

7 Years PYQ Trend Analysis
GS PRELIMS (2017 - 2023)

Environment



AHMEDABAD



BENGALURU



BHOPAL



CHANDIGARH



DELHI



GUWAHATI



HYDERABAD



JAIPUR



JODHPUR



LUCKNOW



PRAYAGRAJ



PUNE

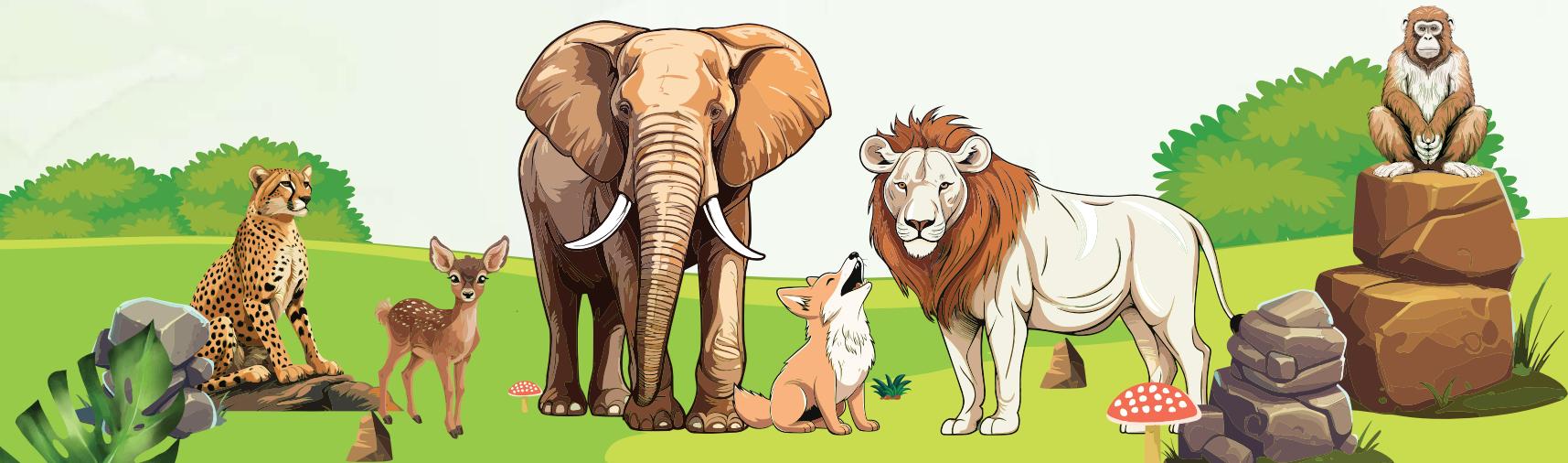


RANCHI

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General Observations on Environment Section



— 01 —

Environment continues to hold a high weightage in the overall scheme of subjects asked in the UPSC Civil Services preliminary examination.



— 02 —

Questions range from a wide variety of topics such as those ranging from biodiversity to pollution, climate change to agriculture.



— 03 —

Most of the questions draw inspiration from news and related current affairs.



— 04 —

Behavioral aspects of different species such as their diet, sleep patterns, defense mechanisms etc. continue to be one of the key themes of the examination.

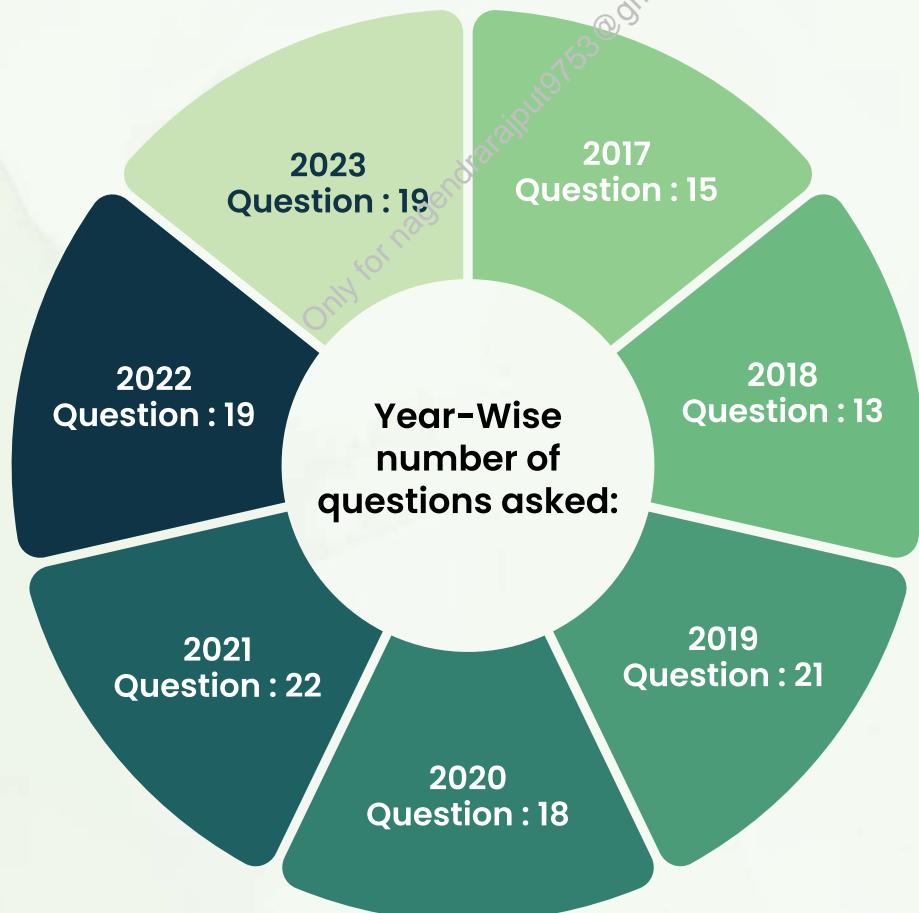


— 05 —

The subject seems to have an overlap with Geography, Biology and science and Technology which makes it necessary for a candidate to have a broader understanding in these areas as well.



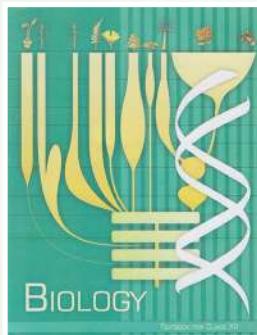
Total Number of Question Asked in the last seven years



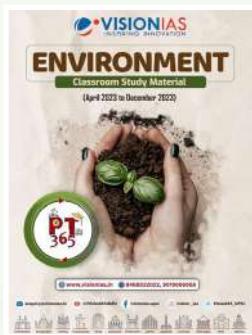
Topic Wise Questions



Sources



Class XII Biology
NCERT



Vision IAS PT 365
Environment



Vision IAS Monthly
Current Affairs



Standard
Newspapers

Difficulty Level





Ecosystems

2018

Which of the following leaf modifications occur(s) in the desert areas to inhibit water loss?

1. Hard and waxy leaves
2. Tiny leaves
3. Thorns instead of leaves

Select the correct answer using the code given below:

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

Answer D



Explanation:

These are plants growing in extreme dry conditions throughout the year. For example, plants growing in deserts (psammophytes), on rock (lithophytes) or alpine plants growing above 14000 feet altitude.

► **Xerophytes Adaptations:** Plants adapted to dry, hot and arid climates are considered xerophytes. Examples include the entire yucca family, acacia trees, and mesquite trees. Xerophytes spend much of their energy in the pursuit and maintenance of water.

» **Conservation of Water- Modifications:**

- Leaves few or absent or represented by spines only
- Petiole modified into leaf like structure
- Stem reduced, branching sparse
- In some cases stem flattened, leaf like, green, photosynthetic in nature Thick, fleshy and succulent leaves as well as stem

» **Storage of Water- Modifications:**

- Thick, fleshy and succulent leaves as well as stem

» **Prevention of loss of water by transpiration- Modifications:**

- Intercellular spaces reduced
- Spongy parenchyma/ palisade parenchyma present
- Stomata on lower surface, sunken in stomatal pits
- Leaves needle like
- Thick cuticle on leaf surface

» **Prevention of excessive heat- Modifications:**

- Leaves covered with dense hairs;
- Leaf surfaces shiny or glabrous
- Leaf blade remains rolled during the day

» **Efficient mechanism of water absorption- Modifications:**

- Long and profusely branched roots
- Dense root hairs
- Well developed xylem

➤ Hence option (d) is the correct answer.



Source:

NCERT Class 6 and Biology NCERT Class XII



Motivation:

Previous year question

In case of which one of the following biogeochemical cycles, the weathering of rocks is the main source of release of nutrient to enter the cycle?

- (a) Carbon cycle
- (b) Nitrogen cycle
- (c) Phosphorus cycle
- (d) Sulphur cycle

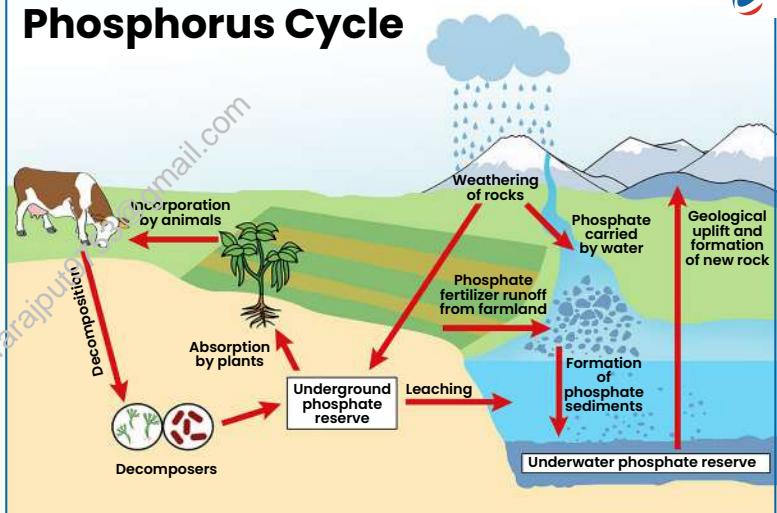
Answer C



Explanation:

- Phosphorus is a major constituent of biological membranes, nucleic acids and cellular energy transfer systems. Many animals also need large quantities of this element to make shells, bones and teeth.
- **The natural reservoir of phosphorus is rock, which contains phosphorus in the form of phosphates. When rocks are weathered, minute amounts of these phosphates dissolve in soil solution and are absorbed by the roots of the plants.** Herbivores and other animals obtain this element from plants. The waste products and the dead organisms are decomposed by phosphate-solubilising bacteria releasing phosphorus.
- Unlike the carbon cycle, there is no respiratory release of phosphorus into the atmosphere. The other two major and important differences between carbon and phosphorus cycle are firstly, atmospheric inputs of phosphorus through rainfall are much smaller than carbon inputs, and, secondly, gaseous exchanges of phosphorus between organism and environment are negligible. **Hence option (c) is the correct answer.**

Phosphorus Cycle



Source:

NCERT Class XII Biology



Motivation:

Basic concepts given in the NCERT are often tested by UPSC.

The vegetation of savannah consists of grassland with scattered small trees, but extensive areas have no trees. The forest development in such areas is generally kept in check by one or more or a combination of some conditions. Which of the following are such conditions?

1. Burrowing animals and termites
2. Fire
3. Grazing herbivores
4. Seasonal rainfall
5. Soil properties

Select the correct answer using the code given below.

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

Answer C



Explanation:

- Savanna ecosystems are heterogeneous environments characterised by the presence of trees, bushes, and grasses. Nutrient and soil moisture availability are usually the limiting factors affecting the biomass growth in savannas, and overall biomass is impacted by competition, fire, grazing, and harvesting.
- **Savanna grassland soils are not very fertile.** The nutrients in the soil are found near the surface as they come from decayed organic matter (vegetation) from the previous growing season. This organic matter decays rapidly due to the high temperatures.
- In the parched grasslands and savannas, or drylands, of Africa, South America and Asia, termite mounds store nutrients and moisture and via internal tunnels, allow water to better penetrate the soil. Dirt mounds the insects build sustain significantly more shrubs, fruit-bearing trees, bugs, and animals, such as elephants, cheetahs, and zebras, than do surrounding areas.
- **Herbivory and burrowing activities can reduce overall plant biomass associated with burrowing mammal colonies,** but the higher levels of soil nutrients and greater degree of water infiltration that occurs around their mounds can result in elevated foliar nutrient concentrations and greater plant biomass surrounding their burrows.
- In general, savannas grow in tropical regions 8° to 20° from the Equator. Conditions are warm to hot in all seasons, but significant rainfall occurs for only a few months each year—about October to March in the Southern Hemisphere and April to September in the Northern Hemisphere. **Due to limited rainfall, it is characterised by an open tree canopy. Hence option (c) is the correct answer.**

Source:

Geography by GC Leong



Motivation:

Following question on the similar line was asked by UPSC in 2013.

In the grasslands, trees do not replace the grasses as a part of an ecological succession because of

- (a) insects and fungi
- (b) limited sunlight and paucity of nutrients
- (c) water limits and fire
- (d) None of the above

2021

"If rainforests and tropical forests are the lungs of the Earth, then surely wetlands function as its kidneys." Which one of the following functions of wetlands best reflects the above statement?

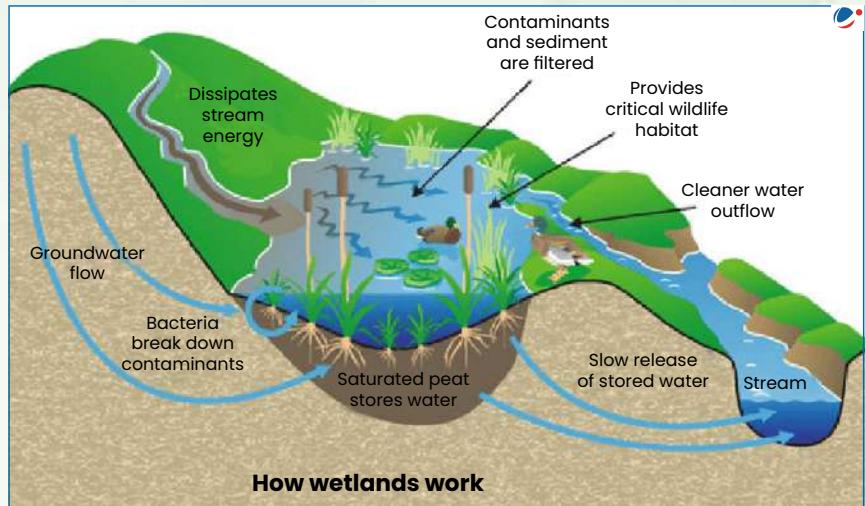
- (a) The water cycle in wetlands involves surface runoff, subsoil percolation and evaporation.
- (b) Algae form the nutrient base upon which fish, crustaceans, molluscs, birds, reptiles and mammals thrive.
- (c) Wetlands play a vital role in maintaining sedimentation balance and soil stabilization.
- (d) Aquatic plants absorb heavy metals and excess nutrients.

Answer D



Explanation:

- Tropical rainforests are often called the “lungs of the planet” because they generally draw in carbon dioxide and breathe out oxygen. **Natural wetlands have often been referred to as “earth’s kidneys”** because of their high and long-term capacity to filter pollutants from the water that flows through them. **Hence option (d) is the correct answer.**
- Aquatic plants can uptake large amounts of metals from water and/or sediment through active and passive absorption, with this absorption capacity of metals through different organs such as roots, stems, and leaves, making these plants suitable for heavy metal alterations in the aquatic environment.
- Wetlands do many important jobs called ecological services. An ecological service is a benefit that we as humans get from the environment around us. Just as a dry cleaner provides the service of cleaning clothes, the environment provides services like cleansing water and giving wildlife places to live.
- Wetlands are like sponges soaking up water and pollutants.
- Wetlands are transitions, or buffers, between waterways and the surrounding land (such as fields, neighbourhoods and forests).
- Wetlands provide habitat for many different types of wildlife. Birds, amphibians, fish, insects, mammals, reptiles and many types of plants can be found in wetlands.



Source:

<https://www.tiredearth.com/articles/wetlands-the-earth-s-kidneys>



Motivation:

Role and importance of wetlands is often discuss in news.

Biological Oxygen Demand (BOD) is a standard criterion for

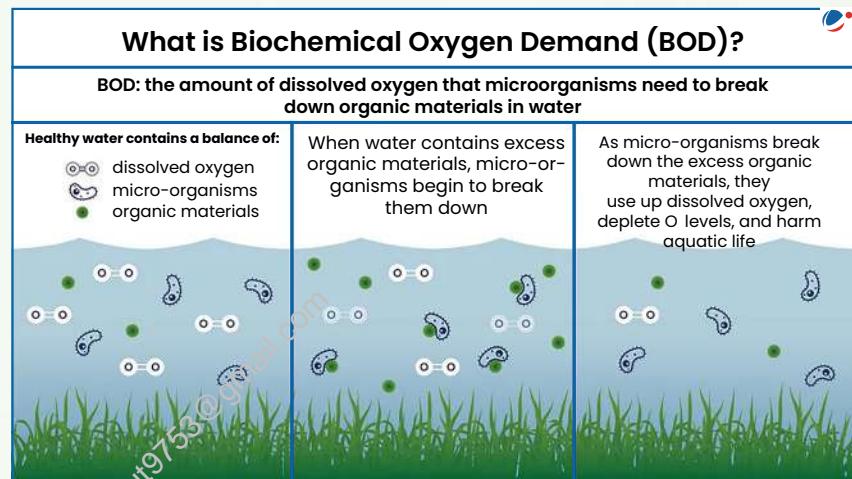
- (a) Measuring oxygen levels in blood
- (b) Computing oxygen levels in forest ecosystems
- (c) Pollution assay in aquatic ecosystems
- (d) Assessing oxygen levels in high altitude regions"

Answer C



Explanation:

- Biological oxygen demand (BOD) is the amount of dissolved oxygen needed (i.e., demanded) by aerobic microorganisms to break down organic material present in a given water sample. A highly polluted water will have a high level of biological oxygen demand (BOD). **Hence option (c) is the correct answer.**



Source:

Biology NCERT Class XII



Motivation:

To check the basic concepts of ecology and environment.



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Environmental Degradation

2018

Which of the following is/are the possible consequence/s of heavy sand mining in river beds?

1. Decreased salinity in the river
2. Pollution of groundwater
3. Lowering of the water-table

Select the correct answer using the code given below:

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

Answer B



Explanation:

- Excessive instream sand-and-gravel mining causes the degradation of rivers. Instream mining lowers the stream bottom, which may lead to **bank erosion**. Depletion of sand in the streambed and along coastal areas causes the **deepening of rivers and estuaries**, and the enlargement of river mouths and coastal inlets. It may also **lead to saline-water intrusion from the nearby sea**. Hence option (b) is the correct answer.
- The effect of mining is compounded by the effect of sea level rise. Any volume of sand exported from streambeds and coastal areas is a loss to the system.
- Excessive instream sand mining is a threat to bridges, river banks and nearby structures. Sand mining also affects the adjoining groundwater system and the uses that local people make of the river.

► Sand aquifer helps in recharging the water table and sand mining causes sinking of water tables in the nearby areas, drops leaving the drinking water wells on the embankments of these rivers dry. Turbidity increases at the mining site.

Adverse effects of sand mining



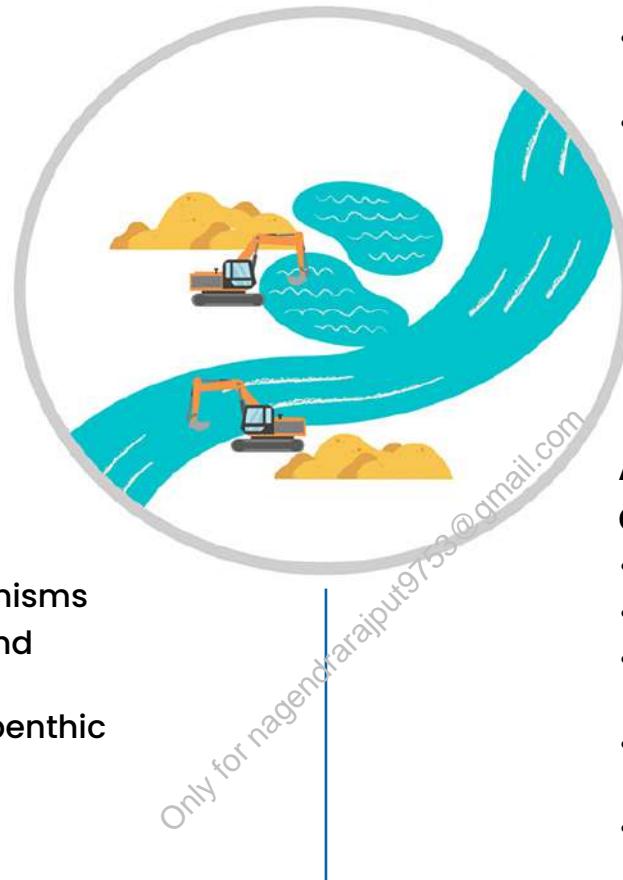
Physical environment

- Riverbed deepening and widening
- Riverbed, -bank and slope instability
- Increased erosion
- Reduced sand replenishment
- Altered hydrological table
- Riverbed coarsening



Biological environment

- Habitat loss and fragmentation
- Smothered microorganisms
- Reduced respiration and photosynthesis
- Reduced presence of benthic organisms
- Noise pollution



Chemical environment

- Increased turbidity and total suspended solids (TSS)
- Increased concentrations of heavy metals
- Pollution of air, water and soil



Anthropogenic environment

- Destruction of infrastructure
- Loss of agricultural land
- Reduced yield of farmers and fisheries
- Increased risk of waterborne diseases
- Poor working circumstances

Source:

<http://www.thehindu.com/business/Economy/government-launches-sand-mining-framework/article23302652.ece>



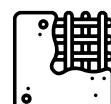
Motivation:

Sand mining guidelines were issued in 2016 and amended in 2020, sand mining framework was issued in 2018.

Extra Information:

- » Sand is classified as a “**minor mineral**”, under the **Mines and Minerals (Development and Regulations) Act, 1957** (MMDR Act), and administrative control over minor minerals vests with the State Governments, accordingly, regulated through State specific rules.
- » **Sand Mining Framework (2018)** prepared by the Ministry of Mines envisages alternative sources of sand in the form of Manufactured Sand (M-Sand) from crushed rock fines (crusher dust), and sand from Overburden (OB) of coal mines.
 - » **M-Sand, or Manufactured Sand**, is an alternative to natural river sand used in construction. It is produced by crushing rocks or quarry stones to obtain sand particles of consistent size and shape.
- » **Enforcement and Monitoring Guidelines for Sand Mining 2020:**
 - » It provides a uniform protocol for monitoring sand mining across India.
 - » It covers the identification of sand mineral sources, their dispatch, and their end-use.
 - » It also considers the use of new surveillance technologies, such as drones and night vision, to monitor the sand mining process.

Why M.Sand is better than River Sand?



Concrete strength is higher in M.Sand as it is manufactured in a controlled process



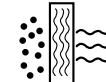
Price of M.Sand is low



No organic impurities in Msand



No oversized materials and thus no need to sieve before usage



Uniform gradation of the particle sizes

2022

Which one of the following lakes of West Africa has become dry and turned into a desert ?

- (a) Lake Victoria
- (b) Lake Faguibine
- (c) Lake Oguta
- (d) Lake Volta

Answer B



Explanation:

- ▶ Lake Faguibine is an isolated lake in Mali, west of Timbuktu (Tombouctou). It lies north of the Niger River in the Macina depression. Lake Faguibine in northern Mali is dry and has been since the 1970s. Over seven years, droughts in the 1970s dried up the lakes. Then sand filled the channels connecting the lakes to the River Niger, with the result that when rain finally returned the water could no longer reach the lakes. **Hence option (b) is the correct answer.**



Source:

<https://www.climatecentre.org/6788/icrc-climate-change-transforms-malis-lake-faguibine-into-desert-and-forces-people-to-move/>



Motivation:

Impact of climate change such as lakes that are drying up. Following question on the similar line was asked by UPSC in 2018



Which of the following has/have shrunk immensely/dried up in the recent past due to human activities ? (Pre18 Set-D)

1. Aral Sea
2. Black Sea
3. Lake Baikal

Select the correct answer using the code given below :

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



Biodiversity

Number of questions asked



17

Animals



9

Plants



3

Microorganisms & Others

2017

Question. Due to some reasons, if there is a huge fall in the population of species of butterflies, what could be its likely consequence/consequences?

1. Pollination of some plants could be adversely affected.
2. There could be a drastic increase in the fungal infections of some cultivated plants.
3. It could lead to a fall in the population of some species of wasps, spiders and birds.

Select the correct using the code given below:

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

Answer C



Explanation:

Statement 1 and 3 are correct. Butterflies are pollinating insects. They help in pollination of many flowering plants. Pollination is defined as the transfer of pollen from stamen to pistil. Bees are also well known pollinators.

Butterflies also act as a lower member of the food chain. A number of animals, including birds and mice feed on butterfly. As populations of butterfly diminish, so will populations of birds and other animals that rely on them as a food source. This loss of the butterfly is the beginning of the "butterfly effect."

W There is no proven link between fall in butterfly population and a drastic increase in the fungal infections of some cultivated plants.

Bees pollinate many of the fruits and vegetables we like to eat.



Hummingbirds transfer pollen with their beaks and on their heads as they feed on nectar.

Butterflies are dusted with pollen while sipping nectar from flowers.



Moths get covered in pollen while using their tongues like straws to sip nectar.

Wind moves the pollen of grasses, conifers, and many other trees.



Flies are often considered pests, but some species are valuable pollinators.



Similar UPSC Question in 2013: Consider the following kinds of organisms

1. Bat
2. Bee
3. Bird

Which of the above is/are pollinating agent/agents?

- A. 1 and 2 only
- B. 2 only
- C. 1 and 3 only
- D 1, 2 and 3

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| | STATE | BUTTERFLY NAME |
|---|--------------------------------------|------------------------|
|  | Arunachal Pradesh | Kaiser-i-Hind |
|  | Goa | Malabar Tree-Nymph |
|  | Union Territory of Jammu and Kashmir | Blue Pansy |
|  | Karnataka | Sahyadri Birdwing |
|  | Kerala | Malabar Banded Peacock |
|  | Maharashtra | Blue Mormon |
|  | Sikkim | Blue Duke |
|  | Tamil Nadu | Tamil Yeoman |
|  | Uttarakhand | Common Peacock |
|  | Tripura | Common Birdwing |

Source:

<http://www.thehindu.com/news/cities/Tiruchirapalli/when-butterflies-take-a-hit/article7928831.ece>



Motivation:

Role of pollinators is often discussed in the news.

Question. If you want to see gharials in their natural habitat, which one of the following is the best place to visit?

- (a) Bhitarkanika Mangroves
- (b) Chambal River
- (c) Pulicat Lake
- (d) Deepor Beel

Answer B



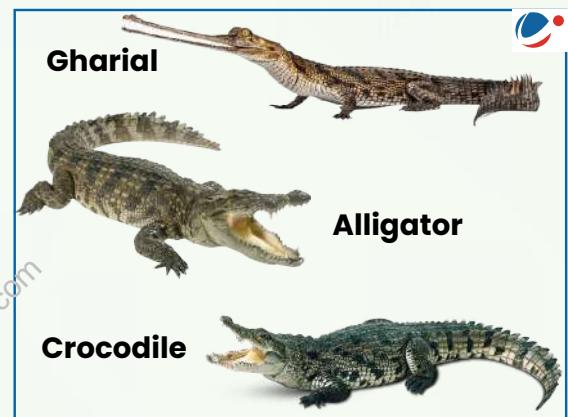
Explanation:

National Chambal Sanctuary, also called the National Chambal Gharial Wildlife Sanctuary is a tri-state protected area in northern India for the critically endangered gharial (small crocodiles), the red-crowned roof turtle and the endangered Ganges river dolphin.

The gharial, also known as gavial or fish-eating crocodile, is a crocodilian in the family Gavialidae and among the longest of all living crocodilians.

Their primary threats include habitat loss due to human encroachment, unsustainable fishing practices and hunting. The species came alarmingly close to extinction in the 1970s.

Today, their major population occur in three tributaries of the Ganga River: the Chambal and the Girwa Rivers in India and the Rapti-Naryani River in Nepal. The Gharial reserves of India are located in three States – Uttar Pradesh, Madhya Pradesh and Rajasthan.



The Gharial and Saltwater are Crocodile Conservation Program was launched in Odisha in early 1975, followed by the Mugger Conservation Program.



| Aspects | Crocodiles | Alligators | Gharials |
|-------------------------|---|---|---|
| Family | Crocodylidae | Alligatoridae | Gavialidae |
| Body Color | Olive and Tan (Lighter) | Gray and black (Darker) | Olive colored |
| Water bodies | Saltwater | Freshwater | Freshwater |
| Snout Shape | Pointed & V-shaped | Wide & U-shaped | Long, thin and distinct boss at the end snout Present |
| Salt Glands | Present and osmoregulate in salinity regions regulate in salinity regions | No salt glands | Present |
| Behavior | Aggressive | Less Aggressive | Very shy |
| Teeth | Lower jaw teeth visible when mouth shut | Lower jaw teeth not visible when mouth shut | Sharp teeth |
| Locomotion Speed | 20 mph | 30 mph | 15 mph |
| Body Length | Up to 17 feet long | Up to 14 feet long | Up to 15 feet long |
| Body Weight | Over 2200 lbs (Saltwater Crocodile) | Around 1000 lbs (American Alligator) | Up to 2000 lbs |
| Bite Force | 3500 pounds per square inch (PSI) | 2900 PSI | 2006 PSI |
| Life Span | Up to 70 years | Up to 50 years | Up to 50 to 60 years |
| Total Species | 13 | 8 | 2 |

Source:

NCERT: Contemporary India - II , Chapter -2 Forest and Wildlife Resources.

<http://timesofindia.indiatimes.com/city/agra/number-of-gharial-muggers-goes-up-in-chambal/articleshow/57993791.cms>



Motivation:

Recently it was reported that the population of Ghariyals has increased in the Chambal Gharial Wildlife Sanctuary.

Consider the following statements:

1. Asiatic lion is naturally found in India only.
2. Double-humped camel is naturally found in India only.
3. One-horned rhinoceros is naturally found in India only.

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

Answer A

| Characterstics | Asiatic Lion  | African Lion  |
|---------------------|---|---|
| IUCN Status | Vulnerable | Vulnerable |
| Weight | Asiatic Lions are lighter, weighing 240 (female) and 450 pounds (male). | African lions weigh 345 (female) and up to 500 pounds (male). |
| Mane | They have sparser mane but have bushier tails. | They have bushier mane. |
| Distribution | Their range is limited to the Gir Forest National Park in India. | They are spread over sub-Saharan Africa and west Africa. |
| Pride | Males live with the females of their pride only for mating or for hunting. | Males live with the females of their pride. |
| Habitat | Forest, savanna, shrubland, grassland, and desert. | Dry deciduous forest. |



Explanation:

Statement 1 is correct: Asiatic Lion (*Panthera leo persica*) is found naturally in India only. Gir National Park is the last natural habitat of this species. IUCN Status of Asiatic Lion was reclassified from "endangered" to "vulnerable," signifying a significant improvement in their conservation status. Today, the state is home to 674 lions according to the last census. 10 districts of Gujarat Junagadh, Amreli, Jamnagar, Porbandar, Gir-Somnath, Rajkot.

Statement 2 is not correct: The Bactrian camel or Double-humped camel is a large, even-toed ungulate native to the steppes of Central Asia. The Bactrian camel occupies habitats in Central Asia from Afghanistan to China, primarily up into the Mongolian steppes and the Gobi desert. In India, it is found in the Nubra valley



The Bactrian camel (*Camelus bactrianus*), also known as the Mongolian camel, domestic Bactrian camel or two-humped camel, is a large even-toed ungulate native to the steppes of Central Asia.

Its population of 2 million exists mainly in the **domesticated** form. With its tolerance for cold, drought, and high altitudes, it enabled the travel of **caravans** on the **Silk Road**.

These camels are migratory, and their habitat ranges from rocky mountain massifs to flat **steppe**, arid desert, (mostly the **Gobi Desert**), stony plains and sand dunes. The coat of the Bactrian camel can withstand cold as low as -30 °C (-22 °F) in winter to 50 °C (122 °F) in summer. They have a remarkable ability to go without water for months at a time, but when water is available they may drink up to 57 liters at once.

Bactrian camels are **diurnal**, sleeping in the open at night and foraging for food during the day. They are primarily herbivorous. With tough mouths that can withstand sharp objects such as thorns, they are able to eat plants that are dry, prickly, salty or bitter, and can ingest virtually any kind of vegetation.

The **Indian Army** uses these camels to patrol in Ladakh.

Wild camels live in the Gobi desert. The Bactrian camel occupies habitats in Central Asia from Afghanistan to China, primarily up into the Mongolian steppes and the Gobi desert. The International Union for Conservation of Nature and Natural Resources (IUCN) has listed the wild Bactrian camel as a critically endangered species since 2002, owing to multiple threats.

Statement 3 is not correct: One-horned rhino is naturally found in areas of Assam such as Kaziranga National Park, India and also in Chitwan National Park (CNP) of Nepal.



Important Note: Five Rhino Range Countries countries – India, Bhutan, Indonesia, Malaysia and Nepal – signed the **Chitwan Declaration for Asian Rhinos Conservation (2023)** and agreed on managing the population of the greater one-horned Rhinos, Javan and Sumatran Rhinos with the intention of achieving at least 3% annual growth rate in their population

Source:

<https://www.thehindu.com/news/national/india-to-collaborate-with-four-nations-to-protect-asian-rhinos/article26431985.ece>

<http://pib.nic.in/newsite/PrintRelease.aspx?relid=186688>



Motivation:

Animals which are exclusively found in India is one of the often repeated themes of UPSC. Also, Government Launched Asiatic Lion Conservation Project ; New Delhi Declaration on Asian Rhinos 2019

Question: Consider the following statements:

1. Some species of turtles are herbivores.
2. Some species of fish are herbivores.
3. Some species of marine mammals are herbivores.
4. Some species of snakes are viviparous.

Which of the statements given above are correct?

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

Answer D



Explanation:

Statement 1 is correct: Green sea turtles eat seagrasses and algae, though juveniles snack on crabs, sponges, and jellyfish. In the wild, they can live up to 80 years and grow up to five feet long. Once mature, it is the only sea turtle that is strictly herbivorous.

Statement 2 is correct: Parrotfish are algae eaters. They obtain the algae by ripping small chunks of coral from a reef. Many other herbivores thrive among the fish population. Other herbivores include the Japanese angelfish, damselfish, surgeonfish, yellow blotch rabbitfish, and tilapia.

Statement 3 is correct: The diet of Manatees consists of water grasses, weeds, and algae. Dugongs are related to manatees, which are both endangered and protected animals. These slow-moving herbivores graze on underwater grasses, rooting them out with bristled, sensitive snouts and chomping them with rough lips.

Statement 4 is correct: Snakes that are viviparous nourish their developing young through a placenta and yolk sac, something that is highly unusual among reptiles. Boa constrictors and green anacondas are two examples of viviparous snakes, meaning they give birth to live young with no eggs involved at any stage of development.



Parrotfish

KNOW YOUR SIRENIANS

THE MANATEE & DUGONG FAMILY



DUGONG
Dugong dugon
VULNERABLE



WEST INDIAN MANATEE
Trichechus manatus latirostris (*Florida manatee*)
Trichechus manatus manatus (*Antillean manatee*)
VULNERABLE



WEST AFRICAN MANATEE
Trichechus senegalensis
VULNERABLE



AMAZONIAN MANATEE
Trichechus inunguis
VULNERABLE

THREE WAYS SNAKES ARE BORN

OVIPAROUS

snakes that give birth to offspring by laying eggs

70% of snakes are Oviparous



Eastern Milksnake
(*Lampropeltis triangulum*)
Least Concern

VIVIPAROUS

young develop inside the mother's placenta and are born live



Northern Watersnake
(*Nerodia sipedon*)
Least Concern

OVOVIVIPAROUS

eggs incubate and hatch inside the mother's body and are baby snakes are born live



Massasauga Rattlesnake
(*Sistrurus catenatus*)
Least Concern

Source:

<https://sciencing.com/list-herbivores-ocean-8599405.html>



Motivation:

Dietary preferences of animals and exceptions in biology is a common theme.



Similar Previous Year Question:

UPSC has previously asked two questions on Dugong (aquatic animal) and its herbivore nature. in 2013 UPSC asked:

Consider the following animals:

1. Sea Cow
2. Sea Horse
3. Sea Lion

Which of the above is/are mammal/mammals

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

in 2015 UPSC asked:

19. With reference to 'dugong', a mammal found in India, which of the following statements is/are correct?
1. It is a herbivorous marine animal.
 2. It is found along the entire coast of India.
 3. It is given legal protection under Schedule I of the Wildlife (Protection) Act, 1972.

Select the correct answer using the code given below.

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

Consider the following pairs:

| Wildlife | Naturally found in |
|------------------------|--------------------|
| 1. Blue-finned Mahseer | : Cauvery River |
| 2. Irrawaddy Dolphin | : Chambal River |
| 3. Rusty-spotted Cat | : Eastern Ghats |

Which of the pairs given above are correctly matched?

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

Answer C



Explanation:

Pair 1 is correctly matched: **Blue-finned Mahseer** is found naturally in the Cauvery river. Mahseer fish belongs to the genus *Tor* of the family Cyprinidae (carps). It thrives in clear rivers and lakes of India and southeastern Asia, and among the largest of Indian river fishes. The Golden Mahseer inhabits the Himalayan foothills, the Indus, Ganga and Brahmaputra basins and can also be found down south in the Balamore, Cauvery, Tamraparini, and Kosi Rivers.



Pair 2 is not correctly matched: The Irrawaddy dolphin is a critically endangered species. It is found near sea coasts and in estuaries and rivers in parts of the Bay of Bengal and Southeast Asia. In India, it is found in Lake Chilika and not the Chambal river. The gangetic dolphin is found in the Chambal river.



Pair 3 is correctly matched: Rusty Spotted Cat is one of the world's smallest feline. The rusty spotted cat, one of the few wild cats that inhabit the forests of Andhra Pradesh, is among the animals in the Eastern Ghats



Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/the-hump-backed-mahseer-critically-endangered/article26653559.ece>

<https://www.telegraphindia.com/india/cauvery-fish-faces-extinction/cid/1511529>

<http://www.newindianexpress.com/states/odisha/2019/may/10/chilikas-4-new-mouths-evoke-mixed-reaction-1974991.html>

<https://timesofindia.indiatimes.com/city/mumbai/spotted-cats-find-home-at-sgnp/articleshow/67445358.cms>

<https://www.thehindu.com/sci-tech/energy-and-environment/This-cat-is-so-small-science-is-forgetting-it/article16695161.ece>



Motivation:

Natural Habitats of various species and where they are found in India is an important topic in biodiversity. It is important to note here that the question requires application of both environment and geography. One must not only know the important protected areas where various species are found but also where these protected areas lie within the physiographic divisions of India.

