

ANSWERS & EXPLANATIONS GENERAL STUDIES (P) TEST – 4718 (2025)

Q 1.B

- **Bioprospecting, also known as biodiversity prospecting, involves the systematic exploration of natural resources, particularly plants, animals, and microorganisms, to discover and commercialize new products of potential value.** These products are often utilized in various industries, including pharmaceuticals, agriculture, bioremediation, and cosmetics, where unique genetic or biochemical compounds derived from biodiversity can lead to groundbreaking innovations.
- The primary goal of bioprospecting is to harness nature's diversity to develop beneficial products, such as antibiotics, anti-cancer agents, or sustainable agricultural solutions. The process requires careful research and collection methods to identify species with specific, valuable traits. For example, compounds from tropical plants or marine organisms have contributed to new drugs in cancer treatment and infection control.
- However, ethical considerations arise with bioprospecting, especially around issues of biopiracy, which occurs when biological resources or traditional knowledge are exploited without fair compensation or acknowledgment to indigenous communities. Sustainable and ethical practices in bioprospecting aim to protect biodiversity and respect the rights of local communities, who often possess crucial knowledge about natural resources.
- **Hence option (b) is the correct answer.**

Q 2.A

- **Kunming-Montreal Global Biodiversity Framework (KM-GBF) was adopted at the Convention on Biological Diversity's (CBD) 15th Conference of Parties (CoP15). Hence statement 1 is correct.**
 - It replaced Aichi Biodiversity Targets (time period 2011-2020). It is legally non-binding in nature.
- 196 countries agreed to halt and reverse biodiversity loss by 2030 to achieve a nature-positive world.
 - **USA is not a party to the KM-GBF. Hence statement 2 is correct.**
- Key highlights of KMGBF
 - Four overarching goals for 2050:
 - > Halt human-induced species extinction
 - > Sustainable use of biodiversity
 - > Equitable sharing of benefits
 - > Closing the biodiversity finance gap of \$700 billion per year.
- It has set 23 Global Targets for 2030, it includes-
 - 30 % conservation of land, sea, and inland waters
 - 30% restoration of degraded ecosystems
 - Integration of biodiversity into policies
 - Halving the introduction of invasive species
- Funding: Global Biodiversity Framework (GBF) Fund, a Special Trust Fund by the Global Environment Facility (GEF).
 - GEF was established at the Rio Earth Summit (1992) and the World Bank serves as the GEF Trustee.
- Monitoring and Reporting: Countries to monitor and report progress every 5 years or less on a set of indicators.
- As part of its commitment under the Kunming-Montreal Global Biodiversity Framework (KM-GBF), India submitted its National Biodiversity Strategy and Action Plan (NBSAP) spelling out its 23 national biodiversity targets during the conclusion of the annual United Nations conference on biodiversity in Cali, Colombia.

- Under its goals to reduce threats to biodiversity, India's NBSAP has stated it will prioritise the effective restoration of at least 30 percent of degraded terrestrial, inland water, and marine and coastal ecosystems. Hence statement 3 is not correct.
- The updated National Biodiversity Strategy and Action Plan (NBSAP) aims to support both national and global conservation agendas.

Q 3.C

- The term pollinator decline refers to the reduction in abundance of insect and other animal pollinators in many ecosystems worldwide beginning at the end of the 20th century, and continuing into the present. **Hence statement 1 is correct.**
- Pollination is among the most visible and important ecosystem services and is necessary for reproduction of 60–70% of all plant species and 35% of global crop production. Several large-scale studies have looked at the nutritional consequences of pollinator decline. Since pollinators are responsible for propagating certain plants and crops, populations that are heavily reliant on those crops are at risk for malnutrition. **Hence statement 2 is correct.**

Q 4.B

- The **National Tiger Conservation Authority (NTCA)** is a statutory body under the Ministry of Environment, Forests, and Climate Change constituted under enabling provisions of the Wildlife (Protection) Act, 1972, as amended in 2006, for strengthening tiger conservation, as per powers and functions assigned to it under the said Act. **Union cabinet minister for Environment, Forests and Climate Change acts as chairperson of NTCA.** The National Tiger Conservation Authority (NTCA) has an overarching supervisory / coordination role, performing functions as provided in the Wildlife (Protection) Act of 1972. The '**Project Tiger**' is a **Centrally Sponsored Scheme (CSS)** of the Ministry of Environment, Forests and Climate Change, providing funding support to tiger range States for in-situ conservation of tigers in designated tiger reserves. **Hence statement 1 is not correct.**
- As per the 5th cycle of the **All India Tiger Estimation 2022 (usually done in cycles of four years)** summary report, India has a minimum of 3,167 tigers and is now home to more than **70% of the world's wild tiger population**. Further data analysis using the latest statistical models for camera-trapped and non-camera-trapped tiger presence areas estimates the upper limit of the tiger population at 3,925, with an average number of 3,682 tigers, reflecting a commendable annual growth rate of 6.1%. This remarkable conservation feat has been achieved due to the pioneering initiatives undertaken by the National Tiger Conservation Authority, Government of India, in collaboration with State Governments. **Hence statement 2 is correct.**
- The National Tiger Conservation Authority (NTCA) in 2023 granted approval for establishing the **54th tiger reserve in Rajasthan's Karauli and Dholpur districts**. This decision marks a significant stride in wildlife preservation efforts within Rajasthan. It will be the **fifth tiger reserve in the state**, joining the ranks of **Mukundra Hills, Ranthambore, Sariska, and Ramgarh Vishdhari**. However, **Madhya Pradesh has the most tiger reserves, with six in total. It also has the largest number of tigers in the entire country**. **Hence statement 3 is not correct.**

Q 5.D

- **Guindy National Park is located in the heart of Chennai, Tamil Nadu.** It is one of the very few national parks located within an urban area in India. The park is known for its tropical dry evergreen forests and houses several species of mammals, including black-naped hare, Indian palm squirrels, Nilgai, and the Indian leopard. **Hence, pair 1 is not correctly matched.**
- **Recently environmental activists protested against the potential adverse impact of a proposed 6-lane elevated highway in Bannerghatta National Park. Bannerghatta National Park is located about 22 km south of Bangalore, Karnataka.** This park is famous for its safari experience, where visitors can see animals like tigers, lions, and bears in their natural habitats. It also houses an elephant sanctuary, providing a home for orphaned and injured elephants. It has a wide variety of ecosystems ranging from dry scrubland to dense forests, making it a significant biodiversity hotspot. **Hence, pair 2 is not correctly matched.**
- **Guru Ghasidas National Park is located in the Koriya district of Chhattisgarh.** The park is a known habitat for Bengal Tigers and forms part of the central Indian tiger landscape, contributing to India's tiger conservation effort. The park is located in an area where many indigenous tribes live and it offers unique cultural aspects along with its wildlife. **Hence, pair 3 is correctly matched.**

- **Mrugavani National Park** is located near Hyderabad in Telangana. The park is known for its dry deciduous forest ecosystem, which is home to a variety of plants and animal species adapted to the dry conditions. Although small in size, the park plays an important role in the conservation of species like blackbuck and sambar. Hence, pair 4 is correctly matched.

Q 6.A

- **The PARAKH Rashtriya Sarvekshan 2024:**
 - The PARAKH Rashtriya Sarvekshan 2024 is an **educational assessment survey** recently introduced to measure and understand the performance levels of school students across India. Hence option (a) is the correct answer.
 - The purpose is to evaluate system-level educational outcomes in core subjects and provide insight into the effectiveness of schools nationwide.
 - The survey includes **government, government-aided, and private schools**, covering students in **Grades 3, 6, and 9** across key subjects such as **Language, Mathematics, Science, Social Science, and other essential educational areas**.
- **Methodology and Technology:**
 - The PARAKH Rashtriya Sarvekshan employs both paper-based assessments and Optical Mark Recognition (OMR) technology for streamlined data collection and analysis, ensuring reliable insights into educational quality and trends.
- **Policy Alignment:**
 - This initiative aligns with India's National Education Policy (NEP) 2020, aiming to strengthen foundational, preparatory, and middle stages of education and provide structured feedback at national, state, and district levels.
- **Alignment with Global Standards:**
 - The survey evaluates students in different key subjects, which aligns closely with international standards and frameworks, such as the **Programme for International Student Assessment (PISA)**.

Q 7.B

- A UNESCO World Heritage Site is a place that is listed by the United Nations Educational, Scientific and Cultural Organization as of special cultural or physical significance.
- Currently India has seven Natural World Heritage Sites. Western ghats (7,953.15 square km) is the largest Natural World Heritage Sites in India and Sundarban is the second largest Natural World Heritage Sites (1,330.10 square km). Hence statement 1 is not correct.

Natural World Heritage Sites in India (As on January, 2024)

Sl. No.	Name of WH Site	State Location	Year of Notification	Area (sq.km)
1	Great Himalayan National Park Conservation Area	Himachal Pradesh	2014	905.4
2	Western Ghats	Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala	2012	7,953.15
3	Nanda Devi and Valley of Flowers National Parks	Uttarakhand	1988	630.00 87.50
4	Sundarbans National Park	West Bengal	1987	1,330.10
5	Kaziranga National Park	Assam	1985	429.96
6	Keoladeo National Park	Rajasthan	1985	28.73
7	Manas Wildlife Sanctuary	Assam	1985	391.00

- India has only a single Mixed World heritage site which is Khangchendzonga National Park in Sikkim recognised by UNESCO in 2016. Hence statement 2 is correct.
- Its cultural significance is that it is home to the **Lepcha community, who are thought to be the earliest inhabitants of Sikkim**. The park is also of religious importance to the Sikkimese people. It also stands to have natural significance as it is **home to half of India's bird diversity and one-third of India's flowering plants**. The park is also home to flagship species such as the snow leopard, Tibetan wolf, red panda, blue sheep, and Himalayan Tahr.

Q 8.B

- A gradual, continuous change in the species composition between two ecosystems or communities of organisms across an environmental gradient is known as an **ecocline**. A gradation from one ecosystem to another when there is no sharp boundary between the two, it is the joint expression of associated community (coenocline) and complex environmental gradients. Hence option (b) is the correct answer.
- **Ecophene:** These are otherwise called ecads or morphologically-changed forms. When a species is transported to a new environment, its first response will be to develop abilities to survive there. For example, when a European comes to the tropics, the immediate response is increased production of melanin-his skin becomes darker.
- **Ectotypes** refers to the species having a wide range of distribution which evolve genetically adapted local populations.
- **Ecotone:** An ecotone is a transition area between two biomes. It is where two communities meet and integrate. It may be narrow or wide, and it may be local (the zone between a field and forest) or regional (the transition between forest and grassland ecosystems)

Q 9.C

- **Statement 1 is correct:** Mammals from colder climates generally have shorter ears and limbs to minimise heat loss. (This is called Allen's Rule.)
- **Statement 2 is correct:** In the polar seas, aquatic mammals like seals have a thick layer of fat (blubber) below their skin that acts as an insulator and reduces the loss of body heat.
- Many fish thrive in Antarctic waters where the temperature is always below zero. These animals protect themselves from the excessive cold by developing cold hardiness. Cold hardiness is achieved by developing extra solutes in the body fluid and special ice nucleating proteins in the extracellular spaces. The extra solutes which prevent cold are glycerol and anti-freezing proteins. They lower the freezing points of body fluids.

Q 10.C

- Melanistic tigers are pseudo-melanistic tigers, a rare color morph of the Bengal tiger; this variety has a very dark coat but retains stripes, very nearly black. This coloration is caused by a genetic mutation that impacts the **Taqpep** gene-affecting thus the pattern and, therefore, the dispersion of the tigers' stripes. Hence statement 1 is correct.
- Pseudo-melanistic coloration is caused by a missense mutation in the **Taqpep** gene, making the stripes wider and more spread out. This gene also affects markings in other felines.
- Occurrence: Many believe that melanistic tigers are a mere fable, but there have been accounts of their appearance in some regions, such as the Similipal Tiger Reserve in Odisha, India. Interestingly, a survey has recently revealed that a significant percentage of Similipal's tigers are carrying this mutation. Hence statement 2 is correct.
- **Population Isolation:** The cause of this significantly high prevalence of pseudo-melanistic tigers observed in Similipal is associated with genetic isolation and inbreeding among a small founding population. Isolation provides a higher likelihood of passing down the mutated gene.
- **Conservation Efforts:** To counter the issue of inbreeding and enhance genetic diversity, tigers are translocated; for example, a tigress from Tadoba-Andhari Tiger Reserve to Similipal.
- The earliest known record of a black tiger dates back to the early 1700s; the modern records have been documented in the late 20th century.
- The research and conservation of these striped beauties are continuously ongoing and help in maintaining the genetic difference, which ensures the health of tigers living in their natural habitat.
- Hence option (c) is the correct answer.

Q 11.A

- **Context: Recently, the EU Nature Restoration Law came into force.**
 - The Nature Restoration Law is a European Union (EU) regulation that aims to restore the EU's nature and ecosystems to a good ecological state. The law aims to support sustainable economic development, agricultural production, and renewable energy. It also aims to improve human health and well-being, and to mitigate and adapt to climate change.
 - It will help achieve, by 2030, the objective of restoring at least 25,000 km of rivers into free-flowing rivers. In addition, it will contribute to reversing the decline of pollinator populations and improving their diversity, enhance biodiversity in agricultural ecosystems and the biodiversity of forest

ecosystems, and contribute to the commitment to plant at least three billion additional trees by 2030 at the EU level.

- About the Law
 - EU's first continent-wide legislation for nature restoration.
 - Aim: Restore 20% of degraded ecosystems by 2030 and all by 2050.
 - Requires Member States to prepare National Restoration Plans by 1 September 2026.
 - Prioritizes conservation of Natura 2000 network areas.
 - Natura 2000 is a network of protected areas in EU.
- Legally binding targets:
 - Restore 30% of terrestrial, coastal, freshwater, drained peatlands, and marine ecosystems by 2030.
 - Restore 25,000 km of rivers to free-flowing
- **Hence option (a) is the correct answer.**

Q 12.D

- Biological Interaction are the manner in which species interact with each other. These interactions can be inter-specific (interactions with different species) or intra-specific (interactions between same species). Neutralism is also a type of interaction where neither species affects the other. However, true neutralism is extremely unlikely.

	Interaction type	Combination	Effects		Examples
1. Positive interaction					
1.	Mutualism	(+)	(+)	Both species benefitted	cyanobacteria, Mediterranean orchid Ophrys for pollination with the help of bees., Lichen, Mycorrhiza etc.
2.	Commensalism Hence pair 1 is not correctly matched.	(+)	(0)	One species is benefitted and the other species is neither benefitted nor harmed	Epiphyte on a mango branch, barnacles growing on the back of a whale, sea anemone and clown fish, orchids, Lianas etc.
2. Negative interaction					
4.	Predation	(+)	(-)	One species benefitted, the other species are harmed	Invasive Cactus, starfish Pisaster, Drosera; Nepenthes etc.
5.	Parasitism	(+)	(-)	One species benefitted, the other species are harmed	Cuckoo Bird, Cuscuta, Datura, Viscum etc.
6.	Competition Hence pair 2 is not correctly matched	(-)	(-)	Harmful for both	Abingdon tortoise in Galapagos Islands, barnacle Balanus, Grassland species.
7.	Amensalism Hence pair 3 is not correctly matched	(-)	(0)	Harmful for one but the other species are unaffected	Penicillium and Staphylococcus.

(+) Benefitted, (-) Harmed, (0)Unaffected

- **Hence option (d) is the correct answer.**

Q 13.B

- Researchers have discovered a sacred grove- a Myristica swamp forest in Kumral (Maharashtra), which is protected by the local community. This sacred grove is dominated by Myristica magnifica, an endangered species native to Karnataka and Kerala.
- **Myrisstica Swamp forests are tree-covered wetlands found within the evergreen forests in the Western Ghats, Andaman and Nicobar Islands, and Meghalaya.**
- These forests are marked by prolonged waterlogging. These forests typically exist in tropical and subtropical regions where heavy rainfall or monsoon patterns support their hydrological conditions.
- Mystica swamp forests are crucial carbon sinks, trapping vast amounts of carbon dioxide. They also help in filtering pollutants from water. **Hence, option (b) is the correct answer.**

Q 14.A

- **Recent India-China Disengagement Agreement: Steps Toward De-escalation in Ladakh**
 - India and China have recently reached a significant agreement to initiate a **phased disengagement process along the Line of Actual Control (LAC) in the Ladakh region.** This agreement focuses on areas with long-standing tensions, notably the Demchok and Depsang Plains regions.

