer an alkaline environment.
  - So, microbial species in the soil and water shift from bacteria-bound to fungi-bound.
  - This causes a delay in the decomposition of soil organic material.
- Effect on buildings, monuments and materials
  - Many old, historical, ancient buildings and works of art/textile etc. are adversely affected by acid rain.
  - Limestone and marble are destroyed by acid rain. Smoke and soot cover such objects. They slowly dissolve/flake away from the surfaces because of acid fumes in the air.
  - Many buildings/monuments such as the Taj Mahal in Agra have suffered from acid rain (Marble Cancer).

99.

Answer: d

Explanation:

- **Biopesticides:** They are biological agents that are helpful in controlling plant pests. There are basically two types of bio-pesticides: Bio-herbicides and bio-insecticides. Bio-herbicides are living organisms that destroy herbs. These may be insects that feed on specific weeds or microorganisms that may cause diseases in weeds. Here are some examples –
  - **Mycoherbicide:** This is derived from a fungus called *Phytophthora palmivora*. It controls the growth of milkweed vines in citrus.
  - **Cochineal insect (Cactoblastic cactorum):** This insect eats away cactus plants. This is being introduced in controlling the overgrowth of cacti in India and Australia.
    - Pyrethrum (pyrethins), rotenone or ryania (botanical insecticides), or minerals, such as boric acid, cryolite, or diatomaceous earth.
  - **Bacillus Thuringiensis** is a naturally occurring soil bacteria that is toxic to the larvae of several species of insects but not toxic to non-target organisms. **Hence option (d) is the correct answer.**
- **Glyphosate** is a broad-spectrum systemic herbicide and crop desiccant. It is an organophosphorus compound, specifically a phosphonate, which acts by inhibiting the plant enzyme 5-enolpyruvylshikimate-3-phosphate synthase.
- Recently, transgenic plants of vegetables like tomato and tobacco have been developed through genetic engineering. These plants are so engineered genetically that they can develop resistance against herbicides. Garlic, Cloves, Cedarwood oil, etc. have been tested indigenously and have been found useful in repelling certain insect-pests. Besides these, Pheromones like Xanthenes and Plant Hormones like Auxins, gibberellins, etc. are also used as bio-pesticides.
- **Bio-insecticides:** The natural enemies of particular insects and certain other substances that are used for killing or repelling insect pests in a particular area are called bio-insecticides. There are the following categories of bio-insecticides –
  - Disease-causing organisms (pathogens), parasites, and predators.
  - Pheromones or insect hormones.
  - Natural Insecticides like tobacco extract, neem oil, and specific bacterial toxins (called Thurioides).
  - Viral bio-insecticides like Bioculoviruses affect insect pests.
  - Fungal agents or different fungi are useful in controlling insect pests.
  - Insect insecticides like Lady Bird and Praying Mantis eat away many types of insects.

100.

Answer: d

Explanation:

- **Scientists from the Wadia Institute of Himalayan Geology (WIHG), an autonomous institute of the Department of Science and Technology (DST) found fossils of the new genus and species of treeshrew (known as *Sivatupaia ramnagarensis* n. gen. n. sp) i.e. fossils of a small mammal resembling squirrels from the middle Miocene (extends from about 23.03 to 5.333 million years ago) site of Ramnagar in Jammu and Kashmir.**
  - It can provide a precise age estimate for the locality.
  - This treeshrew currently represents the oldest record of fossil tupaiids in the Siwaliks, extending their time range by 2.5–4.0 Million Years in the region and can help provide a more precise age estimate for this Ramnagar locality lying in the Udhampur District (UT-Jammu & Kashmir).
  - Siwalik sediments document the evolution of many mammalian groups from the middle Miocene

through the Pleistocene including treeshrews, hedgehogs, and other small mammals. Treeshrews, in particular, are very rare elements of the fossil record, with only a few species known throughout the entire Cenozoic era.

- Hence option (d) is the correct answer.