2020

Question: With reference to Indian elephants, consider the following statements:

1. The leader of an elephant group is a female.
2. The maximum gestation period can be 22 months.
3. An elephant can normally go on calving till the age of 40 years only.
4. Among the States in India, the highest elephant population is in Kerala.

Which of the statements given above is/are correct?

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

Answer A



Explanation:

Statement 1 is correct: The Indian elephant is one of three extant recognised subspecies of the Asian elephant and native to mainland Asia. The oldest female in an elephant herd is always the leader.

Statement 2 is correct: Elephants have the longest gestation period of all mammals. The average gestation period of an elephant is about 640 to 660 days, or roughly 95 weeks.

Statement 3 is not correct: Female elephants live for 60 to 70 years, but only have about four offspring throughout their lifetime. Fertility decreases after age 50 in elephants, but the pattern differed from a total loss of fertility in menopausal women with many elephants continuing to reproduce at least until the age of 65 years. Therefore it is not till the age of 40 years only.

Statement 4 is not correct: South India had the highest number of wild elephants - 14,612. Among the south Indian states, Karnataka leads the table with 6,049 elephants followed by Kerala.

(*Elephas maximus*) Asian Elephant



Habitat Grasslands, floodplains, evergreen rainforests, deciduous forests, scrub forests

Eats Plants - leaves, grass, bamboo, fruits, tree bark, roots, agricultural crops like millets, paddy, bananas, and sugarcane

Family
21 months - gestation period
1 calf is born
4-5 years - breeding interval
36 to 48 months - maternal care of offspring



Geographic range
India, Bangladesh, Bhutan, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam

Did You Know?

- Elephants are good **swimmers**, using their trunk as a snorkel
- Believed to have incredible **memory**, often remembering old migration route and perennial sources of water
- Can learn to **negotiate** electric fences and other human obstacles

Asia's largest terrestrial mammal is a herbivore

20,000-40,000 wild population | 60-70 years in the wild | 86 years in captivity - Lifespan | 2,000-6,000 - weight

Different From African Elephant

- Smaller than African elephant.
 - Smaller, rounder ears
 - African elephant has two finger-like projections at tip of the trunk to manipulate objects; Asian elephant has one

TUSKS

- Only male elephants have tusks. Tusks grow throughout their lifetime
- Used in combat while competing for access to females
- Demand for tusks has largely led to poaching and decline in elephant numbers
 - Adult male elephants without tusks are known as makhnas

HERDS

- Led by a matriarch, usually one of the oldest elephants in the group
- Adult male elephants may form bachelor herds or are solitary, joining herds during the mating season
- Calves are communally cared for and protected, not just by the mother

THREATS

- Poaching for tusks
- Hunting for meat
- Retaliatory killing
- Accidental deaths on roads, railway track, and by electrocution
- Habitat loss

Protection Status : Endangered on the IUCN Red List





Motivation:

A tragic case of death of a young pregnant elephant, who was fed a cracker-filled pineapple in Kerala, was extensively covered and discussed in the news. The incident occurred in June 2020 and the question was asked in September the same year.

Pregnant wild elephant dies in Kerala after cracker filled pineapple explodes in her mouth

It is certain that she was offered the pineapple filled with crackers to eliminate her, says Chief Wildlife Warden.



2021

Question: Consider the following animals:

1. Hedgehog
2. Marmot
3. Pangolin

To reduce the chance of being captured by predators, which of the above organisms rolls up/roll up and protects/protect its/their vulnerable parts?

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

Answer D



Explanation:

Hedgehogs are a small mammal with short limbs and a body low to the ground. When they are frightened, or annoyed, **hedgehogs will roll into a ball** so that a predator will feel the full brunt of its sharp spines and will then leave the hedgehog alone. **Hence option 1 is correct.**



Marmots are relatively large ground squirrels in the genus *Marmota*, with 15 species living in Asia, Europe, and North America. These herbivores are active during the summer when often found in groups, but are not seen during the winter when they hibernate underground. They are the heaviest members of the squirrel family. They do not roll up when threatened. **Hence, option 2 is not correct.**



Pangolins are uniquely covered in tough, overlapping scales. These mammals eat ants and termites using an extraordinarily long, sticky tongue, and are able to **quickly roll themselves up into a tight ball** when they feel threatened. **Hence option 3 is correct.**



Motivation:

Unique behavioural aspects such as defence mechanisms of various species is an often repeated theme in the Prelims examination.

Additional Information:

Defence mechanisms of various organisms (infographic) (See link: <https://www.pugdundeesafaris.com/blog/defence-mechanisms-in-nature/>)

2021

Question: Which one of the following is a filter feeder?

- (a) Catfish
- (b) Octopus
- (c) Oyster
- (d) Pelican

Answer C



Explanation:

A Filter Feeder is an animal (such as a clam or baleen whale) that obtains its food by filtering organic matter or minute organisms from a current of water that passes through some part of its system.

Oysters are natural filter feeders. This means they feed by pumping water through their gills, trapping particles of food as well as nutrients, suspended sediments and chemical contaminants. **Hence, option (c) is the correct answer.**

Source:

Class XI NCERT covers types and modes of nutrition in animals.

Additional Information:

Other Filter Feeder Organisms

| Classification of animals based on Nutrition | |
|---|--|
| Herbivorous | The animal which exclusively feeds on plants. Their length of alimentary canal is more as compared to others. Examples – Tadpole larva of frog, rabbit, cow, horse, sheep etc. |
| Carnivorous | The animal which kills and feeds on other animals. The length of their alimentary canal is minimum. Examples – Tiger, lion etc. |
| Omnivorous | The animal which can take both plant and animal products as food. They have maximum type of digestive enzymes. Example – Human, Dog, Prawn. |
| Insectivorous | The animal which feeds on insects. Example – Frog, Common bats, wall lizards. |
| Sanguivorous | The animal which feeds on blood of other animal. Examples - Leech, body louse, mosquito, vampire bat etc. |
| Carrion Eaters (scavengers) | They feeds on dead animais also termed as scavengers. Examples – Hyaena, neltura, kites etc. |
| Cannibalus | Organisms which feeds on its own species. Examples - Cockroaches, some fishes, frog, snakes etc. |
| Detritus | Animals feed chiefly upon organic matters present in the humus. Examples – Earthworm. |
| Coprophagus or pseudorumination or refection | Animals which feeds on their own faeces. Example – Rabbit, Guinea pig |
| Larvivorous | Feeds on larva. Example – Gambusia (mosquito fish) and Dragon fly. |
| Frugivorous | Feeding on fruits. Example – Parrot, Bat, Squirrel. |
| Food robbers | Feed upon food formed in alimentary canal. Example – Ascaris, Taenia solium. |
| Filter feeder | Paramecium, Unio, Sponge. |

Question: Which of the following are detritivores?

1. Earthworms
2. Jellyfish
3. Millipedes
4. Seahorses
5. Woodlice

Select the correct answer using the code given below.

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

Answer C



Explanation:

Detritivores are heterotrophs that obtain nutrients by consuming detritus. By doing so, all these detritivores contribute to decomposition and the nutrient cycles.

Examples of detritivores are earthworms, blowflies, millipedes, maggots, and woodlice.

Decomposer vs Detritivor



DEFINITION

Decomposer

Decomposer is an organism that breaks down dead organic matter in the environment.

EXAMPLES

Bacteria, fungi, protists, etc.

DIGESTION OF DEAD ORGANIC MATTER

Decomposers secrete enzymes on the surface of organic matter in order to absorb nutrients. So the digestion occurs externally.

Detritivor

Detritivore is a decomposer that eats dead organic matter and digests internally to gain nutrients.

Earthworms, millipedes, sea stars, crab and dung flies, etc.

Detritivores actually eat organic matter and carry out internal digestion.

Seahorse is considered a secondary consumer. They occupy a middle position in their food chain. Seahorses do not have teeth; they suck in their food and swallow it whole. Thus their prey needs to be very small. Primarily, seahorses feed on plankton, small fish and small crustaceans, such as shrimp and copepods. **Fish, jellyfish and crustaceans are common secondary consumer.** Hence, option (c) is the correct answer.

Source:

Class 12 Biology NCERT



Motivation:

Basic concepts covered in NCERT are important from examination point of view.

2022

Question: Which of the following is not a bird?

- (a) Golden Mahseer
- (b) Indian Nightjar
- (c) Spoonbill
- (d) White Ibis

Answer A



Explanation:

Golden Mahseer, a fish, lives in fast-moving waters, inhabiting hill streams with a rocky and stony substrate. They can be found in temperatures between 5°C and 25°C. Also known as Tor putitora, the Putitor mahseer, Himalayan mahseer, or golden mahseer, is an endangered species of cyprinid fish. Its native range is within the basins of the Indus, Ganges and Brahmaputra rivers.



The Indian nightjar is a small bird which is a resident breeder in open lands across South Asia and Southeast Asia. The first bird to be called a "nightjar" was the European Nightjar (*Caprimulgus europaeus*) which was so named in the 17th-century because it was active at night and made a jarring noise (night + jar = nightjar).

Spoonbills are tall white waterbirds with long broad black bills and black legs. They fly with necks and legs extended. Spoonbills are found in estuaries, saltwater bayous, and lakes. They feed by sweeping the long bill from side to side in the mud or shallow water and thereby catching mostly small fishes and crustaceans. Spoonbill is a summer migrant to Ranganatittu Bird Sanctuary



White Ibises are wetland birds. They use freshwater marshes, coastal estuaries, mangroves, flooded pastures, mudflats, and swamps.

2022

Question: Certain species of which one of the following organisms are well known as cultivators of fungi?

- (a) Ant
- (b) Cockroach
- (c) Crab
- (d) Spider

Answer A



Explanation:

The ant-fungus mutualism is a symbiosis seen between certain ant and fungal species, in which ants actively cultivate fungus much like humans farm crops as a food source.

Leafcutter ants use leaves as their fertilizer to grow their crop: fungus. They cultivate their fungal gardens by providing them with freshly cut leaves, protecting them from pests and molds, and clearing them of decayed material and garbage. In return, the fungus acts as a food source for the ants' larvae.



Motivation:

Types of interactions and relationships between species is a common theme covered by UPSC. For example UPSC asked a similar question on Lichens, in the Civil Services preliminary examination, in 2014.



Lichens, which are capable of initiating ecological succession even on a bare rock, are actually a symbiotic association of

- (a) algae and bacteria
- (b) algae and fungi
- (c) bacteria and fungi
- (d) fungi and mosses

2023

Question: Consider the following statements:

Statement-I:

Marsupials are not naturally found in India.

Statement-II:

Marsupials can thrive only in montane grasslands with no predators.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
- (b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
- (c) Statement-I is correct but Statement-II is incorrect
- (d) Statement-I is incorrect but Statement-II is correct

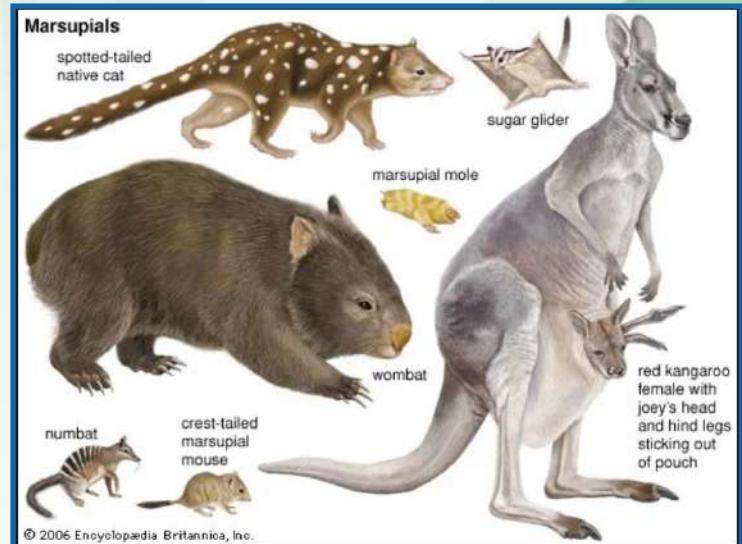
Answer C



Explanation:

Marsupials: Marsupials give birth to a tiny, immature embryo. The embryo then continues to grow and develop in a pouch on the mother's belly. Marsupial development is less risky for the mother. However, the embryo is fragile, so it may be less likely to survive than the fetus of a placental mammal.

Characteristics of marsupials include **small birth size, short gestation period, the presence of pouches** or protective skin folds used to protect offspring during their development outside the uterus, unique reproductive anatomy, and the lack of a corpus callosum in their brains.



The largest and most-varied assortment of marsupials—some 200 species—is found in Australia, New Guinea, and neighbouring islands, where they make up most of the native mammals found there. **They are not restricted to montane grasslands. Hence statement I is correct and statement II is not correct.**



Motivation:

Smuggling of Baby kangaroos, also known as, Joeys, was reported in eastern India.

Baby kangaroos in forest reveal smuggling in Bengal

Joeys were abandoned by smugglers amid a crackdown by officials.



Important Note: UPSC emphasizes wildlife conservation issues in the news, making them potential themes for examination questions. For example: If Kangaroos were smuggled into India, the question was asked about their natural habitat.

Question: Consider the following fauna:

1. Lion-tailed Macaque
2. Malabar Civet
3. Sambar Deer

How many of the above are generally nocturnal or most active after sunset?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer **B**



Explanation:

1. The lion-tailed macaque is a rainforest dweller, often being found in the upper canopy of tropical moist evergreen forests or monsoon forests. It is diurnal, meaning it is active exclusively in daylight hours. Hence option 1 is not correct.



2. The Malabar civet is considered nocturnal and so elusive that little is known about its biology and ecology apart from habitat use. Hence option 2 is correct.



3. Sambar deer are either crepuscular (active at dusk and dawn) or nocturnal (active during the night) animals. Hence option 3 is correct.



Motivation:

Behavioral aspects of species, such as their eating (herbivore, carnivore) and sleeping patterns (nocturnal, diurnal) is an oft-repeated theme in the civil services examination.

Note:

On similar lines, aspirants are advised to look up for special characteristics of any of the species they read about. Also cover social behavior, learned behavior, reproductive behavior, communication etc.

Question: Which of the following organisms perform waggle dance for others of their kin to indicate the direction and the distance to a source of their food?

- (a) Butterflies
- (b) Dragonflies
- (c) Honeybees
- (d) Wasps

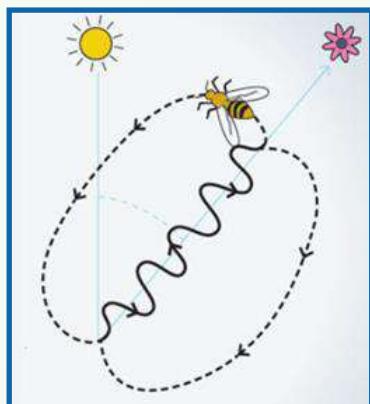
Answer C



Explanation:

The honey bee dance – also known as the waggle dance, is a form of communication performed by worker honey bees to other members of the honey bee colony. The waggle dance was famously decoded by Austrian scientist, Karl von Frisch.

The waggle dance – the direction the bee moves in relation to the hive indicates direction; if it moves vertically the direction to the source is directly towards the Sun. The duration of the waggle part of the dance signifies the distance. **Hence option (c) is the correct answer.**



Source:

<https://www.thehindu.com/sci-tech/science/unlocking-secrets-of-the-honeybee-dance-language/article66603728.ece>



Motivation:

An article on the waggle dance of honey bees was reported in the hindu newspaper.

TH India World Opinion Sports e-Paper

HOME / SCIENCE / SCIENCE

Unlocking secrets of the honeybee dance language

Astonishingly, honeybees possess one of the most complicated examples of nonhuman communication

March 11, 2023 12:04 pm | Updated 12:04 pm IST

JAMES C HENK

COMMENTS SHARE

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2023

Question: Consider the following statements regarding the Indian squirrels:

1. They build nests by making burrows in the ground.
2. They store their food materials like nuts and seeds in the ground.
3. They are omnivorous.

How many of the above statements are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer B



Explanation:

Squirrels are generally small to medium-size rodents but there are few species that are giant in size like Malabar giant squirrel and Malayan giant squirrel. Giant tree squirrels are the members of the squirrel family, They are arboreal species and live mostly on trees in the forest but now also have adapted to human environments. **Hence statement 1 is not correct.**

To prepare for colder months, squirrels cache food during the spring and summer by gathering extra nuts. They bury the surplus in the area surrounding their nests, splitting it into different underground pantries to save for later. **Hence statement 2 is correct.**



While nuts and fruits make up a majority of its diet, the Indian sun squirrel will also eat insects, other smaller mammals, and reptiles. **Hence statement 3 is correct.**



Motivation:

Article dated 10 Nov 2022

INDIA TODAY



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Dark Mode



Premium



News / Trending News / Man feeds Kurkure to squirrels in viral video. Internet reacts

Man feeds Kurkure to squirrels in viral video. Internet reacts

A video that has gone viral on social media shows a man feeding Kurkure to squirrels. The video has over 10k views.

2023

Question: Which one of the following makes a tool with a stick to scrap insects from a hole in a tree or a log of wood?

- (a) Fishing cat
- (b) Orangutan
- (c) Otter
- (d) Sloth bear

Answer B



Explanation:

In animal tool use, the physical aspects of mediation are easy to see: a chimpanzee might use its hand to strike a surface with some force; if the chimpanzee strikes with a stone in its hand, the force is amplified. An orangutan might reach into a hole with its finger; a stick held in its hand will reach farther or into narrower openings. **Hence option (b) is the correct answer.**



Motivation:

Unique abilities of species is one of the most commonly repeated themes in the prelims examination.

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Ease of Revision: Content categorisation is based on subjects or topics to make it easier for aspirants to locate and revise specific areas



Value Addition: Includes infographics, related developments, or news, ensuring comprehensive coverage of important information.



Crisp Material: Crisp points have been used in the articles. It allows aspirants to easily do multiple revisions in limited span of time.



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Biodiversity (Plants)

2018

Question: Why is a plant called Prosopis Juliflora often mentioned in the news?

- (a) Its extract is widely used in cosmetics.
- (b) It tends to reduce the biodiversity in the area in which it grows.
- (c) Its extract is used in the synthesis of pesticides.
- (d) None of these

Answer B



Explanation:

Prosopis juliflora (P. juliflora), an exotic tree, is one of the top invaders in India. A native of South and Central America, it was introduced in India to meet the fuel and wood requirement of the rural poor and to restore degraded lands. A recent study has shown that apart from threatening local plants, with whom it competes for resources, this tree is also affecting the nesting success of birds.



Source:

<http://www.downtoearth.org.in/news/silent-invader-44025>

<http://ncert.nic.in/ncerts/l/kesy203.pdf>



Motivation:

Often in news due to its impact on habitat loss.

Question: Recently, there was a growing awareness in our country about the importance of Himalayan nettle (*Girardinia diversifolia*) because it is found to be a sustainable source of

- (a) anti-malarial drug
- (b) biodiesel
- (c) pulp for paper industry
- (d) textile fibre

Answer D



Explanation:

Girardinia diversifolia (c), a fibre-yielding plant, has become an important livelihood option for people living in the remote mountainous villages of the Himalayas.

Source:

DownToEarth

ENVIRONMENT

Khar's experimentation with Himalayan nettle brings recognition

Himalayan nettle, a fibre-yielding plant, has become an important livelihood option for people living in the remote mountainous villages of the Hindu Kush Himalaya



Motivation:

Himalayan Nettle was reported to have increased the livelihood of people in the Himalayan region.

Question: In the nature, which of the following is/are most likely to be found surviving on a surface without soil?

1. Fern
2. Lichen
3. Moss
4. Mushroom

Select the correct answer using the code given below.

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



Answer C



Explanation:

A fern is a member of a group of vascular plants that reproduce via spores and have neither seeds nor flowers. Ferns require indirect sunlight, moist soil, and a humid atmosphere. Ferns prefer potting soil with good drainage and high organic content. **Hence, option 1 is not correct.**

Lichens are a complex life form that is a symbiotic partnership of two separate organisms, a fungus and an alga. They only require an undisturbed surface, time, and clean air. Lichens grow on any undisturbed surface—bark, wood, mosses, rock, soil, peat, glass, metal, plastic, and even cloth. **Hence option 2 is correct.**

Mosses are non-flowering plants which produce spores and have stems and leaves, but don't have true roots. Moss is very low maintenance and needs virtually nothing except shade and moisture to thrive. **Hence option 3 is correct.**

A mushroom or toadstool is the fleshy, spore-bearing fruiting body of a fungus, typically produced above ground, on soil, or on its food source. Mushrooms can be cultivated hydroponically as fungi. **Hence option 4 is not correct.**

Source:

Class XII NCERT Ecological succession

Elimination Technique:

Lichens and mosses are known to be one of the pioneer species that occupy a barren rock/land in primary ecological succession where soil development is poor. Ferns are large vascular plants that require soil and similarly mushrooms also need a soil substratum to grow on.

Question: Which one of the following is used in preparing a natural mosquito repellent?

- (a) Congress grass
- (b) Elephant grass
- (c) Lemongrass
- (d) Nut grass

Answer C



Explanation:

Citronella is an essential oil found in Lemongrass. It is the most widely used natural mosquito repellent found in candles, sprays, and lotions. To help deter mosquitoes with its strong fragrance, plant lemongrass along walkways and in locations close to seating areas. Hence, option (c) is the correct answer.



Source:

Chapter -9 Biomolecules, Class XI NCERT



Motivation:

India, being a tropical country, is always confronted with the problem of vector borne diseases.

Aroma of lemongrass oil fills Anchunadu forests

Oil extraction provides livelihood for tribespeople at Marayur, Kanyakumari

November 26, 2020 06:14 pm | Updated November 27, 2020 06:27 pm IST - IDUKKI

Question: Consider the following kinds of organisms:

1. Copepods
2. Cyanobacteria
3. Diatoms
4. Foraminifera

Which of the above are primary producers in the food chains of oceans?

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

Answer B



Explanation:

Autotrophs or primary producers are organisms that acquire their energy from sunlight and materials from nonliving sources.

Copepods are a group of small crustaceans found in nearly every freshwater and saltwater habitat. Copepods are major secondary producers in the World Ocean. They represent an important link between phytoplankton, microzooplankton and higher trophic levels such as fish. They are an important source of food for many fish species but also a significant producer of detritus. **Hence, option 1 is not correct.**

Cyanobacteria, also called blue-green algae, are microscopic organisms found naturally in all types of water. Cyanobacteria are important primary producers and form a part of the phytoplankton. They may also form biofilms and mats (benthic cyanobacteria). **Hence option 2 is correct.**

Diatoms are photosynthesising algae, they have a siliceous skeleton (frustule) and are found in almost every aquatic environment including fresh and marine waters. Diatoms are one of the major primary producers in the ocean, responsible annually for ~20% of photosynthetically fixed CO₂ on Earth. **Hence option 3 is correct.**

Foraminifera are single-celled organisms, members of a phylum or class of amoeboid protists characterized by streaming granular ectoplasm for catching food and other uses. **Hence, option 4 is not correct.**

Source:

Class XII NCERT Ecological succession



Important Note: Try to remember one species for each of the taxonomic classification to remember their characteristics. For example - Mollusca-Octopus, Crustaceans-Crab etc.

2021

Question: With reference to 'palm oil', consider the following statements:

1. The palm oil tree is native to Southeast Asia.
2. The palm oil is a raw material for some industries producing lipstick and perfumes.
3. The palm oil can be used to produce biodiesel.

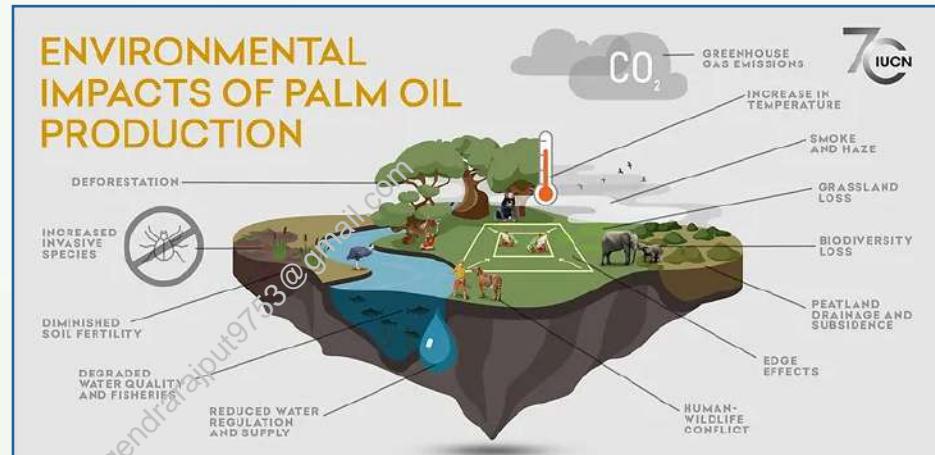
Which of the statements given above are correct?

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

Answer B



Explanation:



Palm oil is an edible vegetable oil derived from the mesocarp (reddish pulp) of the fruit of the oil palms. Palm oil tree is native to Africa. **Hence, statement 1 is not correct.**

Palm oil is used in lipstick as it holds color well, doesn't melt at high temperatures, and has a smooth application and virtually no taste.

Also, palm oil makes perfumed and deodorants more effective and helps the fragrance to last longer. **Hence, statement 2 is correct.**

Palm oil contains various phytonutrients that can be separated out prior to biodiesel production. **Hence, statement 3 is correct.**



Motivation: Often in news due to its impact on habitat loss.

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/what-would-the-proposed-large-scale-cultivation-of-oil-palm-mean-to-indias-ecology-and-economy/article36510961.ece>

Question: Consider the following statements:

1. Moringa (drumstick tree) is a leguminous evergreen tree.
2. Tamarind tree is endemic to South Asia.
3. In India, most of the tamarind is collected as minor forest produce.
4. India exports tamarind and seeds of moringa.
5. Seeds of moringa and tamarind can be used in the production of biofuels.

Which of the statements given above are correct?

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

Answer **B**



Explanation:

Moringa has a straight trunk with cork-like bark. Depending on the species and climate, Moringa trees may be evergreen or semi-deciduous. Moringaceae is a member of the mustard-oil plants, the great group of families that includes the mustards, the capers, the papayas etc. It does not fix nitrogen. **Hence, statement 1 is not correct.**

Tamarind is native to tropical Africa. It is widely cultivated in tropical and subtropical regions for its edible fruit, the sweet and sour pulp of which is extensively used in foods, beverages, and traditional medicines. **Hence, statement 2 is not correct.**

Tamarind (with seeds) is classified as minor forest produce. It is also covered under Minimum Support Price Scheme for NTFP. **Hence, statement 3 is correct.**

India produces 1.2-2 million tonne moringa every year making it the largest producer of the crop in the world. The country is also the largest moringa exporter and meets 80 per cent of its world demand. Last year China procured huge quantity of moringa seeds from India at Rs 3,000 per kg while the usual cost is between Rs 800 and Rs 1,000 per kg.

Tamarind seed is highly nutritious and contains upto 17-20 percent protein. Chemical called Pectin extracted from the seed is added in bakery products. Tamarind is exported from India to about 60 countries. Karnataka is the largest producer of tamarind in the country. About 18 percent of the national I production is from Kerala and half of this is from Palakkad district. **Hence, statement 4 is correct.**

Tamarind seed oil biodiesel possesses excellent combustion properties and can be sanctioned for its adoption in engine. Moreover, the tamarind seed oil biodiesel is environment-friendly and can contribute in the reduction of carbon emission when used as an engine fuel.

Moringa seed oil exhibit a high oxidative stability and its thermal stability exceeds other oil crops like sunflower oil, soybean oil amongst others. Biodiesel produced from *M. oleifera* seed oil exhibit enhanced oxidative ability, high cloud point and a higher cetane number of approximately 67 than for most biodiesels. **Hence, statement 5 is correct.**

Source:

Down to Earth Article

AGRICULTURE

Sweet 'n' sour

Moringa and tamarind are popularly known as the trees of life for Indians. Moringa is in fashion as the world eyes India to feed its frenzy for the new superfood. Hardy tamarind shares the same versatility but struggles to find its way out of the wood. Karnika Bahuguna and Shreeshan Venkatesh travel to the hinterland of eastern and southern India to make sense of this dichotomy

2022

Question: Which of the following are nitrogen-fixing plants?

1. Alfalfa
2. Amarnath
3. Chickpea
4. Clover
5. Purslane (Kulfa)
6. Spinach

Select the correct answer using the code given below:

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

Answer A



Explanation:

Alfalfa, also called lucerne, is a perennial flowering plant in the legume family Fabaceae. It is cultivated as an important forage crop in many countries around the world. Symbiotic N₂ fixation by alfalfa provides substantial amounts of nitrogen (N) to livestock operations, subsequent crops, and soil organic matter. Hence option 1 is correct.

Amarnath: Amaranthus is a cosmopolitan genus of annual or short-lived perennial plants collectively known as amaranths. **Hence option 2 is not correct.**

Chickpea: The chickpea or chick pea is an annual legume of the family Fabaceae. **Hence option 3 is correct.**

Clover: Nitrogen is “fixed” in clovers through a symbiotic relationship with Rhizobium bacteria that infects the plant’s roots. **Hence option 4 is correct.**

Purslane: Purslane is a green, leafy vegetable that can be eaten raw or cooked. It is known scientifically as Portulaca oleracea, and is also called pigweed, little hogweed, fatweed and pusley. This succulent plant contains about 93% water. It has red stems and small, green leaves. **Hence option 5 is not correct.**

Spinach: Spinach is a leafy green flowering plant native to central and western Asia. It is of the order Caryophyllales, family Amaranthaceae. **Hence option 6 is not correct.**

Source:

Class 12th Biology NCERT



Motivation:

In 2021 UPSC asked a question on the leguminous nature of certain plants. In 2022 it sought to test the candidates on nitrogen fixing plants.

2023

Question: Consider the following statements:

1. Some mushrooms have medicinal properties.
2. Some mushrooms have psychoactive properties.
3. Some mushrooms have insecticidal properties.
4. Some mushrooms have bioluminescent properties.

How many of the above statements are correct?

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

Answer D



Explanation:

1. Pleurotus or “oyster mushroom” possesses medicinal properties and health-promoting effects. These species have been used as medicinal mushrooms for long time since they contain several compounds with important pharmacological/nutraceutical properties. **Hence statement 1 is correct.**
2. Psilocybin or magic mushrooms are naturally occurring and are consumed for their hallucinogenic effects. They are psychedelic drugs, which means they can affect all the senses, altering a person’s thinking, sense of time and emotions. **Hence statement 2 is correct.**



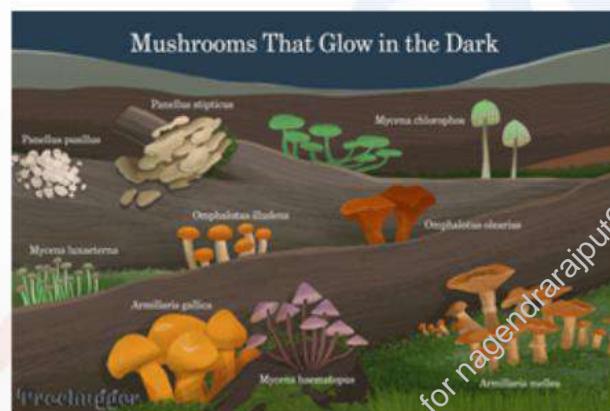
Cordyceps



Psilocybe cubensis



Lactarius



3. Recently, an increasing number of mushrooms have been found to contain insecticidal compounds. Among these are species of Lactarius (Russulaceae), which react to wounding by exuding a milky fluid and/or color change reactions (Ramsbottom, 1954), which could be a warning reaction. **Hence statement 3 is correct.**
4. Some mushrooms use luciferins—light-emitting compounds found in other glowing animals and plants—to attract insects. **Hence statement 4 is correct.**



Motivation:

In 2022, a question on Gucci mushroom was asked. The following year, UPSC asked a general question on the properties of mushrooms.



Biodiversity

(Microorganisms & Others)

2021

Which of the following have species that can establish symbiotic relationship with other organisms?

1. Cnidarians
2. Fungi
3. Protozoa

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

Answer D



Explanation:

Cnidaria is a phylum under kingdom Animalia containing over 11,000 species of aquatic animals found both in freshwater and marine environments. Cnidarians, also called coelenterate, are mostly marine animals. They include the corals, hydras, jellyfish, sea anemones, sea pens, sea whips, and sea fans. The relationship between cnidarians and dinoflagellate algae is termed as 'symbiotic', because both the animal host and the algae are benefiting from the association. It is a mutualistic interaction.



Fungi have several mutualistic relationships with other organisms. In mutualism, both organisms benefit from the relationship. Two common mutualistic relationships involving fungi are mycorrhizae and lichen.

Termites have a mutualistic relationship with protozoa that live in the insect's gut. The termite benefits from the ability of bacterial symbionts within the protozoa to digest cellulose. **Hence option (d) is the correct answer.**

Source:

Class XII Biology NCERT



Motivation:

Mutualism and similar interactions between species is one of the key components of plant and animal behavior.

2023

Consider the following statements:

1. Some microorganisms can grow in environments with temperature above the boiling point of water.
2. Some microorganisms can grow in environments with temperature below the freezing point of water.
3. Some microorganisms can grow in highly acidic environment with a pH below 3.

How many of the above statements are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer C

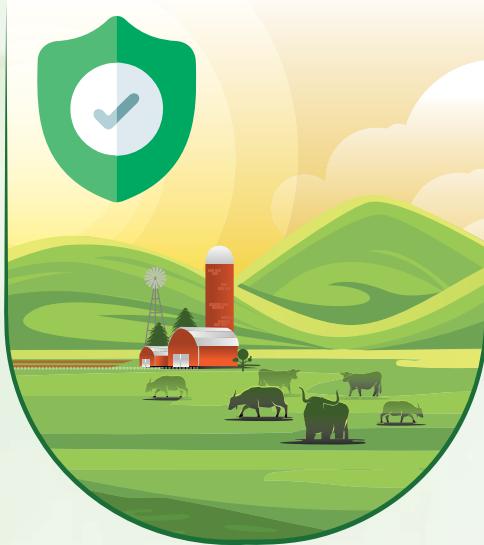


Explanation:

Statement 1 is correct: Pyrolobus fumarii, an archaeon living at 113 °C in Atlantic hydrothermal vents. Pyrococcus furiosus, an archaeon which thrives at 100 °C, first discovered in Italy near a volcanic vent.

Statement 2 is correct: Psychrophiles or cryophiles (adj. psychophilic or cryophilic) are extremophilic organisms that are capable of growth and reproduction in low temperatures, ranging from -20 °C (-4 °F) to 20 °C (68 °F).

Statement 3 is correct: Acidophiles are microorganisms that show optimal growth in highly acidic environments. These are of two types. The extreme acidophiles dwell in environments with a pH value <3, and moderate acidophiles grow optimally in conditions having pH values ranging between 3 and 5.



Protected Areas

2018

Question: In which one of the following States is Pakhui Wildlife Sanctuary located?

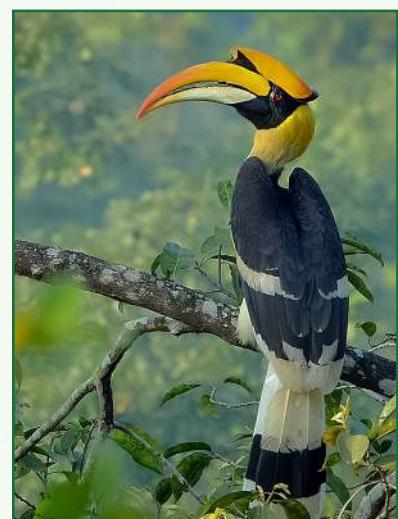
- (a) Arunachal Pradesh
- (b) Manipur
- (c) Meghalaya
- (d) Nagaland

Answer A



Explanation:

- Pakhui is a Wildlife Sanctuary and a dedicated Tiger Reserve (also known as the Pakke Tiger Reserve) in the district of East Kameng in Arunachal Pradesh, India. **Hence option (a) is the correct answer.**
- It has an area of over 860 square kilometres and is bordered by the Kameng River and Pakke River, which are important sources of water for the animals and the irrigation of the vegetation. The Pakhui reserve is neighbour to the Nameri Tiger reserve in Assam, making this area a true treasure trove in terms of these spectacular animals.
- This area was first declared the Pakke Reserve Forest in July of 1966. Eleven years later, it was named the Camo Sanctuary. Then, in 2002, it was formally christened Pakhui Wildlife Sanctuary and Pakke Tiger Reserve.
- **Pakhui is mainly important from two aspects, one is tiger reserve as it is a part of 'Project Tiger' and another hornbills.**
- **The great hornbill is the state bird of Arunachal Pradesh** and is the most valued and hunted by tribal groups, followed by the Rufous-necked hornbill. There have been campaigns to save hornbills. Hornbills are especially vulnerable in North-east India due to the traditional value of these birds for their feathers, casques, medicinal value of



their fat and flesh among many tribal groups. Many areas especially in eastern and central Arunachal have such high hunting pressure that the great hornbill has become extremely rare or locally extinct.

Seven Sisters of Northeast India



Source:

<https://economictimes.indiatimes.com/magazines/panache/history-amid-natural-beauty-tawang-in-arunachal-pradesh-has-a-culture-of-its-own/articleshow/51297423.cms>

<https://www.fantasticindia.org/pakhui-wildlife-sanctuary.html>



Motivation:

- This Tiger Reserve has won India Biodiversity Award 2016 in the category of 'Conservation of threatened species' for its Hornbill Nest Adoption Programme.
- The Prime Minister's frequent visit to North-East India and his inauguration of Hornbill festival has kept the region in news.
- Orang Tiger Reserve in Assam and Kamlang Tiger Reserve in Arunachal Pradesh were notified of the 49th and 50th tiger reserves in the country.

2019

Question: Which of the following are in Agasthyamala Biosphere Reserve?