- After several rounds of diplomatic and military talks, both countries have **committed to reducing military presence and establishing buffer zones to prevent further stand-offs**. This agreement is part of broader efforts to maintain peace and stability along the disputed borders while both nations seek to resolve complex territorial disagreements through continued negotiations and confidence-building measures.
- **Location of Demchok and Depsang Plains regions.**
 - **Demchok:** Located in southeastern Ladakh, near the Line of Actual Control (LAC) with China, Demchok is a sensitive area frequently referenced in the context of border tensions between India and China. It lies close to the LAC, marking a key point in the broader geopolitical landscape of the Ladakh region.
 - **Depsang Plains:** Positioned in northern Ladakh, the Depsang Plains lie close to the strategic Karakoram Pass. This area is of significant military importance due to its proximity to key routes leading towards the Shaksgam Valley and Aksai Chin. The plains provide strategic access to the Karakoram Pass, which is crucial for controlling approaches from China into the region.
 - **Hence option (a) is the correct answer.**



Q 15.D

- An indicator species is a species whose presence, absence or abundance, and changes therein, can indicate certain environmental conditions. Changes in indicator species's populations are used to monitor changes in particular ecosystems and sometimes trends affecting the environment as a whole.
- **Tubifex tubifex**, also called the sludge worm, or sewage worm, is a species of tubificid segmented worm that inhabits the sediments of lakes and rivers on several continents. Tubifex tubifex is used as a water quality indicator because of its ability to tolerate low oxygen conditions, the presence of heavy metals, and other environmental conditions.
- **Mosses** are reliable indicators of air pollution risks to ecosystems, because they get most of their nutrients direct from the air and rain, rather than the soil. Ecosystems dominated by mosses and lichens are amongst the most sensitive to nitrogen pollution. Because mosses are so good at absorbing nitrogen they prevent it from leaching into ground water, but if they get overloaded they quickly deteriorate. Some moss species are especially sensitive to increased levels of nitrogen.
- **River otter** are an important indicator species. This is because the otter is a strict carnivore and contaminants that occur in the environment may concentrate in the otter over time in a process known as biomagnification.
- **Sparrow** being very sensitive to changes in the environment, is one of the most preferred indicator species of urban ecosystems. A stable house sparrow population indicates a healthy ecosystem for human beings in terms of air and water quality, vegetation and other parameters of habitat quality.
- **Hence option (d) is the correct answer.**

Q 16.B

- **Conservation International (CI) was a pioneer in defining and promoting the concept of hotspots.** Conservation International adopted this idea of protecting them as the guiding principle of their investments. **Hot spots are areas that are extremely rich in species, have high endemism, and are under constant threat. Hence statement 1 is correct.**
- **To qualify as a biodiversity hotspot, a region must meet two strict criteria:**
 - It must have at least 1,500 vascular plants as endemics — which is to say, it must have a high percentage of plant life found nowhere else on the planet. A hotspot, in other words, is irreplaceable.
 - **It must have 30% or less of its original natural vegetation. In other words, it must be threatened. Hence statement 2 is correct.**
- Following the criteria for an area to be declared as a Biodiversity Hotspot, according to Conservation International, **India has 4 Biodiversity Hotspots. Hence statement 3 is not correct.**

- **The Himalayas-** Includes the entire Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China and Myanmar)
- **Indo-Burma Region-** Includes entire North-eastern India, except Assam and Andaman group of Islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia, and southern China).
- **The Western Ghats-** Includes the entire Western Ghats (and Sri Lanka).
- **Sundaland-** Includes Nicobar group of Islands (and Indonesia, Malaysia, Singapore, Brunei, Philippines).

Q 17.B

- **Context:** Recently, a study of the first tardigrade fossil has enabled Scientist to classify them and retrace their evolutionary history.
- Tardigrades are invertebrates belonging to the phylum Tardigrada. They are related to arthropods (e.g., crustaceans and insects) and nematodes (i.e., roundworms). Tardigrades are microscopic eight-legged animals that have been to outer space and would likely survive the apocalypse. They look like adorable miniature bears.
- Around 1,300 species of tardigrades are found worldwide. Considered aquatic because they require a thin layer of water around their bodies to prevent dehydration, they've also been observed in all kinds of environments, from the deep sea to sand dunes. Freshwater mosses and lichens are their preferred habitat, hence their nickname, moss piglet.
- Despite looking squishy, tardigrades are covered in a tough cuticle, similar to the exoskeletons of grasshoppers, praying mantises, and other insects to which they are related. Like those insects, tardigrades have to shed their cuticles in order to grow. They have four to six claws on each foot, which helps them cling to plant matter, and a specialized mouthpart called a bucco pharyngeal apparatus, which allows them to suck nutrients from plants and microorganisms.
- Tardigrades belong to an elite category of animals known as extremophiles, or critters that can survive environments that most others can't. For instance, tardigrades can go up to 30 years without food or water. They can also live at temperatures as cold as absolute zero or above boiling, at pressures six times that of the ocean's deepest trenches, and in the vacuum of space.
- Their resiliency is in part due to a unique protein in their bodies called Dsup—short for "damage suppressor"—that protects their DNA from being harmed by things like ionizing radiation, which is present in soil, water, and vegetation.
- Another amazing survival trick is cryptobiosis, a state of inactivity triggered by a dry environment. The micro-animals squeeze all the water out of their bodies, retract their heads and limbs, roll up into a little ball, and become dormant. When conditions improve, they unfurl themselves and go about their business.
- Hence option (b) is the correct answer.

Q 18.B

- According to the report 'Status of Tigers Co-predators and Prey in India', released by Union environment minister on the eve of Global Tiger Day, **Uttarakhand's Corbett Tiger Reserve (CTR) has reported the highest tiger density among India's 50 reserves with 14 tigers per 100 sq km, followed by Kaziranga, Nagarhole and Orang tiger reserves. Hence, statement 2 is correct.**
- According to the report, CTR has the highest tiger numbers with 231 inside the reserve and 266 using the reserve. CTR is followed by Nagarhole tiger reserve in Karnataka with 127 tigers, Bandipur Tiger Reserve (Karnataka) with 126 tigers and Bandhavgarh and Kaziranga tiger reserves with 104 tigers each.
- 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 and has the largest area under Critical 'tiger' habitats .** 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). Hence, statement 1 is not correct.

Q 19.D

- India with an abysmal score of 45.5 (out of 100) has been ranked 176th in the Global Nature Conservation Index, 2024. The country ranks as one of the five worst performers alongside Kiribati (180), Turkey (179), Iraq (178), and Micronesia (177) in the ranking of 180 countries

- The first-ever Nature Conservation Index (NCI) evaluates conservation efforts using four markers — land management, threats to biodiversity, capacity and governance, and future trends.
- **The NCI is developed by Goldman Sonnenfeldt School of Sustainability and Climate Change at Ben-Gurion University of the Negev and BioDB.com, a non-profit website dedicated to maintaining biodiversity data. Hence option (d) is the correct answer.**
- The NCI is a data-driven analysis assessing each country's progress in balancing conservation and development, aimed at helping governments, researchers, and organisations identify concerns and enhance conservation policies for long-term biodiversity protection.
- India's rank at the bottom is mainly attributed to inefficient land management and rising threats to its biodiversity.

Q 20.B

- Temperate grasslands, savannas, and shrublands is a terrestrial biome defined by the World-Wide Fund for Nature. The predominant vegetation in this biome consists of grass and/or shrubs. The climate is temperate and ranges from semi-arid to semi-humid. The habitat type differs from tropical grasslands in the annual temperature regime and the types of species found here.
- **The habitat type is known as prairie in North America, pampas in South America, veld in Southern Africa and steppe in Asia.** Generally speaking, these regions are devoid of trees, except for riparian or gallery forests associated with streams and rivers.
- Steppes/shortgrass prairies are short grasslands that occur in semi-arid climates. Tallgrass prairies are tall grasslands in higher rainfall areas. Heaths and pastures are, respectively, low shrublands and grasslands where forest growth is hindered by human activity but not the climate.
- Tall grasslands, including the tallgrass prairie of North America, the north-western parts of Eurasian steppe (Ukraine and south of Russia), and the Humid Pampas of Argentina, have moderate rainfall and rich soils which make them ideally suited to agriculture, and tall grassland ecoregions include some of the most productive grain-growing regions in the world. The expanses of grass in North America and Eurasia once sustained migrations of large vertebrates such as bison (*Bos bison*), saiga (*Saiga tatarica*), and Tibetan antelopes (*Pantholops hodgsoni*) and kiang (*Equus hemionus*). Such phenomena now occur only in isolated pockets, primarily in the Daurian Steppe and Tibetan Plateau.
- **Hence option (b) is the correct answer.**

Q 21.D

- Ecosystem is maintained by the cycling energy and nutrients obtained from different external sources with Sun being primary source of energy for all ecosystems on Earth. Photosynthetically Active Radiation (PAR) is the amount of light available for photosynthesis. Plants capture only 2-10 per cent of the PAR and this small amount of energy sustains the entire living world.
- The trophic level of an organism is the position it occupies in a food chain. The trophic level is the number of steps an organism is from start of the chain. A given species may occupy more than one trophic level in the same ecosystem at the same time.
 - **First Trophic level: Phytoplankton, grass, trees. Hence pair 1 is not correctly matched.**
 - **Second Trophic level: Zooplankton, grasshopper and cow. Hence pair 2 is not correctly matched.**
 - **Third Trophic level: Birds, fishes wolf. Hence pair 3 is not correctly matched.**
 - Fourth Trophic level: Man, lion.

Examples		
Tertiary Consumer	Fourth Trophic level (Top Carnivore)	Man, lion
Secondary Consumer	Third trophic level (Carnivore)	Birds, fishes wolf
Primary Consumer	Second trophic level (Herbivore)	Zooplankton, grasshopper and cow
Producer	First Trophic level (Plants)	Phytoplankton, grass, trees

- Hence option (d) is the correct answer.

Q 22.B

- Mangroves are unique coastal ecosystems found in tropical and subtropical regions.** They consist of salt-tolerant trees and shrubs that thrive in intertidal zones, where seawater meets the land. Mangroves are highly adapted to harsh coastal environments, with specialized root systems that provide stability and reduce erosion.
- They play crucial roles in:
 - Protecting coastlines by acting as natural barriers against storm surges and coastal erosion.
 - Providing habitats for a variety of species, including fish, crabs, and birds.
 - Supporting biodiversity by offering breeding and nursery grounds.
 - Carbon sequestration, as they store more carbon per unit area than most other ecosystems, helps mitigate climate change.
- West Bengal indeed has the largest area of mangroves in India, primarily due to the Sundarbans, which is one of the largest mangrove forests in the world. Hence statement 1 is correct.**
 - India's mangrove area in the Sundarbans extends over approximately 2,112 square kilometers.
 - The Sundarbans support a unique range of flora and fauna, including the iconic Bengal tiger, saltwater crocodiles, and several fish and bird species.

Table 3.2 Mangrove Cover Assessment 2021 (in sq km)

Sl. No.	State/UT	Very Dense Mangrove	Moderately Dense Mangrove	Open Mangrove	Total	Change with respect to ISFR 2019
1.	Andhra Pradesh	0	213	192	405	1
2.	Goa	0	21	6	27	1
3.	Gujarat	0	169	1,006	1,175	-2
4.	Karnataka	0	2	11	13	3
5.	Kerala	0	5	4	9	0
6.	Maharashtra	0	90	234	324	4
7.	Odisha	81	94	84	259	8
8.	Tamil Nadu	1	27	17	45	0
9.	West Bengal	994	692	428	2,114	2
10.	A&N Islands	399	168	49	616	0
11.	D&NH and Daman & Diu	0	0	3	3	0
12.	Puducherry	0	0	2	2	0
Total		1,475	1,481	2,036	4,992	17

- India's mangrove coverage is significant, but it accounts for around 3% of the world's total mangrove area, not more than 20%. Hence statement 2 is not correct.**
 - India's mangrove cover is about 4,992 square kilometers (0.15% of geographical area) as per the latest Forest Survey of India report.
 - Indonesia has the largest mangrove coverage in the world, with 42,278 square kilometers of mangrove trees. This is 19% of the world's total mangrove area.**

- **Mangroves use viviparous seed dispersal, an adaptation unique to coastal and saline environments. Hence statement 3 is correct.**
 - In vivipary, seeds germinate while still attached to the parent plant. The young seedlings (propagules) grow until they detach and float in the water, increasing their chances of settling in suitable habitats.
 - Species like Rhizophora (red mangrove) and Avicennia exhibit vivipary, with specialized propagules that can withstand saltwater and later establish in the soil.
- Mangroves are thus vital for coastal stability, biodiversity, and carbon sequestration, with unique adaptations like viviparous seed dispersal enabling them to thrive in challenging environments.

Q 23.A

- **Recently, the National Green Tribunal has stayed the construction of a road inside Barak Bhuban Wildlife Sanctuary. Barak Bhuban Wildlife Sanctuary is situated in the Cachar district of Assam, not Karnataka.** The sanctuary is home to tropical evergreen and semi-evergreen forests, with unique species like hoolock gibbons (the only ape found in India), rhesus macaques, and wild boars. It is part of the Indo-Burma biodiversity hotspot and plays a vital role in preserving the wildlife of Assam's Barak Valley. **Hence, pair 1 is not correctly matched.**
- **Recently National Tiger Conservation Authority (NTCA) approved to develop Kaimur Wildlife Sanctuary as Bihar's second tiger reserve after the Valmiki Tiger Reserve.** Kaimur Wildlife Sanctuary is located in Bihar. The sanctuary contains prehistoric rock paintings and caves. It is home to leopards, sloth bears, sambar deer, nilgai, and tigers. **Hence pair 2 is correctly matched.**
- **Recently a rare weather phenomenon flattened thousands of trees in Eturunagaram Wildlife Sanctuary. Eturunagaram Wildlife Sanctuary is located in Warangal district of Andhra Pradesh.** It is one of the oldest wildlife sanctuaries of Telangana as it was established in 1953. The sanctuary is famous for its tree diversity, including teak, bamboo, and a wide variety of medicinal plants. The sanctuary has a significant tribal population including the Koya tribe. The Godavari River, running through the sanctuary, provides essential water resources and supports a large number of aquatic species. **Hence, pair 3 is not correctly matched.**

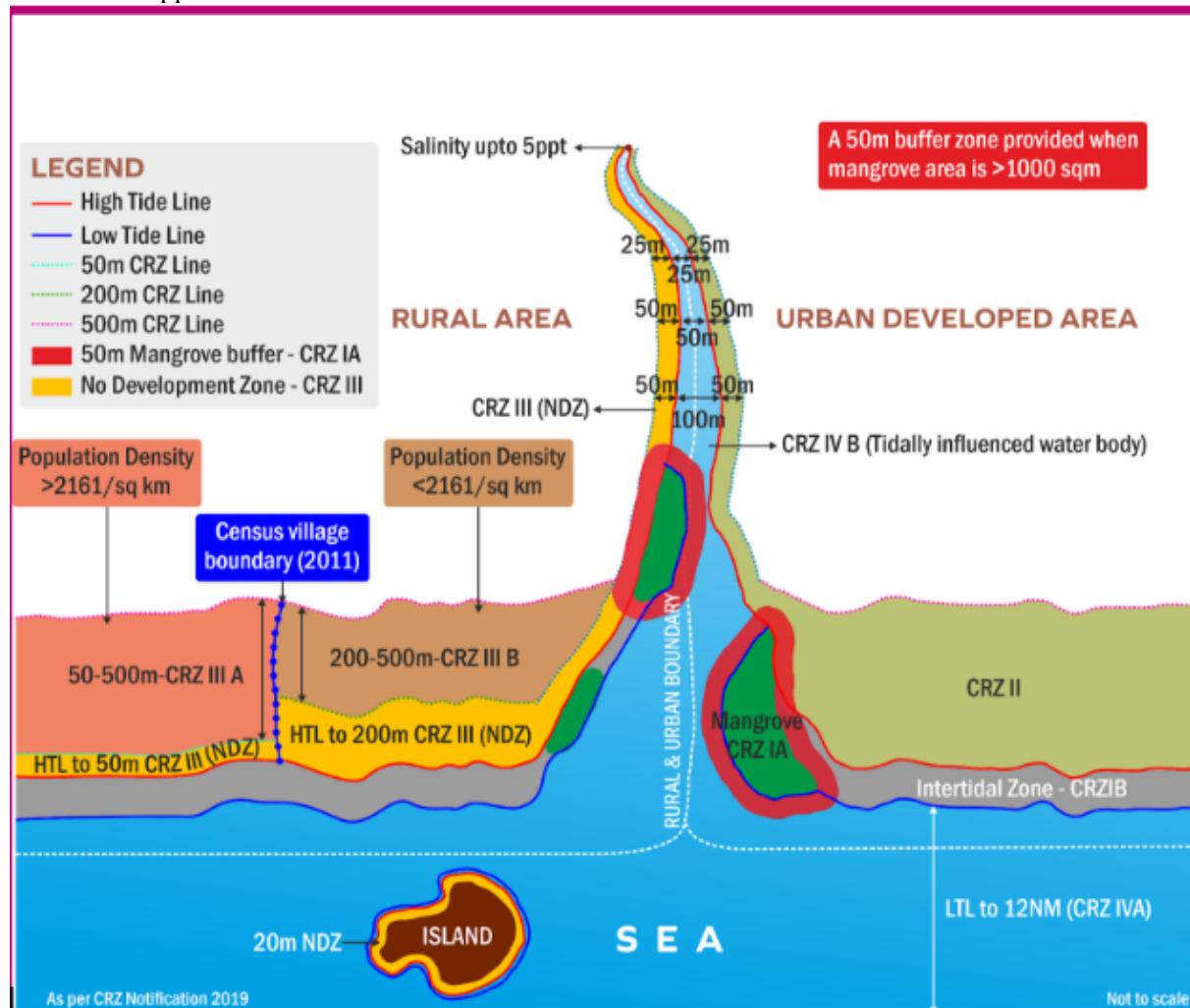
Q 24.C

- **Recent context:** Eravikulam National Park (ENP), the natural habitat of the Nilgiri tahr in Munnar, is set to become a fully disabled-friendly tourism destination.
- **Eravikulam National Park is located in the Western Ghat of the Idukki district of Kerala.** It was initially declared a wildlife sanctuary in 1975 and later upgraded to a national park in 1978.
- It lies at an altitude ranging from 2000 to 2700 meters, making it one of the highest in Kerala. The park is home to Anamudi Peak, the highest peak in South India, standing at 2695 m above sea level.
- The park's vegetation is a mix of montane grasslands and shola forests. These shola forests are unique to the Western Ghats and play a crucial role in supporting the region's biodiversity.
- Eravikulam is known for its highest level of endemism. The Neelakurinji, a shrub that blooms once every 12 years, is especially famous here.
- Eravikulam is home to the largest population of endangered Nilgiri Tahr. Nilgiri Tahr is the park's flagship species. The park is also home to other mammals like Indian muntjac, sambar deer, Nilgiri marten, Indian porcupine, small-clawed otter, and gaur.
- Rajamala region is a designated tourist zone within the park where visitors can observe Nilgiri Tahr and the blooming of the Neelakurinji flowers, which turns the hill into vibrant blue spectacles. **Hence, option (c) is the correct answer.**