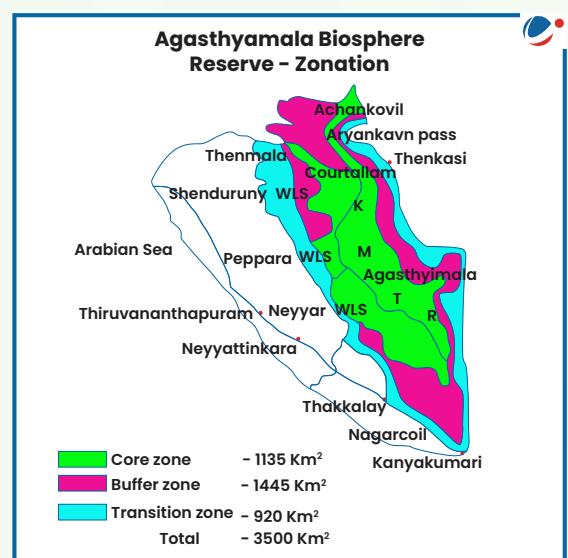
- (a) Neyyar, Peppara and Shendurney Wildlife Sanctuaries; and Kalakad Mundanthurai Tiger Reserve
- (b) Mudumalai, Sathyamangalam and Wayanad Wildlife Sanctuaries; and Silent Valley National Park
- (c) Kaundinya, Gundla Brahmeswaram and Papikonda Wildlife Sanctuaries; and Mukurthi National Park
- (d) Kawal and Sri Venkateswara Wildlife Sanctuaries; and Nagarjunasagar-Srisailam Tiger Reserve

Answer A



Explanation:

- Located in the Western Ghats in the south of the country, the Agasthyamala Biosphere Reserve is a unique genetic reservoir of cultivated plants. Three wildlife sanctuaries, Shendurney, Peppara and Neyyar, are located in the site, as well as the Kalakad Mundanthurai Tiger reserve (KMTR)



Source:

<https://timesofindia.indiatimes.com/city/thiruvananthapuram/women-get-nod-to-trek-to-agasthyamala/articleshow/67402572.cms>

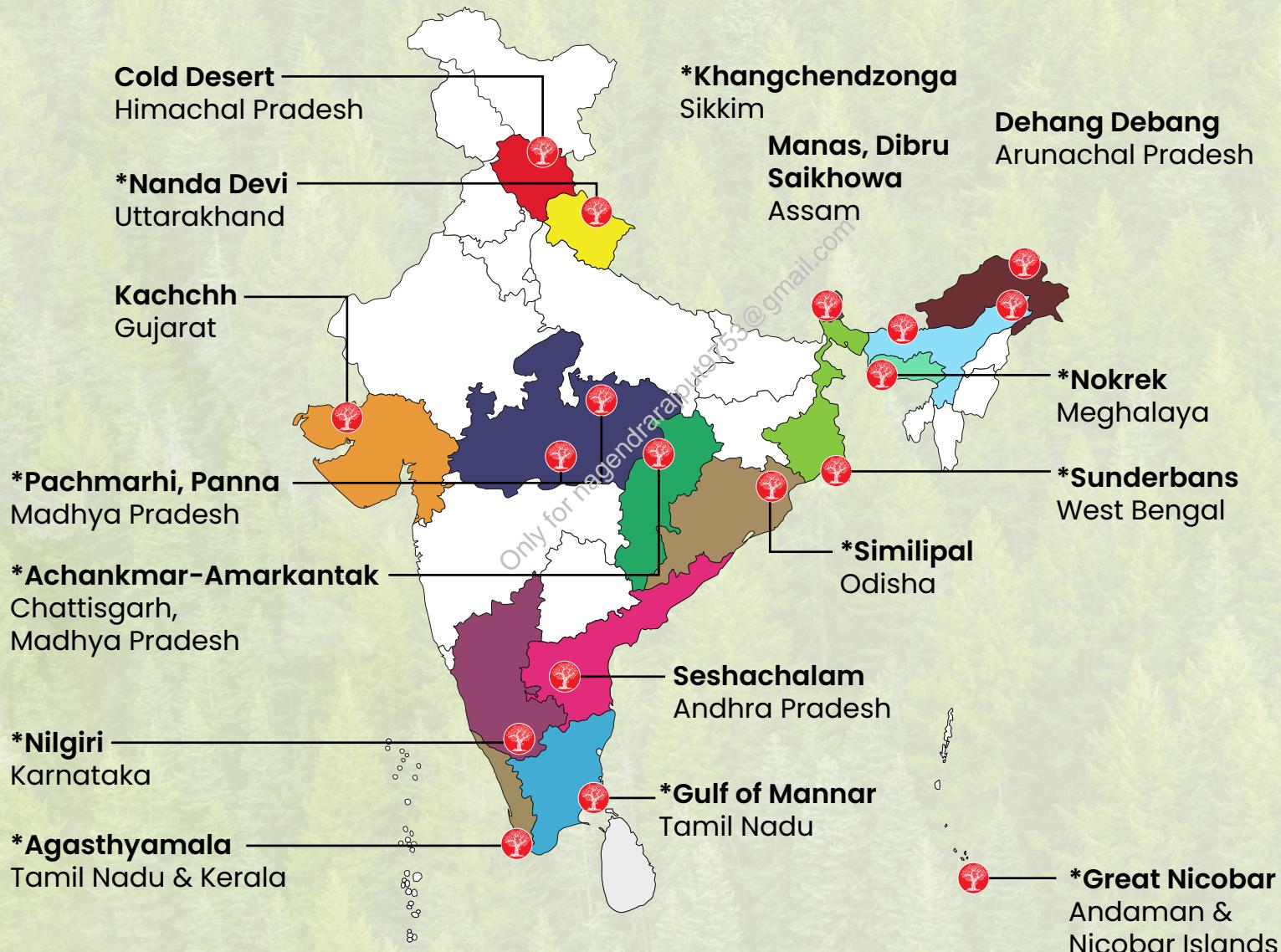


Motivation:

Agasthyamala Biosphere Reserve was in the news.



Biosphere Reserves in India



*World Network of Biosphere Reserve (NAB-UNESCO)

Nilgiri Biosphere Reserve:

- » Nilgiris (blue mountain) got their name from the purplish blue flowers of Neelakurinji (blossoms once in 12 years).
- » The Nilgiri Sub-Cluster (UNESCO World Heritage Site) includes the **Mudumalai, Mukurthi, Nagarhole, Bandipur and Silent Valley national parks**, as well as the **Aralam, Wayanad and Sathyamangalam wildlife sanctuaries**.
- » **Vegetation:** tropical evergreen forests (western side of Western Ghats), montane sholas and grasslands (at high altitudes), semi-evergreen forests, moist deciduous forests, dry deciduous forests, and thorn forests.
- » **Major Fauna:** **Lion Tailed Macaque (EN), Nilgiri Tahr (EN), Malabar Giant Squirrel (LC), Nilgiri Langur (VU)**, etc.

Nanda Devi Biosphere Reserve:

- » Nanda Devi Biosphere Reserve = **Nanda Devi National Park + Valley of Flowers NP.**
- » Major Fauna: **Snow Leopard (VU), Musk Deer (EN), Bharal Or Blue Sheep (LC)**, etc.

Nokrek Biosphere Reserve:

- » Nokrek (1,412 m) is the highest peak of the Garo hills.
- » Vegetation: Evergreen, semi-evergreen & deciduous.
- » Key Fauna: **Red Panda (EN), Hoolock Gibbons (EN), Red Giant Flying Squirrel (LC)**, etc.

Gulf of Mannar Biosphere Reserve:

- » It lies between the west coast of Sri Lanka and the south-eastern tip of India, in the Coromandel Coast region.
- » The chain of low islands and reefs known as Ramsethu (Adam's Bridge), which includes Mannar Island, separates the Gulf of Mannar from **Palk Bay**, which lies to the north between Sri Lanka and India.
- » The biosphere reserve comprises islands with estuaries, seagrasses, coral reefs, salt marshes and **mangroves**.
- » Major Fauna: **Dugong (VU), Olive Ridley turtles (VU)**, etc.

Sundarbans Biosphere Reserve:

- » It is located in the vast Delta of the Ganges, south of Kolkata and bordering **Bangladesh** in the east. It provides **habitat** for the threatened Royal Bengal **Tiger (EN)**.
- » Sundarbans BR = **Sundarbans National Park + Sajnekhali Wildlife Sanctuary + Lothian Wildlife Sanctuary + Halliday WLS**.
- » **Manas Biosphere Reserve**
- » **Manas BR = Manas National Park.** It is contiguous with the Royal Manas National Park in Bhutan. Manas is famous for its population of the **Wild Water Buffalo (EN)**.
- » Rare and endemic wildlife: **Assam Roofed Turtle (EN), Hispid Hare (EN), Golden Langur (EN) & Pygmy Hog (EN)**.

- » The grassland biomes: **Pygmy Hog, Rhinoceros** (re-introduced in 2007), elephants, **Bengal florican (CR)** etc.

Great Nicobar Biosphere Reserve:

- » Great Nicobar BR = Campbell Bay National Park + Galathea NP.
- » Vegetation: tropical wet evergreen forests.
- » Major Fauna: **Dugong (VU), Saltwater Crocodile (LC)**, etc.

Similipal Biosphere Reserve:

- » It includes **Mayurbhanj Elephant Reserve (Similipal TR + Hadgarh Wildlife Sanctuary + Kuldiha WLS)**.
- » **Tribes:** Erenga, Kharias, Mankirdias, Ho, Gonda & Munda.
- » Major Fauna: **Royal Bengal Tigers, Wild Elephants (EN), Gaurs (VU – Indian Bison), Chausingga (VU)**.

Pachmarhi Biosphere Reserve:

- » **Pachmarhi BR (Satpura National Park + Bori Wildlife Sanctuary + Pachmarhi WLS)** lies in the centre of the Satpura Range. The highest peak is the Dhoopgarh (1,352 m). Gonds are the major tribes.
- » Fauna: **Tiger, Gaur, Indian Giant Flying Squirrels (LC)**, etc.

Khangchendzonga Biosphere Reserve:

- » The biosphere reserve is a transboundary bio-diversity hotspot conservation area. It includes the third highest mountain peak in the world, Kanchenjunga (8,586 m). It is one of the highest ecosystems in the world, reaching elevations of 1,220 m to 8,586 m above sea level.
- » The Khangchendzonga NP, which comprises the core area of the KBR, was inscribed as **India's first "Mixed World Heritage Site"**.
- » Major Fauna: **Red Panda (EN), Snow Leopard (VU), Musk Deer (EN), Great Tibetan Sheep (Argali – NT)**, etc.

Dibru-Saikhowa Biosphere Reserve:

- » Dibru-Saikhowa BR = Dibru-Saikhowa National Park.
- » Major Fauna: **Bengal Tiger, Clouded Leopard (VU), Gangetic Dolphin (EN)**, etc.

Dihang-Dibang Biosphere Reserve:

- » The **Mouling NP** and the **Dibang WLS** are located fully or partly within this biosphere reserve. The terrain is rugged, with an altitudinal range of 750 to 3000 m at the highest point, the Mouling Peak.
- » Major Fauna: **Takin (VU), Red Panda (EN)**.

Agasthyamala Biosphere Reserve:

- » Agasthyamala BR = **Shendurney Wildlife Sanctuary + Peppara Wildlife Sanctuary + Neyyar Wildlife Sanctuary + Kalakad Mundanthurai TR**. The reserve is home to Kani tribes from both Tamil Nadu and Kerala.

» Major Fauna: Nilgiri Tahr (EN)

Achanakmar-Amarkantak Biosphere Reserve:

- » It extends across the states of Madhya Pradesh and Chhattisgarh. Maikal hills together with eastern Vindhya and Satpuras lie within the reserve.
- » Major Fauna: **Four Horned Antelope (Chousingha (VU)), Indian Wild Dog (VU)**, etc.
- » Vegetation: moist deciduous and dry deciduous forests.

Great Rann of Kutch Biosphere Reserve:

- » The Great Rann of Kutch is a salt marsh in the Thar Desert.
- » Great Rann of Kutch BR = **Kachchh Desert Sanctuary (in Great Rann of Kutch) + Wild Ass Sanctuary (in Little Rann of Kutch), Narayan Sarovar Sanctuary + Kutch Bustard Sanctuary + Banni Grasslands Reserve.**
- » Major Fauna: **Great Indian Bustard (CR), Indian Wild Ass (NT)**, etc.

Cold Desert Biosphere Reserve:

- » It includes **Pin Valley National Park, Chandratal**, Sarchu and Kibber Wildlife Sanctuaries.
- » Major Fauna: **Snow Leopard (VU), Himalayan Ibex (also referred to as Siberian Ibex – LC)**.

Seshachalam Hills Biosphere Reserve:

- » The Seshachalam Hills are part of the **Eastern Ghats (south of Panna River)** in southern Andhra Pradesh.
- » Tirupati, a major Hindu pilgrimage town and Sri Venkateswara National Park are located in these ranges.
- » Major Flora: rare and endemic plant species like **Red Sanders (NT)** are of great economic importance.
- » Major Reptilian Fauna: **Golden Gecko (LC – Endemic To Tirumala Hills)**.

Panna Biosphere Reserve:

- » Panna Biosphere Reserve = Panna TR.
- » Fauna: **Tiger (EN), Chital (LC), Chinkara (LC), Sambar (VU)**.

Which one of the following National Parks lies completely in the temperate alpine zone?

- (a) Manas National Park
- (b) Namdapha National Park
- (c) Neora Valley National Park
- (d) Valley of Flowers National Park

Answer D



Explanation:

- The Western Himalayan region extends from Kashmir to Kumaon. Its temperate zone is rich in forests of chir, pine, other conifers and broad-leaved temperate trees. Higher up, forests of deodar, blue pine, spruce and silver fir occur. The alpine zone extends from the upper limit of the temperate zone of about 4,750 metres or even higher. The characteristic trees of this zone are high-level silver fir, silver birch and junipers.
- **Valley of Flower National Park is a high altitude Himalayan valley in the transition zone between Zanskar and Great Himalayas. It is known for its meadows of endemic alpine flowers.**
- **Both the Valley of Flowers National Park and the Nanda Devi National Park forms the core area of Nanda Devi Biosphere Reserve.**
- Vegetation: **Alpine vegetation.**
- Major Flora: Orchids, poppies, marigold, daisies, rhododendron and birch.
- Major Fauna: Asiatic black bear, snow leopard, musk deer, brown bear, red fox, and bharal (blue sheep). **Hence option (d) is the correct answer.**



Source:

<https://uttarakhandtourism.gov.in/valley-of-flower>

National Parks of India

Jammu & Kashmir

1. City Forest (Salim Ali)
2. Dachigam
3. Kishtwar
4. Kazinag

Haryana

1. Kalesar
2. Sultanpur

Rajasthan

1. Mukundra Hills
2. Desert
3. Keoladeo Ghana
4. Ranthambhore
5. Sariska

Gujarat

1. Vansda
2. Blackbuck
3. Gir
4. Marine (Gulf of Kutchh)

Maharashtra

1. Chandoli
2. Gugamal
3. Nawegaon
4. Pench (Jawaharlal Nehru)
5. Sanjay Gandhi (Borivilli)
6. Tadoba

Madhya Pradesh

1. Bandhavgarh
2. Fossil
3. Kanha
4. Madhav
5. Panna
6. Pench (Priyadarshini)
7. Sanjay
8. Satpura
9. Van Vihar
10. Dinosaur
11. Kuno

Kerala

1. Anamudi Shola
2. Eravikulam
3. Mathikettan Shola
4. Pambadum Shola
5. Periyar
6. Silent Valley

Himachal Pradesh

1. Great Himalaya
2. Pin Valley
3. Inderkilla
4. Khirganga
5. Simbalbara

Ladakh

1. Hemis

Uttarakhand

1. Jim Corbett
2. Gangotri
3. Govind
4. Nanda Devi
5. Rajaji
6. Valley of Flowers

Uttar Pradesh

1. Dudhwa

Bihar

1. Valmiki

Sikkim

1. Khangchendzonga

Assam

1. Dibrus-Saikhowa
2. Dehing Pathai
3. Raimona
4. Kaziranga
5. Manas
6. Nameri
7. Orang

Arunachal Pradesh

1. Mouling
2. Namdapha

Nagaland

1. Intanki

Meghalaya

1. Balphakram
2. Nokrek Ridge

Manipur

1. Keibul Lamjao
2. Sirohi

Mizoram

1. Murlen
2. Phawngpui

Tripura

1. Clouded Leopard
2. Bison (Rajbari)

West Bengal

1. Buxa
2. Gorumara
3. Neora Valley
4. Singalila
5. Sunderban
6. Jaldapara

Andaman and Nicobar

1. Campbell Bay
2. Galathea
3. Mahatama Gandhi Marine
4. Middle Button Island
5. Mount Harriett
6. North Button
7. Rani Jhansi Marine
8. Saddle Peak
9. South Button

Goa

1. Mahavir (Mollem)

Karnataka

1. Anshi
2. Bandipur
3. Bannerghatta
4. Kudremukh
5. Rajiv Gandhi (Nagarahole)

Tamil Nadu

1. Guindy
2. Gulf of Mannar
3. Indira Gandhi (Annamalai)
4. Mudumalai
5. Mukurthi

Andhra Pradesh

1. Sri Venkateswara
2. Rajiv Gandhi (Rameswaram)
3. Papikonda

With reference to India's Desert National Park, which of the following statements are correct?

1. It is spread over two districts.
2. There is no human habitation inside the Park.
3. It is one of the natural habitats of Great Indian Bustard.

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

Answer C



Explanation:

- Desert National Park, Rajasthan, India, is situated in the west Indian state of Rajasthan near the towns of Jaisalmer and Barmer. This is one of the largest national parks, covering an area of 3162 km². The Desert National Park is an excellent example of the ecosystem of the Thar Desert. **The Desert National Park (DNP) covers an area of 3162 km² of which 1900 km² is in Jaisalmer district and remaining 1262 km² is in Barmer district of Rajasthan State. Hence statement 1 is correct.**
- **The Thar desert is the most thickly populated desert in the world** with an average density of 83 persons/km² (compared to 7km² of other deserts) (Baqri and Kankane 2001). **However, the human population within the DNP is low (4-5 persons per km²).** There are 73 villages and also settlements or Dhanis existing within the Park. These communities have inhabited this area for hundreds of years and with their rich culture and tradition they are an integral part of this ecosystem. **Hence statement 2 is not correct.**
- The DNP is the most important site for the long-term survival of the Globally Threatened Great Indian Bustard and other endemic fauna and flora. Other birds of significance include the endangered Oriental White-backed vulture Gyps bengalensis and Long-billed Gyps indicus, Stoliczka's Bushchat Saxicola macrorhyncha, Green Munia Amandava formosa MacQueen's or Houbara Bustard Chlamydotis maqueeni. Eleven bird species representative of Biome-13 have been identified by BirdLife International. **Hence statement 3 is correct.**

Source:

<https://whc.unesco.org/en/tentativelists/5448/#:~:text=The%20Desert%20National%20Park%20>



Motivation:

Desert National Park, Rajasthan is a part of UNESCO's tentative list. A Tentative List is an inventory of those properties which each State Party intends to consider for nomination.

Among the following Tiger Reserves, which one has the largest area under "Critical Tiger Habitat"?

- (a) Corbett
- (b) Ranthambore
- (c) Nagarjunsagar-Srisailam
- (d) Sunderbans

Answer C



Explanation:

- ▶ **Option (c) is the correct answer:** Critical 'tiger' habitats (CTHs), also known as core areas of tiger reserves—are identified under the Wild Life Protection Act (WLPA), 1972 based on scientific evidence that "such areas are required to be kept as inviolate for the purpose of tiger conservation, without affecting the rights of the Scheduled Tribes or such other forest dwellers". The notification of CTH is done by the state government in consultation with the expert committee constituted for the purpose.
- ▶ **Nagarjunsagar-Srisailam Tiger Reserve is the largest tiger reserve in India.** The reserve spreads over five districts, Kurnool District, Prakasam District, Guntur District, Nalgonda District and Mahbubnagar district. The total area of the tiger reserve is 3,728 km² (1,439 sq mi).

TIGER RESERVES OF INDIA



RAJASTHAN

1. Sariska (1978-79)
2. Ranthambore (1973-74)
3. Mukundra Hills (2013-14)
4. Ramgarh Vishdhari (2022)

MADHYA PRADESH

1. Kanha (1973-74)
2. Pench (1992-93)
3. Bandhavgarh (1993-94)
4. Panna (1994-95)
5. Satpura (1999-2000)
6. Sanjay Dubri (2008-09)

MAHARASHTRA

1. Nawegaon-Nagzira (2013-14)
2. Tadoba-Andhari (1993-94)
3. Pench (1998-99)
4. Melghat (1973-74)
5. Sahyadri (2009-10)
6. Bor (2014)

KARNATAKA

1. Biligiri Ranganatha Temple (2010-11)
2. Bhadra (1994-95)
3. Bandipur (1973-74)
4. Dandeli-Anshi (Kali) (2008-09)
2. Nagarhole (2008-09)

KERALA

1. Periyar (1978-79)
2. Parambikulam (2008-09)

UTTARAKHAND

1. Jim Corbett (1973-74)
2. Rajaji (2015)

UTTAR PRADESH

1. Dudhwa (1987-88)
2. Pilibhit (2014)
3. Amangarh (Buffer) 2012-2013
4. Ranipur (2022-2023)

Bihar

1. Valmiki (1989-90)

ODISHA

1. Satkosia (2008-09)
2. Similipal (1973-74)

TELANGANA

1. Kawal (2012-13)
2. Amrabad (2014)

ARUNACHAL PRADESH

1. Kamlang (2016)
2. Namdapha (1982-83)
3. Pakke (1999-2000)

ASSAM

1. Manas (1973-74)
2. Kaziranga (2008-09)
3. Nameri (1999-2000)
4. Orang (2016)

Mizoram

1. Dampa (1994-95)

Jharkhand

1. Palamau (1973-74)

WEST BENGAL

1. Sunderbans (1973-74)
2. Buxa (1982-83)

CHHATTISGARH

1. Indravati (1982-83)
2. Udanti-Sitanadi (2008-09)
3. Achanakmar (2008-09)

TAMILNADU

1. Mudumalai (2008-09)
2. Anamalai (2008-09)
3. Kalakad-Mundanthurai (1988-89)
4. Sathyamangalam (2013-14)
5. Srivilliputhur Megamalai (2020-2021)

Source:

<https://www.thehindu.com/news/national/nearly-3000-tigers-in-india-finds-census/article28744392.ece>

<https://www.hindustantimes.com/india-news/tiger-estimation-report-provides-glimpse-of-hope-for-human-animal-co-existence/story-Ej8dYMZLO4zXO7S3qEjYNI.html>



Motivation:

Status of Tigers, Co-predators, Prey and their Habitat, 2018' report was released.

2020

Which one of the following protected areas is well-known for the conservation of a sub-species of the Indian swamp deer (Barasingha) that thrives well on hard ground and is exclusively graminivorous?

- (a) Kanha National Park
- (b) Manas national Park
- (c) Mudumalai Wildlife Sanctuary
- (d) Tal Chhapar Wildlife Sanctuary

Answer A



Explanation:

- Barasingha also known as swamp deer is one of the largest species of deer found in India, known for its distinctive character of twelve tined stags. Today, Swamp deer or Barasingha are only found in the Kanha National Park of Madhya Pradesh, Kaziranga and Manas National Parks of Assam and a large population in Dudhwa National Park of Uttar Pradesh.
- Kanha Tiger Reserve has a significant population of Bengal tiger, Indian wild dog and barasingha deer in India. The park is the reintroduction site of barasingha and first tiger reserve in India to introduce Barasingha as an official mascot.
- There are three subspecies of swamp deer found in the Indian Subcontinent. The western swamp deer (*Rucervus duvaucelii*) found in Nepal, southern swamp deer (*Rucervus duvaucelii branderi*) found in central and north India and eastern swamp deer (*Rucervus duvaucelii ranjitsinhi*) found in the Kaziranga and Dudhwa National Parks. The southern swamp deer has hard hooves and is adapted to hard ground. The other two subspecies are adapted to swampy areas. **Hence option (a) is the correct answer.**



Source:

<https://www.downtoearth.org.in/news/wildlife-biodiversity/near-extinct-hard-ground-swamp-deer-see-revival-in-kanha-69603>



Motivation:

It was recently seen in the news.

2020

Question: Which of the following are the most likely places to find the musk deer in its natural habitat?

1. Askot Wildlife Sanctuary
2. Gangotri National Park
3. Kishanpur Wildlife Sanctuary
4. Manas National Park

Select the correct answer using the code given below:

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

Answer A



Explanation:

- Musk deer is a small compact deer belonging to the family Cervidae. A solitary shy animal, the musk deer lives in mountainous regions from Siberia to the Himalayas.
- **Askot Musk Deer Sanctuary** is located 54 km from Pithoragarh near the town of Askot in Uttarakhand. As the name suggests, the sanctuary has been set up **primarily for the conservation of musk deer** and its natural habitat.
- **Gangotri National Park** is a national park in Uttarkashi District of Uttarakhand in India. Various rare and endangered species like bharal or blue sheep, black bear, brown bear, Himalayan Monal, Himalayan Snowcock, Himalayan Tahr, **musk deer** and Snow leopard are found in the park. **Hence option (a) is the correct answer.**
- **The Kishanpur Wildlife Sanctuary** is a part of the Dudhwa Tiger Reserve near Mailani in Uttar Pradesh, India. It covers an area of 227 km² (88 sq mi) and was founded in 1972. The tiger, chital, hog deer, wild boars, otters, and many more animals find a home here.

► **Manas National Park or Manas Wildlife Sanctuary** is a national park, UNESCO Natural World Heritage site, a Project Tiger reserve, an elephant reserve and a biosphere reserve in Assam, India. Located in the Himalayan foothills, it is contiguous with the Royal Manas National Park in Bhutan.

(*Moschus leucogaster*) **HIMALAYAN MUSK DEER**

HABITAT
Alpine forests above 2,500 m and edges of alpine forests and meadows with a preference for steep slopes

Lifespan
10-14 years

Length
86-100 cm

Weight
11-18 kg

Height
50-60 cm

AKA
white-bellied musk deer, kasturi

COMMUNICATION THROUGH SMELL

- ▶ Communicate using latrines (defecation sites)
- ▶ Also use secretions (with strong odour) from the caudal gland

AGILE

- ▶ Can climb low trees to reach leaves and lichen
- ▶ Can leap 6 m in length

MUSK

- ▶ Males secrete a waxy substance called musk from a gland in the abdomen
- ▶ Males rub musk on surfaces to attract mates

BEHAVIOR

- ▶ Most active during the morning and evening
- ▶ Spend the day in dense vegetation
- ▶ Males are territorial and will fight other males, mostly during the mating season

GEOGRAPHIC RANGE
India (Himalayan range states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh); also, Pakistan, Nepal, Bhutan, China (bordering India & Bhutan)

CONSERVATION STATUS
Endangered on the IUCN Red List

THREATS

- ▶ Hunted for their highly prized musk pods (in males), used in making perfumes and medicine
- ▶ Intensive grazing by livestock drives musk deer away
- ▶ Loss of habitat to infrastructure projects

Source:

<https://forest.uk.gov.in/pages/view/160-gangotri-national-park>

Consider the following statements:

Once the Central Government notifies an area as a 'Community Reserve'

1. the Chief Wildlife Warden of the State becomes the governing authority of such forest
2. hunting is not allowed in such area
3. people of such area are allowed to collect non-timber forest produce
4. people of such area are allowed traditional agricultural practices

How many of the above statements are correct?

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

Answer C



Explanation:

- Conservation reserves and community reserves in India are terms denoting protected areas of India which typically act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved and protected forests of India. Such areas are designated as conservation areas if they are uninhabited and completely owned by the Government of India but used for subsistence by communities and community areas if part of the lands are privately owned.
- These protected area categories were first introduced in the Wildlife (Protection) Amendment Act of 2002 - the amendment to 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.
- The provisions of the WLPA apply to an area once it has been declared a community reserve. Section 33 of the WLPA passes the authority of the sanctuary to the chief wildlife warden. **Hence statement 1 is correct.**
- After a forest has been made into a community reserve, people cannot hunt there, nor can they use it for agricultural practices. **Hence statements 2 and 3 are correct and statement 4 is not correct.**

FORESTS

Community reserves: Are they forest department's backdoor entry into North East India

Provisions of Wild Life (Protection) Act apply to an area once it becomes a community reserve; it is also unclear as to which law will apply if forest land is used for development projects

By Shuchita Jha
Published: Friday 30 September 2022

Source:

Recently there was a proposal to translocate some of the lions from their habitat in Gujarat to which one of the following sites?

- (a) Corbett National Park
- (b) Kuno Palpur Wildlife Sanctuary
- (c) Mudumalai Wildlife Sanctuary
- (d) Sariska National Park

Answer **B**



Explanation:

- An environment ministry's expert committee approved Kuno Palpur in Madhya Pradesh as the second home for Asiatic lions found only in Gir national park. However, the Gujarat government will not share lions unless 33 studies as mandated by international wildlife watchdog IUCN is completed. **Hence option (b) is the correct answer.**

Source:

Environment ministry committee approved Kuno Palpur in Madhya Pradesh as second home for Asiatic lions

Neeraj Santoshi, Hindustan Times, Bhopal | By HT Correspondent

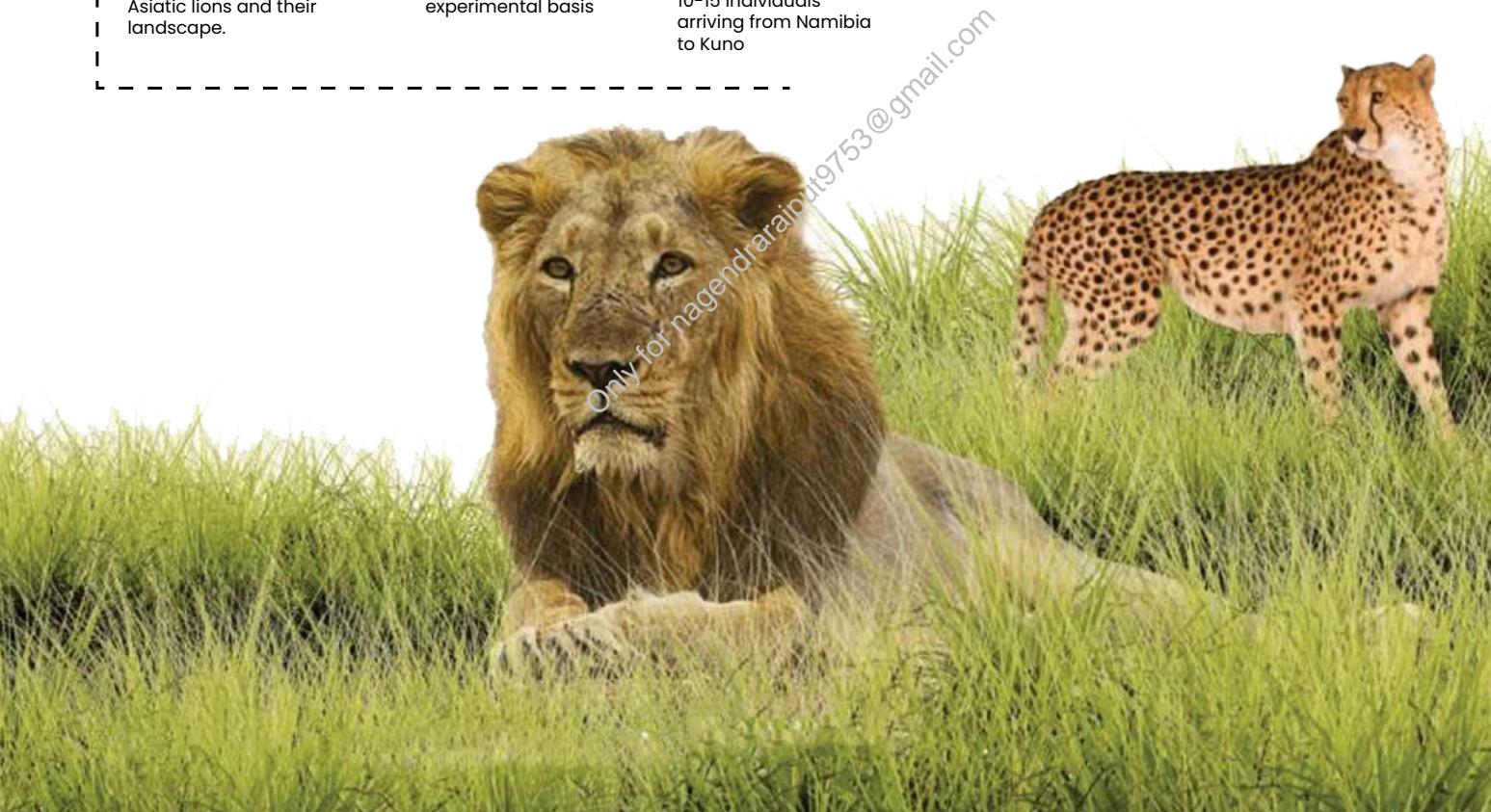
Mar 01, 2017 02:16 PM IST

The lion & Cheetah in India

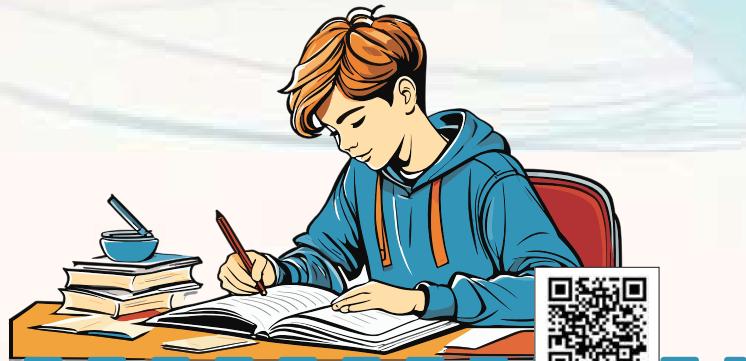
A Timeline



| | | | | | | | |
|------------------|--|-------------|--|------------------|---|------------------|---|
| 1878 | Nawab of Junagadh bans hunting of Asiatic lions in Junagadh" | 1947 | The last three recorded Asiatic cheetahs were shot in Surguja, in present-day Chhattisgarh | 1965 | The population increased to 11 individuals but later perished | 1957 | The first reintroduction of lions was attempted outside Gujarat in Chandraprabha, UP |
| 1956 | Executive Committee meeting of the Indian Board of Wildlife in Gir identifies the need for a second home for lions | 1952 | The cheetah was declared extinct in India | 1965 | Gir Forest declared as a Wildlife Sanctuary | 1986-1996 | Scientific study on Asiatic lions in Gir started by the Wildlife Institute of India (WII) |
| 1995-1996 | The first scientific proposal to move lions to Kuno National Park, Madhya Pradesh mooted by WII | 2018 | An outbreak of Canine Distemper Virus in eastern Gir killed 28 lions. | 2013 | The Supreme Court (SC) orders a stay on cheetah reintroduction | 1994 | 1000 African lions dead after Canine Distemper Virus" outbreak in Serengeti, Tanzania |
| 2009-2010 | Project is initiated by the Government of India: Kuno is selected as one of the sites for their reintroduction | | | 2013 | Supreme Court orders Gujarat govt to move lions to Kuno and forms an expert committee to supervise the relocation | | |
| 2020 | Project Lion is launched by Govt of India to conserve Asiatic lions and their landscape. | 2020 | SC allows cheetahs to be moved to India on an experimental basis | 2021-2022 | Cheetah reintroduction in Kuno going ahead with 10-15 individuals arriving from Namibia to Kuno | | |



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Conventions and Organizations

2017

Consider the following statements in respect of Trade Related Analysis of Fauna and Flora in Commerce (TRAFFIC):

1. TRAFFIC is a bureau under the United Nations Environment Programme (UNEP).
2. The mission of TRAFFIC is to ensure that trade in wild plants and animals is not a threat to the conservation of nature.

Which of the above statements is/are correct?

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

Answer B



Explanation:

- TRAFFIC, the wildlife trade monitoring network, is the leading non-governmental organization working globally on trade in wild animals and plants in the context of both biodiversity conservation and sustainable development. **Hence statement 2 is correct.**
- TRAFFIC was established in 1976 by IUCN and WWF to respond to the growing threats posed by illegal wildlife trade and overexploitation. It is not a bureau under UNEP. **Hence statement 1 is not correct.**
- Headquarters: Cambridge, United Kingdom
- TRAFFIC also works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- TRAFFIC operates as a Programme Division of WWF-India, based in New Delhi since 1991.

Source:

<http://www.traffic.org/traffic-programme>



Motivation:

Recent issues of wildlife poaching and organisations related.

2018

How is the National Green Tribunal (NGT) different from the Central Pollution Control Board (CPCB)?

1. The NGT has been established by an Act whereas the CPCB has been created by an executive order of the Government.
2. The NGT provides environmental justice and helps reduce the burden of litigation in the higher courts whereas the CPCB promotes cleanliness of streams and wells, and aims to improve the quality of air in the country.

Which of the statements given above is/are correct?

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

Answer B



Explanation:

- **The National Green Tribunal (NGT) is a statutory body that was established in 2010 by the National Green Tribunal Act.**
 - » It was set up to handle cases and speed up the cases related to environmental issues.
 - » The Tribunal shall not be bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided by principles of natural justice.
 - » **The Tribunal's dedicated jurisdiction in environmental matters shall provide speedy environmental justice and help reduce the burden of litigation in the higher courts.**
 - » The Tribunal is mandated to make an endeavour for disposal of applications or appeals finally within 6 months of filing the same. Initially, the NGT is proposed to be set up at five places of sittings and will follow circuit procedure for making itself more accessible. New Delhi is the Principal Place of Sitting of the Tribunal and Bhopal, Pune, Kolkata and Chennai shall be the other 4 places of sitting of the Tribunal.

» **NGT adjudicates matters relating to following Acts:**

- Environment (Protection) Act, 1986
- Air (Prevention and Control of Pollution) Act, 1974
- Water (Prevention and Control of Pollution) Act, 1974
- Biological Diversity Act, 2002
- Forest Conservation Act, 1980
- The Public Liability Insurance Act, 1991

» **The Central Pollution Control Board (CPCB), statutory organisation, was constituted in September, 1974 under the Water (Prevention and Control of Pollution) Act, 1974.** Further, CPCB was entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. **Hence statement 1 is not correct.**

- » It serves as a field formation and also provides technical services to the Ministry of Environment and Forests of the provisions of the Environment (Protection) Act, 1986.
- » Principal Functions of the CPCB, as spelt out in the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981,
 - **to promote cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution, and**
 - **to improve the quality of air and to prevent, control or abate air pollution in the country.**
Hence statement 2 is correct.

Source:

<http://envfor.nic.in/rules-regulations/national-green-tribunal-ngt>

<http://cpcb.nic.in/Introduction/>



Motivation:

NGT and CPCB were in news throughout the year due to various reasons.

With reference to the 'Global Alliance for Climate-Smart Agriculture (GACSA)', which of the following statements is/are correct?

1. GACSA is an outcome of the Climate Summit held in Paris in 2015.
2. Membership of GACSA does not create any binding obligations.
3. India was instrumental in the creation of GACSA.