Q 25.B

- Recently the National Green Tribunal (NGT) has directed to halt the Chennai shoreline Renourishment and Revitalization project in this CRZ II zone, where such activities are prohibited.
- The coastal regulation zones (CRZ) rules govern human and industrial activity close to the coastline in order to protect the fragile ecosystems near the sea.
- The CRZ notification was first issued in 1991 under the Environment Protection Act 1986 with the mandate to take measures to protect and conserve the coastal environment. It was replaced later by the CRZ notification 2011 and then the CRZ notification 2019.
- **Classification of CRZs:**
 - CRZ IA - ecologically sensitive areas like mangroves, salt marshes, etc. **Hence, pair 1 is correctly matched.**
 - CRZ IB - intertidal zone i.e. area between low tide line and high tide line

- CRZ II - constitutes the developed land areas up to or close to the shoreline within the existing municipal limits or in other existing legally designated urban areas. **Hence, pair 2 is correctly matched.**
- CRZ III - land areas that are relatively undisturbed (rural areas) and those which do not fall under CRZ II
- CRZ IVA - areas between low tide line up to 12 nautical miles on the seaward side. **Hence, pair 3 is not correctly matched.**
- CRZ IVB - applicable on tidal-influenced water bodies

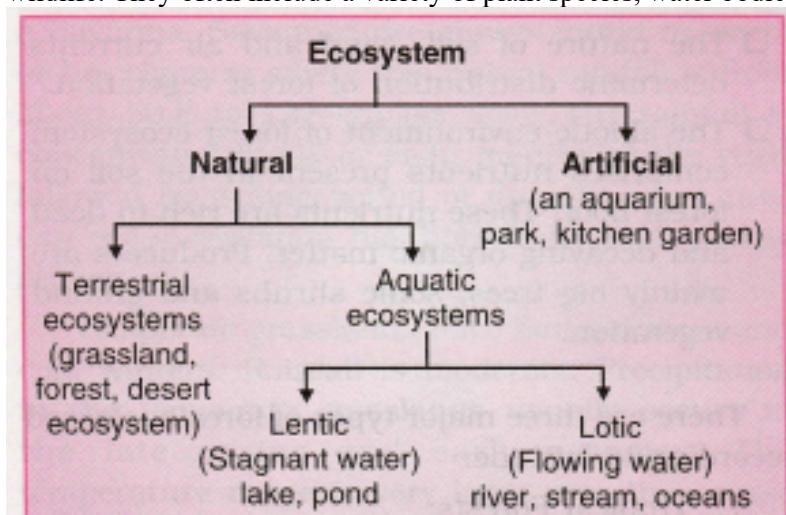


Q 26.C

- Identifying hotspots of species richness is the most commonly used approach worldwide for defining areas of high conservation importance. The desirability of targeting conservation spending towards biodiversity hotspots, to the degree presently occurring, is seriously questioned.
- More and more scientists and advocates are warning that directing conservation funds nearly exclusively to hotspots is "bad investment advice" and "maybe a recipe for major losses in the future". This is particularly true as "the hot-spot concept has grown so popular in recent years within the larger conservation community that it now risks eclipsing all other approaches".
- **Conservation biologists are also interested in biodiversity coldspots, areas that have relatively low biological diversity but also include threatened or rare species. Hence option (c) is the correct answer.**
- Coldspots are not necessarily "cold." Although these areas are low in species richness, they can also be important to conserve, as an individual "coldspot" may be the only location where a rare species is found. Extreme physical environments (low or high temperatures or pressures, or unusual chemical composition) inhabited by just one or two specially adapted species are "coldspots" that warrant conservation because they represent unique environments that are biologically and physically interesting.
- A biodiversity hotspot is a bio-geographic region with a significant reservoir of biodiversity that is threatened with destruction.

Q 27.B

- An ecosystem is a community of living organisms and their physical environment that interact with each other. Natural and artificial (man-made) ecosystems are two different ecosystems
- **Natural Ecosystem:** They are self-regulating ecosystem without much direct human interferences and manipulations. For example, ecosystems existing in a pond, lake, river, stream, spring, sea, ocean, forest, grassland, desert, etc. The natural ecosystems are further categorised into terrestrial and aquatic. Terrestrial Ecosystems include forests, grasslands and deserts. Aquatic ecosystems can be either freshwater (ponds, lakes, streams), or salt water (marine, estuaries) type. **Hence option 2 and 4 are not correct.**
- **Artificial Ecosystems:** They are man-made. Human activities modify or convert natural ecosystems into man-made ecosystems. For example,
 - **Aquariums:** These enclosed environments recreate aquatic habitats, housing various fish and plant species. They require careful maintenance of water quality, temperature, and lighting to sustain life. **Hence, option 3 is correct.**
 - **Crop fields:** These are cultivated areas where humans plant and harvest crops. They involve modifying the natural environment by tilling the soil, adding fertilizers, and controlling pests to optimize plant growth. **Hence, option 1 is correct.**
 - **Gardens:** Gardens are intentionally designed spaces where humans cultivate plants for aesthetic or practical purposes. They can range from small backyard gardens to large botanical gardens, each with its unique plant and design elements.
 - **Greenhouses:** These structures create controlled environments for growing plants, often in areas with unfavourable climates. They regulate temperature, humidity, and light to provide optimal conditions for plant growth.
 - **Urban parks:** These are green spaces within cities, providing recreational areas and habitat for wildlife. They often include a variety of plant species, water bodies, and walking paths.



- **Hence option (b) is the correct answer.**

Q 28.B

- Since the creation of the UNESCO MAB Programme in 1971, one of the main goals has been interdisciplinary research into mountains. The uniqueness of mountain ecosystems and the ecosystem services they provide have been the object of international studies whose interdisciplinary approach is reproduced across all areas of the Man and Biosphere Programme (MAB).
- During the 4th World Congress of Biosphere Reserves, which took place in 2016 in Lima, Peru, a proposal was made to create a thematic network of biosphere reserves located in mountain areas.
- In December 2021 – **the International Year of Sustainable Mountain Development – the UNESCO MAB Programme, along with the Mountain Research Initiative (MRI)**, launched the World Network of Mountain Biosphere Reserves. **Hence statement 3 is correct.**
- Representing one-quarter of the Earth's terrestrial surface, mountainous regions harbour relatively untouched ecosystems and habitats with a unique biodiversity.
- Of the **727 biosphere reserves that are part of the World Network of Biosphere Reserves, 474 (65%)** are located in mountain ecosystems. **Hence statement 1 is correct.**
- There is no biosphere reserve from India which is part of the World Network of Mountain Biosphere Reserves. **Hence statement 2 is not correct.**

Q 29.D

- Ecology is a science that studies the interdependent, mutually reactive and interconnected relationship between the organisms and their physical environment on the one hand and among the organisms on the other hand.
- Ecosystems can be studied at small levels or at large levels. The levels of organization are described below from the smallest to the largest:

2. SEVEN MAJOR LEVELS OF ORGANIZATION OF ECOLOGY



- Hence option (d) is the correct answer.

Q 30.A

- Recent Context: A drought has drained Lake Kariba close to record lows, causing power shortage in the region.
- About Lake Kariba It is the world's largest artificial lake and reservoir by volume. **Hence statement 1 is correct.**
- Kariba lake is located in Central Africa in the Zambezi River basin between Zambia and Zimbabwe. **Hence statement 2 is not correct.**
- Its construction was started during 1950s when British ruled Northern and Southern Rhodesia (now Zambia and Zimbabwe). Kariba Dam provides electric power to both Zambia and Zimbabwe and supports a thriving commercial fishing industry in Africa.

Q 31.A

- **Statement 1 is correct and statement 2 is not correct:** Biological magnification is the phenomenon through which certain pollutants get accumulated in tissues in **increasing concentrations along the food chain**. Such pollutants (e.g., DDT and PCB) are **non-biodegradable** i.e., once they are absorbed by an organism, they cannot be metabolised and broken down or excreted out.
- These pollutants generally get accumulated in fat-containing tissues of the organism. The classic example of biomagnification is that of PCB (polychlorinated biphenyls), an industrial toxic waste which contaminated water in Great Lakes in the USA during the 1960s, leading to declining in fishes and birds. It was discovered that the PCB concentration, which 0.000002 ppm in water, increased along the food chain to as much as 4.83 ppm in fishes and 123 ppm in birds.

Q 32.B

- Eco-sensitive zones (ESZ) were formulated by the Ministry of Environment and Forests to ensure that these areas act as “shock absorbers” for the protected areas against any non-forest activity by way of regulating, managing, and prohibiting such activities around ecologically fragile areas.
- This was a part of the action plan envisaged in the ‘Wildlife Conservation Strategy’, adopted in 2002. The basic aim of these guidelines was to regulate certain activities around protected areas so as to minimize the negative impacts of activities such as mining, power projects, etc. in the fragile ecosystem encompassing the PAs.
- According to the guidelines, **activities including commercial mining, the setting of sawmills and industries causing pollution, commercial use of firewood, and establishment of major hydropower projects, are prohibited in such areas**. It also prohibits tourism activities like flying over protected areas in an aircraft or hot air balloon, and discharge of effluents and solid waste in natural water bodies or terrestrial areas. **Hence options 1 and 2 are correct.**
- **Felling of trees, drastic change in agriculture systems and commercial use of natural water resources, movement of vehicular traffic, groundwater harvesting and setting up of hotels and resorts, are the activities regulated in the areas. Hence option 3 is not correct.**
- On the other hand, **activities permitted in the areas include ongoing agriculture and horticulture practices by local communities, rainwater harvesting, organic farming, adoption of green technology, and use of renewable energy sources**. The width of the ESZ and type of regulation differs from one protected area to the other. However, as a general principle, the width of the ESZ is 10 km around the protected area. **Hence option 4 is not correct.**

Q 33.A

- The elephant is a **National Heritage animal of India** and has been protected under Schedule I species of the Indian Wild Life Protection Act, 1972. Concerned at the primary need to restore the elephant habitats and reduce the suffering of both elephants as well as the human population, the Government of India launched **“Project Elephant” in 1992 as a Centrally Sponsored Scheme** of the Ministry of Environment, Forests & Climate Change. It was intended to provide financial and technical support to the elephant range states of India to protect elephants, their habitats, and corridors and address the issue of human-animal conflict. **The first elephant reserve in India was the Singhbhum Elephant Reserve in Jharkhand**, established in 2001. **Hence statement 2 is not correct.**
- **Singhbhum Elephant Reserve has an area of 13440 km², the country's largest Elephant Reserve.** It is located in the South-West part of Jharkhand and borders the **Mayubhanj Elephant Reserve of Odisha** on the Southern side and the **Mayurjharna Elephant Reserve of West Bengal** on the Western side. The elephant reserve includes reserve forest and Protected Areas in **Dalma Wildlife Sanctuary, Saranda, Kolhan, Podahat, Chaibasa South, Chaibasa North, and Dhalbhum Forest Divisions**. **Hence statement 1 is correct.**
- **Terai Elephant Reserve (TER) is 33rd in the country and second in Uttar Pradesh.** The TER is set up in an area of 3,049.39 square kilometers comprising forest areas of **Pilibhit Tiger Reserve (PTR), Dudhwa Nation Park (DNP), Kishanpur Wildlife Sanctuary (KWS), Katarniaghata Wildlife Sanctuary (KGWS)**. The first elephant reserve in Uttar Pradesh was notified in **Shivalik** in Saharanpur and Bijnor districts in 2009.

Q 34.D

- Nitrogen is one of the primary nutrients critical for the survival of all living organisms. Although nitrogen is very abundant in the atmosphere, it is largely inaccessible in this form to most organisms. It has to be converted into nitrates through a process called nitrogen fixation.

- Natural lightning in atmosphere and biological activity are two major natural pathways of nitrogen fixation.
- Nitrogen-fixing bacteria like azobacter, rhizobium, blue green algae etc. convert atmospheric nitrogen into nitrates, that is soluble in water. Nitrogen thus assimilated is used by plants.
- Atmospheric nitrogen and oxygen are combined by natural lightning discharge to form nitric oxide. This nitric oxide then converted into nitrogen dioxide by the oxygen of the atmosphere, which further changes to nitric acid after combining with water. This acid is brought to the soils by rainwater. In the soil, this nitric acid reacts with minerals like calcium carbonate to form calcium nitrate and is absorbed by the roots of the plants.
- Nitrogen can also be fixed artificially by man through the use of chemical fertilizers.
- Hence, all the given options are correct.

Q 35.B

- The Marine Protected Area (MPA) network in India has been used as a tool to manage natural marine resources for biodiversity conservation and for the well-being of people dependent on it.
- **The Wildlife Protection Act of 1972 does not define the term “Marine Protected Area (MPA)” specifically and explicitly.** However, the act allows for the declaration of national parks and wildlife sanctuaries in marine regions, indirectly providing a way to protect marine Biodiversity. **Hence statement 1 is not correct.**
- India has recognized the importance of marine conservation but lacks a distinct legislative framework that defines and manages Marine Protected Areas specifically as some other countries do. Most marine protections come under national parks and wildlife sanctuaries established through the WPA.
- **The Marine Protected Area can be declared as a national park and wildlife sanctuary. Apart from these, the Ramsar site, the biosphere, etc can also be declared a Marine Protected Area. Hence statement 2 is correct.**
- Some of the important marine protected areas in India are the Gulf of Kutch Marine National Park, Gahirmatha Marine Sanctuary, and the Gulf of Mannar Biosphere Reserve.
- The Forest Rights Act 2006 allows Indigenous communities certain rights to live and practice sustainable livelihood involved in these protected areas.

Q 36.D

- The programme of Biosphere Reserve was initiated under the 'Man & Biosphere' (MAB) programme by UNESCO in 1971.
- Biosphere Reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use.
- They are internationally recognized, nominated by National Governments and remain under sovereign jurisdiction of the states where they are located.
- Criteria for designation of BR
 - A site that must contain an effectively protected and minimally disturbed core area of value of nature conservation.
 - The core area should be typical of a bio-geographical unit and large enough to sustain viable populations representing all trophic levels in the ecosystem.
 - The management authority to ensure the involvement/cooperation of local communities to bring variety of knowledge and experiences to link biodiversity conservation and socio-economic development while managing and containing the conflicts.
 - Areas potential for preservation of traditional tribal or rural modes of living for harmonious use of the environment.
- There are 18 Biosphere Reserves in the country.
 - The Dibru-Saikhowa Biosphere Reserve is the smallest and Kachchh Biosphere Reserve is the largest in terms of area. **Hence statement 1 and 2 are not correct.**
 - Agasthyamalai Biosphere Reserve is spread across Tamil Nadu and Kerala. Achanakamar-Amarkantak Biosphere Reserve is spread across Madhya Pradesh and Chhattishgarh. Rest all 15 Biosphere Reserves (except Nilgiri) lies in only one state. **Hence statement 3 is not correct.**
 - Nilgiri Biosphere Reserve is spread across Tamil Nadu, Kerala and Karnataka.

Q 37.D

- **Recent context:** Ministry of Environment has proposed an amendment to the Wildlife Protection Act, 1972 to accord legal status to elephant reserves and corridors on the lines of tiger reserves.
- Elephant reserves are conservation reserves to demarcate large landscapes that hold elephants and their movements.
- **Elephant reserves do not have formal legal protection like National Park or Wildlife Sanctuary under Wildlife Protection Act, 1972. Hence statement 1 is not correct.**
- **Elephant reserves are out of the purview National Board of Wildlife (NBWL). No permission of NBWL is needed to change the boundaries of the elephant reserves unlike in the case of National Parks and Wildlife Sanctuaries. Hence statement 2 is not correct.** Thus, elephant reserves are not secure and their land can easily be diverted.
- The National Board for Wildlife (NBWL) is a statutory body constituted by the Central Government under Section 5A of the Wildlife (Protection) Act, 1972. It is advisory in nature and advises Central Government on framing policies and measures for the conservation of wildlife in the country and carries out impact assessment of projects in areas inhabited by Wildlife.
 - The National Board for Wildlife is constituted by the Central Government and has 47 members with the Prime Minister as the Chairperson and the Minister of Environment and Forests as the Vice-Chairperson.
- Powers of the National Board for Wildlife (NBWL)
 - The National Board for Wildlife has the reviewing power in all wildlife-related cases.
 - No alteration of boundaries of the National Parks and Wildlife Sanctuaries can be done without permission from the Board.
 - Without approval or permission from the NBWL no construction of tourist lodges, destruction or diversion of wildlife habitat and de-notification of Tiger Reserves can be done.

Q 38.B

- **The Traditional Artisans' Upliftment Livelihood Programme (TULIP):**
 - The Traditional Artisans' Upliftment Livelihood Programme (TULIP), recently launched by the **Ministry of Social Justice and Empowerment**, aims to empower marginalized artisans by providing them with a digital e-commerce platform. Hence option (b) is the correct answer.
 - This initiative enables artisans from Scheduled Castes (SC), Other Backward Classes (OBC), sanitation workers, and persons with disabilities to market their products globally, thereby promoting economic self-reliance.
- **Details of the scheme:**
 - **Digital Empowerment:** TULIP focuses on integrating artisans into the digital economy by offering an online platform to showcase and sell their crafts, reaching a wider audience beyond local markets.
 - **Global Exposure:** By leveraging e-commerce, artisans gain access to international markets, enhancing their visibility and potential customer base.
 - **Economic Self-Reliance:** The program aims to reduce dependency on intermediaries, allowing artisans to receive fair compensation for their work, thereby fostering financial independence.

Q 39.D

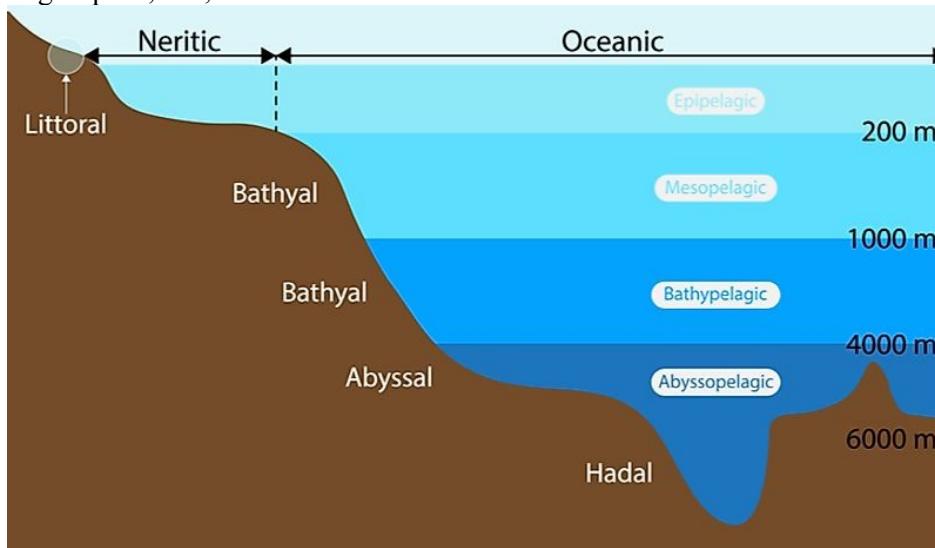
- Under the Wildlife Protection Act of 1972, protected areas are defined and legally recognized categories of conserving wildlife and biodiversity.
- The act initially recognized national parks and wildlife sanctuaries as protected areas. Through amendments in 2003, community reserve and conservation reserves were also added as protected areas. **However, sacred groves and biosphere reserves are not defined as protected areas under the Wildlife Protection Act.**
- National parks have strict protection regulations prohibiting human activities like grazing and hunting. Wildlife sanctuaries are designated to protect specific species and habitats, though certain regulated human activities may be permitted within them.
- Community reserves involve local community participation and can be declared on private or community land for conservation purposes
- **Sacred groves are traditionally protected areas conserved by the local community due to their cultural or religious significance. They are not legally recognized as a protected area**
- **Biosphere reserves are designated under UNESCO's Man and Biosphere (MAB) program and are not defined as protected areas under the Wildlife Protection Act of 1972. Hence, option (d) is the correct answer.**

Q 40.C

- **Abiotic components**
- These are non-living parts of an ecosystem that shape its environment. Some examples of abiotic components are following:
 - **Temperature:** The temperature range that an organism can tolerate depends on the organism. For example, most plants and animals prefer temperatures between 20°C and 35°C.
 - **Water(moisture):** Water is essential for all living beings. Majority of biochemical reactions take place in an aqueous medium. Water helps to regulate body temperature. Further, water bodies form the habitat for many aquatic plants and animals.
 - Soil: Soil is an abiotic component because it does not have life.
 - **Sunlight:** Sunlight provides energy. Green plants utilize sun light for photosynthesis for synthesizing food for themselves as well as all other living organisms.
 - **Atmosphere:** The earth's atmosphere is made of 21% oxygen, 78% nitrogen and 0.038% carbon dioxide. Rest are inert gases (0.93% Argon, Neon etc).
 - Wind: The wind direction and speed in an area affect its temperature and humidity. Very high wind speeds, often in mountainous areas, can be the reason behind stunted plant growth. Wind also carries seeds and aids in pollination.
- **Biotic components**
- Biotic components are living or once-living organisms that make up an ecosystem. Examples of biotic components include:
 - **Plants: Trees, shrubs, herbs** Hence, point 2 is not correct.
 - Animals: Horses, kangaroos, fish, sharks, jellyfish
 - Bacteria: E. coli
 - Eukaryotic microbes: Amoebas
 - Fungi: Mushrooms
 - Waste from living things: Trash from living organisms
 - Remains of dead species: Remains of dead species
- **Hence option (c) is the correct answer.**

Q 41.C

- **The neritic zone is the shallow part of the ocean that extends from the intertidal zone to the continental shelf drop-off, with a maximum depth of about 200 meters.** It's also known as the sunlit zone because of the ample sunlight that reaches the seafloor, which allows for photosynthesis by marine organisms. **Hence statement 1 is not correct.**
- **The neritic zone does correspond with the continental shelf area,** which is the submerged extension of the landmass around continents. The zone ends at the edge of the continental shelf, making it highly productive due to light availability and nutrient influx. **Hence statement 2 is correct.**
- **The neritic zone is rich in nutrients and sunlight, fostering a high concentration of primary producers like phytoplankton.** In turn, zooplankton, which feed on phytoplankton, are also abundant. Together, they form the base of the food web in this zone, supporting various fish and marine species. Extensive communities of gant kelps, different types of fishes, snails, whales, sea-otters, sea-snakes and large squids, etc., are found in this zone. **Hence statement 3 is correct.**



Q 42.A

- Lakes and ponds are divided into three different "zones" which are usually determined by depth and distance from the shoreline.
 - **Littoral Zone:** The topmost zone near the shore of a lake or pond is the littoral zone. This zone is the warmest since it is shallow and can absorb more of the Sun's heat. It sustains a fairly diverse community, which can include several species of algae (like diatoms), rooted and floating aquatic plants, grazing snails, clams, insects, crustaceans, fishes, and amphibians. The vegetation and animals living in the littoral zone are food for other creatures such as turtles, snakes, and ducks.
 - **Limnetic Zone:** The near-surface open water surrounded by the littoral zone is the limnetic zone. The limnetic zone is well-lighted (like the littoral zone) and is dominated by plankton, both phytoplankton and zooplankton. Plankton are small organisms that play a crucial role in the food chain. Without aquatic plankton, there would be few living organisms in the world, and certainly no humans. A variety of freshwater fish also occupy this zone.
 - **Profundal Zone:** The deep-water part of the lake or pond is called the profundal zone. This zone is much colder and denser than the other two. Little light penetrates all the way through the limnetic zone into the profundal zone. The fauna are heterotrophs, meaning that they eat dead organisms and use oxygen for cellular respiration.
- Hence option (a) is the correct answer.

Q 43.A

- Indian Elephant (EN) is listed in Schedule I of the Indian Wildlife (Protection) Act, 1972, CITES Appendix I and CMS Appendix I and Convention on the Conservation of Migratory Species of Wild Animals (CMS COP13). It aims:
 - To protect Elephants and their habitat Government of India launched Project Elephant that is a Central Government sponsored conservation scheme launched in 1992
 - To protect elephant corridors and habitats
 - To mitigate and prevent human-elephant conflict.
- The government also provides technical and financial help to the elephant range states in the protection and management of elephant corridors and elephant habitats declared by the states.
- Mayurjharna Elephant Reserve is located in the areas of Midnapore, Bankura, and Purulia District of West Bengal. It is contiguous with the Singhbhum Elephant Reserve of Jharkhand State on the west and the Mayurbhanj Elephant Reserve of Odisha on the east. Hence pair 1 is correctly matched.
- Baitami or (Brahmani-Baitarani) Elephant Reserve is located in Odisha. It covers the portions of Keonjhar, Sundargarh, Angul and Dhenkanal districts. Hence pair 2 is correctly matched.
- Lemru Elephant Reserve is located in Chhattisgarh. It was declared as Elephant Reserve in 2019 to preserve the Hasdeo Arand forest (has high-quality coal reserves) and covers the portions of Surguja, Korba, Jashpur and Raigarh districts in Northern Chhattisgarh. The reserve is a refugee for elephants migrating from Jharkhand where open cast mining is rampant. Hence pair 3 is not correctly matched.
- Mahanadi Elephant Reserve is also located in the state of Odisha and consists of Satkosia Tiger Reserve and its adjoining wildlife sanctuaries i.e. Satkosia Gorge Wild Life Sanctuary and Baisipalli Wild Life Sanctuary. Hence pair 4 is not correctly matched.

Q 44.B

- The Thadou community, one of the oldest and largest non-Naga tribes in Manipur, has recently expressed its support for the implementation of the National Register of Citizens (NRC).
 - The Thadoos have taken part in the ongoing ethnic conflict between the Meitei and Kuki-Zo communities since May 2023 while exercising focus on their unique identity from that of the Kuki community whom they deem several settlers from Myanmar. The resolution made by the community is a pointer that they consider the NRC as an avenue for Indian national interests and an apparatus for guarding the rights of the indigenous people.
- The Thadou people are assumed to have migrated from the Chin and Lushai Hills in contemporary Myanmar (Burma) into Manipur.
- The Thadou community has a typical cultural identity with its own distinct language, belonging to the Tibeto-Burman family. They also claim their distinctness from the other tribes, especially the Kuki community, by showing their unique traditions and customs, and historical narratives. The Thadou language is the mother tongue of several Chin-Mizo dialects.

- The Thadou tribe has been recognized as one of the indigenous tribes of Manipur. They were listed as a Scheduled Tribe under the 1956 Presidential Order, which acknowledges their status and rights within the state.
- Hence option (b) is the correct answer.

Q 45.C

- **The species that invade a bare area are called pioneer species.** In primary succession on rocks these are usually **lichens** which are able to secrete acids to dissolve rock, helping in weathering and soil formation. These later pave way to some very small plants like bryophytes, which are able to take hold in the small amount of soil. They are, with time, succeeded by bigger plants, and after several more stages, ultimately a stable climax forest community is formed. **Hence statement 1 is correct.**
- The climax community remains stable as long as the environment remains unchanged. With time the xerophytic habitat gets converted into a mesophytic one. In primary succession in water, the **pioneers are the small phytoplanktons**, they are replaced with time by free-floating angiosperms, then by rooted hydrophytes, sedges, grasses and finally the trees. The climax again would be a forest. With time the water body is converted into land. **Hence statement 2 is correct.**

Q 46.D

- Animals and birds use the following navigation methods while migrating from one place to another:
 - **Sun and Moon**—some animals follow the sun as it crosses the sky from east to west. *Starlings* (birds) orient themselves using the path of the sun. Clouds, time of year, and moving at night can make it impractical to use the sun as the only cue for direction.
 - **Stars**—hundreds of years ago, explorers used the stars to navigate their course as they travelled over land and sea. Animals use stars, such as Betelgeuse and the North Star, most likely because those stars are very bright and often visible. Using the stars, Mallard ducks can find north.
 - **Smell**—over small distances, or at specific locations on a migratory path, scents can help animals find their way. For example, salmon use scents in rivers to find spawning areas to lay their own eggs—in the same area where they were hatched. Scientists think wildebeest follow the scent of rain on the dry Serengeti soils to reach greener pastures.
 - **Magnetic field**—the Earth has a magnetic field, and although humans usually cannot detect it without a compass, some animals have the ability to detect and use it for their migrations. It helps them know which way is north. Scientists are not sure exactly how animals use the magnetic field, but it's similar to humans using a compass to find magnetic north.
 - **Communication and signalling among individuals**—some animals that migrate in groups communicate as they travel to help with navigation. For example, whales use sound to tell each other where they are and where they are headed.
 - **Ocean currents**—some animals can use ocean currents to navigate to and from breeding or feeding grounds. Some eggs, larvae, and young fish drift passively with ocean currents. Some adult fish migrate to breeding grounds by deliberately moving against ocean currents.
- **Hence option (d) is the correct answer.**

Q 47.B

- **The Namo Drone Didi Scheme:**
 - The Namo Drone Didi Scheme is a **Central Sector Scheme under the Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM)**. **Hence statement 1 is not correct.**
 - It is **implemented by the Ministry of Agriculture & Farmers Welfare**, with support from the Ministry of Rural Development and the Ministry of Fertilizers. **Hence statement 2 is correct.**
 - The scheme aims to empower Women Self-Help Groups (SHGs) by providing them with drones to offer rental services to farmers for agricultural purposes.
 - Financial support covers **80% of the cost of drones and accessories (up to ₹8 lakhs)**, with the remaining **20% available through loans under the National Agriculture Infrastructure Financing Facility (AIF) with a 3% interest subvention**. **Hence statement 3 is not correct.**
 - This initiative encourages Women SHGs to enter the agricultural technology sector, enhancing productivity and efficiency in farming through the use of drones.

Q 48.C

- **The Yamuna River has been covered with toxic foam ahead of Chhath Puja celebrations November 6-8, raising serious concerns over pollution in the Delhi NCR region.** A sign of extreme levels of pollution, the foam sent authorities into some panic and deployed chemical defoamers to deal with the issue.

- **The factor for foam generation:**
 - **Anaerobic bacteria:** Bacteria break down pollutants, contributing to foam formation, especially in places like the Okhla barrage.
 - **Detergent phosphates:** These are major foamers, as they are surfactants that accumulate in the water.
 - **Chemical industrial effluent:** Industrial effluents are composed of a variety of chemicals that form foam.
 - **Pollutant concentration because of meager river flow during the winter season:** Since, during the winter season, the flow of rivers is at an all-time low, this enhances the concentration of pollutants, which increases the foam formation.
 - **Reduced seasonable Oxygenation: Poor oxygenation further deteriorates the pollution and favors foam development.**
- The government has initiated sprinkling polyoxypropylene-based defoamer, an anti-foaming agent across the Okhla barrage with approximately 12-15 tons of a diluted anti-foaming agent to be applied before Chhath Puja.
- **Hence option (c) is the correct answer.**

Q 49.B

- **The Global Tuberculosis (TB) Report 2024:**
 - The Global Tuberculosis (TB) Report 2024, published by the World Health Organization (WHO), highlights India and Indonesia as the primary contributors to the global rise in reported TB cases for 2022 and 2023. This report underscores significant challenges in global TB control, noting that while efforts to diagnose and treat TB have increased, the disease remains prevalent in certain high-burden countries.
- **Global TB Scenario and WHO Reporting:**
 - **TB has once again become the leading cause of death from a single infectious agent, surpassing COVID-19.**
 - **Incidence:** In 2023, approximately 10.8 million people developed TB, with an incidence rate of 134 per 100,000 population.
 - **Mortality:** TB-related deaths totaled around 1.25 million in 2023, indicating a decrease from previous years.
 - **Regional Distribution:**
 - > The majority of TB cases were reported in Southeast Asia, Africa, and the Western Pacific regions. **India and Indonesia were the largest contributors to the global increase in reported TB cases during 2022 and 2023. Hence option (b) is the correct answer.**
 - **Drug-Resistant TB:**
 - > Multidrug-resistant TB (MDR-TB) remains a significant public health concern. In 2023, an estimated 400,000 people developed MDR-TB, but only 44% were diagnosed and treated.
- **Reason for High Contribution from India and Indonesia:**
 - Both countries face challenges with TB due to **high population densities, limited healthcare resources** in certain areas, and barriers to timely diagnosis and treatment.
 - India, in particular, **has the world's highest TB burden**, and while diagnostic efforts have improved, reaching TB elimination remains challenging.
 - Indonesia has also ramped up diagnostic measures, leading to higher reported cases.