Select the correct answer using the code given below:

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

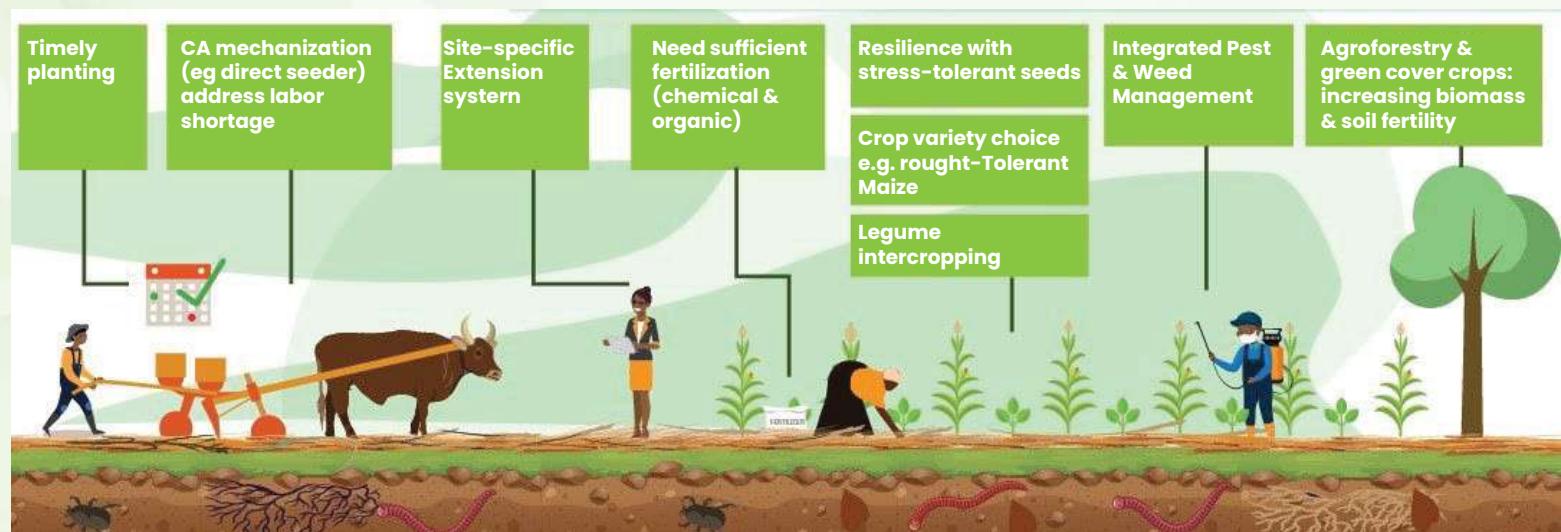
Answer B



Explanation:

The concept of Climate-Smart Agriculture (CSA) was originally developed by FAO and officially presented at the Hague Conference on Agriculture, Food Security and Climate Change in 2010, through the paper "Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation". **Hence statement 1 is not correct.**

They have been established based on bottom-up, inclusive, independent and **voluntary processes**, with specific objectives, functioning and institutional setting. The emergence of CSA alliances and platforms worldwide is a positive and strong signal to the international community on the willingness of all stakeholders, at various levels of action, to tackle the climate challenges in the agricultural sectors, based on joint efforts and context-specific approaches. India (only a signatory) was not involved in the creation of it. **Hence statement 2 is correct and statement 3 is not correct**



Source:

<http://sdg.iisd.org/news/gacsa-annual-forum-focuses-on-collective-action-for-climate-smart-agriculture/>

<http://www.downtoearth.org.in/blog/climate-smart-agriculture-proposed-at-cop-raises-many-concerns-56358>



Motivation:

GACSA Annual Forum Focuses on Collective Action for Climate-Smart Agriculture- 21 December 2017: Participants at the Second Annual Forum of the Global Alliance for Climate-Smart Agriculture (GACSA) discussed how multi-stakeholder efforts can promote the implementation of climate-smart agriculture (CSA) practices and systems that address the implications of climate change in diverse agro-ecological regions.

2018

The Partnership for Action on Green Economy (PAGE), a UN mechanism to assist countries transition towards greener and more inclusive economies, emerged at

- (a) The Earth Summit on Sustainable Development 2002, Johannesburg
- (b) The United Nations Conference on Sustainable Development 2012, Rio de Janeiro
- (c) The United Nations Framework Convention on Climate Change 2015, Paris
- (d) The World Sustainable Development Summit 2016, New Delhi

Answer B



Explanation:

The Partnership for Action on Green Economy (PAGE) was launched in 2013 as a response to the call at Rio+20 to support those countries wishing to embark on greener and more inclusive growth trajectories.

PAGE seeks to put sustainability at the heart of economic policies and practices to advance the 2030 Agenda for Sustainable Development and supports nations and regions in reframing economic policies and practices around sustainability to foster economic growth, create income and jobs, reduce poverty and inequality, and strengthen the ecological foundations of their economies.

PAGE brings together five UN agencies – UN Environment, International Labour Organization, UN Development Programme, UN Industrial Development Organization, and UN Institute for Training and Research – whose mandates, expertises and networks combined can offer integrated and holistic support to countries on inclusive green economy, ensuring coherence and avoiding duplication. **Hence option (b) is the correct answer.**

Consider the following statements:

1. The Global Ocean Commission grants licences for seabed exploration and mining in international waters.
2. India has received licences for seabed mineral exploration in international waters.
3. 'Rare earth minerals' are present on seafloor in international waters.

Which of the statements given above are correct?

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

Answer **B**



Explanation:

The Global Ocean Commission was an international initiative between 2013 and 2016 to raise awareness, and promote action to address, the degradation of the ocean and help restore it to full health and productivity. Licences for seabed exploration and mining in international waters are granted by International Seabed Authority (ISA). **Hence statement 1 is not correct.**

India has been exploring deep sea for minerals since 1981. In 2017, India's exclusive rights to explore polymetallic nodules from seabed in Central Indian Ocean Basin (CIOB) have been extended by five years. **Hence statement 2 is correct.**

The deep seabed contains two potential sources for rare earth elements: polymetallic nodules which typically contain manganese, nickel, copper, cobalt and rare earth minerals; and seafloor hydrothermal vents which pump out rare-earth elements dissolved in their hot fluids. **Hence statement 3 is correct.**

Source:

<https://www.firstpost.com/india/explained-india-launches-deep-ocean-mission-what-is-seabed-mining-and-its-challenges-9789581.html>

<https://www.thehindu.com/sci-tech/science/why-is-india-pulled-to-deep-sea-mining/article28809029.ece>



Motivation:

Recently India has launched Deep Ocean Mission.

In the context of WHO Air Quality Guidelines, consider the following statements :

1. The 24-hour mean of PM 2.5 should not exceed $15 \mu\text{g}/\text{m}^3$ and annual mean of PM2.5 should not exceed $5 \mu\text{g}/\text{m}^3$.
2. In a year, the highest levels of ozone pollution occur during the periods of inclement weather.
3. PM10 can penetrate the lung barrier and enter the bloodstream.
4. Excessive ozone in the air can trigger asthma.

Which of the statements given above are correct ?

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

Answer B



Explanation:

Statement 1 is correct: According to the guidelines, The annual average for PM2.5 should not exceed 5 micrograms per cubic metre of air, while the 24-hour average should not exceed 15 micrograms per cubic metre.

Statement 2 is not correct: Ozone at ground level is one of the major constituents of photochemical smog. It is formed by the reaction with sunlight (photochemical reaction) of pollutants such as nitrogen oxides (NOx) from vehicle and industry emissions and volatile organic compounds (VOCs) emitted by vehicles, solvents and industry. As a result, the highest levels of ozone pollution occur during periods of sunny weather. (Inclement weather is unpleasant, especially with cold wind and rain.)

Statement 3 is not correct: While particles with a diameter of 10 microns or less, ($\leq \text{PM10}$) can penetrate and lodge deep inside the lungs, the even more health-damaging particles are those with a diameter of 2.5 microns or less, ($\leq \text{PM2.5}$). PM2.5 can penetrate the lung barrier and enter the blood system.

Statement 4 is correct: Excessive ozone in the air can have a marked effect on human health. It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases."

Source:

<https://www.thehindu.com/sci-tech/health/who-tightens-global-air-quality-norms/article36617490.ece>



Motivation:

The World Health Organisation (WHO) in its first-ever update since 2005 tightened global air pollution standards in Sep, 2021

Elimination technique

Fomation of ground level ozone may require sunlight and inclemet weather with heavy rains may not be a suitable condition for its formation. Thus option 2 can be eliminated.



In Mains 2021 UPSC asked the following question on the exact same theme

Q. Describe the key points of the revised Global Air Quality Guidelines (AQGs) recently released by the World Health Organisation (WHO). How are these different from its last update in 2005? What changes in India's National Clean Air Programme are required to achieve revised standards?

2023

Invasive species Specialist Group' (that develops Global Invasive Species Database) belongs to which one of the following organizations?

- (a) The International Union for Conservation of Nature
- (b) The United Nations Environment Programme
- (c) The United Nations World Commission for Environment and Development.
- (d) The World Wide Fund for Nature

Answer A



Explanation:

The Invasive Species Specialist Group (ISSG) is a global network of scientific and policy experts on invasive species, organized under the auspices of the Species Survival Commission (SSC) of the International Union for Conservation of Nature (IUCN). **Hence option (a) is the correct answer.**



Source:

<https://www.newindianexpress.com/states/tamil-nadu/2022/Oct/02/tamil-nadu-corals-in-chokehold-of-exotic-seaweed-2504390.html>

<http://www.iucngisd.org/gisd/about.php>



Motivation:

The Invasive Species Specialist Group of IUCN had described the exotic sea weed Kappaphycus as "destructive invasive species and poses a serious danger to the coral reefs". This sea weed was cultivated in Tamil Nadu

2017

With reference to the role of UN-Habitat in the United Nations Programme working towards a better urban future, which of the statements is/are correct?

1. UN-Habitat has been mandated by the United Nations General Assembly to promote socially and environmentally sustainable towns and cities to provide adequate shelter for all.
2. Its partners are either governments or local urban authorities only.
3. UN-Habitat contributed to the overall objective of the United Nations system to reduce poverty and to promote access to safe drinking water and basic sanitation.

Select the correct answer using the code given below:

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

Answer B



Explanation:

Statement 1 is correct: UN-Habitat is the United Nations programme working towards a better urban future. Its mission is to promote socially and environmentally sustainable human settlements development and the achievement of adequate shelter for all. Statement 1 is correct.

Statement 2 is not correct: It partners with a range of organizations in its endeavour. For example, governments, local authorities, NGOs, Trade unions, professionals, Academics and Researchers, Human Solidarity Groups, Indigenous People, Private Sector, Foundations, Financial Institutions.

Statement 3 is correct: In the absence of effective urban planning, the consequences of this rapid urbanization can lead to lack of proper housing and growth of slums, inadequate and outdated infrastructure – be it roads, public transport, water, sanitation, or electricity – escalating poverty and unemployment, safety and crime problems, pollution and health issues. UN-Habitat contributes to the overall objective of a sustainable urbanization."

Source:

<http://www.thehindu.com/news/national/india-elected-president-of-un-habitat/article18413884.ece>

<http://www.thehindu.com/opinion/editorial/Making-cities-inclusive/article16079545.ece> <https://unhabitat.org/about-us/un-habitat-at-a-glance/>



Motivation:

It was in news due to two factors: 1. In October 2016, at the UN Conference on Housing and Sustainable Urban Development – Habitat III – member states signed the New Urban Agenda. This conference happens once in 20 years. 2. In May 2017, India was elected as the president of the UN-Habitat. On behalf of India, Housing and Urban Poverty Alleviation Minister will preside over the meetings of UN-Habitat.

2021

'R2 Code of Practices' constitutes a tool available for promoting the adoption of

- (a) environmentally responsible practices in electronics recycling industry
- (b) ecological management of 'Wetlands of International Importance' under the Ramsar Convention
- (c) sustainable practices in the cultivation of agricultural crops in degraded lands.
- (d) 'Environmental Impact Assessment' in the exploitation of natural resources

Answer A



Explanation:

R2 stands for Responsible Recycling and is a standard specifically created for the electronics recycling industry by Sustainable Electronics Recycling International (SERI). **Hence, option (a) is the correct answer.**

SERI is the housing body and ANSI-accredited Standards Development Organization for the R2 Standard: Responsible Recycling Practices for Use in Accredited Certifications Programs.

Stakeholders who contributed to the creation of these standards include the U.S. Environmental Protection Agency (the EPA was responsible for a study of the implementation of the R2 standards); regulators from state agencies; electronics recyclers, refurbishers, and their trade associations; OEMs/customers of electronics recycling services; and non-governmental organizations.

Source:

<https://www.trustcobalt.com/articles/what-is-r2-certification-and-why-is-it-important/>



Motivation:

Recently SERI (Sustainable Electronics Recycling International), Minnesota, has launched the latest R2 Standard for electronics reuse and recycling, R2v3

2021

Consider the following statements:

Statement 1:

The United Nations Capital Development Fund (UNCDF) and the Arbor Day Foundation have recently recognized Hyderabad as 2020 Tree City of the World.

Statement 2:

Hyderabad was selected for the recognition for a year following its commitment to grow and maintain the urban forests.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement 1 and Statement 2 are correct and Statement 2 is the correct explanation for Statement 1
- (b) Both Statement 1 and Statement 2 are correct but Statement 2 is not the correct explanation for Statement 1
- (c) Statement 1 is correct but Statement 2 is not correct
- (d) Statement 1 is not correct but Statement 2 is correct

Answer D



Explanation:

Statement 1 is not correct and statement 2 is correct: Hyderabad is the only city from India to have been recognised as a 2020 Tree City of the World by the Arbor Day Foundation and the Food and Agriculture Organization (FAO) for its commitment to growing and maintaining urban forests.

Source:

<https://www.thehindubusinessline.com/news/hyderabad-a-tree-city-of-the-world/article33874032.ece>

Consider the following statement :

1. Recently, all the countries of the United Nations have adopted the first-ever compact for international migration, the 'Global Compact for Safe, Orderly and Regular Migration (GCM)'.
2. The Objectives and commitments stated in the GCM are binding on the UN member countries.
3. The GCM addresses internal migration or internally displaced people also in its objectives and commitments.

How many of the above statements are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer D

"The Global Compact for Safe, Orderly and Regular Migration is the first intergovernmental agreement, adopted under the auspices of the United Nations, to cover all dimensions of international migration in a holistic and comprehensive manner. It was adopted at an intergovernmental conference on migration in Marrakesh, Morocco, on 10 December 2018. At the ceremony to adopt the text on 10 December, only 163 countries formally adopted it. Further, countries like Austria were critical of it and refrained to adopt it in 2018. **Hence statement 1 is not correct.**

The Global Compact for Migration is the first-ever UN global agreement on a common approach to international migration in all its dimensions. The global compact is non-legally binding. **Hence, statement 2 is not correct.**

The Global Compact enumerates 23 objectives for State action, bolstered by specific commitments, that seek to address challenges related to today's migration. The GCM commitments and actions can be seen as a guide for States to meet their human rights obligations when designing migration governance measures to reduce the risks and vulnerabilities migrants face at different stages of migration and to create conducive conditions that empower all migrants to become active members of society. **Key commitments include:**

- » Strengthening evidence-based and human rights-based policy-making and public discourse on migration;
- » Minimizing the adverse drivers of migration, including combatting poverty and discrimination and addressing climate and disaster-related displacement;
- » Ensuring migrants' rights to information and to a legal identity;
- » Expanding and diversifying availability of pathways for safe, orderly and regular migration, taking into account the particular needs of migrants in situations of vulnerability;
- » Protecting the right to decent work and other labour rights for migrants;

- » Addressing and reducing vulnerabilities and human rights violations in the context of migration;
- » Protecting the right to life in the context of migration;
- » Combatting smuggling and trafficking while protecting the human rights of those who have been smuggled or trafficked;
- » Respecting human rights at borders and conducting human rights-based and individualized screening, assessment and referral of migrants;
- » Protecting the right to liberty and freedom from arbitrary detention, including by prioritizing alternatives to immigration detention;
- » Ensuring migrants' rights to access basic services, including health, education, and social support, without discrimination;
- » Eliminating discrimination and combatting hate speech and xenophobia;
- » Upholding the prohibitions of collective expulsion and refoulement for all migrants, ensuring that returns are safe and dignified and reintegration is sustainable. **Hence statement 3 is not correct.**

Hence option (d) is the correct answer.

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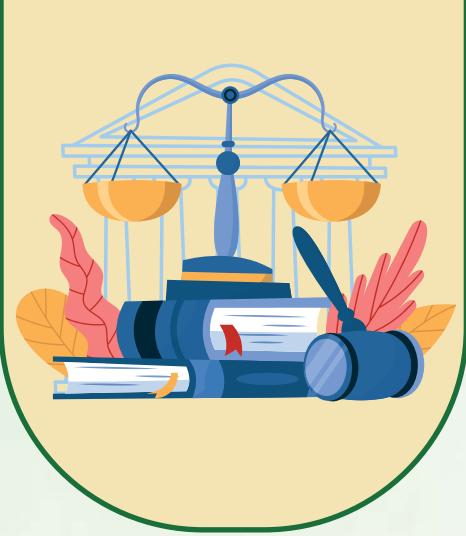
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Laws & Policies

2017

The term 'M-STIPES' is sometimes seen in the news in the context of

- (a) Captive breeding of Wild Fauna
- (b) Maintenance of Tiger Reserves
- (c) Indigenous Satellite Navigation System
- (d) Security of National Highways

Answer B



Explanation:

- **Monitoring System for Tigers: Intensive Protection and Ecological Status (M-STIPES)** is a software monitoring system launched by the Indian Government in 2010 in some tiger reserves to reduce vulnerability of Tigers. **Hence option (b) is the correct answer.**
- The MStIPES program uses **Global Positioning System (GPS), General Packet Radio Services (GPRS), and remote sensing**, to collect information from the field, create a database using modern Information Technology (IT) based tools, analyses the information using GIS and statistical tools to provide inferences that allow tiger reserve managers to better manage their wildlife resources.

Source:

<http://www.newindianexpress.com/states/odisha/2017/feb/08/m-stripes-to-monitor-str-from-april-1568257.html>

<http://timesofindia.indiatimes.com/city/dehradun/mobile-app-to-monitor-tiger-reserves-launched/articleshow/56896945.cms>



Motivation:

Official launch of M-STIPES (Monitoring System For Tigers-Intensive Protection and Ecological Status) software-enabled mobile app at Corbett Tiger Reserve.



Tiger Census 2022

**ONCE
EVERY 4YR**

The national tiger census is conducted once every four years

The National Tiger Conservation Authority (NTCA) conducts tiger censuses in partnership with state forest departments, conservation NGOs, and the Wildlife Institute of India (WII).



The tiger population in India grew by 200 from 2018 to 2022, according to the fifth cycle of the All India Tiger Estimation (2022) released recently.

75%

India hosts some 75% of the global tiger population living in forests

The Nationwide tiger census was earlier held in

2006, 2010, 2014, & 2018.

Key findings of All India Tiger Estimation (2022):

The tiger population in India grew by 200 from 2018 to 2022

The tiger population has grown the most in the Shivalik hills and Gangetic flood plains, followed by central India, the northeastern hills, plains, and the Sundarbans.

Western Ghat: it showed a significant decline in numbers, from 981 in 2018 to 824 in 2022

The local tiger population has become extinct in several areas including Sri Venkateswara National Park, Tiger Reserves like Kaval, Satkosia, and Sahyadri.

Shivalik: the number of tigers has increased to 804 from 646 in 2018.

Northeastern landscape: increased to 219 from 194 in 2018

Sunderbans: increased to 100 from 88 in 2018

Central Indian landscape: increased to 1,161 from 1,033 in 2018.

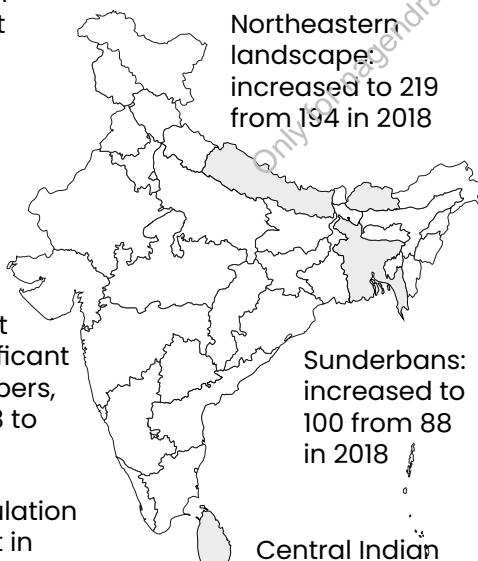
Although the tiger populations in the Periyar landscape remained stable, the tiger occupancy has declined outside Periyar.

3,080 tigers were photographed in 2022, compared with 2,461 captured on camera in 2018

Decline in tiger occupancy was also observed outside the protected areas of the Anamalai-Parambikulam complex.

Tiger occupancy in Jharkhand, Odisha, Chhattisgarh and Telangana showed a decline.

However, most tiger reserves in India are like "tiny islands of conservation" and unsustainable land use outside the protected zones could lead to localised extinction in some parts of central India.



In India, 'extended producer responsibility' was introduced as an important feature in which of the following?

- (a) The Bio-medical Waste (Management and Handling) Rules, 1998
- (b) The Recycled Plastic (Manufacturing and Usage) Rules, 1999
- (c) The e-Waste (Management and Handling) Rules, 2011
- (d) The Food Safety and Standard Regulations, 2011

Answer C



Explanation:

"Extended producer's responsibility (EPR) is the main feature of the E-waste (Management and Handling) Rules, 2011, wherein the producer of electrical and electronic equipment has the responsibility of managing such equipment after its 'end of life', thus the producer is responsible for their products once the consumer discards them.

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/what-about-e-waste/article24193081.ece>

<https://www.downtoearth.org.in/news/waste/report-on-e-waste-management-places-5-companies-in-the-red-63317>



Motivation:

The term EPR is frequently seen in news.

Elimination technique

UPSC has attempted to confuse students as the concept of EPR was also introduced in the Plastic Waste (Management and Handling) Rules, 2016.

However, option(b) mentions The Recycled Plastic (Manufacturing and Usage) Rules, 1999. Therefore the correct answer is E-waste (Management and Handling) Rules, 2011, in which Extended producer's responsibility (EPR) was also the main feature."

Consider the following statements:

The Environment Protection Act, 1986 empowers the Government of India to

1. State the requirement of public participation in the process of environmental protection, and the procedure and manner in which it is sought
2. Lay down the standards for emission or discharge of environmental pollutants from various sources

Which of the statements given above is/are correct?

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

Answer B

Source:

"<http://extwprlegs1.fao.org/docs/pdf/ind4656.pdf>



Motivation:

The Environment Protection Act-1986 is frequently seen in news.

As per the Solid Waste Management Rules, 2016 in India, which one of the following statements is correct?

- (a) Waste generator has to segregate waste five categories.
- (b) The Rules are applicable to notified urban local bodies, notified towns and all industrial townships only.
- (c) The Rules provide for exact and elaborate criteria for the identification of sites for landfills and waste processing facilities.
- (d) It is mandatory the part of waste generator that the waste generated in one district cannot be moved to another district."

Answer C



Explanation:

The SWM Rules 2016 provide for detailed criteria for setting up solid waste processing and treatment facility, solid waste management in hilly areas, for waste to energy process, for Sanitary Landfills, for site selection, development of facilities at the sanitary landfills, specifications for land filling operations and closure on completion of landfilling, pollution prevention, Closure and Rehabilitation of Old Dumps etc.

Source:

<http://pib.nic.in/newsite/PrintRelease.aspx?relid=138591>



Motivation:

For major Acts and Rules, it is expected to know the associated detailed guidelines and how they have been an improvement over previous rules.

2019

Consider the following statements:

1. Under Ramsar Convention, it is mandatory on the part of the Government of India to protect and conserve all the wetlands in the territory of India.
2. The Wetlands (Conservation and Management) Rules, 2010 were framed by the Government of India based on the recommendation of Ramsar Convention.
3. The Wetlands (Conservation and Management) Rules, 2010 also encompass the drainage area or catchment regions of the wetlands as determined by the authority.

Which of the statements given above is/are correct?

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

Answer C



Explanation:

Statement 1 is not correct: Article 4 of the Ramsar Convention states that "Each Contracting Party shall promote the conservation of wetlands and waterfowl by establishing nature reserves on wetlands, whether they are included in the List or not, and provide adequately for their wandering."

It is not mandatory on the part of the Government of India to protect and conserve all the wetlands in the territory of India.

Statement 2 is correct: Article 3 of the Ramsar Convention states that "The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory."

Statement 3 is correct: As per Wetlands (Conservation and Management) Rules, 2010, a "wetland" means an area or of marsh, fen, peatland or water; natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres and includes all inland waters such as lakes, reservoir, tanks, backwaters, lagoon, creeks, estuaries and manmade wetland and the zone of direct influence on wetlands that is to say the drainage area or catchment region of the wetlands as determined by the authority.

Source:

https://www.ramsar.org/sites/default/files/documents/library/scan_certified_e.pdf

2020

If a particular plant species is placed under Schedule VI of The Wildlife Protection Act, 1972, what is the implication?

- (a) A license is required to cultivate that plant.
- (b) Such a plant cannot be cultivated under any circumstances.
- (c) It is Genetically Modified crop plant.
- (d) Such a plant is invasive and harmful to the ecosystem.

Answer A



Explanation:

Option (a) is the correct answer: There are six schedules under the Wildlife Protection Act, 1972. The specified endemic plants in Schedule VI are prohibited from cultivation and planting. The hunting to the Enforcement authorities have the power to compound offences under this Schedule (i.e. they impose fines on the offenders).

The wildlife Protection Act defines ""specified plant"" as any plant specified in Schedule VI.

It further states that ""Cultivation of specified plants without license prohibited. - (1) no person shall cultivate a specified plant except under, and in accordance with a license granted by the Chief Wildlife Warden or any other officer authorized by the State Government in this behalf; 2) Every license granted under this section shall specify the area in which and the conditions, if any, subject to which the licensee shall cultivate a specified plant."

Source:

"THE WILD LIFE (PROTECTION) ACT, 1972

[http://legislative.gov.in/sites/default/files/A1972-53_0.pdf"](http://legislative.gov.in/sites/default/files/A1972-53_0.pdf)



Motivation:

Frequently seen in news. It is also the only schedule which includes plants under the Wildlife Protection Act. However now the act has been amended.

2020

Consider the following statements:

1. 36% of India's districts are classified as ""overexploited"" or ""critical"" by the Central Ground Water Authority (CGWA).
2. CGWA was formed under the Environment (Protection) Act.
3. India has the largest area under groundwater irrigation in the world.

Which of the statements given above is/are correct?

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

Answer B



Explanation:

To effectively regulate the groundwater extraction, the Centre, following the NGT's directions, has divided areas with declining water tables in three categories: Overexploited, Critical, Semi-critical. Areas with an extraction rate of 70-100% of groundwater recharge. Two hundred and fifty six of our approximately 700 districts have groundwater levels which are "critical" or "over-exploited" as per the latest data from the Central Ground Water Board (2017). (Approx 36%)

Statement 2 is correct: Central Ground Water Authority (CGWA) was constituted under sub-section (3) of Section 3 of the Environment (Protection) Act, 1986 for the purposes of regulation and control of ground water development and management in the country.

Statement 3 is correct: At 39 million hectares (67% of its total irrigation), India has the world's largest groundwater well equipped irrigation system (China with 19 mha is second, USA with 17 mha is third). India, Pakistan, and Bangladesh are, respectively, the first, fourth and sixth largest users of groundwater globally. India pumps more than the US and China combined - the second and third-largest users, respectively.

Source:

<https://science.thewire.in/environment/india-groundwater-extraction-replenishment-ngt-cgwa-industrial-growth-sustainability/>

<https://indianexpress.com/article/opinion/columns/the-respect-she-deserves-water-crisis-6236859/>



Motivation:

Ground water and its related bodies are frequently asked by UPSC

2022

Which one of the following has been constituted under the Environment (Protection) Act, 1986?

- (a) Central Water Commission
- (b) Central Ground Water Board
- (c) Central Ground Water Authority
- (d) National Water Development Agency

Answer C



Explanation:

Central Ground Water Authority (CGWA) was constituted under sub-section (3) of Section 3 of the Environment (Protection) Act, 1986 for the purposes of regulation and control of ground water development and management in the country.

Source:

<https://cgwa.mowr.gov.in/AboutUs.html>

With reference to Indian laws about wildlife protection, consider the following statements:

1. Wild animals are the sole property of the government.
2. When a wild animal is declared protected, such animal is entitled for equal protection whether it is found in protected areas or outside.
3. Apprehension of a protected wild animal becoming a danger to human life is sufficient ground for its capture or killing.

Which of the statements given above is/are correct?

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

Answer B



Explanation:

Statement 1 is correct: The Wild Life (Protection) Act, 1972 mentions that every wild animal, other than vermin, which is hunted shall be the property of the State Government, and, where such animal is hunted in a sanctuary or National Park declared by the Central Government, such animal or any animal article shall be the property of the Central Government. In a significant verdict in 2012, the Bombay High Court has ruled that wild animals including tiger should be treated as ““government property for all purposes””.

Statement 2 is correct: The law governing the subject of wildlife, the Wildlife (Protection) Act, 1972, does not discriminate between animals found in protected areas and outside. It provides for equal protection for wild animals irrespective of where they are found. The WLPA prohibits people from hunting wildlife, provides legal safeguards for different species based on their threat status, regulates trade and commerce in wild species, imposes penalties for wildlife-related crimes and specifies the terms to declare protected areas.

Statement 3 is not correct: Only if the wild animal becomes a danger to human life or is diseased or disabled beyond recovery can it be allowed to be captured or killed by the competent authority, the Chief Wildlife Warden of the State. This provision is applicable to wild animals listed in Schedule I of the Wildlife (Protection) Act, 1972, which includes leopards. Mere apprehension or fear that a wild animal could endanger human life is not a ground for capture or killing.

Elimination technique

Mere apprehension may not be a sufficient condition. It may be considered as dangerous if there is human casualty. Hence option 3 may be eliminated.

Consider the following statements :

1. In India, the Biodiversity Management committees are key to the realization of the objectives of Nagoya Protocol.
2. The Biodiversity Management committees have important functions in determining access and benefit sharing, including the power to levy collection fees on the access of biological resources within its jurisdiction.

Which of the statements given above is/are correct?

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

Answer C



Explanation:

Statement 1 is correct: Under Section 41(1) of the Biological Diversity Act, 2002, every local body in the State shall constitute a Biodiversity Management Committee within its area of jurisdiction for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties & cultivars, domesticated stocks and breeds of animals and micro-organisms and chronicling of knowledge relating to biological diversity.

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, also known as the Nagoya Protocol on Access and Benefit Sharing is a 2010 supplementary agreement to the 1992 Convention on Biological Diversity. It aims to share the benefits that arise from the utilization of genetic resources fairly and equitably thus BMCs have important role to play in the implementation of the provisions of the Nagoya Protocol.

Statement 2 is correct: The main function of the BMC is to prepare People's Biodiversity Register (PBR) in consultation with local people. The Register shall contain comprehensive information on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with them. The BMC may levy charges by way of collection fees from any person for accessing or collecting any biological resource for commercial purposes from areas falling within its territorial jurisdiction.



Motivation:

Implementation of International conventions is an important theme.

Consider the following statements:

1. The definition of "Critical Wildlife Habitat" is incorporated in the Forest Rights Act, 2006.
2. For the first time in India, Baigas have been given Habitat Rights.
3. Union Ministry of Environment, Forest and Climate Change officially decides and declares Habitat Rights for Primitive and Vulnerable Tribal Groups in any part of India.

Which of the statements given above is/are correct?

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

Answer A



Explanation:

Statement 1 is correct: The phrase 'critical wildlife habitat' is defined only in the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

Statement 2 is correct: In a bid to undo historical injustice meted out to primitive tribal communities living in central India, the government of Madhya Pradesh, for the first time, recognised the habitat rights of seven villages in Dindori district, mostly inhabited by the Baigas.

Statement 3 is not correct: Under the act the District Level Committee shall ensure that all Particularly Vulnerable Tribal Groups receive habitat rights, in consultation with the concerned traditional institutions of Particularly Vulnerable Tribal Groups and their claims for habitat rights are filed before the concerned Gram Sabhas."

Source:

<http://pib.nic.in/newsite/PrintRelease.aspx?relid=69806>

<http://www.downtoearth.org.in/news/baiga-tribals-become-india-s-first-community-to-get-habitat-rights-52452> EN "Critical Wildlife Habitat guidelines were issued

<http://www.downtoearth.org.in/news/critical-wildlife-habitat-guidelines-issued-ntca-order-superseded-59934>

Elimination technique

Rights of forest tribes and other traditional forest dwellers are granted under FRA 2006 which is under Ministry of Tribal Affairs. Hence option 3 may be eliminated

Which one of the following statements best describes the 'Polar Code'?

- It is the international code of safety for ships operating in polar waters.
- It is the agreement of the countries around the North Pole regarding the demarcation of their territories in the polar region.
- It is a set of norms to be followed by the countries whose scientists undertake research studies in the North Pole and South Pole.
- It is a trade and security agreement of the member countries of the Arctic Council.

Answer A



Explanation:

The International Code for Ships Operating in Polar Waters or Polar Code is an international regime adopted by the International Maritime Organization in 2014. The Code sets out regulations for shipping in the polar regions, principally relating to ice navigation and ship design.

POLAR CODE LIMITATIONS

The WWF Arctic Programme is calling on Arctic nations to address gaps in the Polar Code to protect ships, crews, and the pristine waters that unique Arctic ecosystems depend on. Right now, the Polar Code:

- Does not address air pollution
- Does not clearly state who is responsible for making sure ships obtain polar ship certificates
- Is neither strong enough nor clear enough about the tools and data needed for safe navigation in polar waters
- Allows ships without ice-strengthening to operate in first-year ice, increasing the risk of accidents
- Does not apply to fishing vessels, including accident-prone smaller boats
- Excludes a large area of the Arctic where there is seasonal ice, putting ships at risk
- Does not address grey water and underwater noise generated by ships

Source:

<https://www.imo.org/en/OurWork/Safety/Pages/polar-code.aspx>

<https://indianexpress.com/article/india/india-arctic-policy-climate-change-mineral-resources-7825518/>



Motivation:

India recently unveiled its Arctic policy.

2017

In India, if a species of tortoise is declared protected under Schedule I of the Wildlife (Protection) Act, 1972, what does it imply?

- (a) It enjoys the same level of protection as the tiger.
- (b) It no longer exists in the wild, a few individuals are under captive protection; and not it is impossible to prevent its extinction.
- (c) It is endemic to a particular region of India.
- (d) Both (b) and (c) stated above are correct in this context.

Answer A



Explanation:

- The Act provides for the protection of wild animals, birds and plants; and for matters connected therewith or ancillary or incidental thereto. It extends to the whole of India, except the State of Jammu and Kashmir which has its own wildlife act.
- It has six schedules which give varying degrees of protection.
- Schedule I and part II of Schedule II provide absolute protection - offences under these are prescribed the highest penalties.
- Species listed in Schedule III and Schedule IV are also protected, but the penalties are much lower.
- Schedule V includes the animals which may be hunted.

Source:

NCERT: Contemporary India - II , Chapter -2 Forest and Wildlife Resources.



Motivation:

Schedule I of the Wildlife (Protection) Act, 1972 is often seen in the news.

2017

According to the Wildlife (Protection) Act, 1972, which of the following animals cannot be hunted by any person except under some provisions provided by law?

1. Gharial
2. Indian wild ass
3. Wild buffalo

Select the correct answer using the code given below:

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

Answer D

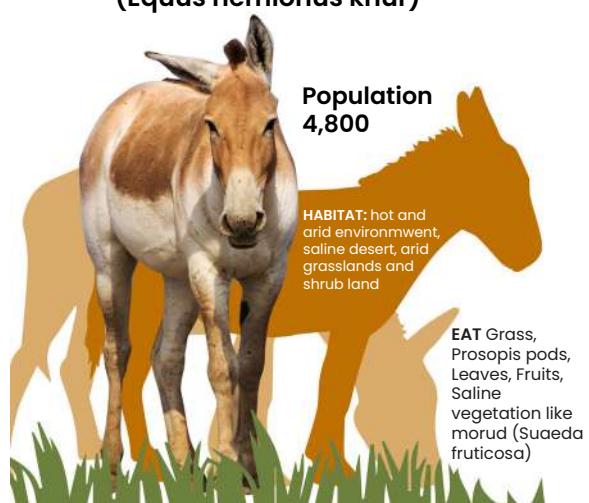


Explanation:

► Gharial (*Gravialis gangeticus*), Indian Wild Ass (*Equus hemionus khur*) and Wild Buffalo (*Bubalus bubalis*) are all mentioned under Schedule I for the Wildlife (Protection) Act, 1972. Species listed under Schedule I can not be hunted. Hence option (d) is the correct answer.

Indian Wild Ass

(*Equus hemionus khur*)



GHUDKHUR, khur, Indian onager, GHOR KHUR

GEOGRAPHIC RANGE: mainly in Gujarat in the Indian Wild Ass Sanctuary in the Little Rann of Kutch, also in Greater Rann of Kutch and bordering districts in Rajasthan



Run

70-80 kmph is the speed it can reach. One of the fastest Indian mammals.

HERD

- Group size varies widely through the year
- Family groups consist of breeding females, foals, yearlings and sub-adult males
- Stallions are either solitary or live in small male groups
- Dominant males defend territories throughout the year

WATER

- Need to drink water at least once a day
- Proximity to water determines how wild asses use their landscape

BABIES

- Mares give birth to one foal who is weaned at 1-2 years
- The female-foal bond is the strongest in the group

PROTECTION STATUS: NEAR THREATENED ON THE IUCN RED LIST

THREATS - Proliferation of the invasive and alien plant *Prosopis juliflora* that alters native habitat
 • Roads and infrastructure projects
 • Susceptibility to diseases

(BUBALUS ARNEE) ASIATIC WILD BUFFALO or

WILD WATER BUFFALO

Among the largest members of the cattle family—second only to gaur (*Bos gaurus*)

THOUGHT TO BE THE ANCESTOR OF THE WATER BUFFALO

CAN WEIGH BETWEEN 800-1200 KG

CLASSIFIED AS "ENDANGERED" IN THE IUCN RED LIST

ONLY 3,400 LEFT, OF WHICH 3,100 ARE IN INDIA

Main threats are interbreeding with domestic cousins, loss of habitat, and transmission of diseases from domestic livestock



Kaziranga National Park and Manas National Park in Assam are the best places to see them

A small, isolated population exists in central India, but status is unknown

Is a grazer, preferring alluvial grasslands, and feeds mainly on grasses and sedges

Assam Forest Department, Wildlife Trust of India, and Nepal's Department of National Parks and Wildlife Conservation are all working to conserve the wild water buffalo.

Herds are mostly 20-30 individuals but can sometimes go up to 100

Most commonly preyed upon by tigers. Calves are particularly vulnerable

Source:

NCERT: Contemporary India - II , Chapter -2 Forest and Wildlife Resources.

<http://envfor.nic.in/legis/wildlife/wildlife2s1.pdf>



Motivation:

The questions aim to test general awareness on endangered species.



Forests & Forest Laws

2019

Consider the following statements:

1. As per law, the Compensatory Afforestation Fund Management and Planning Authority exists at both National and State levels.
2. People's participation is mandatory in the compensatory afforestation programmes carried out under the Compensatory Afforestation Fund Act, 2016.

Which of the statements given above is/are correct?

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

Answer A



Explanation:

The Compensatory Afforestation Fund Act, 2016 was enacted to manage the funds collected for compensatory afforestation which till then was managed by ad hoc Compensatory Afforestation Fund Management and Planning Authority (CAMPA).

Compensatory afforestation means that every time forest land is diverted for non-forest purposes such as mining or industry, the user agency pays for planting forests over an equal area of non-forest land, or when such land is not available, twice the area of degraded forest land.

Statement 1 is correct: As per law, the Compensatory Afforestation Fund Management and Planning Authority exists at both National and State levels.

Statement 2 is not correct: It does not provide for mandatory people participation in the compensatory afforestation programmes carried out under the Compensatory Afforestation Fund Act, 2016."

The CAF Act was enacted to manage the funds collected for compensatory afforestation, driven by the ad hoc CAMPA.

90% of the CAF money will be given to the states, while the Centre will retain 10%.

The funds can be used for:

- » Treatment of catchment areas,
- » Assisted natural regeneration,
- » Forest management,
- » Wildlife protection and management,
- » Relocation of villages from protected areas,
- » Managing human-wildlife conflicts,
- » Training and awareness generation,
- » Supply of wood-saving devices and allied activities.

Source:

"<https://www.downtoearth.org.in/news/forests/green-fund-rules-notified-some-hits-major-misses-61381>

<https://www.thehindu.com/sci-tech/energy-and-environment/what-the-new-caf-rules-imply/article24782006.ece>

<http://egazette.nic.in/WriteReadData/2018/188469.pdf>

<http://pib.nic.in/newsite/PrintRelease.aspx?relid=181889>



Motivation:

The CAF Rules were recently published on August 10, 2018, paving the way for smooth implementation and coming into force of the Compensatory Afforestation Fund Act, 2016.

A controversy regarding the same had emerged as rights of gram sabhas or Van Sanrakshan Samitis (Village Forest Committees) had been restricted to mere 'consultation' and not 'consent'. However, the Act still mandates that consultation shall be taken up paving the way for people's participation in management of working plans in forest land."

Consider the following statements:

1. As per recent amendment to the Indian Forest Act, 1927, forest dwellers have the right to fell the bamboos grown on forest areas.
2. As per the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, bamboo is a minor forest produce.
3. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 allows ownership of minor forest produce to forest dwellers.

Which of the statements given above is/are correct?

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

Answer B



Explanation:

Statement 1 is not correct: The Indian Forest (Amendment) Ordinance, 2017 exempts bamboo grown in non-forest areas from definition of tree, thereby dispensing with the requirement of felling/transit permit for its economic use.

Statement 2 is correct: Minor Forest Produce (MFP) is defined under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, as all non-timber forest produce of plant origin, and includes bamboo, brushwood, stumps, canes, Tusser, cocoon, honey, waxes, Lac, tendu/kendu leaves, medicinal plants and herbs, roots, tuber and the like.

Statement 3 is correct: The Forest Rights Act 2006 defines forest rights as inclusive of 'Right of ownership, access to collect, use and dispose of minor forest produce which have traditionally been collected within or outside village boundaries'. Individuals, communities and gram sabhas having rights under this particular section of the Act will not only have the rights to use but also rights of ownership over MFPs."

Source:

<https://www.downtoearth.org.in/news/bamboo-now-a-minor-forest-produce-33239>
[http://www.arthapedia.in/index.php?title=Minor_Forest_Produce_\(MFP\)](http://www.arthapedia.in/index.php?title=Minor_Forest_Produce_(MFP))



Motivation:

The Union Ministry of Environment and Forests has asked states to treat bamboo as a minor forest produce (MFP).

Consider the following states:

1. Chhattisgarh
2. Madhya Pradesh
3. Maharashtra
4. Odisha

With reference to the States mentioned above, in terms of percentage of forest cover to the total area of State, which one of the following is the correct ascending order?

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

Answer C



Explanation:

The percentage of forested area in 2017 by state as published by the Forest Survey of India in ascending order is: Maharashtra (16.47%), Madhya Pradesh (25.11%), Odisha (32.98%), Chattisgarh (41.09%). **Hence option (c) is Correct answer.**

Source:

<https://www.downtoearth.org.in/news/forests/green-fund-rules-notified-some-hits-major-misses-61381>

<https://www.thehindu.com/sci-tech/energy-and-environment/what-the-new-caf-rules-imply/article24782006.ece>

<http://egazette.nic.in/WriteReadData/2018/188469.pdf>

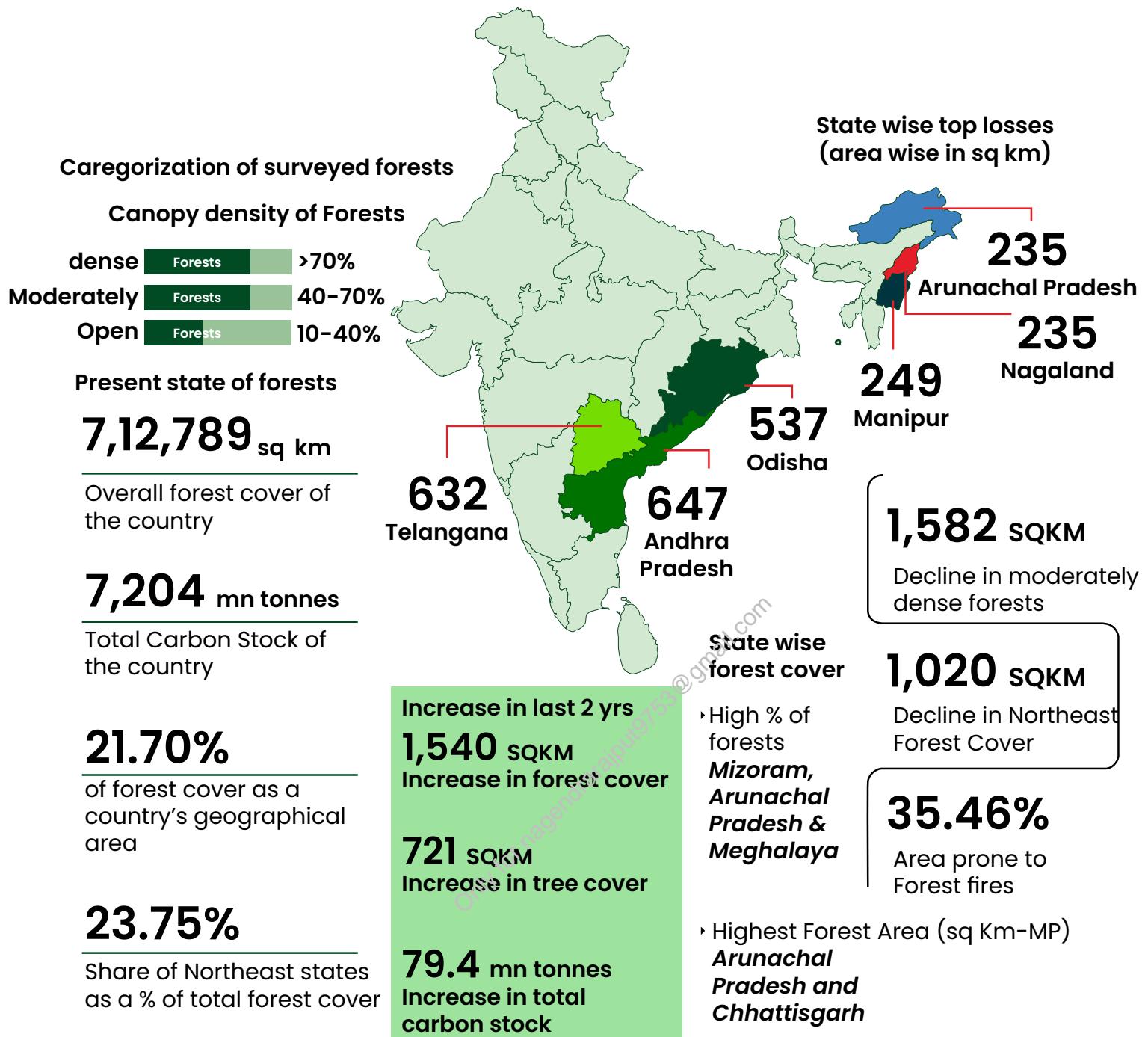
<http://pib.nic.in/newsite/PrintRelease.aspx?relid=181889>



Motivation:

The 16th India State of Forest Report 2019, besides providing regular information on forest resources of the country, has also brought out findings of a few special studies which are important for the policy makers, planners, forest managers, researchers and students.

India State of Forest Report 2021



With reference to the 'New York Declaration on Forests', which of the following statements are correct?

1. It was first endorsed at the United Nations Climate Summit in 2014.
2. It endorses a global timeline to end the loss of forests.
3. It is a legally binding international declaration.
4. It is endorsed by governments, big companies and indigenous communities.
5. India was one of the signatories at its inception.

Select the correct answer using the code given below.

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

Answer A



Explanation:

The New York Declaration on Forests (NYDF) is a political declaration calling for global action to protect and restore forests. It offers a common, multi-stakeholder framework for forest action, consolidating various initiatives and objectives that drive forest protection, restoration, and sustainable use.

It is a voluntary and non-legally binding political declaration which grew out of dialogue among governments, companies and civil society, spurred by the United Nations Secretary-General's Climate Summit held in New York in 2014. **Hence statements 1 and 4 are correct while statement 3 is not correct.**

The declaration includes ambitious targets to end natural forest loss by 2030, with a 50% reduction by 2020 as a milestone toward its achievement. **Hence, statement 2 is correct.**

The Declaration is currently endorsed by over 190 entities including more than 50 governments, more than 50 of the world's biggest companies, and more than 50 influential civil society and indigenous organizations. It is not endorsed by India. **Hence, statement 5 is not correct.**



Motivation:

A study published in the journal Nature Ecology and Evolution in 2020, was reported in the news which mentioned this declaration.

FORESTS

Empower communities to restore forests: Study

Crucial forest-restoration areas in low-income countries — home to 12 per cent of their total population — can have an impact on carbon sequestration projects and local livelihoods

By Akshit Sangomla
Published: Wednesday 26 August 2020



Climate Change

Questions under the overarching topic of Climate Change include a range of topics such as those from impact of Climate Change, Adaptation and Mitigation Conventions, Carbon Sequestration technologies among others.

IMPACT OF CLIMATE CHANGE

2018

Which of the following statements best describes “carbon fertilization”?

- (a) Increased plant growth due to increased concentration of carbon dioxide in the atmosphere
- (b) Increased temperature of Earth due to increased concentration of carbon dioxide in the atmosphere
- (c) Increased acidity of oceans as a result of increased concentration of carbon dioxide in the atmosphere
- (d) Adaptation of all living beings on Earth to the climate change brought about by the increased concentration of carbon dioxide in the atmosphere

Answer A



Explanation:

Rising levels of CO₂ in the atmosphere drive an increase in plant photosynthesis—an effect known as the carbon fertilization effect. **Hence option (a) is correct answer.**

It causes an increased rate of photosynthesis while limiting leaf transpiration in plants. Both processes result from increased levels of atmospheric carbon dioxide (CO₂). The carbon fertilization effect varies depending on plant species, air and soil temperature, and availability of water and nutrients.

Source:

<http://environmentalresearchweb.org/cws/article/news/54347>



Motivation:

Impact of climate change and increasing anthropogenic sources of carbon emissions is an often discussed theme in the news.

2019

Which of the following statements are correct about the deposits of 'methane hydrate'?

1. Global warming might trigger the release of methane gas from these deposits.
2. Large deposits of 'methane hydrate' are found in Arctic Tundra and under the seafloor.
3. Methane in atmosphere oxidizes to carbon dioxide after decade or two.

Select the correct answer using the code given below.

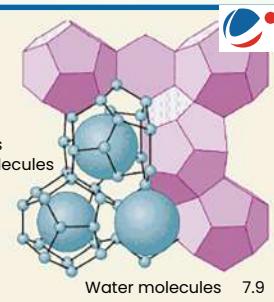
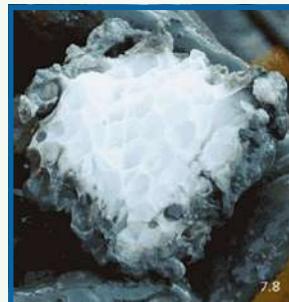
- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Answer D



Explanation:

Statement 1 is correct: Methane hydrate ($\text{CH}_4 \cdot 5.75\text{H}_2\text{O}$ or $4\text{CH}_4 \cdot 23\text{H}_2\text{O}$) is a solid clathrate compound in which a large amount of methane is trapped within a crystal structure of water, forming a solid similar to ice. Methane hydrate is a crystalline solid that consists of a methane molecule surrounded by a cage of interlocking water molecules. Methane hydrate is an "ice" that only occurs naturally in subsurface deposits where temperature and pressure conditions are favorable for its formation. Owing to melting of ice, global warming might trigger the release of methane gas from these deposits.



Statement 2 is correct: Four Earth environments have the temperature and pressure conditions suitable for the formation and stability of methane hydrate. These are: 1) sediment and sedimentary rock units below Arctic permafrost; 2) sedimentary deposits along continental margins; 3) deep-water sediments of inland lakes and seas; and, 4) under Antarctic ice.

Statement 3 is correct: Methane is relatively short-lived in the atmosphere; a molecule of methane is oxidized to water and carbon dioxide after a decade or so, mainly by reaction with another trace gas, the hydroxyl radical OH-. Thus, unlike the case of carbon dioxide (which stays in the atmosphere longer than methane), a concerted effort to reduce methane emissions would have almost immediate results in terms of reduction of greenhouse effect.

Source:

https://www.business-standard.com/article/economy-policy/india-might-hold-world-second-largest-gas-hydrate-reserves-118060501430_1.html

<http://www.bbc.com/future/story/20181119-why-flammable-ice-could-be-the-future-of-energy>

<https://geology.com/articles/methane-hydrates/>



Motivation:

IT Madras team produces gas hydrates under 'space' conditions.

CONVENTIONS

2021

The 'Common Carbon Metric', supported by UNEP, has been developed for

- (a) assessing the carbon footprint of building operations around the world
- (b) enabling commercial farming entities around the world to enter carbon emission trading
- (c) enabling governments to assess the overall carbon footprint caused by their countries
- (d) assessing the overall carbon foot-print caused by the use of fossil fuels by the world in a unit time

Answer A



Explanation:

The Common Carbon Metric is the calculation used to define measurement, reporting, and verification for GHG emissions associated with the operation of buildings types of particular climate regions. It does not include value-based interpretation of the measurements such as weightings or benchmarking. **Hence option (a) is the correct answer.**

While it is not a building rating tool, it is consistent with methods for assessing the environmental performance of buildings used globally.

The Common Carbon Metric is applied to the specific inventory of the buildings under study. Such

an inventory can be developed from a top-down or bottom-up approach, depending on the scope and goal of the investigation.

Source:

<https://wedocs.unep.org/handle/20.500.11822/7922;jsessionid=9BC477336B8DDA4AC9DB1DE59033A231>



Motivation:

A new initiatives in building energy efficiency launched by the Bureau of Energy Efficiency (BEE).

2023

Consider the following statements:

Statement-I:

Carbon markets are likely to be one of the most widespread tools in the fight against climate change.

Statement-II:

Carbon markets transfer resources from the private sector to the State.

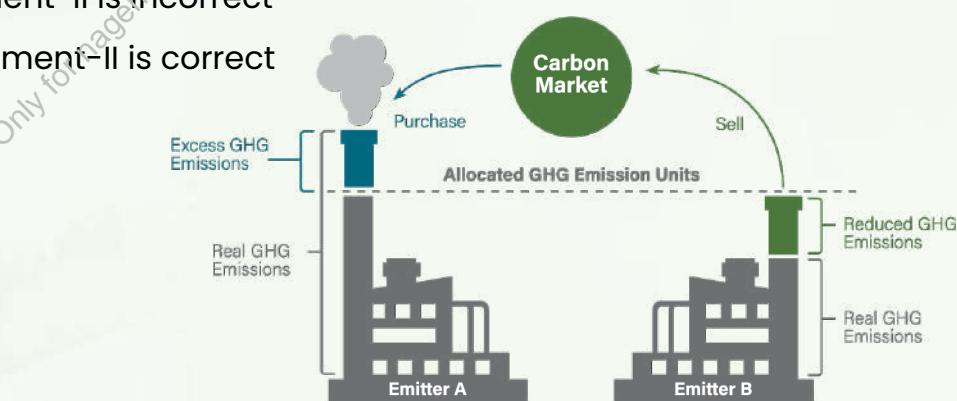
Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
- (b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
- (c) Statement-I is correct but Statement-II is incorrect
- (d) Statement-I is incorrect but Statement-II is correct

Answer A



Explanation:



Statement 1 is correct: Carbon markets are trading systems in which carbon credits are sold and bought. Companies or individuals can use carbon markets to compensate for their greenhouse gas emissions by purchasing carbon credits from entities that remove or reduce greenhouse gas emissions. Several countries and territories have started carbon trading programs. Carbon trading is adapted from cap and trade, a regulatory approach that successfully reduced sulfur pollution in the 1990s.

Carbon markets, have at last become one of the most widespread tools in the fight against climate

change. By the end of 2021 more than 21% of the world's emissions were covered by some form of carbon pricing, up from 15% in 2020.

Statement 2 is correct: Ever more businesses have to pay regulators for the right to release a tonne of carbon dioxide into the atmosphere. Investors are getting interested too: trading on these markets grew by 164% last year, to €760bn (\$897bn). Like taxes, carbon markets transfer resources from the private sector to the state.

83% of NDCs submitted by countries mention their intent to make use of international market mechanisms to reduce GHGs.

Also, the World Bank estimates that trading in carbon credits could reduce the cost of implementing NDCs by more than half – by as much as \$250 bn by 2030. So, carbon markets will likely be an effective tool against Climate change. **Hence statement 2 is the correct explanation of statement 1.**

Source:

<https://www.economist.com/finance-and-economics/2022/05/26/carbon-markets-are-going-global>



Motivation:

Carbon Credits and markets were often in the news due to global carbon market value hits record \$949 in 2023.

Climate Change Conventions and International Initiatives

2017

With reference to 'Global Climate Change Alliance', which of the following statements is/are correct?

1. It is an initiative of the European Union.
2. It provides technical and financial support to targeted developing countries to integrate climate change into their development policies and budgets.
3. It is coordinated by World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD).

Select the correct answer using the code given below:

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

Answer A



Explanation:

- **Statement 1 is correct: The Global Climate Change Alliance (GCCA) was established by the European Union (EU) in 2007** to strengthen dialogue and cooperation with developing countries, in particular least developed countries (LDCs) and small island developing States (SIDS).
- **Statement 2 is correct: Under the first pillar, the GCCA+ serves as a platform for dialogue and exchange of experience between the EU and developing countries**, focusing on climate policy and bringing renewed attention to the issue of international climate finance. Under the second pillar, the GCCA+ acts as a source of technical and financial support for the world's most climate-vulnerable countries, whose populations need climate finance the most.
- **Statement 3 is not correct: International organisations – notably the Centre for International Forestry Research (CIFOR), the Food and Agriculture Organisation (FAO), the United Nations Capital Development Fund (UNCDF), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), UN Habitat and the World Bank – are involved in the implementation of some GCCA-funded interventions, and also co-finance some initiatives.**

Source:

<https://climatefundsupdate.org/the-funds/global-climate-change-alliance/>



Motivation:

To check about the Institutions related to climate change and climate change financing mechanism

2018

"Momentum for Change : Climate Neutral Now" is an initiative launched by

- (a) The Intergovernmental Panel on Climate Change
- (b) The UNEP Secretariat
- (c) The UNFCCC Secretariat
- (d) The World Meteorological Organization

Answer C



Explanation:

The UNFCCC secretariat launched its Climate Neutral Now initiative in 2015. The following year, the secretariat launched a new pillar under its Momentum for Change initiative focused on Climate Neutral Now, as part of larger efforts to showcase successful climate action around the world. **Hence option (c) is the correct answer.**

Source:

<https://unfccc.int/climate-action/momentum-for-change/climate-neutral-now>



Motivation:

India ratified the Paris Agreement to the UNFCCC in 2016. The action plan for implementation of the Paris Agreement and its components is being developed.

2022

Climate Action Tracker, which monitors the emission reduction pledges of different countries is a:

- (a) Database created by coalition of research organisations
- (b) Wing of "International Panel of Climate Change"
- (c) Committee under "United Nations Framework Convention on Climate Change"
- (d) Agency promoted and financed by United Nations Environment Programme and World Bank

Answer A



Explanation:

The Climate Action Tracker is an independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement aim of “holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C.”

A collaboration of two organisations, Climate Analytics and NewClimate Institute, the CAT has been providing this independent analysis to policymakers since 2009.

CAT quantifies and evaluates climate change mitigation targets, policies and action. It also aggregates country action to the global level, determining likely temperature increases during the 21st century using the MAGICC climate model.

MAGICC stands for ‘Model for the Assessment of Greenhouse Gas Induced Climate Change’. It is a prime reduced-complexity model, often used by the Intergovernmental Panel on Climate Change (IPCC), for key scientific publications and by a number of Integrated Assessment Models.

CAT tracks 39 countries and the EU covering around 85% of global emissions

CAT covers all the biggest emitters and a representative sample of smaller emitters covering about 85% of global emissions and approximately 70% of global population. **Hence option (a) is the correct answer**

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/explained-is-the-worlds-climate-action-plan-on-track/article66070590.ece>



Motivation:

The Climate Action Tracker classified India's climate action as "highly insufficient."

2022

Consider the following statements :

1. "The Climate Group" is an international non-profit organization that drives climate action by building large networks and runs them.
2. The International Energy Agency in partnership with the Climate Group launched a global initiative "EP100".
3. EP100 brings together leading companies committed to driving innovation in energy efficiency and increasing competitiveness while delivering on emission reduction goals.
4. Some Indian companies are members of EP100.
5. The International Energy Agency is the Secretariat to the "Under2 Coalition".

Which of the statements given above are correct?

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

Answer B



Explanation:

Statement 1 is correct: The Climate Group is a non-profit organisation that works with business and government leaders around the world to address climate change. The group has programmes focussing on renewable energy and reducing greenhouse gas emissions.

Statement 2 is not correct and Statement 3 is correct: EP100 is a global initiative led by the international non-profit Climate Group, bringing together over 120 energy smart businesses committed to measuring and reporting on energy efficiency improvements. The Climate Group's global EP100 initiative, delivered in partnership with the Alliance to Save Energy, brings together leading companies improving their energy productivity; using less energy to achieve higher economic output.

Statement 4 is correct: Mahindra & Mahindra Ltd., the world's largest manufacturer of tractors, has signed up to EP100. The Indian-based company has committed to doubling their energy productivity by 2030, a core requirement for any business signing on to the campaign. Recently, Dalmia Cement and JSW Cement – two leading Indian cement companies – committed to the Climate Group's flagship business initiatives RE100, EV100 and EP100. Dalmia Cement committed to EV100, while they are already members of RE100 and EP100. JSW Cement, committed to all the three campaigns in one go.

Statement 5 is not correct: It is the largest global network of state and regional governments committed to reducing emissions in line with the Paris Agreement.

Source:

<https://www.theclimategroup.org/our-work/news/indias-road-cop26-summit-mobilising-business-commitment-and-action-climate>



Motivation:

In 2021, Dalmia Cement and JSW Cement – two leading Indian cement companies – committed to the Climate Group's flagship business initiatives RE100, EV100 and EP100. In 2016, Mahindra & Mahindra became the first company to join EP100 campaign.

Smart and Effective Notes Making for UPSC CSE Principles and Strategies



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Climate Change (Technologies)

2017

In the context of mitigating the impending global warming due to anthropogenic emissions of carbon dioxide, which of the following can be potential sites for carbon sequestration?

1. Abandoned and uneconomic coal seams
2. Depleted oil and gas reservoirs
3. Subterranean deep saline formations

Select the correct answer using the code given below:

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

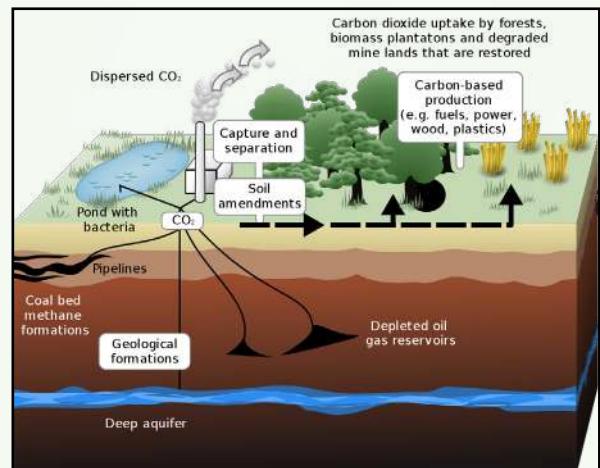
Answer D



Explanation:

Carbon sequestration is the process involved in carbon capture and the long-term storage of atmospheric carbon dioxide. Geological sequestration involves the storage of CO₂ underground in depleted oil and gas reservoirs, saline formations or deep, unmineable coal beds. **Hence option (d) is the correct answer.**

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Source:

<http://www.thehindu.com/sci-tech/energy-and-environment/Carving-out-a-model-for-enhancing-CO2-sinks/article14001561.ece>



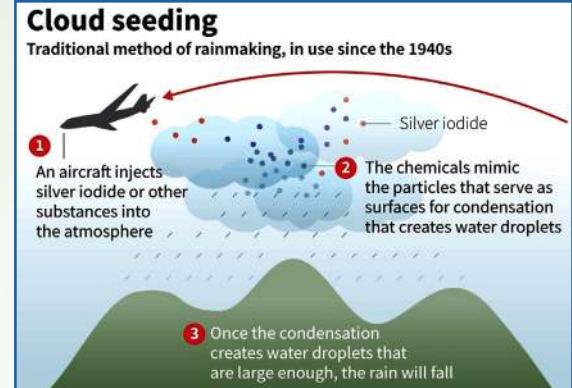
Motivation:

Carbon sequestration and its methods are often seen in news. UPSC has gone one step further to ask potential sites for geological carbon sequestration.

2019

In the context of which of the following do some scientists suggest the use of cirrus cloud thinning technique and the injection of sulphate aerosol into stratosphere?

- (a) Creating the artificial rains in some regions
- (b) Reducing the frequency and intensity of tropical cyclones
- (c) Reducing the adverse effects of solar wind on the Earth
- (d) Reducing the global warming



Answer D



Explanation:

The geo-engineering technique known as stratospheric aerosol injection (SAI) could limit rising temperatures that are causing climate change.

Cloud thinning strategy would be used to shoot powder over cirrus clouds, which would thin out their coverage and alter their radiative effects over Earth. **Hence option (d) is the correct answer.**

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/scientists-mull-stratospheric-barrier-to-curb-warming/article25587354.ece>



Motivation:

Stratospheric barrier to curb warming were often seen in the news.

Steel slag can be the material for which of the following?

1. Construction of base road
2. Improvement of agricultural soil
3. Production of cement

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



Answer D



Explanation:

Option 1 is correct: Steel slag, a by-product of steel making, is produced during the separation of the molten steel from impurities in steel-making furnaces. One of the ingredients of asphalt is steel slag, a by-product of the steel and iron production processes. Asphalt roads are made of a mixture of aggregates, binders and fillers. The aggregates are typically iron and/or steel slag, sand, gravel or crushed rock, and they are bound together with asphalt itself, which is a bitumen.

Option 2 is correct: Steel slags can be used in several activities, such as construction and paving, and also in the agricultural sector due to its ability to correct soil acidity, as it contains some nutrients for the plants and also as silicate fertilizer that is capable of providing silicon to the plants.

Option 3 is correct: Steel slag, another waste from Iron & Steel Industry, has shown potential for use as a raw mix component up to 10% in the manufacture of cement clinker. Steel slag can also replace granulated blast furnace slag up to 10% in the manufacture of Portland Slag Cement. Steel slag has been used successfully to treat acidic water discharges from abandoned mines.

Source:

<https://www.financialexpress.com/industry/nitin-gadkari-warns-cement-companies-asks-construction-firms-to-cut-costs-but-not-quality/2079919/>

<https://www.financialexpress.com/market/commodities/steel-slag-may-now-be-used-as-fertiliser-for-soil/1115559/>



Motivation:

Applications of steel slag were often seen in the news.

In rural road construction, the use of which of the following is preferred for ensuring environmental sustainability or to reduce carbon footprint?

1. Copper slag
2. Cold mix asphalt technology
3. Geotextiles
4. Hot mix asphalt technology
5. Portland cement

Select the correct answer using the code given below:

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

Answer A



Explanation:

The use of waste materials in the road construction industry is gradually gaining significance in India, considering disposal and environmental problems and the gradual depletion of natural resources. Byproducts, such as biomass ash, coal ash, red mud and copper slag, generated in large volumes, could have applications in the construction of roads, buildings and bridges.

Option 1 is correct: The use of copper slag in cement and concrete provides potential environmental as well as economic benefits for all related industries, particularly in areas where a considerable amount of copper slag is produced.

Option 2 is correct and Option 4 is not correct: Cold asphalt mix is produced by mixing unheated mineral aggregate with either emulsified bitumen or foamed bitumen. Unlike hot mix asphalt (HMA), cold asphalt mix does not require any heating of aggregate which makes it economical and relatively pollution-free (no objectionable fumes or odours). Production of cold asphalt mix does not require high investment in equipment, which makes it economical. It is also suitable for use in remote areas. Cold asphalt mixes can be used both for initial construction (100% virgin mixes) and for recycling of asphalt pavements.

Option 3 is correct: Geotextiles are mostly used in road construction, especially to fill gaps between the roads to improve soil structure. Geotextile makes poor soil more beneficial for use and then easy to build in difficult places also. It helps to prevent the erosion of soil but allows the water to drain off.

Option 5 is not correct: reducing the portland cement that binds concrete together is energy intensive and emits enormous amounts of carbon dioxide (CO₂) as well as numerous other pollutants”

Source:

<https://pib.gov.in/PressReleseDetail.aspx?PRID=1558920>

<https://www.thehindu.com/news/national/tamil-nadu/researchers-collaborate-to-use-industrial-agri-byproducts/article32748554.ece>

<https://link.springer.com/article/10.1007/s10163-014-0254-x>



Motivation:

Case studies on promoting sustainable and climate resilience materials for rural roads were in the news.

2023

Consider the following activities :

1. Spreading finely ground basalt rock on farmlands extensively
2. Increasing the alkalinity of oceans by adding lime
3. Capturing carbon dioxide released by various industries and pumping it into abandoned subterranean mines in the form of carbonated waters

How many of the above activities are often considered and discussed for carbon capture and sequestration?

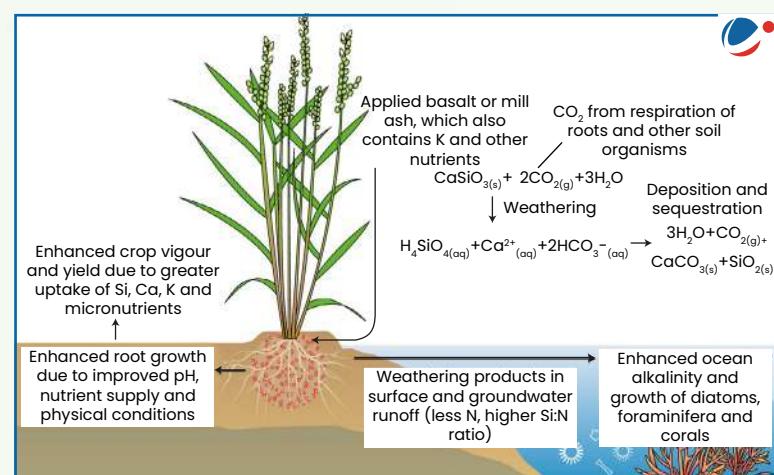
- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer C



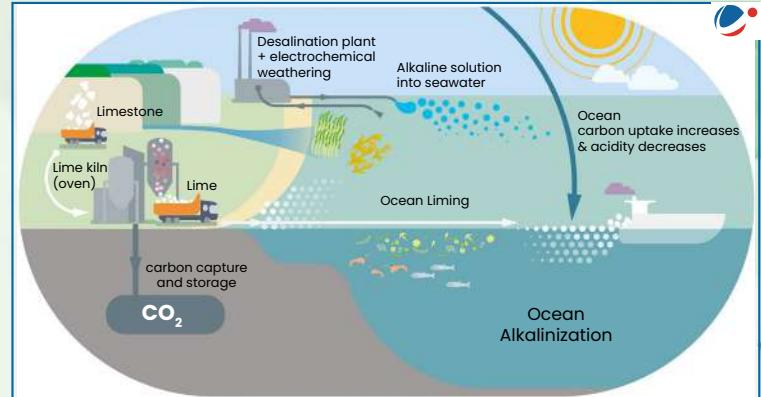
Explanation:

Statement 1 is correct: Adding crushed rock dust to farmland could draw down up to two billion tonnes of carbon dioxide (CO_2) from the air per year. The technique, known as enhanced rock weathering, involves spreading finely crushed basalt, a natural volcanic rock, on fields to boost the soil's ability to extract CO_2 from the air.



Statement 2 is correct: When you add lime to seawater, it reacts with that acid and neutralizes it, forming a carbonate ion. The effect is a boost in alkalinity to the ocean, and greater ocean alkalinity means more CO₂ can be absorbed.

Statement 3 is correct: Geological storage involves injecting CO₂ captured from industrial processes into rock formations deep underground, thereby permanently removing it from the atmosphere. An extensive cap rock or barrier at the top of the formation to contain the CO₂ permanently.



Source:

[https://www.theguardian.com/environment/2020/jul/08/spreading-rock-dust-on-fields-could-remove-vast-amounts-of-co2-from-air'](https://www.theguardian.com/environment/2020/jul/08/spreading-rock-dust-on-fields-could-remove-vast-amounts-of-co2-from-air)

<https://www.weforum.org/agenda/2022/11/volcanic-rock-dust-capture-carbo-farms-lithos/>

<https://www.greenbiz.com/article/microsoft-apple-frontier-extend-support-high-quality-carbon-removal>



Motivation:

Carbon sequestration and its methods are often seen in news, also UPSC has asked a question in 2017 on potential sites for carbon sequestration.

2022

"Biorock technology" is talked about in which one of the following situations?

- (a) Restoration of damaged coral reefs
- (b) Development of building materials using plant residues
- (c) Identification of areas for exploration/extraction of shale gas
- (d) Providing salt licks for wild animals in forest/protected areas

Answer A

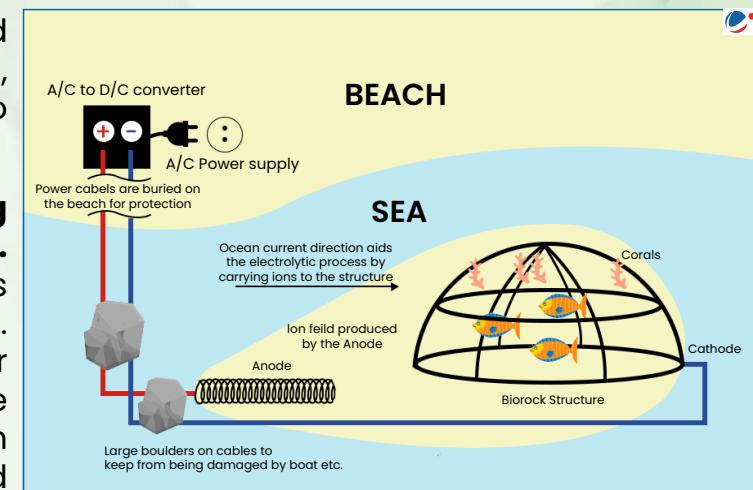


Explanation:

- Biorock technology is an innovative process originally **invented in 1976 by the late architect Wolf Hilbertz** to produce natural building materials in the sea. It has been successfully applied to fish and shellfish mariculture as well as to growing limestone breakwaters to protect islands and coastal areas from erosion and rising sea levels.

► It is a unique method that allows coral reefs, and other marine ecosystems including seagrass, salt marsh, mangrove, and oyster reefs to survive and recover.

► **It is used to preserve coral reefs by constructing materials under the sea that resemble rocks.**
It is the technique through which seawater is passed via a very low-voltage electric current. Crystalline salts of minerals dissolved in water are formed as a result, and they deposit. The deposited crystals, which are primarily calcium carbonate, form a structure on the waterbed that is similar to coral reefs that are formed naturally. **Hence option (a) is the correct answer.**



Source:

<https://www.globalcoral.org/biorock-coral-reef-marine-habitat-restoration/>



Motivation:

Coral Reefs in Kutch were restored for this first time using Biorock technology in India.

Coral Reefs in Gulf of Kutch Restored: How Biorock Tech Brought Back the 'Shape of Water'

"For the first time in the country, we have used biorock technology to protect coral reefs by building rock-like materials beneath the ocean. It uses low-voltage electric current," says R Senthil Kumaran, Deputy Conservator of Forests, MNP, Jamnagar





Pollution

2019

Question: Why is there a great concern about the 'microbeads' that are released into environment?

- (a) They are considered harmful to marine ecosystems.
- (b) They are considered to cause skin cancer in children.
- (c) They are small enough to be absorbed by crop plants in irrigated fields.
- (d) They are often found to be used as food adulterants.

Answer A



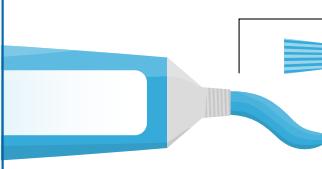
Explanation:

Microbeads are manufactured solid plastic particles of less than one millimetre in their largest dimension. They are most frequently made of polyethylene but can be of other petrochemical plastics such as polypropylene and polystyrene. Microbeads, small pellets of plastic, extensively used in personal care products such as shampoo, baby lotion and face cream and considered toxic to marine life, are being banned internationally.