Q 50.C

- Under the Wildlife Protection Act of 1972, as amended in 2003, a community reserve can be declared only on private or community land, not government-owned land. A community reserve specifically applies to areas where communities or individual voluntarily commit to conserving wildlife on their own land. **Hence statement 1 is not correct.**
- **Community reserves cannot be established within areas already designated as national parks or wildlife sanctuaries**, as these areas have strict protection status under the Wildlife Protection Act. Community reserves are intended for areas outside these strictly protected zones, often to support biodiversity within these protected areas. **Hence statement 2 is correct.**
- **Any changes in the boundaries of a community reserve do not require the approval of the National Board for Wildlife.** The board's involvement is necessary for changes in the boundaries of national parks and wildlife sanctuaries. For community reserves, boundary changes required the approval of the Management Committee responsible for the reserve, along with state government approval. **Hence statement 3 is not correct.**

- Community reserves can be declared on private or community-owned land. The establishment of a community reserve is based on the voluntary commitment of private landowners or community groups to conserve and protect wildlife and habitats on their land. **Hence statement 4 is correct.**

Q 51.A

- Seven big cats include Tiger, Lion, Leopard, Snow Leopard, Puma, Jaguar, and Cheetah. Out of these five big cats viz. **Tigers, Lion, Leopard, Snow Leopard, and Cheetahs are found in India.** Hence statement 1 is not correct.
- Tigers and Lions avoid cohabitation, and today, India is the only country where they are found together in the wild.** Here, their geography-specific habitats also mean that they no longer occur in the same localities. **Hence statement 2 is correct.**
- The Union Cabinet approved the establishment of the **International Big Cat Alliance (IBCA) with headquarters in India** with a one-time budgetary support of Rs.150 crore for a period of five years from 2023-24 to 2027-28. **India formally joined the IBCA in September 2024.** Hence, statement 3 is not correct.
- The International Big Cat Alliance has been conceived as a multi-country, multi-agency coalition of **96 big cat range countries**, non-range countries interested in big cat conservation, conservation partners and scientific organizations working in the field of big cat conservation besides business groups and corporates willing to contribute to the cause of big cats, to establish networks and develop synergies in a focused manner so as to bring to a common platform a centralized repository of successful practices and personnel, backed by financial support which can be leveraged to strengthen the conservation agenda in the field to arrest decline in big cat population and reverse the trend.



Q 52.B

- Global Tiger Forum is an international intergovernmental body exclusively set up for the conservation of tigers in the wild in the range of countries. Hence statement 1 is correct.**
- Out of the 13 tiger range countries, **seven are currently members of GTF**: Bangladesh, Bhutan, Cambodia, India, Myanmar, Nepal and Vietnam besides non-tiger range country U.K. **The secretariat is based in New Delhi, India. Hence statement 2 is not correct.**
- GTF's goal is to highlight the rationale for tiger preservation and provide leadership and a common approach throughout the world in order to safeguard the survival of the tiger, its prey, and its habitat. The GTF is to attain the goal through a set of objectives.
- Objectives
 - Promoting global campaigns to save the Tiger, its prey and its habitat.

- Increasing the number of secure habitats for Tigers.
- Promoting comprehensive legal frameworks for Tiger conservation.
- **Providing financial and infrastructural capabilities for Tiger Conservation.**
 - > **Hence statement 3 is correct.**
- Promoting training and research.
- Eliciting support from Governments, Intergovernmental organizations and individuals.
- Promoting bilateral cooperation.
- Establishing a trust fund to enable the implementation of agreed programmes.
- Calling upon Range Countries to prepare and update their National Action Plans for Tiger Conservation.
- To urge countries to enter into relevant conventions for conservation and elimination of illegal trade.

Q 53.A

- *Amentotaxus assamica*, commonly known as the **Assam catkin yew**, is a **critically endangered and endemic species found only in two locations: Changlagam in Anjaw district, and Deb village in Toru Hills, Papum Pare district, in Arunachal Pradesh**. The species, a conifer and part of the Taxaceae genus, primarily grows in the subtropical biome at altitudes of 1,600 to 2,000 metres. Owing to its strength and fortification, it is highly threatened by accidental cutting for construction purposes, or use in households and other utilities. In the early days, it was primarily used for making bows. **Hence statement 1 is not correct.**
- **Indian Magnolia** are found in tropical, subtropical and temperate forests of southeastern Asia and tropical America. In India, there are a total of 25 species of Magnolia and most of them are distributed in Northeast India, with the **highest number in Assam**. Of all the species, two (*Magnolia gustavii* and *M. pleiocarpa*) are **Critically Endangered**. The highly threatened nature of most of the magnolia species calls for their immediate conservation and protection measures. Members of this genus are known to be rich in a wide variety of **biologically active compounds** including alkaloids, flavonoids, lignans, neolignans and terpenoids. Many of the species have been found to possess potent procognitive activity, antioxidative, anti-microbial, anti-inflammatory, antiangiogenic, diuretic, anti-ulcer, analgesic, anti-helmintholytic, and anticancer activities. The species have huge economic potential and are used for a number of purposes including ornamental, medicinal, culinary, timber and joinery works. **Hence statement 2 is not correct.**
- *Commiphora wightii*, a **critically endangered plant species**, commonly known as **Indian bdellium or guggul**, is a small deciduous tree species native to the **Western Ghats in India** and plays a vital role in various ecosystems and is highly valued for its **resin**, which has been used for centuries in traditional Indian medicine, particularly in Ayurveda. **Hence statement 3 is correct.**

FOUR SPECIES ARE CRITICALLY ENDANGERED



■ **Assam catkin yew**

CRITICAL ENDANGERED SPECIES

- Mahonia** (*Magnolia pleiocarpa*)
 - ↳ Found in Assam
- Indian bdellium-tree, gugal in Malayalam** (*Commiphora wightii*)
 - ↳ Found in Gujarat, Madhya Pradesh, Maharashtra and Rajasthan
- Khorokia sopa in Assamese** (*Magnolia gustavi*)
 - ↳ Found in Arunachal Pradesh, Assam
- Minangmose** (*Gymnocladus assamicus*)
 - ↳ Found in Arunachal Pradesh, Meghalaya and Nagaland

ENDANGERED SPECIES

Assam catkin yew (*Amentotaxus assamica*)

↳ Found in Arunachal Pradesh

Kattukaruva, Shanthamaram, Vellakodala in Malayalam (*Cinnamomum wightii*)

↳ Found in Western Ghats, Karnataka, Kerala and Tamil Nadu

White cedar (*Dysoxylum malabaricum*)



■ **Gymnocladus assamicus**

↳ Found in Karnataka, Kerala, Maharashtra and Tamil Nadu

Malabar humboldtia (*Humboldtia vahliana*)

↳ Found in Kerala and Tamil Nadu

Star anise or anisetree (*Illicium griffithii*)

↳ Found in Arunachal Pradesh, Manipur, Meghalaya and Nagaland

Gahori sopa in Assamese (*Magnolia pealiana*)

↳ Found in Assam

Sub species of common mango (*Mangifera austro-indica*)

↳ Found in Karnataka and Tamil Nadu

Thamba jalavi (*Shorea tumbuggia*)

↳ Found in Andhra Pradesh and Tamil Nadu

Ban jamy, mogi, konda nerudu (*Syzygium alternifolium*)

↳ Found in Andhra Pradesh

Q 54.B

- In ecology, “gape limitation” refers to the restriction on a predator’s diet based on the size of its mouth, or gape. This concept implies that a predator can only consume prey small enough to fit within its mouth. For example, a snake or certain fish species are limited to consuming prey that does not exceed the physical size of their mouths. This limitation influences predator-prey interactions by dictating the size and types of prey available to certain predators.
- Gape limitation also has implications for ecological balance, as it affects foraging strategies and prey selection among predators. Species with smaller gapes may target smaller prey, leaving larger prey available for other, larger predators, thus maintaining a balance within ecosystems. Human understanding of gape limitation helps clarify how predator adaptations shape food chains and the distribution of species across different habitats.
- **Hence option (b) is the correct answer.**

Q 55.D

- India has agreed to ratify the Biodiversity Beyond National Jurisdiction Agreement (BBNJ), also known as the High Seas Treaty. It would allow for a better administration and preservation of the high seas, and its implementation will be supervised by the Ministry of Earth Sciences (MoES).
- The High Seas Treaty, formally called the Agreement on Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ), is an international treaty aimed at conserving marine biodiversity in areas outside the jurisdiction of any single country.
 - Commonly referred to as the High Seas, these areas are beyond the Exclusive Economic Zones (EEZs) of nations and cover roughly 64% of the total ocean area.
- **The High Seas Treaty specifically addresses areas beyond national jurisdiction, focusing on the conservation and sustainable use of marine biodiversity in the High Seas.** High seas refer to the parts of the ocean that are not under any country’s jurisdiction, which includes regions beyond 200 nautical miles from any country’s coastline. **Hence statement 1 is correct.**
- The High Seas Treaty seeks to achieve three substantive objectives: conservation and protection of marine ecology; fair and equitable sharing of benefits from marine genetic resources; and establishment of the practice of mandatory environmental impact assessments for any activity that is potentially polluting or damaging to the marine ecosystem.
 - **There is a fourth objective as well, that of capacity building and transfer of marine technologies to developing countries. This will help them make full use of the benefits of the oceans while also contributing towards their conservation. Hence statement 2 is correct.**
- Protection and conservation of marine ecology are supposed to be achieved through the demarcation of Marine Protected Areas (MPAs), much like national parks or wildlife reserves. Activities in MPAs would be regulated, and conservation efforts were also taken up.
- The High Seas Treaty will be critical to achieving the objectives of the ‘30×30’ project, which aims to safeguard 30 percent of marine habitats by 2030 for which it plans to establish several new mechanisms.
- **The High Seas Treaty is not yet in force, as it requires ratification by at least 60 countries to become effective.** After the 60th ratification, the treaty will come into force 120 days later. **Hence statement 3 is correct.**
 - India has signed the treaty.
- The treaty also makes it mandatory to carry out a prior environmental impact assessment (EIA) for any activity that is potentially polluting or damaging to the marine ecosystems, or to conservation efforts.
 - The EIAs need to be made public. An EIA is to be carried out for activities within national jurisdictions as well if the impacts are expected in the high seas.
- The treaty complements the 1982 UN Convention on Laws of the Seas (UNCLOS) which provides broad frameworks for the use and conservation of oceans.

Q 56.C

- Invasive species are non-native plants, animals, or microorganisms introduced (either intentionally or accidentally) into ecosystems where they have no natural predators or controls.
 - These species tend to spread aggressively, outcompeting native flora and fauna for resources like nutrients, light, and space, often leading to biodiversity loss, habitat degradation, and ecological imbalance.
- List of Prominent Invasive Species in India:
 - **Lantana camara – A thorny shrub from Central and South America, highly invasive in Indian forests, disrupting native plant communities.**

- Parthenium hysterophorus (Congress Grass) – Originally from the Americas, it causes allergies and competes with native plants.
- Eichhornia crassipes (Water Hyacinth) – An aquatic plant from South America that clogs water bodies, affecting aquatic biodiversity and water flow.
- **Prosopis juliflora (Vilayati Babul)** – **Introduced for soil conservation, this hardy tree outcompetes native species, especially in arid regions.**
- Leucaena leucocephala (Subabul) – Fast-growing tree that invades pastures and agricultural lands, reducing soil fertility.
- Minute duckweed
- Alligator weed
- Giant African Snail
- Cotton Mealy Bug
- Primrose Willow
- **The list of invasive wildlife in India is also dominated by certain species of fish such as the African catfish, Nile tilapia, red-bellied piranha, and alligator gar, and turtle species such as the red-eared slider.**
- About 66 per cent of the country's natural systems are threatened with invasive species, according to the report published in the Journal of Applied Ecology.
- **The Sociable Lapwing (Vanellus gregarius) is a critically endangered migratory bird species known for its striking appearance and complex migration patterns.**
 - This species primarily breeds in the grasslands and steppes of central Asia, particularly in Kazakhstan and southern Russia.
 - During the winter months, the Sociable Lapwing migrates to warmer climates, with wintering grounds ranging from the Middle East to parts of India and northeastern Africa.
- **Hence option (c) is the correct answer.**

Q 57.A

- While considering the various alternatives available to organisms for coping with extremes in their environment, we have seen that some are able to respond through certain physiological adjustments while others do so behaviourally (migrating temporarily to a less stressful habitat).
- These responses are also actually, their adaptations. So, we can say that **adaptation is any attribute of the organism (morphological, physiological, behavioural) that enables the organism to survive and reproduce in its habitat. Hence option (a) is the correct answer.**
- Many adaptations have evolved over a long evolutionary time and are genetically fixed. In the absence of an external source of water, the kangaroo rat in North American deserts is capable of meeting all its water requirements through its internal fat oxidation (in which water is a by-product). It also has the ability to concentrate its urine so that minimal volume of water is used to remove excretory products.
- Many desert plants have a thick cuticle on their leaf surfaces and have their stomata arranged in deep pits to minimise water loss through transpiration. They also have a special photosynthetic pathway (CAM) that enables their stomata to remain closed during daytime. Some desert plants like Opuntia, have no leaves – they are reduced to spines—and the photosynthetic function is taken over by the flattened stems.

Q 58.C

- Green crackers are something new in the basket full of fireworks, reducing air and noise pollution at festive times like Diwali. **The Council for Scientific and Industrial Research, CSIR through its National Environmental Engineering Research Institute, NEERI had developed these friendly-to-nature alternatives for firecrackers addressing severe issues due to those traditional firecrackers.**
- Green crackers have been manufactured to emit emissions that are significantly lower than conventional firecrackers. **They are estimated to emit about 30 percent less particulate matter and other harmful pollutants in comparison to traditional fireworks.** This is realized by using safer materials and additives that do not include toxic substances like barium nitrate commonly found in traditional fireworks.
- **Types of Green Crackers:** There are three prime varieties of green crackers:
 - **SWAS (Safe Water Releaser):** These crackers utilize water vapor as a dust depressant and contain no potassium nitrate or sulfur. They can be used effectively in controlling particulate matter emissions.
 - **STAR (Safe Thermite Cracker):** Like SWAS, STAR crackers do not use harmful chemicals. Therefore, they are working at sound intensity levels, and further dust emissions are within control.

- The use of minimal aluminum by SAFAL crackers, with such aluminum replaced by magnesium, reduces both the level of sound and the harmful emissions.
- Hence option (c) is the correct answer.

Q 59.C

- Sacred Groves** are the tracts of virgin forests that are left untouched by the local inhabitants and are protected by the local people due to their culture and religious beliefs. Sacred groves are relic vegetation of once-dominant flora. They are repositories of our rich biodiversity; they are also the last bastion where the rich culture and the customs of the indigenous people are still preserved.
- A sacred grove usually consists of a dense cover of vegetation including climbers, herbs, shrubs and trees, with the presence of a village deity and is mostly situated near a perennial water source.
- They are called with different names in different states:
 - Sarna in Bihar
 - Dev Van in Himachal Pradesh
 - Devara Kadu in Karnataka. Hence pair 3 is correctly matched.
 - Kavus in Kerala. Hence pair 2 is not correctly matched.
 - Dev in Madhya Pradesh
 - Devarahati or Devarai in Maharashtra
 - Lai Umang in Manipur
 - Law Kyntang or Asong Khosi in Meghalaya
 - Oran in Rajasthan
 - Kovil Kadu or Sarpa Kavus in Tamil Nadu
 - Than in Assam. Hence pair 1 is correctly matched.

Q 60.B

- World Lion Day** was initiated by **Big Cat Rescue**, the world's largest accredited sanctuary dedicated to big cats. Celebrated on **August 10th**, it is a day for people from across the globe to come together to pay tribute to the mighty lion. World Lion Day is an occasion to celebrate the majestic lions that captivate our hearts with their strength and magnificence. **Hence statement 1 is not correct.**
- Greater Gir Concept** involves developing additional suitable habitats for lions beyond the traditional Gir National Park & Sanctuary. Sanctuaries like Girnar, Pania, and Mitiyala have been notified to expand the protected area network. **Hence statement 2 is correct.**
- Other initiatives for Lion conservation:**
Announced on August 15, 2020, 'Project Lion' is a pivotal initiative aimed at securing the future of Asiatic lions through comprehensive, long-term conservation efforts. This ambitious project focuses on creating a sustainable environment where lions can thrive, thereby contributing to the overall health of their ecosystems. Key components of the initiative include habitat improvement, monitoring through advanced technologies like radio-collaring and camera traps, and addressing human-wildlife conflict.
Launched in April 2023, the International Big Cats Alliance (IBCA) reinforces the global commitment to conserving big cats, including lions. This alliance aims to foster international cooperation among 97 range countries, facilitating the sharing of knowledge and resources to protect these majestic animals. By working together, nations can enhance their conservation strategies and ensure the survival of big cats in their natural habitats.