Hence option (a) is the correct answer.

THREAT FROM PLASTIC PARTICLES

Microbeads, as per US law, are solid plastic particles less than 5mm in size intended to be used to exfoliate or cleanse



Microbeads are found in face/ body washes, lip gloss, tooth-pastes, shaving creams etc

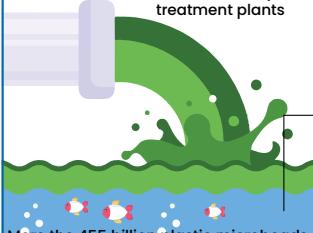
A single cosmetic product like a toothpaste could contain between from 35,000 and one lakh microbeads

These enter the water system and become 'toxin carriers.' These are effective absorbant and accumulate an astonishing level of toxins as they pass through sewage



The particles are too small to be filtered by sewage treatment plants

They get ingested by fish and birds. It goes up the food chain when higher animals consume the 'carrier animals'



Microbeads enter human body through the food chain

More the 455 billion plastic microbeads and 749 billion microplastics have been released into the Indian Ocean in the past few years

See if polyethylene, polymethyl methacrylate, polypropylene are listed as ingredients. These make up microbeads

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/feeding-on-microplastics-a-scourge-stalks-the-sea/article25527355.ece>

2019

Question: Consider the following:

1. Carbon monoxide
2. Methane
3. Ozone
4. Sulphur dioxide

Which of the above are released into atmosphere due to the burning of crop/biomass residue?

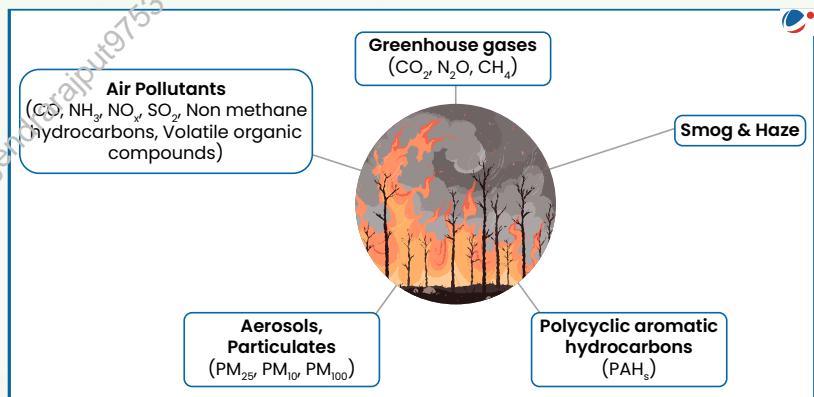
- (a) 1 and 2 only
(b) 2, 3 and 4 only
(c) 1 and 4 only
(d) 1, 2, 3 and 4

Answer D



Explanation:

- Crop residues / biomass burning are the cheapest and easiest method to dispose of the leftover crop residues (wheat, rice, sugarcane etc.) after harvesting, for land clearing and pest control.
- Burning of crop residues is a common approach to eliminate waste after harvesting all over the world. Burning of these residues emit gases like sulphur dioxide (SO_2), oxides of nitrogen (NO_x), carbon dioxide (CO_2), carbon monoxide (CO), black carbon (BC), organic carbon (OC), methane (CH_4), volatile organic compounds (VOC), non-methane hydrocarbons (NMHCs), ozone (O_3), and aerosols etc which affect the global atmospheric chemistry and climate. **Hence option (d) is the correct answer.**



Source:

http://www.isca.in/EARTH_SCI/Archive/v1/i1/4.ISCA-IRJES-2013-005.pdf



Motivation:

Crop Residue/Biomass burning is a long pending issue for the want of relief from smog in northern India during winters.

Question: Which of the following are the reasons/factors for exposure to benzene pollution?

1. Automobile exhaust
2. Tobacco smoke
3. Wood burning
4. Using varnished wooden furniture
5. Using products made of polyurethane

Select the correct answer using the code given below:

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

Answer A



Explanation:

Benzene:

- It is a chemical that is a colourless or light yellow liquid at room temperature.
- It dissolves only slightly in water and will float on top of the water.
- It is highly flammable.
- It is formed from both natural processes and human activities.
- It is found in crude oils and as a by-product of oil-refining processes.
- It is a known human carcinogen and is linked to an increased risk of developing lymphatic and hematopoietic cancers, acute myelogenous leukaemia, as well as chronic lymphocytic leukaemia.

Exposure to benzene pollution:

- **Automobile Exhaust:** Benzene is a well-known component of gasoline and is emitted in automobile exhaust. Therefore, areas with heavy traffic or enclosed spaces like garages can have higher levels of benzene pollution.
- **Tobacco Smoke:** Tobacco smoke is a significant source of benzene exposure for both smokers and those exposed to secondhand smoke. It is one of the most hazardous sources of indoor air pollution in terms of benzene.

- **Wood Burning:** Burning wood can release benzene, among other volatile organic compounds (VOCs), into the environment. This is especially relevant in homes that use wood as a primary heating source or in areas where open burning is common.
- **Using Varnished Wooden Furniture:** Varnishes and paints can contain benzene and other VOCs, especially if they are solvent-based. However, once these finishes have dried and cured, the amount of benzene they emit is significantly reduced. The risk of exposure from varnished wooden furniture is generally lower compared to direct sources like smoke or exhaust, but it can still contribute to indoor air levels of benzene, especially in newly furnished or renovated spaces.
- **Using Products Made of Polyurethane:** Polyurethane foam, used in furniture, mattresses, and various building materials, can emit VOCs. However, benzene is not typically a significant component of the emissions from polyurethane products. The primary concern with polyurethane often relates to isocyanates used in its production and other VOCs, rather than benzene specifically. **Hence option (a) is the correct answer.**

Source:

<https://indianexpress.com/article/cities/mumbai/lockdown-impact-sharp-drop-in-nitrogen-dioxide-benzene/>

<https://www.who.int/ipcs/features/benzene.pdf>



Motivation:

Benzene pollution increased during the lockdown in cities. Benzene is also one of the 12 pollutants monitored under the National Ambient Air Quality Standards (NAAQS).

| Pollutant | Major Emission Sources | Major Exposure Sources |
|---------------------|--|---|
| Formaldehyde | Motor vehicles, photochemistry | Furniture, particle boards |
| Benzene | Motor vehicles, industry | Smoking, ETS |
| Benzo[a]pyrene | Coke/aluminum plants, diesel vehicles | Smoking, ETS |
| Tetrachloroethylene | Dry cleaning shops | Dry cleaning shops |
| Chloroform | Sewage treatment plants | Taking showers |
| p-Dichlorbenzene | Chemical manufacturing | Air deodorizers |
| Particulate matter | Industry, motor vehicles, photochemistry | Smoking, ETS, unvented combustion devices (indoors) |
| Carbon monoxide | Motor vehicles | Driving, gas stoves |
| Nitrogen dioxide | Motor vehicles, industry | Gas stoves |

Consider the following statements:

1. Coal ash contains arsenic, lead and mercury.
2. Coal-fired power plants release sulphur dioxide and oxides of nitrogen into the environment.
3. High ash content is observed in Indian coal.

Which of the statements given above is/are correct?

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

Answer D



Explanation:

Statement 1 is correct: Coal itself isn't a particularly toxic material. But after it's burned, what remains in the ash includes lead, mercury, cadmium, chromium, arsenic, and selenium, all in levels that may threaten human health.

Statement 2 is correct: Thermal power plants produce large amounts of nitrogen oxides and sulphur dioxide—the pollutants that cause acid rain—when they burn fossil fuels, especially coal, to produce energy.

Statement 3 is correct: Ash content of coal produced in the country is generally 25 to 45 % whereas average ash content of imported coal varies from 10 to 20 %. Indian Coal has comparatively higher ash content than imported coal due to drift theory of formation of coal deposits in India. Coal seams formed due to drift theory contains higher ash as compared to in-situ theory of formation.

Source:

<https://economictimes.indiatimes.com/industry/energy/power/thermal-power-plants-allowed-to-use-coal-with-high-ash-content/articleshow/76004154.cms?>



Motivation:

The environment ministry had recently decided that it will no longer regulate the ash-content of coal used by thermal power plants.

| Pollutant | Definition | Source | Damaging to |
|---|--|---|--|
| Aerosols | Suspended liquid or solid particles | Old cosmetics, paint, cleaning supplies | Good, upper atmosphere ozone |
| Ammonia | Volatile chemical compound | Agricultural production | Human cells, respiratory health |
| Asbestos | Fibrous, silicate minerals | Building materials, friction products | Respiratory health |
| Carbon dioxide (CO ₂) | Gas that traps heat in the atmosphere | Burning fossil fuels | Climate |
| Carbon monoxide (CO) | Poisonous gas | Incomplete combustion from heaters, furnaces, automobiles | Blood, vision, brain function |
| Chlorofluorocarbons (CFCs) | Airborne chemical compound | Old aerosols, fire extinguishers, | Good, upper atmosphere ozone |
| Ground level ozone / smog (O ₃) | The chemical reaction of O ₃ , NO _x , VOCs, and sunlight | Motor vehicles, chemical solvents, industrial emissions | Respiratory health |
| Hydrochlor-fluorocarbons (HCFCs) | Airborne chemicals | Air conditioning and refrigerants | Good, upper atmosphere ozone |
| Lead | Metal | Dust and soil, old paint, metal processing plant and | Human and animal organs, blood, nervous systems |
| Mercury | Natural element | Emissions from burning coal or hazardous waste | Human and animal organs, blood, nervous systems |
| Methane | Gas that traps heat in the atmosphere | Landfills, natural gas systems, coal mining, livestock | Climate |
| Nitrogen oxides (NO _x) | Gas that contributes to smog and traps heat in the atmosphere | Burning fuel | Respiratory health, climate, water ecosystems |
| Particulate matter (PM) | Tiny, suspended dust and liquid particles | Smoke and Dust; cooking fires in poor countries | Respiratory health, visibility, immune system |
| Pesticides | Chemical compounds | Agricultural or household pest killers or disinfectants | Respiratory, nervous system, cancer |
| Propellants | Compressed gas that releases an aerosol | Old cosmetics, paint, cleaning supplies | Good, upper atmosphere ozone |
| Radon | Natural radioactive gas | Soil, rocks, water | Respiratory health |
| Refrigerants | Cooling gas | Old refrigerators and air conditioners | Good, upper atmosphere ozone Buildings, visibility |
| Sulfur oxide (SO ₂) | Gas that dissolves easily in water | Burning fuel, gasoline and metal extraction | Buildings, visibility natural water ways, respiratory health |

Question: Why is there a concern about copper smelting plants?

1. They may release lethal quantities of carbon monoxide into environment.
2. The copper slag can cause the leaching of some heavy metals into environment.
3. They may release sulphur dioxide as a pollutant.

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

Answer B



Explanation:

- Smelting is a process of applying heat to ore in order to extract a base metal. The copper concentrates are fed through the flash smelting furnace with oxygen-enriched air. In the furnace, the concentrates are instantly oxidized, after which they melt and separate by their own reaction heat into copper matte with a grade of 65% and slag consisting of iron oxide, silica, and other compounds.
- Extractive metallurgical and smelting processes can be highly polluting activities. Some facilities that carry out metal and smelting processes are known to emit high quantities of air pollutants such as hydrogen fluoride, sulfur dioxide, oxides of nitrogen, offensive and noxious smoke fumes, vapors, gases, and other toxins.
- Due to the application of pyro-metallurgical processes in copper smelters, significant air pollution occurs with suspended particles. These particles contain high concentrations of Lead (Pb), Cadmium (Cd), Nickel (Ni) and Arsenic (As). Copper slag can have heavy metals like cobalt, zinc, arsenic, lead, cadmium, barium etc. Slag can release these elements into the environment under natural weathering conditions and cause pollution of soils, surface waters and groundwater. **Hence, statement 2 is correct.**
- Organic vapors and sulfur oxides resulting from secondary smelting roasting operations and fuel combustion can cause smog, containing ozone, fine airborne particles, nitrogen oxides, sulfur dioxide and carbon monoxide. Carbon monoxide poisoning typically occurs from breathing in carbon monoxide (CO) at excessive levels. Basic copper smelting reaction $\text{Cu}_2\text{O} + \text{CO} \rightarrow 2 \text{Cu} + \text{CO}_2$ produces carbon dioxide and not carbon monoxide. **Hence, statement 1 is not correct and 3 is correct.**

Source:

<https://indianexpress.com/article/explained/sterlite-copper-smelting-plant-tuticorin-protests-5193832/>

2021

Question: With reference to furnace oil, consider the following statements:

1. It is a product of oil refineries.
2. Some industries use it to generate power.
3. Its use causes sulphur emissions into environment.

Which of the statements given above are correct?

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

Answer D

- Fuel oil (also known as heavy oil, marine fuel, bunker, furnace oil, or gasoil) is a fraction obtained from petroleum distillation. **Hence, statement 1 is correct.**
- Diesel-based power plants may use Diesel, Furnace Oil, Heavy Fuel Oil (HFO), Low Sulfur Fuel Oil (LSFO) or Low Sulfur Heavy Stock (LHS). The Basin Bridge Diesel Generator Power Plant (DGPP) in Tamil Nadu was one such example. **Hence, statement 2 is correct.**
- The oxides of sulphur (SO_x ; $\text{SO}_2 + \text{SO}_3$) emissions are a direct result of the sulphur content of the fuel oil. During the combustion process this fuel-bound sulphur is rapidly oxidised to sulphur dioxide (SO_2). A small fraction of the SO_2 , some 3-5% may be further oxidised to sulphur trioxide (SO_3) within the combustion chamber and exhaust duct. **Hence, statement 3 is correct.**

Source:

https://www.worstoppolluted.org/projects_reports/display/61

https://www.researchgate.net/publication/232400604_The_composition_and_environmental_hazard_of_copper_slags_in_the_context_of_the_Basel_Convention

Question: Magnetite particles, suspected to cause neurodegenerative problems, are generated as environmental pollutants from which of the following?

1. Brakes of motor vehicles
2. Engines of motor vehicles
3. Microwave stoves within homes
4. Power plants
5. Telephone lines

Select the correct answer using the code given below.

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

Answer **B**



Explanation:

- Magnetite pollution refers to the presence of a magnetic mineral called Magnetite (Fe_3O_4) in the environment, as a result of human activities such as mining, steel production and industrial processes.
 - » Magnetite is an oxide of iron. It is the most magnetic of all the naturally occurring minerals on earth. It is a natural magnet.
 - » Magnetite contains about 72% metallic iron in it. It is found in Karnataka, Andhra Pradesh, Rajasthan, Tamil Nadu, Goa and Kerala.
- Brakes of Motor Vehicles: When brakes wear down, they can release fine particles into the air, including magnetite due to the iron used in brake pads and other components.
- Engines of Motor Vehicles: Combustion processes can generate a variety of particulate matter, including magnetite particles, especially from diesel engines which can produce more particulate matter than gasoline engines.
- Microwave Stoves Within Homes: While microwaves do emit some electromagnetic fields, they are not known to generate magnetite particles as a pollutant.
- Power Plants: Fossil fuel-fired power plants, especially those burning coal, can emit magnetite particles as part of the fly ash and other combustion by-products.
- Telephone Lines: There is no evidence to suggest that telephone lines generate magnetite particles as an environmental pollutant.

Source:

<https://news.mongabay.com/2021/09/novel-entities-are-we-sleepwalking-through-a-planetary-boundary/>

<https://www.theguardian.com/environment/2016/sep/05/toxic-air-pollution-particles-found-in-human-brains-links-alzheimers>



Motivation:

Toxic air pollution particles found in human brains

Detection of 'abundant' magnetite particles raises concerns because of suggested links to Alzheimer's disease

2022

Question: With reference to polyethylene terephthalate, the use of which is so widespread in our daily lives, consider the following statements:

1. Its fibres can be blended with wool and cotton fibres to reinforce their properties.
2. Containers made of it can be used to store any alcoholic beverage.
3. Bottle made of it can be recycled into other products.
4. Articles made of it can be easily disposed of by incineration without causing greenhouse gas emissions.

Which of the statements given above are correct?

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

Answer A



Explanation:

- Polyethylene terephthalate (PET or PETE), a strong, stiff synthetic fibre and resin and a member of the polyester family of polymers. PET is spun into fibres for permanent-press fabrics and blow-moulded into disposable beverage bottles.
- Statement 1 is correct: They are often used in durable-press blends with other fibres such as rayon, wool, and cotton, reinforcing the inherent properties of those fibres.
- Statement 2 is not correct: Plastic packaging is dangerous to human health and the country liquor and country made foreign liquor cannot be sold in such bottles.



- ▶ Statement 3 is correct: PET bottles are made of one of the few polymers that can be recycled into the same form – a new beverage bottle – again and again. During the process the PET is generally blended in a ratio of virgin to recycled, to give strength to the material for use in a new product. Some other everyday items recycled plastic bottles can be made into are: Plastic packaging, Clothing and shoes, Carpets and soft furnishings, Furniture, Automotive parts etc.
- ▶ Statement 4 is not correct: Globally, in this year alone, researchers estimate that the production and incineration of plastic will pump more than 850 million tonnes of greenhouse gases into the atmosphere. Producing a 16 oz. PET bottles generate more than 100 times the toxic emissions to air and water than making the same size bottle out of glass.

Source:

<https://economictimes.indiatimes.com/news/how-to/how-are-plastic-pet-bottles-recycled-into-clothing/articleshow/92016415.cms> <https://www.freepressjournal.in/mumbai/plastic-industry-opposes-ban-on-alcohol-sale-in-pet-bottles>



Motivation:

PET is commonly used in everyday food and beverage packaging.

2022

Question: Consider the following:

1. Carbon monoxide
2. Nitrogen oxide
3. Ozone
4. Sulphur dioxide

Excess of which of the above in the environment is/are cause(s) of acid rain?

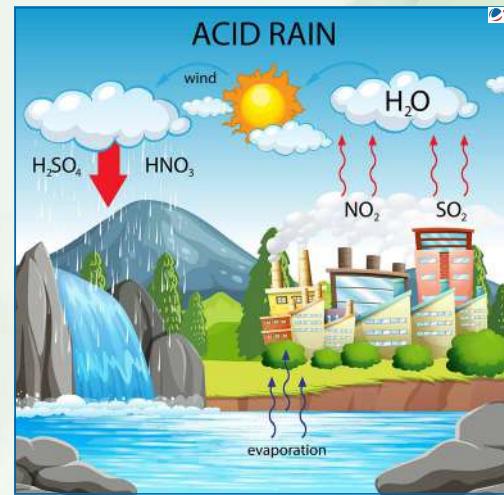
- (a) 1, 2 and 3
- (b) 2 and 4 only
- (c) 4 only
- (d) 1, 3 and 4

Answer B



Explanation:

- Acid rain results when sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NO_x react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.
- Hence option (b) is the correct answer.



2023

Question: Consider the following:

1. Aerosols
2. Foam agents
3. Fire retardants
4. Lubricants

In the making of how many of the above are hydrofluorocarbons used?

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

Answer D



Explanation:

- Hydrofluorocarbons (HFCs) are a group of industrial chemicals primarily used for cooling and refrigeration.
- HFCs are entirely man-made. They are primarily produced for use in refrigeration, air-conditioning, insulating foams and aerosol propellants, with minor uses as solvents and for fire protection. Also, synthetic lubricants used in stationary HFC-based refrigeration equipment.
- HFCs were developed to replace stratospheric ozone-depleting substances that are currently being phased out under the Montreal Protocol on Substances that Deplete the Ozone Layer.
- Though HFCs currently represent around 1% of total greenhouse gases, their impact on global

warming can be hundreds to thousands of times greater than that of carbon dioxide per unit of mass.

➤ Kigali Amendment to phase down HFCs under the Montreal Protocol entered into force in 2019. Under the amendment, countries commit to cut the production and consumption of HFCs by more than 80% over the next 30 years. Hence, all the four options are correct.

➤ Hence option (d) is the correct answer.

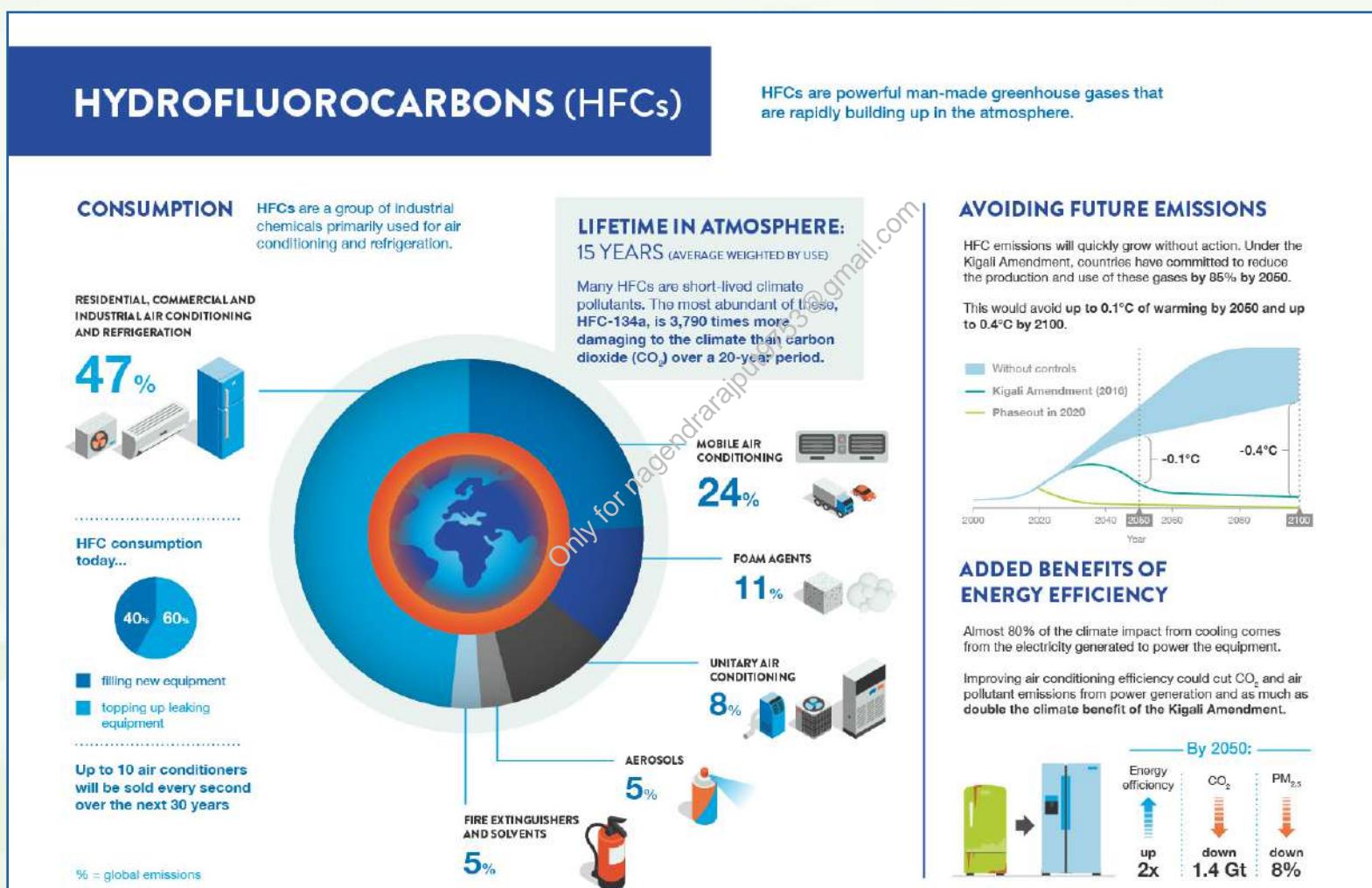
Source:

<https://pib.gov.in/PressReleasePage.aspx?PRID=1746946>



Motivation:

Hydrofluorocarbons are often seen in the news. Recently the Kigali Amendment was also made to the Montreal Protocol which seeks to phase out HFCs.



Question: With reference to the role of biofilters in Recirculating Aquaculture System, consider the following statements :

1. Biofilters provide waste treatment by removing uneaten fish feed.
2. Biofilters convert ammonia present in fish waste to nitrate.
3. Biofilters increase phosphorus as nutrient for fish in water.

How many of the statements given above are correct?

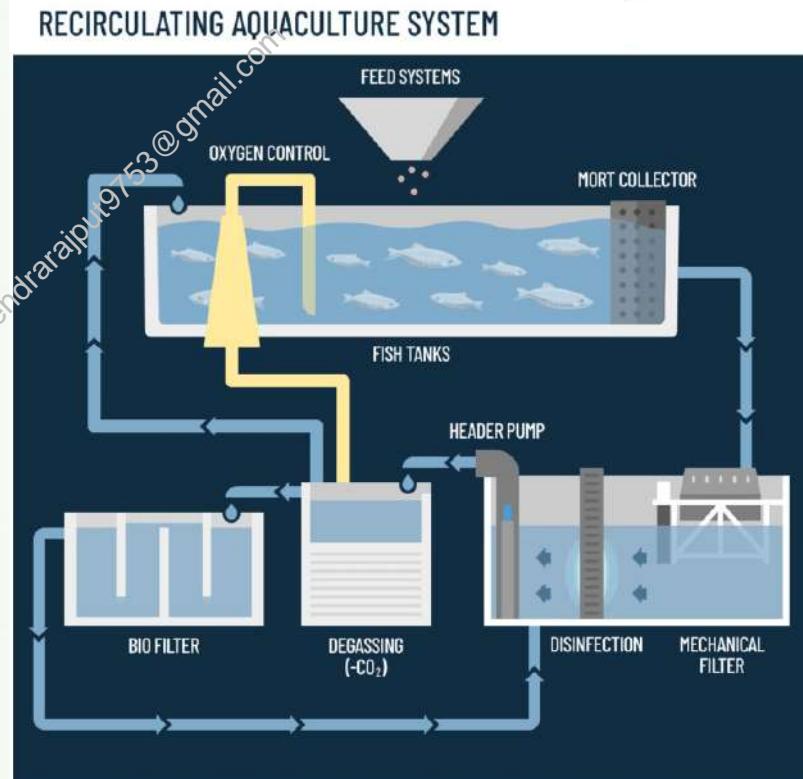
- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer B



Explanation:

- Recirculating aquaculture systems (RAS) are unique engineered ecosystems that minimize environmental perturbation by reducing nutrient pollution discharge. They are indoor, tank-based systems in which fish are grown at high density under controlled environmental conditions.
- A biofilter system purifies the water and removes or detoxifies harmful waste products and uneaten feed. Biofilters use microorganisms, which are capable of degrading many compounds, fixed to an inorganic/organic medium to break down pollutants present. **Hence statement 1 is correct.**
- Ammonia is removed from an aquarium system through the use of a biofilter. The biofilter provides a substrate on which nitrifying bacteria grow. These nitrifying bacteria consume ammonia and produce nitrite, which is also toxic to fish. Other nitrifying bacteria in the biofilter consume nitrite and produce nitrate. **Hence statement 2 is correct.**
- Biofilters are also used to remove phosphorus waste by-products generated by fish. Thus biofilters do not increase phosphorous content in aquatic systems. **Hence statement 3 is not correct.**





Motivation:

Bioremediation techniques is an often repeated theme in the exam as they are eco-friendly means to tackle pollution and related problems.

2023

Question: Consider the following statements regarding mercury pollution :

1. Gold mining activity is a source of mercury pollution in the world.
2. Coal-based thermal power plants cause mercury pollution.
3. There is no known safe level of exposure to mercury.

How many of the above statements are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer C

- **Statement 1 is correct:** Artisanal gold mining currently contributes more than 35 percent of all global mercury emissions created by people.
- **Statement 2 is correct:** Mercury is emitted in the combustion process of coal and other fossil fuels. Coal has much higher mercury concentrations than other fossil fuels, which explains why coal-fired power plants often emit larger quantities of mercury pollution than do power plants that burn other fossil fuels.
- **Statement 3 is correct:** Mercury is a highly toxic element; there is no known safe level of exposure. Ideally, neither children nor adults should have any mercury in their bodies because it provides no physiological benefit.

Source:

<https://www.scientificamerican.com/article/gold-mining-is-poisoning-amazon-forests-with-mercury/>

<https://theconversation.com/how-poisonous-mercury-gets-from-coal-fired-power-plants-into-the-fish-you-eat-176434>

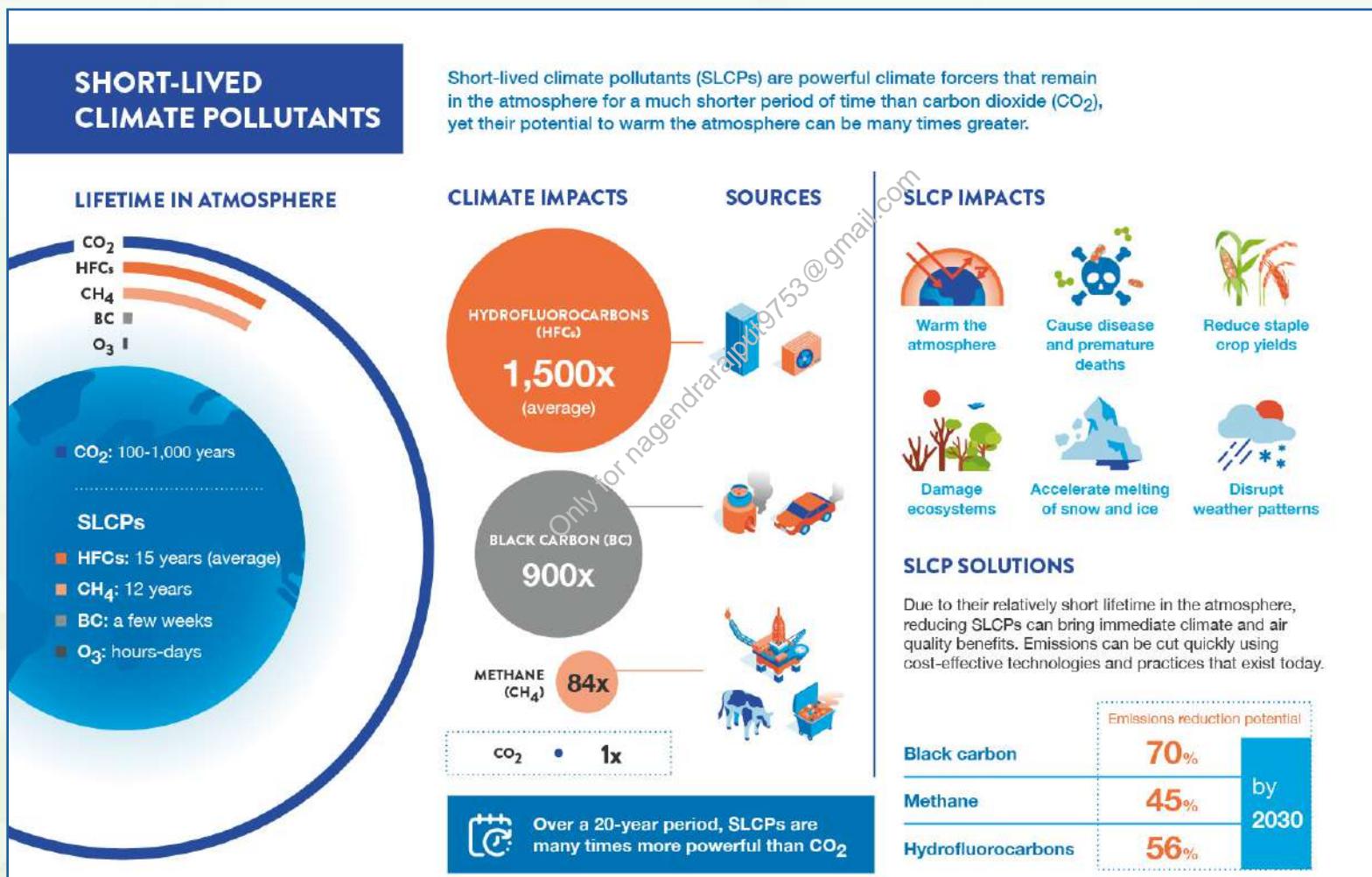
Consider the following statements:

1. Climate and Clean Air Coalition (CCAC) to Reduce Short Lived Climate Pollutants is a unique initiative of G20 group of countries.
2. The CCAC focuses on methane, black carbon and hydrofluorocarbons.

Which of the statements given above is/are correct?

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

Answer B





Explanation:

- The Climate & Clean Air Coalition is the only global effort that unites governments, civil society and the private sector, committed to improving air quality and protecting the climate in next few decades by reducing short-lived climate pollutants across sectors. The Coalition's initial focus is on methane, black carbon, and HFCs.
- The governments of Bangladesh, Canada, Ghana, Mexico, Sweden and the United States, along with the United Nations Environment Programme (UNEP), came together to initiate the first effort to treat these pollutants as a collective challenge. The coalition has 53 country partners and 17 International Governmental Organizations and 45 Non governmental organization partners.
- India is not a partner country however The Energy and Resources Institute (TERI) is a partner NGO since 2015.

Source:

<http://timesofindia.indiatimes.com/city/varanasi/Solid-waste-management-system-a-failure-in-Varanasi-says-report/articleshow/29980955.cms>

<http://www.ccacoalition.org/en/partners>

<http://www.thehindubusinessline.com/news/national/urgent-steps-to-check-4-key-climate-pollutants-can-help-save-2-million-deaths-annually-who/article7796565.ece>



Motivation:

The Pune Municipal Corporation (PMC) was invited to be a member of Climate and Clean Air Coalition (CCAC) in 2013.

Question: In the context of solving pollution problems, what is/are the advantage/advantages of bioremediation techniques?

1. It is a technique for cleaning up pollution by enhancing the same biodegradation process that occurs in nature.
2. Any contaminant with heavy metals such as cadmium and lead can be readily and completely treated by bioremediation using microorganisms.
3. Genetic engineering can be used to create microorganisms specifically designed for bioremediation.

Select the correct answer using the code given below:

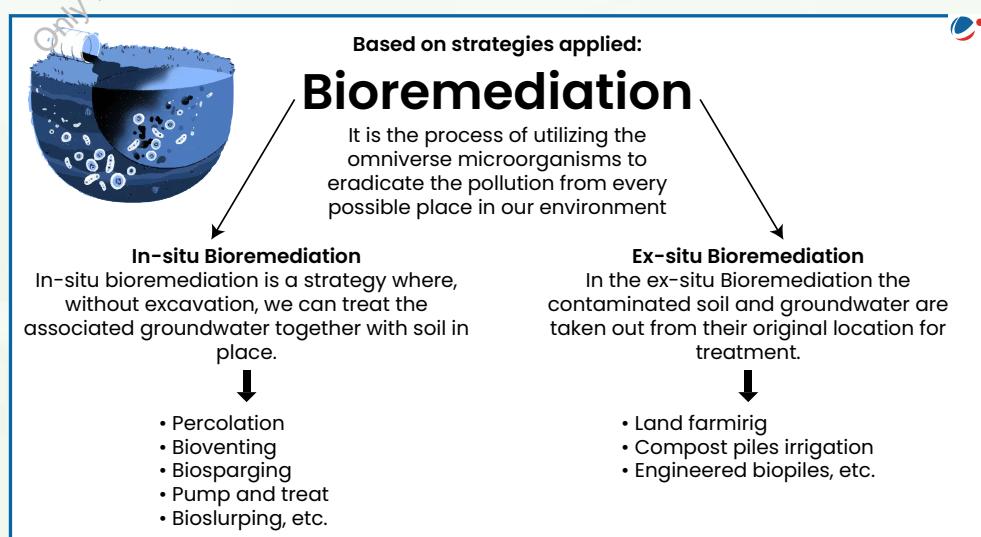
- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer C



Explanation:

- **Statement 1 is correct:** Bioremediation is treatment that uses naturally occurring organisms to break down hazardous substances into less toxic or non-toxic substances. It uses microorganisms to degrade organic contaminants in soil, groundwater, sludge, and solids. The microorganisms break down contaminants by using them as an energy source or metabolising them with an energy source.
- **Statement 2 is not correct:** Not all contaminants are easily treated by bioremediation using microorganisms. For example, heavy metals such as cadmium and lead are not readily absorbed or captured by microorganisms.
- **Statement 3 is correct:** Genetic engineering has been used to create organisms designed for specific purposes. For e.g. bacterium *Deinococcus radiodurans* (the most radioresistant organism known) has been modified to consume and digest toluene and ionic mercury from highly radioactive nuclear waste.



THE PLANET VISION

In a world facing unprecedented environmental challenges, staying informed and empowered is more crucial than ever. **VisionIAS** brings you '**The Planet Vision**', a simplified, informative, and interactive magazine to delve into the complexities of the environment.

With the belief, that individual efforts and awareness are the key to a sustainable future, the magazine seeks to inspire and educate people to **develop a deeper understanding and appreciation for the environment, nature & planet.**

Objectives of 'The Planet Vision'



Sensitise the young generation: Highlighting pressing environmental issues and their multifaceted impacts.



Inspire Action and Promote Sustainable Lifestyle: Inspiring stories and case studies to motivate readers to make environmentally conscious choices.



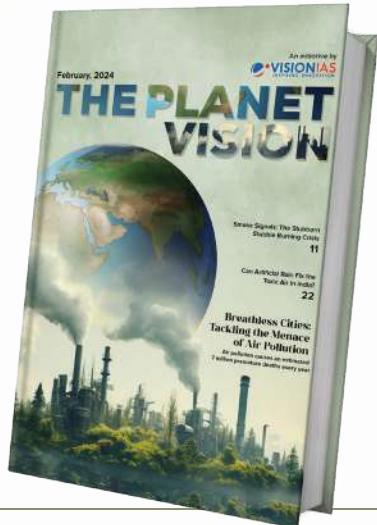
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Highlight Local Efforts: Showcase local conservation efforts, community initiatives, and grassroots projects that make a positive impact on the environment.



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Protect and Preserve: Inspirational stories of local conservation efforts.



Environment and You: Illustrating ways to make environmentally conscious choices in everyday life.



Green Tech: New and emerging technologies in the field of environment.



Interactive elements:

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- Quizzes and crosswords:** To test your understanding and knowledge as a reader.

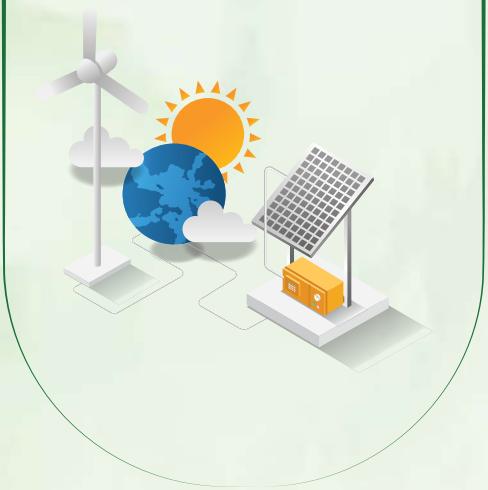


Look deep into nature, and then you will understand everything better.