Q 61.A

- The Hwasong-19:**
 - The Hwasong-19 is an intercontinental ballistic missile (ICBM) **developed by North Korea** and was recently in the news due to a record-breaking test launch. This missile is part of North Korea's growing arsenal of long-range weapons, designed to demonstrate the country's capacity to reach distant targets, including those outside the Asia-Pacific region. **Hence option (a) is the correct answer.**
- Hwasong Series:**
 - North Korea's Hwasong series comprises various missiles with progressively increased ranges and capabilities. The Hwasong-19 is the latest in this series, following earlier models like Hwasong-14 and Hwasong-15, which are also long-range missiles capable of reaching intercontinental distances.
- Geopolitical Implications:**
 - The Hwasong-19's capabilities pose a significant security concern, especially to North Korea's neighboring countries and the United States. As the missile can potentially reach targets across

continents, it underscores the growing nuclear and missile threat posed by North Korea, prompting international responses and calls for denuclearization.

- **Response from Global Community:**

- North Korea's missile tests have led to widespread condemnation from various nations and organizations, urging Pyongyang to halt its missile development programs and return to diplomatic negotiations for denuclearization. These tests violate multiple United Nations Security Council resolutions aimed at restricting North Korea's missile and nuclear programs.

Q 62.D

- The term "habitat" has several meanings. In ecology, it means either the area and resources used by a particular species (the habitat of a species) or an assemblage of animals and plants together with their abiotic environment.
- The definition of habitats used for the EU habitat classification is: "a place where plants or animals normally live, characterised primarily by its physical features (topography, plant or animal physiognomy, soil characteristics, climate, water quality etc.) and secondarily by the species of plants and animals that live there".
- A habitat can be a salt marsh, a meadow or a pine forest, but a habitat can also be recognised at the landscape level of a tundra type or a deep-sea mud covering several hundreds of square kilometres. At the other extreme, it may be a microhabitat of less than 1 m², for example decaying wood, or animal dung in grassland environments.
- A habitat or a group of related habitats can be considered an ecosystem. Ecosystems are dynamic complexes of plant, animal and micro-organism communities and their non-living environment, which interact to form functional units.
- Hence option (d) is the correct answer.

Q 63.B

- **Agrivoltaic Farming Defined:**
 - Agrivoltaic farming is an innovative approach that integrates solar energy production with traditional agriculture on the same plot of land. Hence option (b) is the correct answer.
 - This dual-use system allows for the cultivation of crops while also harnessing solar power, addressing both food security and renewable energy needs.
 - The idea is to use the land more efficiently by combining solar panels with crop growth, which can have mutual benefits. For instance, solar panels provide shade for crops, which can reduce water evaporation and protect plants from extreme sunlight, while the crops can keep the ground cool, helping the solar panels operate more efficiently.
- **Why Agrivoltaic Farming is Relevant:**
 - This technique is gaining attention as it supports both sustainable agriculture and renewable energy goals, helping mitigate land use conflicts by producing energy and food on the same land. It aligns with broader sustainability goals to reduce carbon emissions and enhance food security, making it a valuable approach in regions facing land scarcity and high energy demands.
- **Recent Context:**
 - In November 2024, during the ISA Assembly proceedings, delegates visited a farm site on the outskirts of New Delhi showcasing practical agrivoltaic systems. This site, maintained by the **India Agrivoltaics Alliance**, exemplifies the successful integration of solar panels with agricultural practices, highlighting the potential for widespread adoption.

Q 64.A

- Bamboo is a versatile, fast-growing plant that belongs to the grass family Poaceae and is known for its tall, woody stalks and adaptability. Native to tropical and subtropical regions around the world, bamboo plays a significant ecological and economic role, especially in Asia. In India, bamboo is often called "green gold" due to its vast applications across various sectors.
- Bamboo is drought-tolerant, grows in diverse climates, and has a high resistance to pests, making it an ideal plant for sustainable forestry and soil conservation.
- Its woody stems, known as culms, are hollow and jointed, making bamboo both lightweight and strong.
- **The Indian Forest Act, 1927 no longer classifies bamboo as a tree.** Specifically, it belongs to the Poaceae family, which includes other grasses. Although it grows tall and has a woody appearance, it does not meet the biological criteria to be considered a tree. The amendment was made in 2017 to encourage bamboo cultivation in non-forest areas and increase farmer income. The goals of the amendment were to:

Increase farmer income, Increase the country's green cover, and Promote bamboo cultivation in non-forest areas. **Hence statement 1 is not correct.**

- Bamboo is actually one of the fastest-growing plants in the world. Certain bamboo species can grow up to 3 feet in a single day under optimal conditions, and most species reach full maturity within 3-5 years. Hence statement 2 is not correct.**
- According to the India State of Forest Report (ISFR), Madhya Pradesh has the largest area under bamboo cover in India. The state is rich in bamboo resources, contributing significantly to India's bamboo production. Hence statement 3 is correct.**

1.	Andhra Pradesh	6,104
2.	Arunachal Pradesh	15,739
3.	Assam	10,659
4.	Bihar	1,103
5.	Chhattisgarh	10,467
6.	Goa	288
7.	Gujarat	3,547
8.	Haryana	39
9.	Himachal Pradesh	1,027
10.	Jharkhand	3,717
11.	Karnataka	8,624
12.	Kerala	2,404
13.	Madhya Pradesh	18,394
14.	Maharashtra	13,526
15.	Manipur	8,377
16.	Meghalaya	5,007
17.	Mizoram	4,561
18.	Nagaland	3,947
19.	Odisha	11,199
20.	Punjab	280
21.	Rajasthan	1,555
22.	Sikkim	994
23.	Tamil Nadu	4,001
24.	Telangana	4,535
25.	Tripura	4,201
26.	Uttar Pradesh	1,832
27.	Uttarakhand	1,201
28.	West Bengal	702
29.	Andaman & Nicobar Islands	1,413
Total		1,49,443

- Bamboo is drought-tolerant, grows in diverse climates, and has a high resistance to pests, making it an ideal plant for sustainable forestry and soil conservation.
 - Its woody stems, known as culms, are hollow and jointed, making bamboo both lightweight and strong.

Q 65.A

- The tiger** is India's national animal and is a powerful predator found primarily in forests. Known for its striking orange coat with black stripes, the tiger plays a crucial role in maintaining the balance of ecosystems by keeping prey populations in check.
 - Madhya Pradesh has the highest tiger population, with an estimated 785 individuals as of the latest count.**

- Karnataka follows closely with approximately 563 tigers, making it another stronghold for tiger conservation in India.
- The Asian elephant is the largest terrestrial mammal in Asia, known for its intelligence, strong social bonds, and critical role in forest ecosystems as a "mega-herbivore," dispersing seeds and creating forest clearings that support diverse flora and fauna.
 - **Karnataka holds the largest population of elephants in India, with around 6,395 individuals according to the 2023 Elephant Census.**
 - Assam has the second-largest population, supporting a significant number of elephants in its extensive forests.
- The leopard is a versatile and highly adaptable big cat found in diverse habitats across India. Known for its spotted coat and ability to thrive in both protected areas and human-dominated landscapes, it is a resilient predator with a wide-ranging diet.
 - **Madhya Pradesh has the highest population of leopards, with an estimated 3,907 individuals.**
 - Maharashtra comes next, with approximately 1,985 leopards.
- The snow leopard, known as the "ghost of the mountains," is a solitary and elusive big cat found in high-altitude, rugged terrains. Adapted to cold mountainous habitats, it has thick fur, powerful legs, and a long tail, helping it survive in harsh environments.
 - **Ladakh has the highest population of snow leopards, with around 477 individuals.**
 - Uttarakhand supports the next largest population, estimated at 124 individuals.
- **Hence option (a) is the correct answer.**

Q 66.D

- The Sri Lankan golden-backed frog, which was last documented in India around 200 years ago, was recently discovered in the Koundinya Wildlife Sanctuary. **Hence option (d) is the correct answer.**
- **The Koundinya Wildlife Sanctuary is a notable protected area in the Chittoor and Annamayya districts of Andhra Pradesh.** It spans the Kuppam and Palamaner ranges in the Eastern Ghats.
 - This sanctuary is part of an important elephant corridor that enables seasonal elephant migrations. This is the only sanctuary in Andhra Pradesh known for harboring Asian elephants.
 - The sanctuary's terrain consists of undulating hills, valleys, and rugged landscape typical of the Eastern Ghats. Streams such as Kaigal and Kundiyana, tributaries of the Palar River, flow through the sanctuary, offering water sources for wildlife
- **Coringa Wildlife Sanctuary** is located in Andhra Pradesh along the Godavari estuary. It is known for its mangrove forest and the protection of critically endangered fishing cats. But it is not associated with elephants or the red discovered frog.
- **Kambalakonda Wildlife Sanctuary** is situated near Visakhapatnam in Andhra Pradesh. It contains dry evergreen and mixed deciduous forests and is home to leopards, barking deer, and civets. But it does not have an elephant population.
- **Sri Venkateswara Wildlife Sanctuary** is located in the Tirupati district of Andhra Pradesh. It is known for its rich biodiversity but not associated with the rediscovery of the Sri Lankan golden-backed frog.

Q 67.B

- **Recent Context:** The First Asian Buddhist Summit, recently held in New Delhi, focused on the cultural aspects of Buddhism and its role in strengthening ties among Asian nations. **Hence statement 3 is not correct.**
- Organized by the Ministry of Culture and the International Buddhist Confederation (IBC), the summit brought together over 700 participants from 32 countries, including scholars, monks, and diplomats. **Hence statement 1 is correct.**
- **The theme of the summit was "Role of Buddha Dhamma in Strengthening Asia."** Hence statement 2 is correct.
- Key Cultural Aspects Discussed:
 - **Buddhist Art and Heritage:** The summit highlighted the rich cultural legacy of Buddhist landmarks such as the Sanchi Stupa and Ajanta Caves, emphasizing their importance in promoting a shared cultural identity among Asian nations.
 - **Buddha Dhamma as a Unifying Force:** Experts noted that Buddha's teachings serve as a binding force that not only fosters philosophical understanding but also practical applications that have sustained cultures during crises.
 - **Cultural Diplomacy:** The summit reaffirmed India's commitment to its Buddhist legacy, which has shaped its cultural diplomacy and spiritual understanding across Asia for millennia.

- **Educational Initiatives:** Suggestions were made to establish academic institutions for monastic education in the Himalayas to transfer historical knowledge and wisdom to younger generations.
- **The Delhi Declaration:** This declaration included commitments to strengthen bonds between nations based on Buddha Dhamma principles, promote Buddhist literature, and enhance the sharing of Buddhist art and heritage.
- **Promotion of Pilgrimage and Living Heritage:** The summit resolved to connect the Asian Buddhist Circuit through pilgrimage routes, recognizing the relevance of scientific and medical aspects of Buddha Dhamma.

Q 68.A

- **The PM Vidyalaxmi Scheme is a new initiative launched by the Indian government.**
- **Objective:** The scheme is designed to offer collateral-free and guarantor-free loans to meritorious students, ensuring that financial constraints do not hinder access to higher education.
- **Target Institutions:** It applies to students admitted to Quality Higher Education Institutions (QHEIs) identified through the National Institutional Ranking Framework (NIRF). This includes:
- **Government and private institutions ranked within the top 100 in overall, category-specific, and domain-specific NIRF rankings.**
- State government institutions ranked between 101-200 and all central government-run institutions.
- **Loan Amount:** Students can avail loans up to ₹10 lakh to cover tuition fees and other related expenses.
- **Students with an annual family income of up to ₹8 lakh who do not qualify for other government scholarships can receive a 3% interest subsidy on loans during the moratorium period.**
- Hence option (a) is the correct answer.

Q 69.D

- **Recent Context:** The Maha Kumbh Mela 2025 is scheduled to commence on January 14 with the Makar Sankranti Snan (holy bath) and will conclude on February 26 with the Mahashivratri Snan. **In November 2024, the Uttar Pradesh government allotted over 100 bigha land to all 13 akharas for Maha Kumbh.**
- The Maha Kumbh Mela is one of the biggest and most significant religious festivals in which millions of Hindus from all over the world celebrate. The festival is said to have been born from ancient Hindu mythology and represents spiritual awakening and communal harmony.
- **Origins:** Kumbh Mela is linked with the mythological event of Samudra Manthan, or churning of the ocean, by gods and demons. While doing this they wanted to get hold of amrita, a nectar of immortality. In this process, four drops of nectar fell at four sacred sites, namely Prayagraj, Haridwar, Ujjain, and Nashik. These places have become associated with the Kumbh Mela.
- **Types of Kumbh Mela:** The Kumbh Mela takes place in several forms:
 - **Maha Kumbh Mela:** It is conducted every 144 years in Prayagraj (Devprayag is where Alaknanda and Bhagirathi meet to become one and the Ganges. It is in Uttarakhand). Hence statements 1 and 2 are not correct.
 - Purna Kumbh Mela: This occurs every 12 years at each of the four places.
 - Ardh Kumbh Mela: Half a Kumbh, this is also conducted in alternate intervals of six years at Haridwar and Prayagraj.
- **Cultural Importance:**
 - Gathering of the Faithful: The Maha Kumbh Mela attracts millions of adherents of faith to take a ritual holy bath in the sacred waters, purifying their souls and freeing them for salvation.
 - Community and Commerce: It is a great cultural festival with religious talks, cultural performances, and commerce going on. It brings together the devotees who come from different walks of life.
 - Congregation of Sanyasis: The festival is also famous for having sadhus around. On some occasions, they take part in the initial ritual bath in the water. Sanyasis give it a religious flavor.

Q 70.C

- **The Biological Diversity Act, 2002, is a legislative framework enacted by the Indian Parliament to conserve the nation's rich biodiversity, ensure the sustainable use of its components, and promote the fair and equitable sharing of benefits arising from the utilization of biological resources and associated traditional knowledge.**

- **Key Objectives of the Biological Diversity Act, 2002**
 - Conservation of Biological Diversity: The Act aims to preserve the vast array of life forms in India, including flora, fauna, and microorganisms, by implementing measures to protect ecosystems and prevent the extinction of species.
 - Sustainable Use of Biological Resources: It promotes the responsible and sustainable utilization of biological resources to ensure that their exploitation does not lead to long-term depletion, thereby maintaining ecological balance.
 - Fair and Equitable Benefit Sharing: The Act ensures that benefits derived from the use of biological resources and traditional knowledge are shared fairly with local communities and indigenous peoples who have conserved and nurtured these resources over generations.
- Institutional Framework Established by the Act
 - National Biodiversity Authority (NBA): A statutory autonomous body headquartered in Chennai, established to implement the provisions of the Act at the national level. The NBA advises the central government on matters related to biodiversity conservation, regulates access to biological resources, and ensures benefit-sharing arrangements.
 - State Biodiversity Boards (SBBs): Established in each state to manage biodiversity at the state level, these boards advise state governments on biodiversity conservation and regulate access to biological resources by Indian citizens.
 - **Biodiversity Management Committees (BMCs): Formed at the local body level, BMCs are responsible for promoting conservation, sustainable use, and documentation of biological diversity, including the preparation of People's Biodiversity Registers (PBRs). Hence statement 3 is correct.**
- **People's Biodiversity Register (PBR): Mandated under the Biological Diversity Act, 2002, the PBR is a comprehensive document that catalogues local flora, fauna, and traditional knowledge of local communities. Hence statements 1 and 2 are correct.**
 - It serves as an informal inventory and a means to protect intellectual property rights. The primary objectives of the PBR include:
 - Documentation of Biodiversity: Recording information on locally available biological resources, including landscape and demographic details of a particular area.
 - Preservation of Traditional Knowledge: Safeguarding indigenous knowledge related to the use of medicinal herbs, plants, and other biological resources to prevent biopiracy and ensure benefit-sharing with local communities.
 - Resource Management: Assisting in sustainable resource management by providing a baseline for conservation efforts and supporting claims of local ownership and knowledge of biodiversity.
- The preparation of PBRs involves local communities, BMC members, educational institutions, NGOs, and interested citizens. The National Biodiversity Authority, along with State Biodiversity Boards, provides training and guidance for the documentation process

Q 71.B

- **Context of India's First Analog Space Mission**
 - India's first analog space mission conducted by ISRO in Leh represents a significant step in simulating the conditions that astronauts might face in space. Hence option (b) is the correct answer.
 - Analog missions involve replicating space-like environments on Earth to study various factors affecting human survival, such as limited oxygen, isolation, and space-like radiation exposure.
 - These missions prepare astronauts by helping scientists understand the physical and psychological effects of space environments on the human body. They also allow researchers to refine protocols and test equipment intended for actual space missions.
- **Analog Mission and Its Importance:**
 - The mission, situated in Leh's high-altitude, harsh terrain, was strategically chosen due to its isolation, extreme temperatures, and reduced oxygen levels.
 - These conditions mimic aspects of extraterrestrial life on planets or moons, aiding in assessments of human endurance, survival strategies, and the functionality of equipment under challenging circumstances.
 - Analog space missions also serve to gather data crucial for long-term space missions and help improve astronaut training, mission planning, and technology.

Q 72.B

- The government recently identified 56,825.7 sq km of the Western Ghats as ecologically sensitive, with a complete ban on mining and quarrying in villages. Goa has about 108 villages tagged as an Ecologically Sensitive Area (ESA), which have rich biodiversity.
- The Goa Government wants to exclude around 21 villages from Sattari taluka from the list of ESA, stating that their exclusion would be justified.
- **Under this context, an expert committee is constituted by the Union Environment Ministry, headed by Sanjay Kumar, in order to take a view of the demand raised by the state for excluding certain villages from the ESA category.**
- **Significant committees on the Western Ghats:-**
 - **Gadgil Committee:** It was established in 2010, also referred to as the Western Ghats Ecology Expert Panel. This committee had recommended the entire Western Ghats region as an ecologically sensitive zone with more stringent environmental protection measures.
 - **Kasturirangan Committee:** Established in 2012, it dealt with the recommendations of the Gadgil Committee, and it made sure that conservation and development in the Western Ghats were on an equal scale, so it proposed only 37% of the region be an ecologically sensitive zone.
- **National Biodiversity Action Plan Committee:** This committee is responsive to the issues relating to biodiversity in India but is not specifically concerned with the problem of the Western Ghats.
- **Bhure Lal Committee:** The Bhure Lal Committee was established by the Supreme Court of India under the Environment Protection Act to oversee and ensure the implementation of measures aimed at reducing air pollution and safeguarding environmental standards. **Hence only option 3 is not correct.**
- **Hence option (b) is the correct answer.**

Q 73.A

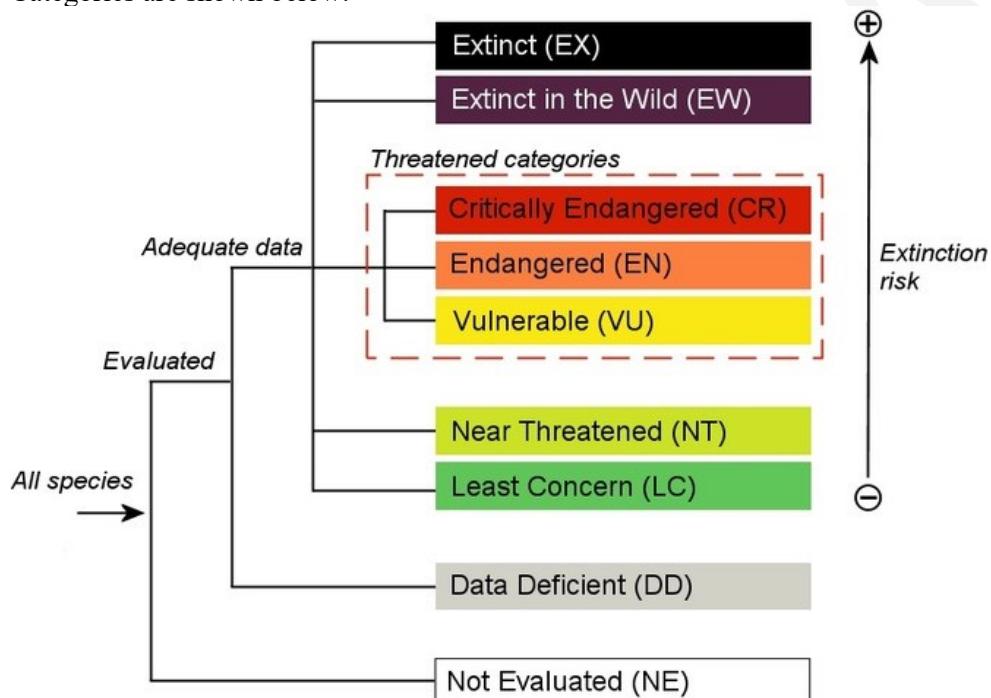
- Ecosystem diversity encompasses the range of different habitats, biological communities, and ecological processes in a particular region. It includes various ecosystems such as forests, deserts, wetlands, grasslands, and aquatic systems, each supporting unique species and ecological functions. This diversity is essential for ecological resilience and adaptation.
- Coral reefs support an exceptionally high level of biodiversity, often surpassing that of tropical rainforests. They provide habitats for thousands of marine species and are known for their high productivity. This biodiversity is critical for marine life and contributes to global ecological balance. **Hence statement 1 is correct.**
- boreal forest ecosystems have lower biodiversity than tropical ecosystems. These ecosystems have fewer tree species than tropical forests, but they still support thousands of species of plants and animals. Boreal forests have harsh winters with freezing temperatures for six to eight months, and some species require specific adaptations to survive. However, boreal forests have many species with unique life histories and vital ecological functions. **Hence statement 2 is not correct.**

Q 74.B

- **Context: Water spinach now reached the door of the farmers with the technology developed by the Indian Institute of Vegetable Research (IIVR).**
 - Water Spinach (*Ipomoea aquatica*) is a member of the Convolvulaceae (Morning glory) family and the same genus as the sweet potato (*Ipomoea batatas*). Water spinach is an herbaceous aquatic or semi-aquatic perennial plant of the tropics and subtropics. It has a creeping growth habit but may grow erect in water. There are two major cultivars of water spinach. Ching Quat, also known as “green stem” water spinach, has narrow leaves and white flowers and is usually grown in moist soils. Pak Quat, also known as “white stem” water spinach, has arrow-shaped leaves and pink flowers and is grown in aquatic conditions, similar to rice. **Hence statement 1 is correct.**
 - Almost all parts of the young plant tissue are edible, but the tender shoot tips and younger leaves are preferred. **It is native to tropics and subtropics;** this semi-aquatic perennial plant is believed to have been the first domesticated in Southeast Asia. **Hence statement 2 is not correct.**
 - Water spinach is commonly used as a food plant. **The leaves are a good source of minerals, vitamins and is considered a possible source of food protein**. It also possesses several medicinal properties. Water spinach has certain essential nutrients like vitamins A and C as well as a high concentration of beta-carotene. These nutrients act as antioxidants to reduce free radicals in the body, thus preventing cholesterol from becoming oxidized. Water spinach is rich in fiber and aids in digestion. Being rich in iron, its beneficial for people with anemia as well as for those who require iron in their diets. Has great potential as a purifier of aquatic habitats. **Hence statement 3 is correct.**

Q 75.A

- The IUCN Red List of Threatened Species serves as a global indicator of the conservation status of animal, plant, and other species. It assesses the extinction risk of species worldwide and is widely used to inform conservation actions and policies. The Red List aims to raise awareness about species at risk, thus promoting measures to prevent extinction. **Hence statement 1 is correct.**
- The IUCN Red List is not updated annually for every species on the list. Instead, the assessment frequency depends on available resources, priorities, and the threat level faced by each species. Updates are done periodically for many species, but not every year for all species globally. **Hence statement 2 is not correct.**
- The IUCN Red List includes assessments not only for animals and plants but also for fungi and other organisms, making it comprehensive in covering a wide array of life forms. For instance, fungi, lichens, and select invertebrates are included, as the Red List continues to expand its scope to document biodiversity thoroughly. Animals, plant and fungi species, subspecies, varieties (plants only) and subpopulations can be assessed on the Red List. However, an assessment of the animal, plant or fungi at the species level is required before subspecies, varieties and subpopulations can be assessed. **Hence statement 3 is not correct.**
- The IUCN Red List Categories indicate how close a species is to becoming extinct. The nine Red List Categories are shown below:



Q 76.B

- Context of the World Cities Report 2024:**
 - The World Cities Report 2024, a critical document shedding light on the pressing challenges faced by urban areas globally, **was launched by UN-Habitat** during the twelfth session of the World Urban Forum. The report primarily focuses on the impacts of climate change and rapid urbanization on cities, providing crucial insights for stakeholders, urban planners, and policymakers involved in developing resilient and sustainable urban infrastructure. **Hence option (b) is the correct answer.**
- Key Highlights of the Report:**
 - Rising Urban Temperatures:** The report warns that over 2 billion urban residents could experience temperature increases of at least 0.5 degrees Celsius by 2040. This emphasizes the need for cities to build climate-resilient infrastructure and adopt sustainable development practices.
 - Funding Gap:** A major focus is on the funding required for resilient urban infrastructure. While an estimated USD 4.5 to 5.4 trillion is necessary annually, only around USD 831 billion is currently available, underscoring a significant shortfall that leaves vulnerable communities exposed to climate risks.
 - Green Gentrification:** Interestingly, the report also points out a **phenomenon called green gentrification**. It notes how some well-intended climate interventions, such as creating green spaces, can inadvertently lead to the displacement of low-income communities by increasing

property values in those areas. This calls for a more balanced approach to ensure equitable solutions.

- **International Alignment:** UN-Habitat encourages cities to align their climate action with broader sustainable development goals (SDGs), advocating for integrated climate strategies that consider urban realities and vulnerable populations.
- **UN-Habitat's Role:**
 - UN-Habitat, a specialized agency of the United Nations, focuses on promoting socially and environmentally sustainable cities. The organization plays a crucial role in providing urban development guidelines, publishing reports like the World Cities Report to inform and support policies that address global urban challenges effectively.

Q 77.B

- The **Ganges River dolphins** are essentially blind, and they **hunt by emitting ultrasonic sounds**, which bounce off of fish and other prey, enabling them to “see” an image in their mind. **Hence statement 1 is correct.**
- The Ganges River dolphin can live only in freshwater and is known as the “**Tiger of the Ganges**” for the role it plays as a **top predator** and because it is an **ecosystem indicator species** – much like a tiger is in a forest. It is legally protected in all countries within which it is found and is the **National Aquatic Animal of India**. The distributional range of the Ganges river dolphin includes over 10,000 km of the **Ganges-Brahmaputra-Meghna** and the **Sangu-Karnaphuli River systems** in Bangladesh, India, and Nepal. Ganges river dolphins are commonly found in deeper sections of the river, and they prefer eddies around islands, river bends, and confluences, which are often also where people prefer to fish. **Hence statement 2 is correct.**
- Dolphins are one of the oldest creatures in the world, along with some species of turtles, crocodiles, and sharks.
 - **IUCN Status: Endangered**
 - The Ganges River dolphin was officially discovered in 1801. Indus and Ganges River dolphins are considered **living fossils**, as they are the most ancient dolphin species still alive. Until recently, the Ganges and Indus River dolphin were considered two sub-species of the **South Asian River dolphin species**. The taxonomy was revised in 2021 so that the Ganges and Indus River dolphins are recognized as separate species. **Hence statement 3 is not correct.**

Q 78.C

- Under the theme ‘**Peace with Nature**,’ COP16 to the Convention of Biodiversity was the first meeting of the COP after adopting the **Kunming-Montreal Global Biodiversity Framework (GBF)** held in the **Colombian city of Cali**. The **Convention on Biological Diversity (CBD)** emerged from the same **1992 Rio Earth Summit** that gave rise to the **UN Framework Convention on Climate Change (UNFCCC)**. CBD aims to protect global biodiversity, restore natural ecosystems, and ensure that benefits from the world’s biological resources are equitably distributed. **Hence statement 1 is correct.**
- COP16 is the first COP after a landmark agreement on biodiversity was finalized two years ago. This agreement, the **Kunming-Montreal Global Biodiversity Framework** concluded at **COP15 in Montreal** in 2022, lays down **four goals and 23 targets** to be achieved collectively by 2030. These include the so-called **30 x 30 targets** — a commitment to put at least 30% of the world’s lands and oceans, especially biodiversity-rich areas, under conservation by 2030 and to initiate restoration work in at least 30% of degraded land or marine ecosystems by 2030. **Hence statement 2 is correct.**

Q 79.C

- **EU-Japan Security and Defense Partnership:**
 - For the first time, the European Union (EU) signed a security and defense partnership agreement **with an Asian nation — Japan**.
 - This partnership represents a significant step in EU’s outreach to Asia, aiming to bolster cooperation in key areas such as **cybersecurity, military exercises, and space security**.
 - This move is part of a broader effort by the EU to strengthen its strategic presence in the **Indo-Pacific region**, recognizing the importance of fostering ties with regional powers amid global security challenges. **Hence option (c) is the correct answer.**
- **Background:**
 - The EU-Japan partnership reflects a shared commitment to peace and stability, especially in the context of growing geopolitical tensions in the Asia-Pacific region. As global powers like the U.S.

and China influence security dynamics, both the EU and Japan seek to support a rules-based international order.

- Japan has been expanding its security partnerships to balance against growing concerns, particularly with regard to North Korea's missile tests and China's increasing assertiveness in regional waters.
- **Key Areas of Cooperation:**
 - **Cybersecurity:** This partnership includes collaboration on cybersecurity measures to protect critical infrastructure and data from potential threats.
 - **Military Exercises:** Japan and the EU will work together to enhance interoperability and conduct joint exercises, which could strengthen their defense postures and preparedness.
 - **Space Security:** Given the growing importance of space as a strategic domain, both parties plan to collaborate on space-related defense initiatives to safeguard satellite networks and space-based assets.

Q 80.A

- **ESA's Proba-3 Mission Overview:**
 - The European Space Agency (ESA) is preparing to launch the Proba-3 mission, a **highly innovative mission aimed at achieving a unique scientific goal: to study the Sun's outer atmosphere (the corona) by creating an artificial eclipse. Hence statement 1 is correct.**
 - This mission exemplifies ESA's commitment to exploring solar phenomena that directly impact space weather and, consequently, various technological systems on Earth.
- **Objective:**
 - Proba-3 will use a **two-satellite formation to artificially block the Sun's light, simulating an eclipse.** This approach allows scientists to capture detailed observations of the Sun's corona, which is otherwise difficult to observe due to the Sun's intense brightness.
 - The corona plays a critical role in understanding solar wind and space weather, making these observations valuable for both scientific research and practical applications.
- **Launch Location and Vehicle:**
 - **Launch Vehicle:** The mission will be launched aboard **India's Polar Satellite Launch Vehicle (PSLV)**, marking a notable example of international collaboration in space research. **This differs from the commonly used Ariane-5 launch vehicle for ESA missions, which is based in French Guiana. Hence statement 2 is not correct.**

Q 81.D

- The Indian Rhinoceros (*Rhinoceros unicornis*), also known as the Greater One-Horned Rhinoceros, is a large, iconic species native to the grasslands and forests of northern India and Nepal. Known for its distinctive single horn and thick, armor-like skin folds, this species is one of the largest among rhino species.
- Primarily found in the Terai grasslands and subtropical forests of the Himalayan foothills, particularly in Kaziranga National Park in Assam, India, and the Terai Arc Landscape in Nepal.
- The Indian Rhino has a single horn, usually 8 to 25 inches long. Its grey-brown skin has deep folds that give it an "armor-plated" look.
 - **Both male and female Indian Rhinos have a single horn. Hence statement 2 is not correct.**
- **The Indian Rhinoceros is not endemic to India. It is found in both India and Nepal. Hence statement 1 is not correct.**
- **Indian Rhinoceroses are generally solitary animals. Hence statement 3 is not correct.**
 - They are mostly solitary, except for temporary groupings in grazing areas or during the mating season.
 - Females may be accompanied by their calves, but adult males do not lead groups.
 - Males establish and defend their territories but do not form social hierarchies or lead herds.
- Classified as Vulnerable by the IUCN, the Indian Rhino population has rebounded from near extinction thanks to successful conservation efforts in India and Nepal.