-Albert Einstein



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Unconventional Sources of Energy

2019

In the context of which one of the following are the terms 'pyrolysis and plasma gasification' mentioned?

- (a) Extraction of rare earth elements
- (b) Natural gas extraction technologies
- (c) Hydrogen fuel-based automobiles
- (d) Waste-to-energy technologies

Answer D



Explanation:

- **Pyrolysis:** Pyrolysis is the process of heating organic material at high temperatures in the absence of oxygen.
- **Plasma Gasification:** Plasma gasification is an extreme thermal process using plasma which converts organic matter into a syngas (synthesis gas) which is primarily made up of hydrogen and carbon monoxide. **Hence option (d) is the correct answer.**

Methods for removal of waste



- Oldest method, waste disposed in landfills.
- Waste digested anaerobically and produce biogas used as source of heating.



- Mass burn technology in presence of oxygen
- Waste burn in incinerators and converted into ash and harmful greenhouse gases



- Thermal treatment in the absence of oxygen at low temperature.
- Syngas, pyrolysis liquid and coke obtained as products



- Partial oxidation of waste at high temperature.
- Products are low quality syngas, slag and metals.



- Waste is converted into syngas and vitrified slag at very high temperature.
- No emission of greenhouse gases.

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/plastic-surgery/article25604517.ece>



Motivation:

Commonly seen in news.

2019

In the context of proposals to the use of hydrogen-enriched CNG (H-CNG) as fuel for buses in public transport, consider the following statements:

1. The main advantage of the use of H-CNG is the elimination of carbon monoxide emissions.
2. H-CNG as fuel reduces carbon dioxide and hydrocarbon emissions.
3. Hydrogen up to one-fifth by volume can be blended with CNG as fuel for buses.
4. H-CNG makes the fuel less expensive than CNG.

Which of the statements given above is/are correct?

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

Answer B



Explanation:

► **Statement 1 is not correct and statements 2 and 3 are correct:** H-CNG is a blend of hydrogen and CNG, the ideal hydrogen concentration being 18%. Compared to conventional CNG, use of H-CNG can reduce emission of carbon monoxide up to 70% and 15% reduction in total hydrocarbon emissions, besides enabling up to 5% savings in fuel.

► **Statement 4 is not correct:** In its report to the Supreme Court, the EPCA has estimated that to fuel Delhi's 5,500 buses, about 400 tonnes H-CNG would be needed per day. Setting up four fuel-dispensing facilities would cost Rs 330 crore, which can be funded from the Environment Compensation Charge (ECC) fund made up of cess on commercial vehicles entering Delhi, it said. For consumers who pay

HCNG is hydrogen-enriched compressed natural gas (CNG). In Delhi, instead of physically blending hydrogen with CNG, hydrogen-spiked CNG will be produced using compact reforming process patented by Indian Oil Corporation



► It is cleaner and more economical; power output of HCNG engine is also better than CNG ones

4-tonne-per-day production plant will come up at DTC's Raghav-1 bus depot by December

₹40cr cost of HCNG plant

50 CLUSTER BUSES WILL RUN ON HCNG

6-month pilot project will start in January

BENEFITS OF HCNG

- 4% more fuel economy than CNG
- 70% more reduction in carbon monoxide emissions compared to CNG
- 4% more fuel economy than CNG

Rs 42 per kg for CNG, the cost of H-CNG would not be more than Rs 43 per kg.

Source:

<https://indianexpress.com/article/explained/cng-to-hydrogen-cng-why-switch-and-how-5278356/>

2020

According to India's National Policy on Biofuels, which of the following can be used as raw materials for the production of biofuels?

1. Cassava
2. Damaged wheat grains
3. Groundnut seeds
4. Horse grams
5. Rotten potatoes
6. Sugar beet

Select the correct answer using the code given below:

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

Answer A



Explanation:

- Under the National Policy on Biofuels 'bioethanol' is defined as ethanol produced from biomass such as sugar containing materials, like sugar cane, sugar beet, sweet sorghum etc.; starch containing materials such as corn, cassava, rotten potatoes, algae etc.; and, cellulosic materials such as bagasse, wood waste, agricultural and forestry residues or other renewable resources like industrial waste.
- For Ethanol Production the following raw materials may be potentially used: B-Molasses, Sugarcane juice, biomass in form of grasses, agriculture residues (Rice straw, cotton stalk, corn cobs, saw dust, bagasse etc.) , sugar containing materials like sugar beet, sweet sorghum, etc. and starch containing materials such as corn, cassava, rotten potatoes etc., Damaged food grains like wheat, broken rice etc. which are unfit for human consumption, Food grains during surplus phase. Algal feedstock and cultivation of seaweeds can also be a potential feedstock

for ethanol production.

- For Biodiesel Production: Non-edible Oilseeds, Used Cooking Oil (UCO), Animal tallow, Acid Oil, Algal feedstock etc.
- For Advanced Biofuels: Biomass, MSW, Industrial waste, Plastic waste etc.
- **Hence option (a) is the correct answer.**

Source:

<https://www.thehindubusinessline.com/economy/policy/cabinet-approves-national-biofuel-policy/article23903816.ece#:~:text=The%20Cabinet%20on%20Wednesday%20approved,to%20be%20mixed%20in%20petrol>

<http://petroleum.nic.in/national-policy-biofuel-2018-0>



Motivation:

National Policy on Biofuels was extensively covered in news as it was recently approved by the Union Cabinet.

2023

Consider the following heavy industries :

1. Fertiliser plants
2. Oil refineries
3. Steel plants

Green hydrogen is expected to play a significant role in decarbonizing how many of the above industries?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer C



Explanation:

- Green hydrogen is the hydrogen produced through electrolysis of water using electricity from renewable sources.
- Hydrogen use today is dominated by industry, namely: oil refining, ammonia production, methanol production and steel production.
- Central to a decarbonised India will be a widespread adoption of renewable power and vehicle electrification. Targets and policies such as the 500 GW non-fossil fuel electricity capacity by 2030, scheme for Faster Adoption and Manufacturing of Electric Vehicles- Phase II (FAME II) etc represent a concrete policy push towards fulfilling these ambitions.
- To further complement these ongoing efforts, India is prioritising green hydrogen as a potential solution to decarbonise hard-to-abate sectors such as refinery, ammonia, methanol, iron and steel and heavy-duty trucking.
- Hence option (c) is the correct answer.

HYDROGEN PRODUCTION METHODS



| GREEN | PURPLE | BLUE | GREY | BLACK |
|---|--|---|---|---|
| Generally considered as hydrogen produced from the electrolysis of water using renewables as the power source | Hydrogen produced from the electrolysis of water using nuclear as the power source | Produced by the reforming of natural gas into carbon dioxide (CO_2) and hydrogen, in combination with carbon capture and storage (CCS) | Produced from fossil fuels, using thermal processes like steam-methane reformation and partial oxidation. Emissions of greenhouse gases occur | Extracted from a synthetic gas produced from coal |

Note: Hydrogen produced using nuclear power has not been given an established color designation.



Motivation:

National Green Hydrogen Mission was launched in January, 2023

With reference to green hydrogen, Consider the following statements :

1. It can be used directly as a fuel for internal combustion.
2. It can be blended with natural gas and used as fuel for heat or power generation.
3. It can be used in the hydrogen fuel cell to run vehicles.

How many of the above statements are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer C



Explanation:

- » Green hydrogen is any hydrogen that is produced from renewable energy. This includes electrolysis with electricity coming from green sources such as solar, wind, and hydroelectric power.
- » **Various uses of Green Hydrogen:**
 - » Industry: Oil refining, ammonia production, methanol production, steel production etc.
 - » Buildings: Hydrogen could be blended into existing natural gas networks, with the highest potential in multifamily and commercial buildings, particularly in dense cities.
 - » Power generation: Hydrogen is one of the leading options for storing renewable energy, and hydrogen and ammonia can be used in gas turbines to increase power system flexibility.
 - » Green Hydrogen Fuel Cell Electric Vehicle (FCEV): Powered by Hydrogen, it is one of the best Zero Emission solutions. It is completely environment friendly with no tailpipe emissions other than water. **Hence statement 3 is correct.**
 - » It can also serve as fuel for internal combustion engines. Hydrogen has a wide flammability range in comparison with all other fuels. As a result, hydrogen can be combusted in an internal combustion engine over a wide range of fuel-air mixtures. A significant advantage of this is that hydrogen can run on a lean mixture. **Hence statement 1 is correct.**
 - » Recently NTPC Ltd commissioned India's first green hydrogen blending project. Green hydrogen blending has been started in the piped natural gas (PNG) network of NTPC Kawas township, Surat. **Hence statement 2 is correct.**

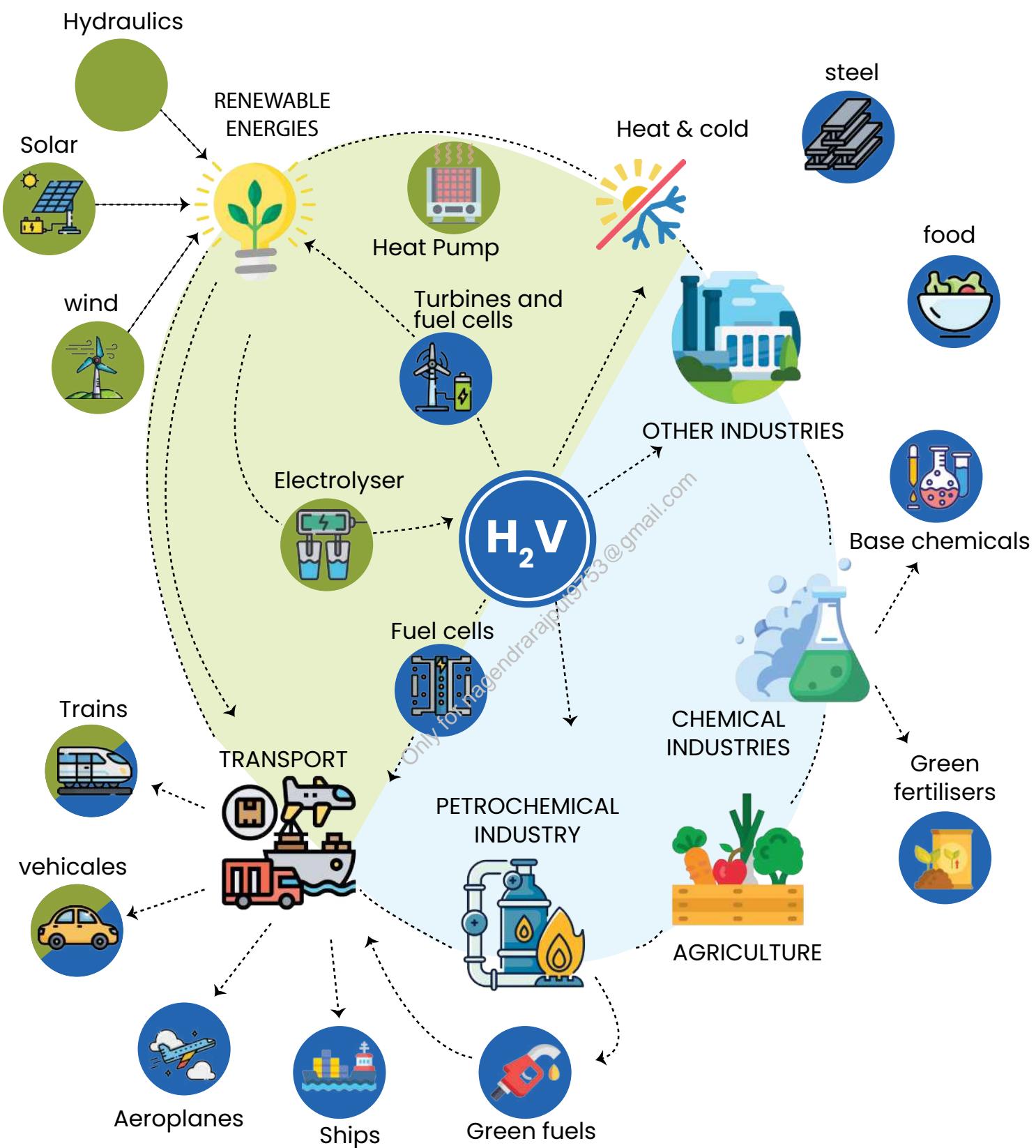


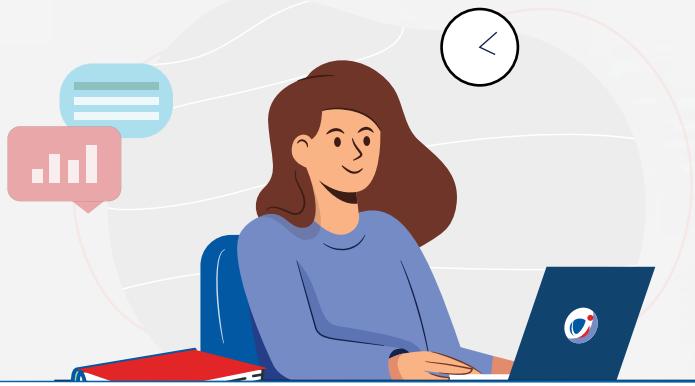
Motivation:

National Green Hydrogen Mission was launched in January, 2023

Applications of Green Hydrogen

Green hydrogen will be a key element in the decarbonisation of the planet and will have an impact on numerous industries and sectors.





Mastering CSAT:

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Strategic Framework for CSAT Preparation



Initial Self-Assessment: Begin with a self-evaluation using the previous year's CSAT papers to identify strengths and areas for improvement.



Study Plan: Develop a structured study plan, focusing on high yielding areas and selecting reliable study sources.



Regular Practice and Post-Test Analysis: Solving and analyzing previous year papers and mock tests to familiarize with the exam format and question types, ensuring a strategic approach to covering the comprehensive syllabus effectively.



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Reasoning: Sharpen your logical and analytical reasoning by practicing diverse question types from Clocks, Calendars, Series & Progression, Direction, Blood Relation, Coding-Decoding, Syllogism, and so on.

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With reference to solar power production in India, consider the following statements:

1. India is the third largest in the world in the manufacture of silicon wafers used in photovoltaic units.
2. The solar power tariffs are determined by the Solar Energy Corporation of India.

Which of the statements given above is/are correct?

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

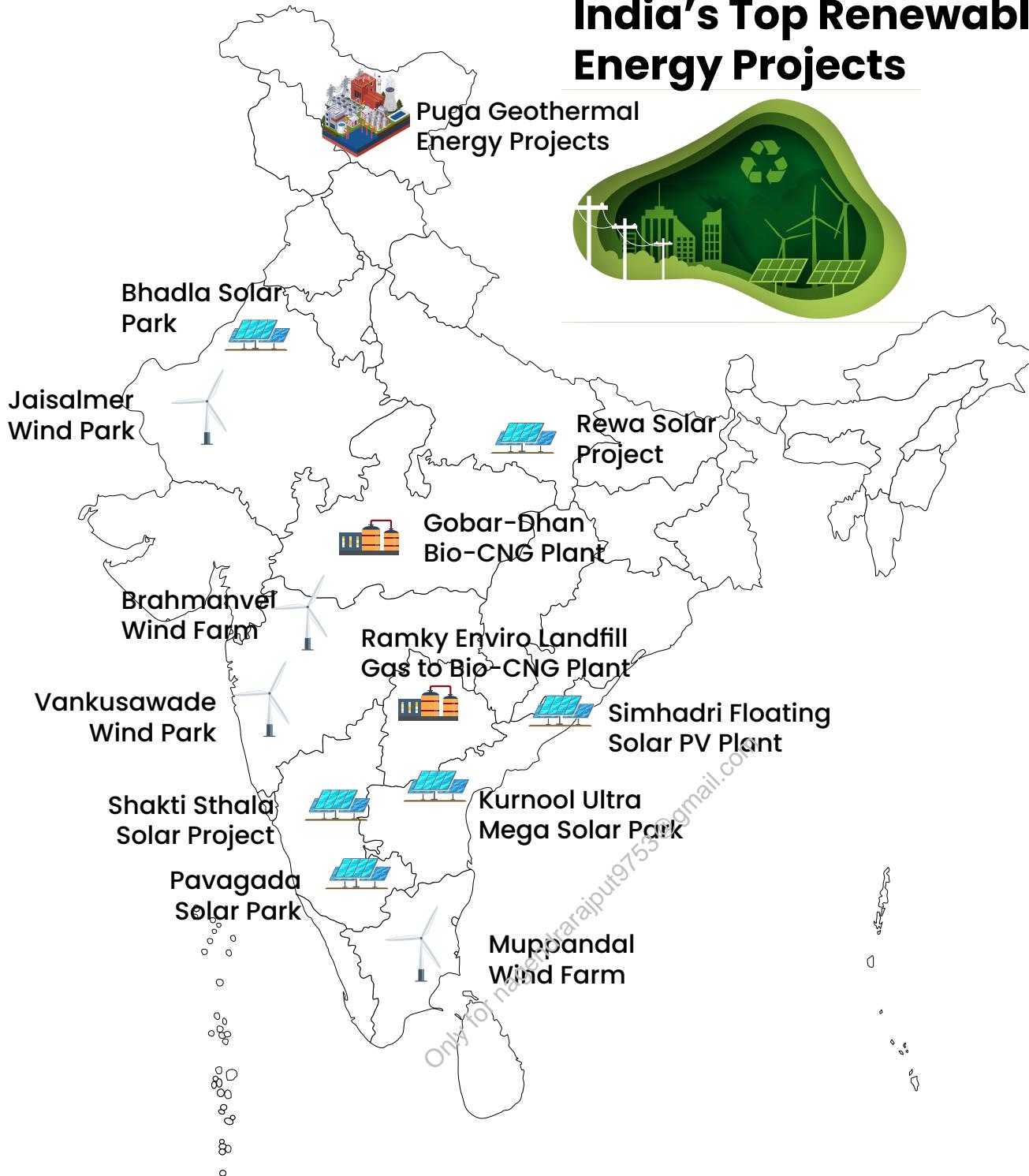
Answer D



Explanation:

- **Statement 1 is not correct.** Manufacturing of solar panels (also called modules) starts with polysilicon, which is made from silicon. Polysilicon is made into ingots, which are cut into wafers. Cells are made with wafers and a string of cells is a module. **Today, only modules and cells are made in India, with imported material.** At present, the only incentives available for manufacturing these are the Modified-Special Incentive Package Scheme, which is available to all electronic goods manufacturers and implemented by the Ministry of Electronics and Information Technology, but there have been few takers for the scheme.
- China is the world's largest silicon producer, with a production volume estimated at 5.4 million metric tons in 2020. The second largest producer of this metalloid in the world is Russia, Norway being third followed by the United States and Brazil.
- **Statement 2 is not correct.** "Solar Energy Corporation of India Ltd" (SECI) is a CPSU under the administrative control of the Ministry of New and Renewable Energy (MNRE). It aims to become the leader in development of large scale solar installations, solar plants and solar parks and to promote and commercialise the use of solar energy to reach the remotest corner of India. It also explores new technologies and their deployment to harness solar energy.
- **Solar Power tariffs are determined either through the regulations of Central Electricity Regulatory Commission/State Electricity Regulatory Commission or through competitive bidding.**

India's Top Renewable Energy Projects



It is possible to produce algae based biofuels, but what is/are the likely limitation(s) of developing countries in promoting this industry?

1. Production of algae based biofuels is possible in seas only and not on continents.
2. Setting up and engineering the algae based biofuels production requires high level of expertise/technology until the construction is complete.
3. Economically viable production necessitates the setting up of large scale facilities which may raise ecological and social concerns.

Select the correct answer using the code given below:

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

Answer B



Explanation:

- ▶ **Statement 1 is not correct.** Production of algal biofuel is possible both in seas and on continents. They can grow on marginal or non-crop land and also on brackish or polluted water. Land based systems are more developed than sea based systems.
- ▶ **Statements 2 and 3 are correct.** Developing and engineering ABB technology requires a high level of expertise until construction is finished. Innovation for higher productivity also requires some knowledge and/or experience. All Algal based biofuel concepts require significant capital investment. Access to this technology by the poor may be difficult. Large-scale facilities are more economically viable, but are also more likely to have higher social and ecological impacts.

Source:

<http://www.fao.org/3/a-ak333e.pdf>

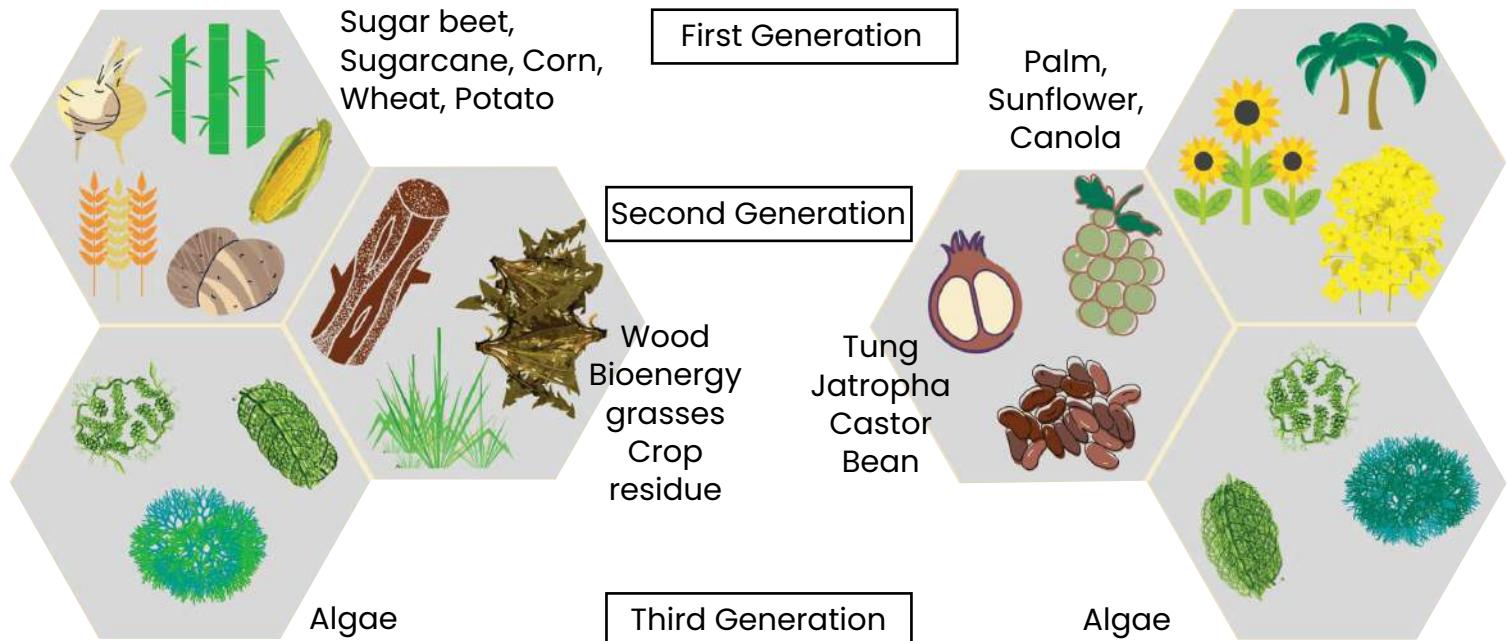
<http://www.thehindubusinessline.com/economy/agri-business/india-can-be-a-world-leader-in-algal-farming-says-us-expert/article9449569.ece>



Motivation:

Biofuels are frequently seen in news.

Biofuel Feedstocks



Production

Enzymatic Hydrolysis
(when necessary)
Fermentation
Distillation
Ethanol Blended Gas



Oil Extraction
Transesterification
Purification
Biodiesel



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Agriculture

2017

Question: Which of the following Practices can help in water conservation in agriculture?

1. Reduced or zero tillage of the land
2. Applying gypsum before irrigating the field
3. Allowing crop residue to remain in the field

Select the correct answer using the code given below:

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

Answer C



Explanation:

Statement 1 is correct: No-till farming (also called zero tillage or direct drilling) is a way of growing crops or pasture from year to year without disturbing the soil through tillage. No-till is an agricultural technique which increases the amount of water that infiltrates into the soil and increases organic matter retention and cycling of nutrients in the soil.

Statement 2 is Not correct: Gypsum improves the ability of soil to drain and not become waterlogged thus increasing water-use efficiency of crops.

Statement 3 is correct: More agricultural remnants left after harvest help the soil retain more water in the following ways: Reducing evaporation. Cover from plant leftovers allows less sunlight to penetrate the soil and slows the flow of air over the soil, both of which help to lower evaporation rates.

Source:

Official Website of FAO, Economic Times article "Pakistan exporting 2,700 tonnes gypsum daily to India"



Motivation:

It was reported in the news that Pakistan was exporting Gypsum to India in huge quantities. Also, conservation of water in Agriculture is one of the most important concerns in India as India is the leading groundwater extractors for agricultural purposes.

2018

Question: With reference to the circumstances in Indian agriculture, the concept of "Conservation Agriculture" assumes significance. Which of the following fall under the Conservation Agriculture?

1. Avoiding the monoculture practices
2. Adopting minimum tillage
3. Avoiding the cultivation of plantation crops
4. Using crop residues to cover soil surface
5. Adopting spatial and temporal crop sequencing/crop rotations

Select the correct answer using the code given below:

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

Answer C



Explanation:

- Conservation Agriculture is a set of soil management practices that minimize the disruption of the soil's structure, composition and natural biodiversity. Despite high variability in the types of crops grown and specific management regimes, all forms of conservation agriculture share three core principles. These include:
 - » ► maintenance of permanent or semi-permanent soil cover (using either a previous crop residue or specifically growing a cover crop for this purpose);
 - » ► minimum soil disturbance through tillage (just enough to get the seed into the ground) ;
 - » ► regular crop rotations to help combat the various biotic constraints;

- ▶ CA also uses or promotes where possible or needed various management practices such as utilization of green manures/cover crops to produce the residue cover; no burning of crop residues; integrated disease and pest management; controlled/limited human and mechanical traffic over agricultural soils.
- ▶ When these CA practices are used by farmers one of the major environmental benefits is reduction in fossil fuel use and greenhouse gas (GHG) emissions. But they also reduce the power/energy needs of farmers.

Source:

<http://conservationagriculture.mannlib.cornell.edu/pages/aboutca/whatisca.html>



Motivation:

Conservation Agriculture is a term sometimes seen in the news.

2018

Question:

With reference to agricultural soils, consider the following statements:

1. A high content of organic matter in soil drastically reduces its water holding capacity.
2. Soil does not play any role in the sulphur cycle.
3. Irrigation over a period of time can contribute to the salinization of some agricultural lands.

Which of the statements given above is/are correct?

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

Answer B

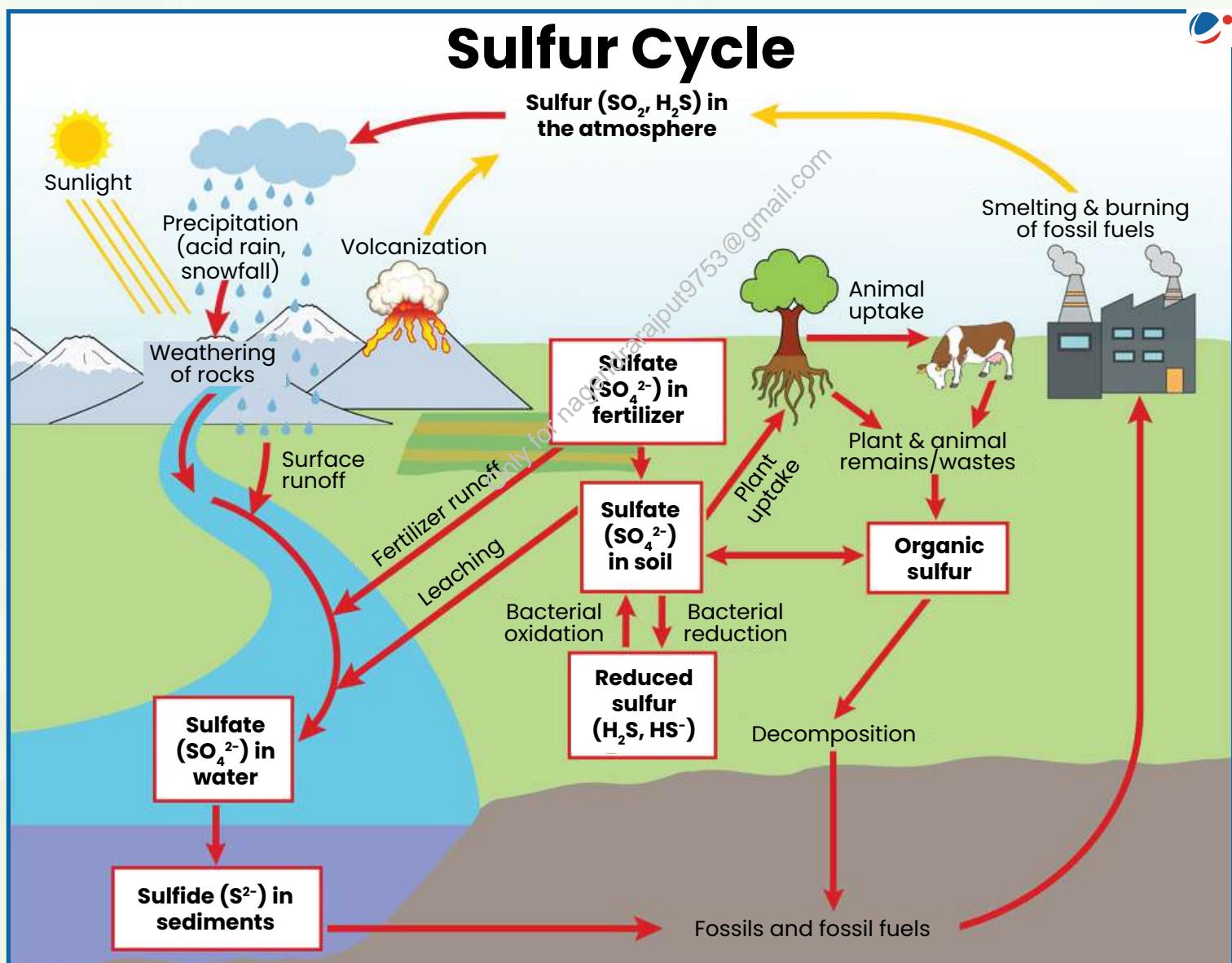


Explanation:

- ▶ Organic matter affects both the chemical and physical properties of the soil. Properties influenced by organic matter include: soil structure; moisture holding capacity; diversity and activity of soil organisms, both those that are beneficial and harmful to crop production; and nutrient availability. **Increased levels of organic matter and associated soil fauna lead to greater pore space with the immediate result that water infiltrates more readily and can be held in the soil.** The improved pore space is a consequence of the bioturbating activities of earthworms

and other macro-organisms and channels left in the soil by decayed plant roots.

- ▶ **Sulfur is one of three nutrients that are cycled between the soil, plant matter and the atmosphere.** Sulfur is released by weathering of rocks and minerals. Water, temperature and chemical reactions break down minerals releasing their component elements. Once sulfur is exposed to the air, it combines with oxygen, and becomes sulfate (SO_4^{2-}). Plants and microbes take up sulfate and convert it into organic compounds. As animals consume plants, the sulfur is moved through the food chain and released when organisms and plants die and decompose.
- ▶ Primary salinization occurs naturally where the soil parent material is rich in soluble salts, or in the presence of a shallow saline groundwater table. In arid and semiarid regions, where rainfall is insufficient to leach soluble salts from the soil, or where drainage is restricted, soils with high concentrations of salts ("salt-affected soils") may be formed. When an excess of sodium is involved in the salinization process this is referred to as sodification.
- ▶ Secondary salinization occurs when significant amounts of water are provided by irrigation, with no adequate provision of drainage for the leaching and removal of salts, resulting in the soils becoming salty and unproductive. Salt-affected soils reduce both the ability of crops to take up water and the availability of micronutrients. They also concentrate ions toxic to plants and may degrade the soil structure.



Source:

Official website of FAO (<http://www.fao.org/docrep/009/a0100e/a0100e08.htm>)

<https://www.fertilesoilsolutions.com/soilwater-science/how-the-sulfur-cycle-works-in-crop-nutrition/>

http://www.fao.org/tempref/agl/agll/docs/salinity_brochure_eng.pdf)



Motivation:

Soil health and conservation is a major theme often seen in the news.

2019

Consider the following statements:

1. Agricultural soils release nitrogen oxides into environment.
2. Cattle release ammonia into environment.
3. Poultry industry releases reactive nitrogen compounds into environment.

Which of the statements given above is/are correct?

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

Answer D



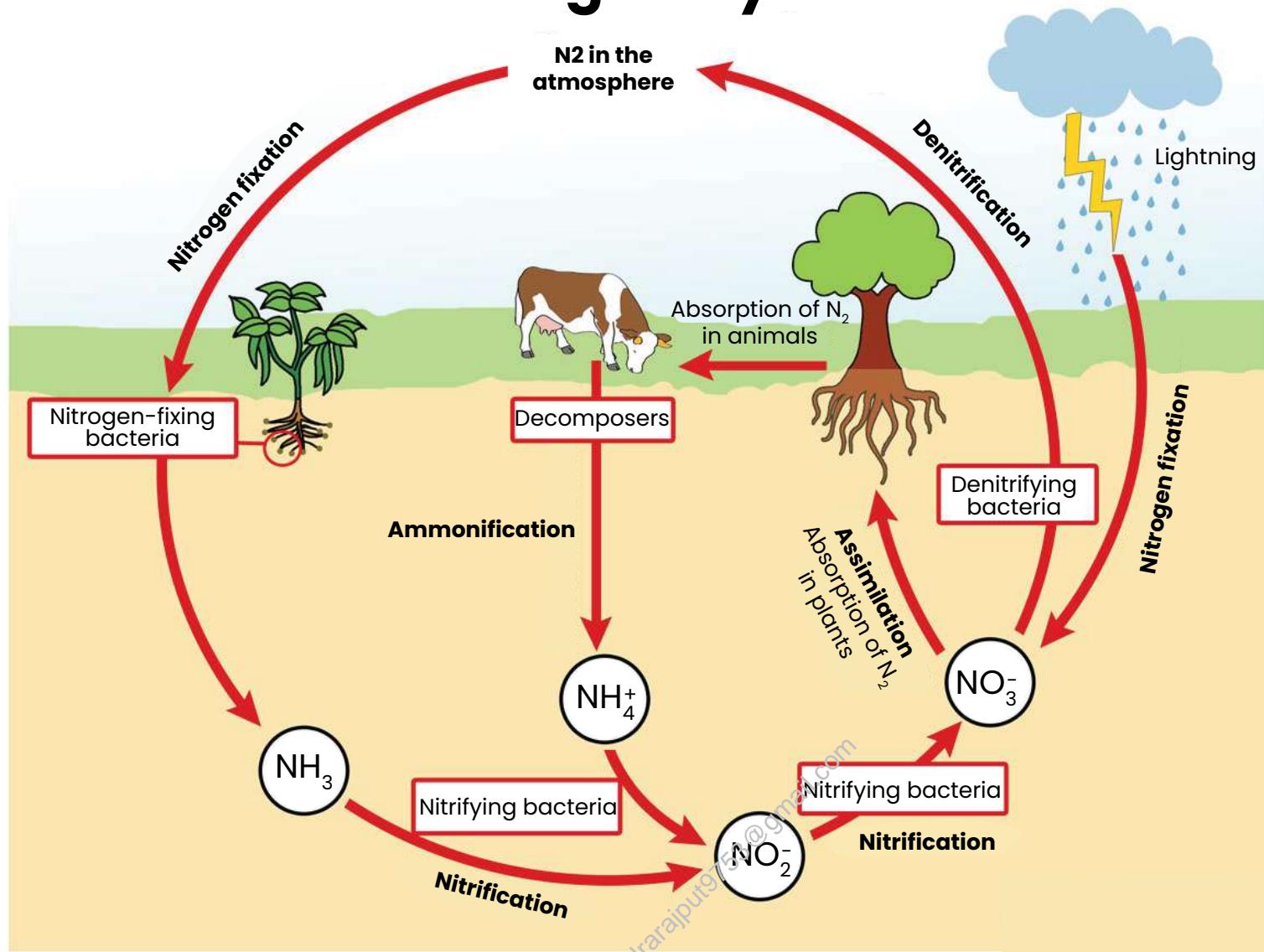
Explanation:

Statement 1 is correct: A major direct source of nitrous oxide from agricultural soils is that of synthetic fertilizer use. Where large applications of fertilizer are combined with soil conditions favorable to denitrification, large amounts of nitrous oxide can be produced and emitted to the atmosphere.

Statement 2 is correct: Ammonia is a common by-product of animal waste due to the often inefficient conversion of feed nitrogen into animal product. Emissions of ammonia from livestock farming are responsible for the acidification and eutrophication of deposited ammonia in the environment.

Statement 3 is correct: Reactive nitrogen includes – ammonia, nitrate, nitric oxide (NO), nitrous oxide (N₂O). Livestock and Poultry are both responsible for emissions of these.

Nitrogen Cycle



Source:

<https://www.downtoearth.org.in/news/pollution/annual-un-report-recognises-the-threats-posed-by-nitrogen-pollution-63469>

<https://www.unenvironment.org/news-and-stories/press-release/it-time-fix-broken-nitrogen-cycle-says-un-environment-frontiers>



Motivation:

The annual Frontiers report 2019 published by the United Nations (UN), has included a chapter on nitrogen pollution in its latest edition, in a sign that pollution caused by the reactive forms of nitrogen is now being recognised as a grave environmental concern on a global level.

Question: In India, the use of carbofuran, methyl parathion, phorate and triazophos is viewed with apprehension. These chemicals are used as

- (a) pesticides in agriculture
- (b) preservatives in processed foods
- (c) fruit-ripening agents
- (d) moisturizing agents in cosmetics

Answer A



Explanation:

Carbofuran, phorate, methyl parathion, monocrotophos, methyl demeton, prophenophos and triazophos are pesticides used in agriculture.

Source:

<https://indianexpress.com/article/explained/fall-armyworm-an-insect-that-can-travel-100-km-per-night-the-threat-it-poses-for-farmers-5710850/>

<https://www.downtoearth.org.in/news/pesticide-ban-lands-kerala-in-court-33657>



Motivation:

In 2018-19, reports of Fall armyworm (FAW) infestations started pouring in from across the country, the Central Insecticide Board and Registration Committee (CIBRC) had allowed spraying of select insecticides/formulations – Carbofuran, Phorate, Thiamethoxam (12.6%) plus Lambda-cyhalothrin (9.5%), and Chlorantraniliprole 18.5% suspension concentrate – on a trial basis.

Question: What are the advantages of fertigation in agriculture ?

1. Controlling the alkalinity of irrigation water is possible.
2. Efficient application of Rock Phosphate and all other phosphatic fertilizers is possible.
3. Increased availability of nutrients to plants is possible.
4. Reduction in the leaching of chemical nutrients is possible.

Select the correct answer using the code given below:

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

Answer C



Explanation:

Explanation: 'Fertigation' is the technique of supplying dissolved fertilizers to crops through an irrigation system.

When combined with an efficient irrigation system both nutrients and water can be manipulated and managed to obtain the maximum possible yield of marketable production from a given quantity of these inputs.

Fertigation has some specific advantages over broadcast and band fertilization:

- (1) A frequent supply of nutrients reduces fluctuation of nutrient concentration in soil.**
- (2) There is efficient utilization and precise application of nutrients according to the nutritional requirements of the crop.**
- (3) Fertilizers are applied throughout the irrigated soil volume and are readily available to plants.
- (4) Nutrients can be applied to the soil when soil or crop conditions would otherwise prohibit entry into the field with conventional equipment.

The pH of the irrigation water is of great importance, as it affects many chemical reactions. In fertigation, the reasons for adjusting the pH to an optimal range are: 1. To allow optimal uptake of nutrients, especially micronutrients; 2. To keep the irrigation system free from clogging. Alkalinity of a fertigation system can be controlled by adding Acid. The injection of acid to the irrigation water should be, as much as possible, uniform and continuous, throughout the entire duration of the irrigation.

Fertigation



Benefits of fertigation

- A.** It is a safe method of fertilizer application without damaging the plant's root system.
- B.** In this, fertilizers are given near the roots, which increases the efficiency of fertilizer use and saves time, labor and money.
- C.** Small loss of nutrients from the soil surface such as evaporation loss of nitrogen.

Drip fertigation increases water and nitrogen use efficiency. **Drip fertigation reduced dissolved inorganic and organic N leaching by 90%.**

Soluble fertilizers like urea, potash and a wide variety of fertilizer mixtures available in the market could be well mixed with irrigation water, filtered and then passed through the irrigation unit.

Rock Phosphate and some other mineral fertilizers containing phosphorus are insoluble in water as well as in citric acid. They are suitable in strongly acid soils or organic soils. These fertilizers are given in green manured fields. The phosphorus is very slowly released by microbes at action and remains in soil for long time. **Hence option (c) is the correct answer.**

Source:

<https://www.thehindu.com/sci-tech/agriculture/active-research-work-in-organic-fertigation/article4268032.ece>

https://www.indiaagronet.com/indiaagronet/manuers_fertilizers/contents/phosphatic_fertilisers.htm



Motivation:

Articles related to fertigation are frequently seen in the news.

2020

Question: What is/are the advantage/advantages of zero tillage in agriculture?

1. Sowing of wheat is possible without burning the residue of previous crop.
2. Without the need for nursery of rice saplings, direct planting of paddy seeds in the wet soil is possible.
3. Carbon sequestration in the soil is possible.

Select the correct answer using the code given below:

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

Answer D



Explanation:

Statement 1 is correct: Zero-till farming is a way of growing crops without tillage or disturbing the soil in harvested fields. Wheat can be sowed without burning the residue of the previous crop. For example, Happy Seeder, a machine developed by Department of Farm Machinery and Power Engineering, Punjab Agricultural University, Ludhiana is one of the unique techniques which is used for sowing seed without any burning of crop residue.

No-Till Farming

A method of growing crops without disturbing the soil through plowing or tilling. Crop residue remains on the soil surface to decompose naturally.

BENEFITS

- Reduced soil erosion caused by plowing and tilling
- Increased soil organic matter
- Improved soil structure and aeration
- Increased beneficial soil microbes
- Retained soil moisture and water conservation
- Reduced fuel use from not plowing



Statement 2 is correct: Direct seeding is a crop establishment system wherein rice seeds are sown directly into the field, as opposed to the traditional method of growing seedlings in a nursery, then transplanting into flooded fields. Direct seeded rice (DSR) has received much attention because of its low-input demand. It involves sowing pre-germinated seed into a puddled soil surface (wet seeding), standing water (water seeding) or dry seeding into a prepared seedbed (dry seeding).

Statement 3 is correct: Adopting no-tillage in agro-ecosystems has been widely recommended as a means of enhancing carbon (C) sequestration in soils.



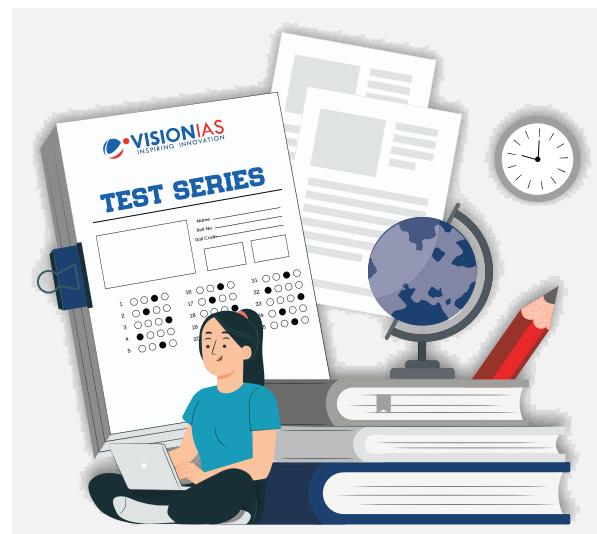
Motivation:

To tackle the problem of stubble burning Happy Seeders were frequently seen in the news. Also, Direct seeded rice (DSR) technique is also frequently discussed in newspapers.

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Question: In the context of India, which of the following is/are considered to be practice(s) of eco-friendly agriculture?

1. Crop diversification
2. Legume intensification
3. Tensiometer use
4. Vertical farming

Select the correct answer using the code given below:

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

Answer A



Explanation:

Crop diversification is the process of shifting from regional dominance of one crop to regional production of number of other crops. The role of crop diversification is to enhance resilience in the agricultural sector by reducing dependency on a single crop. Crop diversification increases agricultural biodiversity (genetic, species and ecosystem), improves crop yields and produces quality to address both food and nutritional security.

Legume intensification: This involves increasing the productivity of legume crops through better management practices. Legumes help to improve soil health by fixing nitrogen and are an important source of protein.

Tensiometer use: A tensiometer is a device used to measure soil moisture. Such tensiometers are used in irrigation scheduling to help farmers and other irrigation managers to determine when to water. Its also considered as eco-friendly agriculture as it help control the excessive use of water distorting the quality of the soil.

Vertical Farming: Vertical farming is considered a highly efficient and sustainable way of producing food. For instance, it uses 250 times less water than a traditional farm would need. Automation is also the key to this efficiency. Other advantages of vertical farming can be seen in the adjoining figure.

VERTICAL FARMING

MEANING

Vertical Farming is the practice of producing food in vertically stacked- layer such as a used warehouse, skyscraper, or shipping container

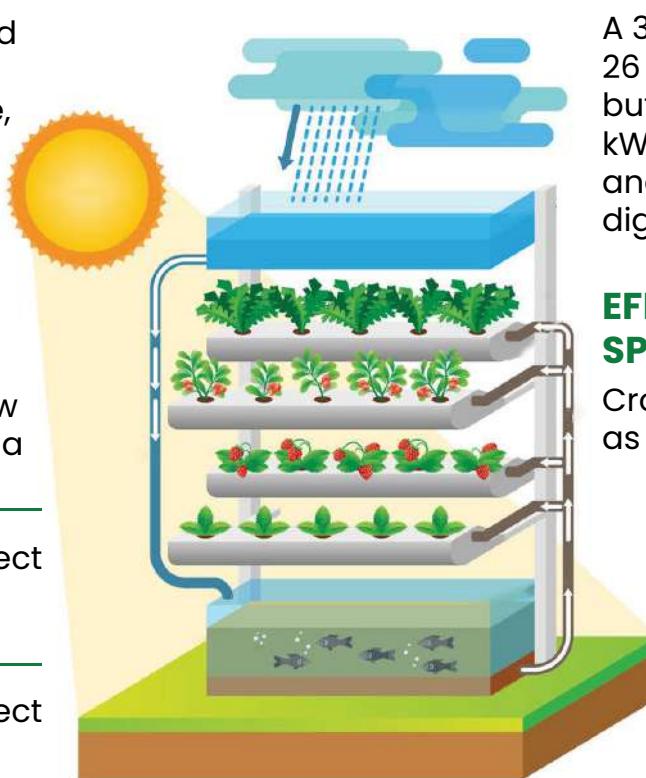
BENEFITS

The Adoption of vertical farming technique allows consumers to grow crops in a warehouse or a multi story building

Indoor farming can protect crops from extreme weather conditions.

Indoor farming can protect crops from extreme weather conditions.

Solution to all food crisis???



RENEWABLE PRODUCTION

A 30 story vertical farm needs 26 million kWh of electricity, but it can generate 56 million kWh through solar energy and the use of biogas digesters.

EFFICIENT USE OF URBAN SPACE

Crops can be stacked as high as the building is built.

WATER CONSERVATION

Hydroponic uses 70% less water than traditional agriculture practices.

WEATHERPROOF

Crops are grown in a controlled environment and are therefore not exposed to extreme weather events like drought and floods.

Source:

<https://www.thehindu.com/sci-tech/agriculture/vertical-farming-explained/article30522508.ece>

<https://www.thehindu.com/sci-tech/agriculture/vertical-farming-explained/article30522508.ece>



Motivation:

Eco-friendly agricultural practices are often seen in the news.

Question: What is the use of biochar in farming?

1. Biochar can be used as a part of the growing medium in vertical farming.
2. When biochar is a part of the growing medium, it promotes the growth of nitrogen-fixing microorganisms.
3. When biochar is a part of the growing medium, it enables the growing medium to retain water for longer time.

Which of the statements given above is/are correct?



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

Answer D

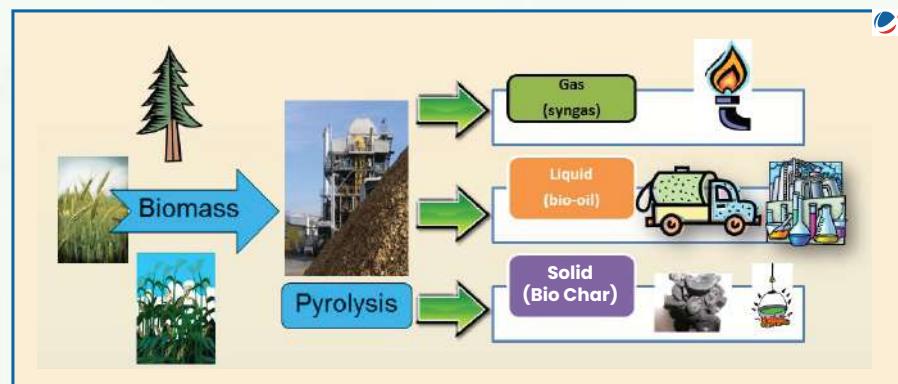


Explanation:

Biochar is defined as a carbon-rich material produced during pyrolysis process that is a thermochemical decomposition of biomass with a temperature about $\leq 700^{\circ}\text{C}$ in the absence or limited supply of oxygen.

Statement 1 is correct: As the use of soilless, hydroponic growing methods becomes more prevalent among crop producers, researchers are looking for new materials that can help growers save money, produce healthy plants, and contribute to sustainable practices. Biochar, a charcoal-like material produced by heating biomass in the absence of oxygen, can be used as a substrate for soilless, hydroponic tomato production. This method could provide growers with a cost-effective and environmentally responsible green-waste disposal method, and supplement substrate, fertilizer, and energy requirements.

Statement 2 is correct: Biochar has the potential to boost the natural ability of legumes to fix nitrogen to the soil. Adding biochar to soil not only provides a way to sequester carbon, but also has many soil health benefits which will help farmers adapt to climate change and increase productivity. In addition to supporting the life of nitrogen-fixing microorganisms, biochar can also decrease soil N₂O emission, and increase nitrogen use efficiency and nitrogen retention in the soil



Statement 3 is correct: Because of its porous nature, biochar can improve your soil's water retention and water holding capacity – defined as the amount of water that a soil can hold for its crops – so that your plants will have more water available to them for a longer period of time.

Source:

<https://www.dpi.nsw.gov.au/content/archive/agriculture-today-stories/ag-today-archives/june-2010/biochar-boasts-nitrogen-fixation---study>

<https://www.downtoearth.org.in/news/climate-change/biochar-application-can-help-ghana-s-smallholder-farmers-fight-back-climate-change-study-73017>



Motivation:

In 2020 it was reported in the news that new research has shown biochar application is more effective in promoting cowpea growth and yield in Ghana.

2021

Question: How is the permaculture farming different from conventional chemical farming?

1. Permaculture farming discourages monocultural practices but in conventional chemical farming, monoculture practices are predominant.
2. Conventional chemical farming can cause increase in soil salinity but the occurrence of such phenomenon is not observed in permaculture farming.
3. Conventional chemical farming is easily possible in semi-arid regions but permaculture farming is not so easily possible in such regions.
4. Practice of mulching is very important in permaculture farming but not necessarily so in conventional chemical farming.

Select the correct answer using the code given below.

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

Answer B



Explanation:

Permaculture is, amongst others, an approach to land management that adopts arrangements observed in flourishing natural ecosystems. Permaculture can be understood as the growth of

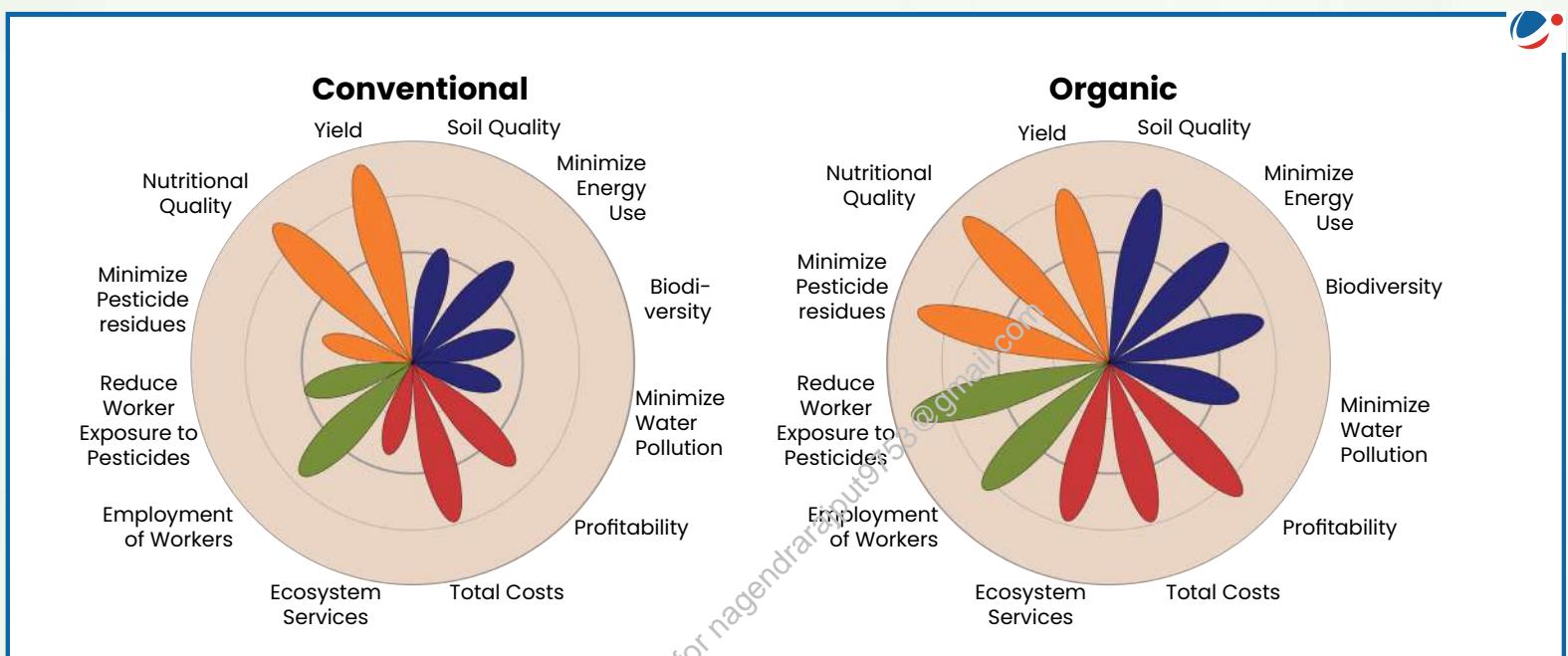
agricultural ecosystems in a self-sufficient and sustainable way. This form of agriculture draws inspiration from nature to develop synergetic farming systems based on crop diversity, resilience, natural productivity, and sustainability.

Permaculture discourages monoculture and serves to open up the possibility of growing a wide range of food grains, fruits and vegetables and thereby expanding the food basket; thus permaculture also contributes to community health. **Hence, statement 1 is correct.**

Application of permaculture methods and introducing permaculture techniques like swales, natural mulching, rainfall harvesting, legume cultivation, have a clear role in improving soil properties, increasing soil organic matter content and reducing soil salinity. **Hence, statement 2 is correct.**

Due to its focus on water conservation and region specific crops, it is very much suitable for arid and semi arid regions. **Hence, statement 3 is not correct.**

Mulch is a material placed on the soil surface to maintain moisture, reduce weed growth, mitigate soil erosion and improve soil conditions. Mulching can help to improve crop yield and optimize water use which is an essential component of permaculture. **Hence, statement 4 is correct.**



Source:

AGRICULTURE

Permaculture: Stricken by drought years ago, a Nepal village comes back to life

Hundreds left Kurule Tenupa village in Nepal's Dhankuta district a decade ago; they are now returning home to newer ways of farming

By Raman Paudel

Published: Monday 15 March 2021



Motivation:

Recently it was reported that permaculture had helped in the restoration of a village in Nepal.

Question: In the context of India's preparation for Climate-Smart Agriculture, consider the following statements:

1. The 'Climate-Smart Village' approach in India is a part of a project led by the Climate Change, Agriculture and Food Security (CCAFS), an international research programme.
2. The project of CCAFS is carried out under Consultative Group on International Agricultural Research (CGIAR) headquartered in France.
3. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India is one of the CGIAR's research centres.

Which of the statements given above are correct?

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

Answer D



Explanation:

Climate-smart agriculture (CSA) is an integrated approach to managing landscapes—cropland, livestock, forests and fisheries—that address the interlinked challenges of food security and climate change.

A climate-smart agriculture (CSA) solution will transform and re-orient agricultural systems to support food security in the context of the new realities of climate change. CSA has three pillars: 1) sustainably increasing agricultural productivity to support equitable increases in incomes, food security, and development; 2) adapting and building resilience to climate change from farm to national levels; and 3) reducing greenhouse gas emissions and sequestering carbon where possible.

Climate Change, Agriculture and Food Security (CCAFS) is an international programme to address the increasing challenge of global warming and declining food security on agricultural practices, policies and measures through a strategic collaboration between CGIAR and Future Earth. CGIAR is a global partnership that unites international organizations engaged in research about food security headquartered in France. **Hence, statement 2 is correct.**

CCAFS Climate-Smart Villages (CSVs) have successfully combined global knowledge with local action to help farmers sustainably produce more food, while curbing greenhouse gas emissions and increasing resilience to climate change. **Hence, statement 1 is correct.**

ICRISAT, a CGIAR Research Center, is a non-profit, non-political public international research organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. **Hence, statement 3 is correct.**

Source:

Official Website of CGIAR



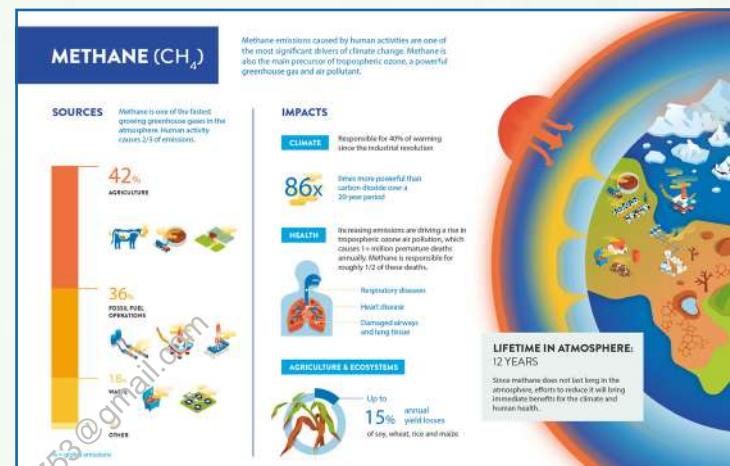
Motivation:

Agriculture and climate function hand in hand. Today, 32–39% of global crop yield variability is explained by climate; this translates to annual production fluctuations of 2–22 million tonnes for major crops such as maize, rice, wheat, and soybean. At the same time, agriculture and livestock directly contribute about 11% of global greenhouse gas emissions, and agriculturally-driven land use changes cause additional emissions

2022

Question: Among the following crops, which one is the most important anthropogenic source of both methane and nitrous oxide ?

- (a) Cotton
- (b) Rice
- (c) Sugarcane
- (d) Wheat



Answer B



Explanation:

Paddy fields are anthropogenic sources of atmospheric nitrous oxide (N_2O) and methane (CH_4), which have been reckoned as 273 and 80–83 times more powerful than CO_2 in driving temperature increase in 20 years.

Paddies are a potential source of anthropogenic nitrous oxide (N_2O) emission. In paddies, both the soil and the rice plants emit N_2O into the atmosphere. The rice plant in the paddy is considered to act as a channel between the soil and the atmosphere for N_2O emission

Source:

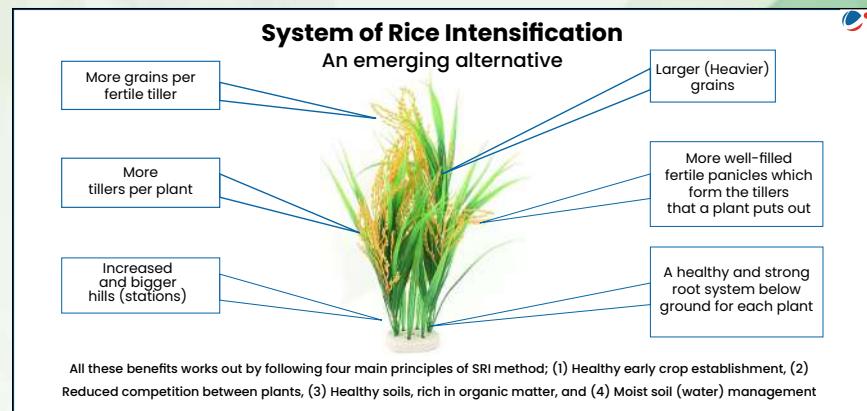
Standard Reference books. It is also frequently reported in the news.

Question: "System of Rice Intensification" of cultivation, in which alternate wetting and drying of rice fields is practised, results in :

1. Reduced seed requirement
2. Reduced methane production
3. Reduced electricity consumption

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



Answer D



Explanation:

System of Rice Intensification (SRI) was first developed in Madagascar in the 1980s and since then several countries in the world have been practising it, including India. It promises to save 15 to 20% ground water, improves rice productivity.

Option 1 is correct: Under SRI 2kg seed is required to grow a nursery for one acre against 5kg seed required in the traditional method.

Option 2 is correct: SRI is a holistic approach to sustainable rice cultivation. By minimizing water use and alternating wet and dry conditions, it minimizes methane production.

Option 3 is correct: With less consumption of water, adoption of SRI saves total energy inputs. A study found in Vietnam has also proved that applying SRI methods can save around 23% of energy inputs, while increasing energy outputs by 11%.

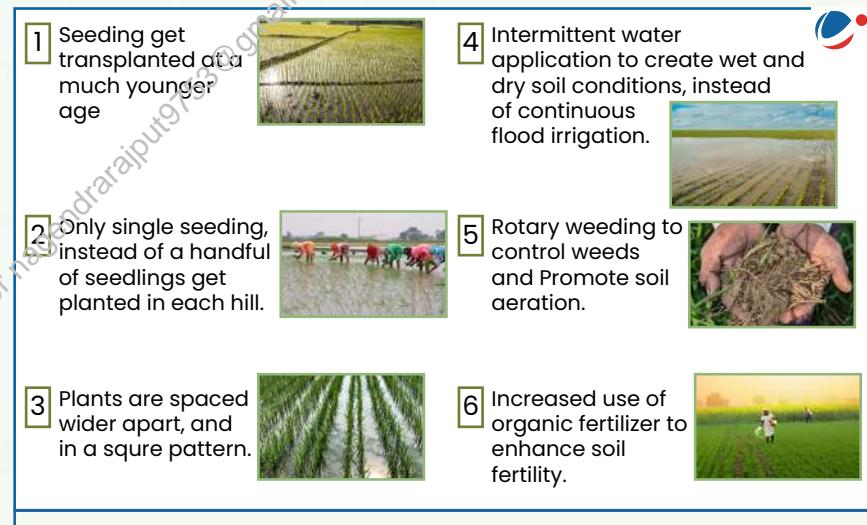


Fig: How System of Rice Intensification works.

| Practices | SRI | Conventional recommended practices | Farmer's practices |
|---------------------------------------|---|--|--|
| Seed rate (kg ha⁻¹) | 5-7 | 20-30 | 50-75 |
| Seedling age (days) | 10-15 | 25-30 | 25-40 |
| Plant spacing (cm) | 20 x 20 or more (square planting) | 15 X 10/20 X 10 | Random |
| Hill number m⁻² | 16-20 | 50-66 | 50-66 |
| Seedling number hill-1 | Single | 2-3 | 3-6 or more |
| Water management | Only moist conditions with shallow flooding and sometimes drying of field | Flooding to 5-10 cm depth of water | Continuous flooding to various depth |
| Weed management | Weeds are turned back into the field by a mechanical hand weeder | Hand weeding twice, at 15 and 35 days after planting, or application of herbicide plus one is hand weeding | 2-3 times hand weeding; herbicide also used by some farmers |
| Intercultivation | Weeder is used 3-4 times in between rows in both directions (perpendicular | No | No |
| Nutrient management | Emphasis on more application of organic manures; sometimes Integrated nutrient management | Integrated nutrient management using organic manures, bio-fertilizers, and chemical fertilizers at recommended levels and timing | Use all recommended manures and fertilizers, but doses and timing vary according to farmers' resources |

Source:

<https://indianexpress.com/article/explained/punjab-paddy-sowing-technique-water-labour-costs-7938766/>



Motivation:

SRI is often seen in the news.

Question: Consider the following statements :

Statement-I : According to the United Nations 'World Water Development Report, 2022', India extracts more than a quarter of the world's groundwater withdrawal each year.

Statement-II : India needs to extract more than a quarter of the world's groundwater each year to satisfy the drinking water and sanitation needs of almost 18% of world's population living in its territory.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
- (b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
- (c) Statement-I is correct but Statement-II is incorrect
- (d) Statement-I is incorrect but Statement-II is correct

Answer C



Explanation:

According to United Nation's 'World Water Development Report, 2022', India accounts for nearly 26% of groundwater abstracted globally. The Asia-Pacific region is the largest groundwater abstractor in the world, containing seven out of the ten countries that extract most groundwater (Bangladesh, China, India, Indonesia, Iran, Pakistan and Turkey). These countries alone account for roughly 60% of the world's total groundwater withdrawal.

Hence statement 1 is correct.

India, as the largest groundwater user globally, at an estimated 251 km³ per year abstracted, uses 89% of its groundwater abstraction for irrigation. The report says, reduced electricity tariffs or free electricity to agriculture, as exist in many Indian states, coupled with assured state or government procurement of crops, encourage farmers to grow water-intensive crops, such as sugarcane, including in semi-arid regions with low natural recharge. **Hence statement 2 is not correct.**

| Country | Abstraction (KM ³ /year) |
|--------------|-------------------------------------|
| India | 251 |
| China | 112 |
| USA | 112 |
| Pakistan | 64 |
| Iran | 60 |
| Bangladesh | 35 |
| Mexico | 29 |
| Saudi Arabia | 23 |
| Indonesia | 14 |

Source:

UN World Water Development Report, 2022 | <https://unesdoc.unesco.org/ark:/48223/pf0000380721>



Motivation:

The Central Ground Water Board (CGWB), a key governmental organization responsible for assessing and managing groundwater resources in India, published the 'Dynamic Ground Water Resources Assessment of India – 2022' report last October.

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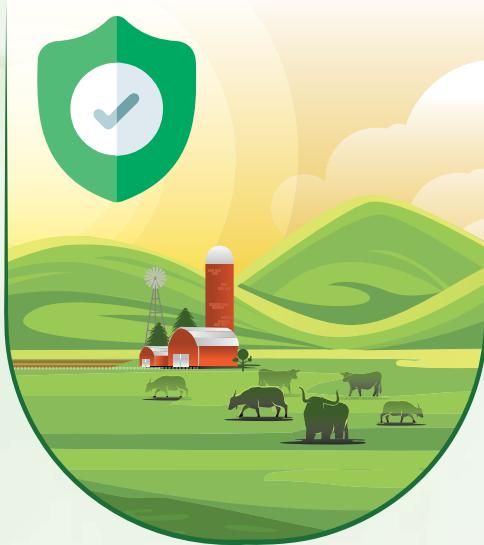
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Terms in News

2020

Which one of the following statements best describes the term 'Social Cost of Carbon'?

It is measure, in monetary value, of the

- (a) long-term damage done by a tonne of CO₂ emissions in a given year.
- (b) requirement of fossil fuels for a country to provide goods and services to its citizens, based on the burning of those fuels.
- (c) efforts put in by a climate refugee to adapt to live in a new place.
- (d) contribution of an individual person to the carbon footprint on the planet Earth.

Answer A



Explanation:

- The social cost of carbon (SCC) is an estimate, in dollars, of the economic damages that would result from emitting one additional ton of greenhouse gases into the atmosphere. The SCC puts the effects of climate change into economic terms to help policymakers and other decision makers understand the economic impacts of decisions that would increase or decrease emissions.

Source:

<https://www.thehindu.com/sci-tech/energy-and-environment/co2-emissions-cost-india-210-billion-every-year-study/article25057550.ece>



Motivation:

Recently, researchers have developed a data set quantifying what the social cost of carbon will be for nearly 200 countries.



Motivation:

Recently, researchers have developed a data set quantifying what the social cost of carbon will be for nearly 200 countries.

2021

What is blue carbon?

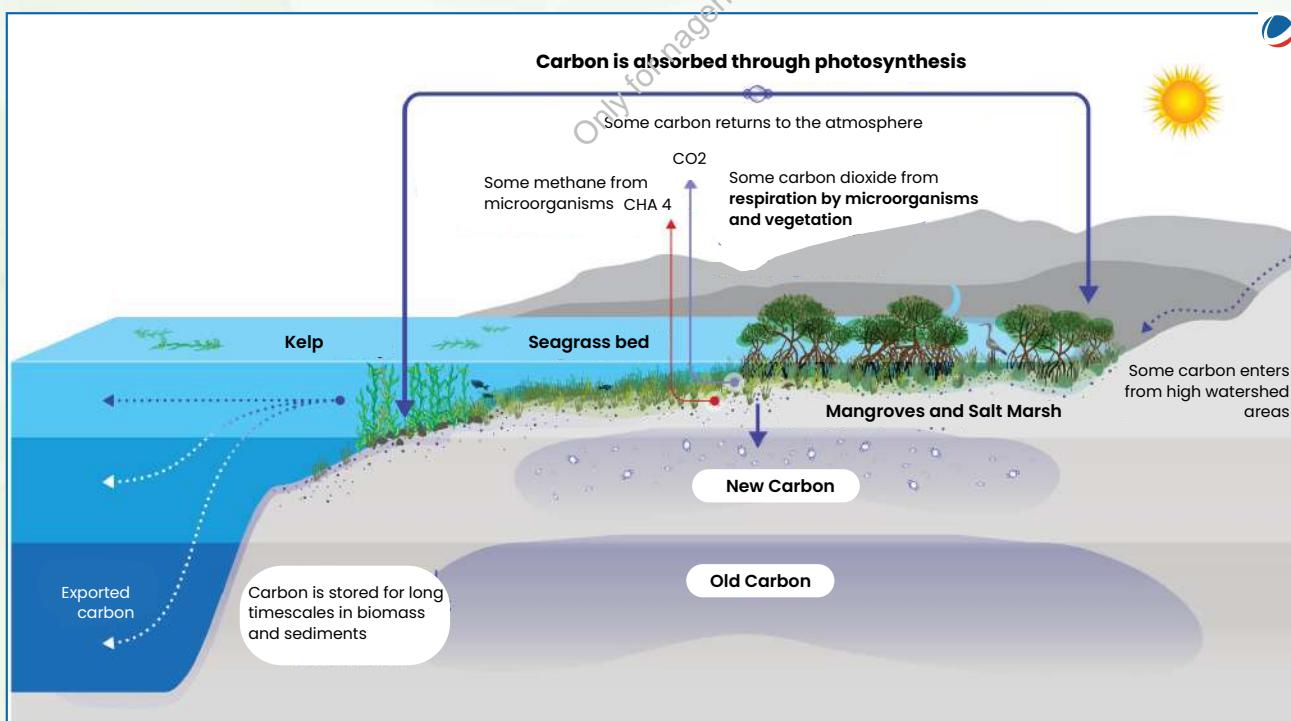
- (a) Carbon captured by oceans and coastal ecosystems
- (b) Carbon sequestered in forest biomass and agricultural soils
- (c) Carbon contained in petroleum and natural gas
- (d) Carbon present in atmosphere

Answer A



Explanation:

- ▶ Blue carbon is the term for carbon captured by the world's ocean and coastal ecosystems. Hence, option (a) is the correct answer.
- ▶ Sea grasses, mangroves, and salt marshes along our coast ""capture and hold"" carbon, acting as something called a carbon sink.
- ▶ These coastal systems, though much smaller in size than the planet's forests, sequester this carbon at a much faster rate, and can continue to do so for millions of years.



The "Miyawaki method" is well known for the:

- (a) Promotion of commercial farming in arid and semi-arid areas
- (b) Development of gardens using genetically modified flora
- (c) Creation of mini forests in urban areas
- (d) Harvesting wind energy on coastal areas and on sea surfaces.

Answer C



Explanation:

- Urban forests are created through Miyawaki, an afforestation method based on the work of Japanese botanist Akira Miyawaki in the 1980s. The technique compresses layers of a forest – shrubs, trees, canopies – on small plots of land, turning them into tiny forests.
- In the Miyawaki technique, various native species of plants are planted close to each other so that the greens receive sunlight only from the top and grow upwards rather than sideways. As a result, the plantation becomes approximately 30 times denser, grows 10 times faster and becomes maintenance-free after a span of 3 years. **Hence option (c) is the correct answer.**

WHAT IS THE MIYAWAKI METHOD?

- Named after Japanese botanist Akira Miyawaki who invented it
- It involves planting of several species very close together in a small pit
- Plants draw nutrients from each other and become healthy
- A dense forest, which grows naturally in 300 years is created in 30-35 years
- Trees grow 10 times faster, and absorb 30 times more carbon dioxide
- Density is 30 times that of normal tree plantations



MIYAWAKI FORESTS IN VADODARA

| Private farm, Sun PharmaRoad | VMC's Rajivnagar STP, Harni |
|---------------------------------|---------------------------------|
| Area 12,000 square feet | Area 16,000 square feet |
| Number of trees planted 3,500 | Number of trees planted 4,000 |

Bhoj village, Padra Forest department's demonstration plot

Area | 30 x 10 metre
Number of trees planted | 831

Which one of the following best describes the term “greenwashing”?

- (a) Conveying a false impression that a company's products are eco-friendly and environmentally sound
- (b) Non-inclusion of ecological/environmental costs in the Annual Financial Statements of a country.
- (c) Ignoring the disastrous ecological consequences while undertaking infrastructure development.
- (d) Making mandatory provision for environmental costs in a government project/programme.

Answer A



Explanation:

- Greenwashing is when a company purports to be environmentally conscious for marketing purposes but actually isn't making any notable sustainability efforts. **Hence option (a) is the correct answer.**
- ‘Greenwashing’ a term was coined by environmentalist Jay Westerveld in 1986.
- For example : A plastic package containing a new shower curtain is labeled “recyclable.” It is not clear whether the package or the shower curtain is recyclable. In either case, the label is deceptive if any part of the package or its contents, other than minor components, cannot be recycled.



Types of Greenwashing



Greenhushing: Companies **underreport or hide sustainable credentials** to avoid scrutiny.



Greenrinsing: When a company **regularly changes its ESG** (Environmental, Social, Governance) targets **before achieving them**.



Greenlabeling: The **labeling** of an essentially **unsustainable product as green or sustainable**.



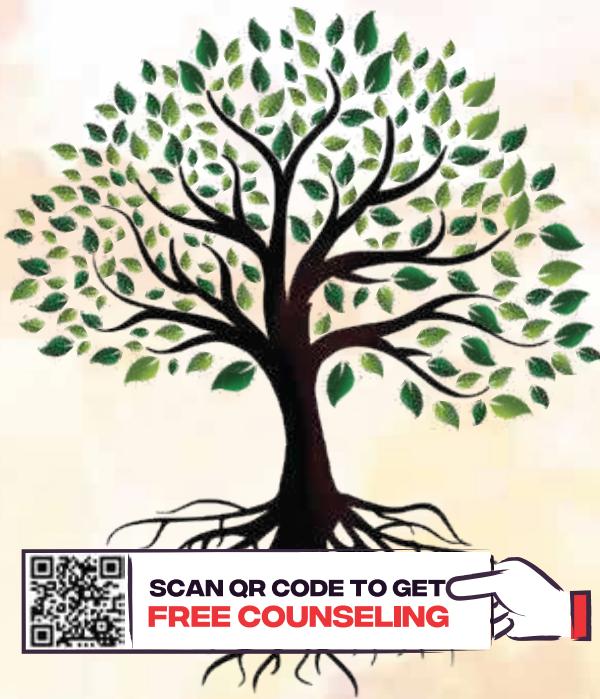
Greenlighting: The **highlighting** of a particularly **green feature** of a business's products or activities to draw attention away from its **environmentally harmful actions**.



Greenshifting: When companies reduce the climate crisis to consumer behavior and **shift responsibility to individuals**.



Greencrowding: When a company **hides within a group and is slow to adopt sustainability policies** (e.g. the 20 largest single-use plastic waste producers are members of the Alliance to End Plastic Waste global alliance).



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