Q 82.A

- Recently the Supreme Court of India halted the Assam government's decision to denotify Pobitora wildlife sanctuary. Pobitora Wildlife Sanctuary is situated in the Morigaon district of Assam.
- **It is known for having the highest density of greater one-horned rhinoceros in the world.** Although Kaziranga National Park in Assam has the highest population of greater one-horned rhinoceros, but Pobitora has the highest density, with approximately over 100 rhinoceros in an area of about 38 square kilometers. **Hence, statement 1 is correct.**

- It is recognized as an Important Bird Area (IBA) by BirdLife International because of its rich avian diversity, particularly migratory and wetland birds. **Hence, statement 2 is correct.**
- Pobitora's wetlands, marshes, and grasslands provide an ideal habitat for over 200 bird species. These include both resident and migratory birds like the Indian pied hornbill, Asian openbill stork, and several species of ducks, which make it a crucial site for bird conservation.
- **Pobitora's landscape primarily consists of grasslands and wetlands rather than evergreen rainforests.** These grasslands and marshes are optimal habitats for rhinos and many bird species but are different from dense rainforests found in other parts of Assam. Pobitora's ecosystem is dominated by the alluvial floodplain of the Brahmaputra River. **Hence statement 3 is not correct.**

Q 83.A

- **DESERT ECOSYSTEM:** Deserts make up about one-fifth of the surface of earth and occur where rainfall is less than 50 cm/year. The major deserts are the Sahara, the Arabian, Kalahari and Namib of Africa, the Atacama of South America, the Mojave, Sonoran and Chihuahuan of North America and the Australian deserts. Besides, there are the Thar Desert in western India and Pakistan and the Gobi Desert of Mongolia.
- **Features of Desert Ecosystems**
 - The soil in the desert is coarse.
 - In the deserts, days are very hot and nights are cold. So the plants and animals are exposed to both types of extremes.
 - The predominant plants found in the deserts are succulent species with waxy surfaces, such as cacti, which can conserve water for longer periods of time, or deciduous shrubs, also with thick waxy leaves.
 - The animal types in the deserts are few. These include burrowing and nocturnal rodents, reptiles, insects and arachnids (Scorpions, spiders etc.). These animals adapt themselves to the temperature extremes and desiccation of desert air by living beneath the surface during the day and moving out only at night. Most of them have remarkable water conservation adaptations.
 - Most of the animals living in the deserts are nocturnal (active only at night). Common animals are camels, foxes, kangaroos, rats squirrels, etc. Many of the insects have waxy coats and reduced water loss through the cuticles.
- **Hence option (a) is the correct answer.**

Q 84.A

- **Understanding Orphan Drugs:**
 - Orphan drugs are medications developed specifically to treat rare diseases, known as orphan diseases, which affect a small percentage of the population. These drugs often require special designation and support due to the high costs and limited market size. **Hence statement 1 is correct.**
- **Designation Criteria for Orphan Drugs:**
 - To qualify as an orphan drug, certain criteria must be met. These vary by region but typically include:
 - > **Low Prevalence:** The disease should have a low prevalence, often defined as affecting fewer than 200,000 people in the U.S. or similar thresholds in other regions.
 - > **Lack of Existing Treatment Options:** The disease usually lacks effective approved treatments, or the orphan drug must demonstrate significant benefits over any existing options.
 - > **Evidence of Efficacy:** Scientific evidence must show the potential of the drug to treat or alleviate the condition. This evidence can be presented at any stage of development:
 - Preclinical Research
 - Clinical Trials (early to late phase).
- **Types of Diseases Targeted by Orphan Drugs**
 - Orphan drugs often target rare and life-threatening diseases, including but not limited to:
 - > **Genetic Disorders:** For example, cystic fibrosis, Huntington's disease.
 - > **Rare Cancers:** Such as neuroblastoma, gliomas. **Hence statement 2 is not correct.**
 - > **Metabolic Disorders:** Includes conditions like Gaucher's disease and Fabry disease.
 - > **Autoimmune Diseases:** Examples include systemic sclerosis and juvenile rheumatoid arthritis.
- **Challenges in Orphan Drug Development**
 - The development of orphan drugs faces unique challenges due to:
 - > **High Development Costs:** Given the smaller target market, recouping costs can be difficult.
 - > **Limited Patient Population for Clinical Trials:** This can slow down the drug development and approval process.

- > **High Treatment Costs:** Treatments often end up being expensive for patients, which can be a barrier to accessibility.

Q 85.B

- **The Belt and Road Initiative (BRI):**
 - The Belt and Road Initiative (BRI) is China's ambitious global infrastructure project, aiming to enhance connectivity and foster trade across Asia, Europe, and Africa, and increasingly includes countries across other continents. Several countries have joined BRI for infrastructure investments, but major economies like India and Brazil have refrained from formally joining it.
- **Brazil:** Despite economic ties with China, Brazil has recently reiterated its decision not to join the BRI. Brazil is cautious about the long-term implications of China's influence and is exploring alternatives to maintain its independence in trade and infrastructure development. **Hence option 1 is correct.**
- **India:** India has consistently opted out of the BRI, citing concerns over sovereignty and the transparency of the projects. Specifically, India opposes the China-Pakistan Economic Corridor (CPEC), a major BRI project that runs through Pakistan-administered Kashmir, an area India claims as its own territory. **Canada and the United States are also not part of the Belt and Road Initiative. Hence option 3 is correct.**
- **Russia:** Russia, on the other hand, is a key supporter of the BRI. It views participation in BRI as mutually beneficial for its infrastructure projects and trade opportunities with China, aligning with its broader goals of countering Western influence. **Hence option 2 is not correct.**
- **South Africa:** South Africa is also a BRI participant, seeing it as a chance to strengthen infrastructure and boost economic opportunities, particularly within Africa. **Hence option 4 is not correct.**

Q 86.C

- **Eutrophication** is the process where water bodies, such as lakes, rivers, or coastal areas, become enriched with nutrients, particularly nitrogen and phosphorus. This enrichment leads to excessive growth of algae and other aquatic plants. Eutrophication can be either natural or accelerated by human activities (cultural eutrophication). Hence, statement 1 is correct.
- **Causes of Eutrophication:**
 - **Agricultural Runoff:** Fertilizers used in agriculture contain high levels of nitrogen and phosphorus. When these fertilizers run off into nearby water bodies, they increase nutrient levels.
 - **Wastewater Discharge:** Untreated or inadequately treated sewage and industrial wastewater often contain significant amounts of nutrients.
 - **Detergents:** Some household detergents contain phosphates, which can contribute to nutrient loading when wastewater is discharged into water bodies.
 - **Atmospheric Deposition:** Nitrogen compounds from industrial emissions and vehicle exhaust can settle on water surfaces, contributing to nutrient levels.
- **Effects of Eutrophication:**
 - **Algal Blooms:** The rapid growth of algae can form dense mats on the water surface, known as algal blooms. Some algal blooms produce toxins harmful to aquatic life and humans. Hence, statement 2 is correct.
 - **Oxygen Depletion:** When algae die and decompose, the process consumes oxygen from the water, leading to hypoxic (low oxygen) or anoxic (no oxygen) conditions.
 - **Death of Aquatic Life:** Oxygen depletion can result in the death of fish and other aquatic organisms that depend on dissolved oxygen.
 - **Loss of Biodiversity:** Eutrophication generally leads to a decrease in biodiversity as oxygen-sensitive species die off and more tolerant species dominate.
 - **Water Quality Decline:** Eutrophication can cause foul Odors, bad taste, and toxic conditions, making water unfit for drinking, recreation, and industrial use.

Q 87.C

- **The Chambal River forms the natural boundary of the Ranthambore National Park towards the east.** The Banas River, a tributary of Chambal, flows to the northeast of the Ranthambore National Park. Ranthambore National Park, Keladevi sanctuary, and the Sawai Man Singh Wildlife Sanctuary together form the Ranthambore Tiger Reserve. **Hence, pair 1 is not correctly matched.**
- **The Sindh River flows across the eastern border of the Madhav National Park.** The Chambal River does flow near the region, but it is not the primary river running through Madhav National Park. The park is not only known for its wildlife but also for the Madhavgarh Fort, which lies within its boundaries. **Hence, pair 2 is not correctly matched.**

- **Orang National Park, located in Assam, is situated along the Dhansiri River.** This park is often referred to as a “mini Kaziranga” due to its population of one-horned rhinoceros. **Hence, pair 3 is correctly matched.**

Q 88.B

- Red Sanders (*Pterocarpus santalinus*) is endemic to the forests of Seshachalam, Veligonda, Lankamala and Palakonda Hill ranges of Andhra Pradesh. It is distributed in very limited area of about 5.83 Lakh Ha in the districts of Kadapa, Nellore, Chittoor and Prakasham. Naturally, this plant species occurs in tropical, dry deciduous forests. However, considering its usefulness and demand in the market, it is described under a separate forest sub-type, ‘The Red Sanders Forest’. This plant is referred to as ‘**the pride of Eastern Ghats.**’ **Hence statement 1 is not correct.**
- Red sanders, a plant species, are valued for their rich red color and grain pattern and are **most revered in China**, called **“Zitanâ** in Chinese. It is very hard, durable (does not develop cracks), and known for its decorative furniture, particularly in China, and **musical instruments (Shamisen) in Japan.** **Hence statement 2 is correct.**
- The heartwood of Red Sanders is heavily impregnated with a red dye called ‘**santalum**,’ for which it is highly valued. It is immune to white ants and other insects and does not require antiseptic treatment. **Hence statement 3 is correct.**

Q 89.A

- The Chief Wild Life Warden is a statutory authority established under the Wildlife Protection Act, 1972, not the forest conservation act of 1980. The Wildlife Protection Act, 1972 is the primary legislation for wildlife conservation in India. on the other hand, the Forest Conservation Act of 1980 is focused on the conservation of forests and preventing deforestation. **Hence, statement 1 is not correct.**
- The Chief Wild Life Warden is not the vice-chairperson of the State Board for Wildlife. The chief minister of the state is the chairperson of the State Board for Wildlife and the minister in charge of Forest and Wildlife generally serves as the vice-chairperson. The Chief Wildlife Warden is an important member of the board but does not hold the position of vice-chairperson. **Hence statement 2 is not correct.**
- The Chief Wildlife Warden is responsible for overseeing wildlife sanctuaries, national parks, and other protected areas within a state. This includes habitat management, anti-poaching measures, and minimizing human-wildlife conflict.
- Under the Wildlife Protection Act 1972, the Chief Wildlife Warden has the authority to grant permits for entry into a wildlife sanctuary or national park for purposes such as scientific research, photography, tourism, and study of wildlife. This is done under specific conditions to ensure that the wildlife and habitat are not disturbed or harmed. **Hence statement 3 is correct.**

Q 90.C

- The forest cover is broadly classified in 4 classes, namely very dense forest, moderately dense forest, open forest and mangrove. The classification of the cover into dense and open forests is based on internationally adopted norms of classification. It has not been possible to further segregate the dense forest into more classes owing to enormity of work of ground validation and limitations of methodology. Mangroves have been separately classified because of their characteristic tone and texture and unique ecological functions. The other classes include scrub and non-forest. These classes are defined below.
- **Classification Scheme**
 - Very dense: Forest All Lands with tree cover (Including mangrove cover) of canopy density of 70% and above
 - Moderate Dense Forest: All lands with tree cover (Including mangrove cover) of canopy density between 40% and 70% above
 - Open forest: All lands with tree cover (Including mangrove cover) of canopy density between 10% and 40%
 - Scurb: All forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10 percent
 - Non-Forest: Any area not included in the above classes
- As per ISFR 2021, The total forest and tree cover of the country is 80.9 million hectare which is 24.62 percent of the geographical area of the country. As compared to the assessment of 2019, there is an increase of 2,261 sq km in the total forest and tree cover of the country. Out of this, the increase in the forest cover has been observed as 1,540 sq km and that in tree cover is 721 sq km.

- The total Forest Cover of the country, as per the current assessment is 7,13,789 sq km which is 21.71 percent of the total geographic area of the country. **In terms of canopy density classes, area covered by VDF is 99,779 sq km (3.04 percent), MDF is 3,06,890 sq km (9.33 percent) and OF is 3,07,120 sq km (9.34 percent).** In the current assessment, Very Dense Forest and Moderately Dense Forest together constitute 57 percent of the total Forest Cover of the country.

Table 2.3 Forest Cover of India

(in sq km)

Class	Area	Percentage of Geographical Area
Very Dense Forest	99,779	3.04
Moderately Dense Forest	3,06,890	9.33
Open Forest	3,07,120	9.34
Total Forest Cover	7,13,789	21.71
Scrub	46,539	1.42
Non-Forest	25,27,141	76.87
Total Geographical Area	32,87,469	100.00

- Hence option (c) is the correct answer.

Q 91.D

- Wetlands** are areas of land that are saturated with water, either permanently or seasonally, and support unique plant and animal communities. Examples include swamps, marshes, bogs, and fens. Generally wetlands are categorised into **coastal or tidal wetlands and inland or non-tidal wetlands**. These sites provide habitat for a diverse array of flora and fauna, and play critical roles in maintaining the ecological, cultural, and socioeconomic values of their regions.
- Ramsar sites** are wetlands designated as Wetlands of International Importance under the Ramsar Convention, an international treaty signed in **1971** to promote the conservation and wise use of wetlands. India is one of the Contracting Parties to Ramsar Convention. **Recently India adds 11 more wetlands to the list of Ramsar sites to make total 75 Ramsar sites covering an area of 13,26,677 ha in the country in the 75th year of Independence.**
- The above description matches to **Keoladeo Ghana National Park** which is a Ramsar site. Keoladeo Ghana National Park is a UNESCO World Heritage Site located in Bharatpur, **Rajasthan**. A complex of ten artificial, seasonal lagoons, varying in size, situated in a densely populated region. Vegetation is a mosaic of scrub and open grassland that provides habitat for breeding, wintering and staging migratory birds. the invasive growth of the grass **Paspalum distichum** has changed the ecological character of large areas of the site, reducing its suitability for certain water bird species, notably the Siberian crane.
- The park is home to over 370 species of birds and animals such as the basking python, painted storks, deer, nilgai and more. Noted Indian ornithologist and naturalist Salim Ali used his influence to garner government support to create Keoladeo National Park. **It was also known as the breeding ground for the rare and elusive Siberian crane.**
- Hence option (d) is the correct answer.

Q 92.B

- The Convention on the Conservation of Migratory Species of Wild Animals (CMS), also known as the Bonn Convention, is an international environmental treaty that was established to protect migratory species across their entire migratory range.
- Established in 1979 under the aegis of the United Nations Environment Programme (UNEP), it aims to conserve terrestrial, aquatic, and avian migratory species** and address the challenges they face due to habitat fragmentation, climate change, and human activities across national borders. **Hence statement 1 and 2 are correct.**
- Key Objectives of CMS
 - Conservation of Migratory Species: CMS focuses on the conservation and sustainable management of migratory species that traverse multiple national jurisdictions and are at risk due to various threats.
 - International Cooperation: Recognizing that migratory species cross international borders, CMS emphasizes collaboration between nations to ensure that these species are protected throughout their entire migratory range.

- Protection Across Multiple Ecosystems: CMS includes a wide variety of species, encompassing terrestrial animals, marine species, and birds, reflecting its goal to provide comprehensive protection for migratory species across different habitats.
- The CMS uses a two-appendix system to classify species based on their conservation status and the level of protection they require:
- **Appendix I:** This list includes migratory species that are threatened with extinction. Species in Appendix I are given the highest level of protection, and countries that are party to CMS are required to work to conserve these species by minimizing or eliminating threats to their survival.
- **Appendix II:** This list contains migratory species that have unfavorable conservation status but are not necessarily threatened with extinction. These species would benefit from international cooperation, so CMS encourages parties to work together to conserve these species and manage their habitats effectively.
 - Hence statement 3 is not correct.
- Habitat Protection: CMS promotes habitat conservation for migratory species by helping countries create and manage protected areas along migration routes and breeding grounds.
- Species Action Plans: CMS coordinates international efforts to develop action plans that address specific conservation needs of migratory species, including combating illegal hunting, habitat loss, and climate change effects.
- Capacity Building and Technical Support: CMS provides capacity-building support to developing countries, particularly in relation to research, monitoring, and conservation planning for migratory species.

Q 93.A

- The Supreme Court of India has ruled, in an 8:1 majority judgment pronounced by a nine-judge bench led by Chief Justice DY Chandrachud on November 5, 2024, that not all private properties qualify as "material resources of the community" within Article 39(b) of the Constitution whereupon community resources should be equitably distributed for common good.
- The judgment overturned the previous decisions, largely the ones that followed a 1978 judgment, which had perceived more leeway to the state in acquiring, under Article 39(b). This is a significant shift in the legal psyche towards the protection of property rights and state interference.
- Article 39(b) of the Indian Constitution is part of the Directive Principles of State Policy and clearly portrays a sense of responsibility the state bears in terms of distributing material resources. Hence statement 1 is correct.
- **Main Provisions of Article 39(b):**
 - **Objective of Distribution:** Article 39(b) lays down that the policies of the state should be so framed that the ownership and operation of the material resources available in this geography are so distributed as would best subserve the common good. This is another way of saying there should be equal access and usability of resources to benefit society.
 - **Material Resources Definition:** The recent Supreme Court ruling clarified that not all private properties qualify as "material resources of the community." The court emphasized that only certain privately owned resources may be considered under this provision if they can be shown to materially benefit the community.
 - **Limitations on State Power:** By its decision, this Supreme Court has put reasonable restraint on the state's ability to seize and appropriate private property en masse, masked under the rubric of serving the "common good." This means individual property rights are protected by virtue of holding that property cannot be treated indiscriminately as community resources.
 - **Determination on a Case-by-Case Basis:** The court said that whether the resource is a material resource for community use has to be decided on a case-by-case basis. Factors relating to public welfare, scarcity, and the nature of ownership would dictate its determination. Hence statement 2 is not correct.
- **Result of the Judgment:**
 - **Property Rights Strengthening:** The Supreme Court's judgment strengthens individual property rights by clarifying that private properties cannot be expropriated without adequate reason.
 - **Impact on Resource Management:** This may affect resource management and procurement policies in the states, requiring a stronger justification for all grievances against private properties.
- Hence option (a) is the correct answer.

Q 94.B

- The Asian Palm Civet (*Paradoxurus hermaphroditus*), also known as the Civet Cat, is famously known for producing one of the world's most expensive coffees, Kopi Luwak. This unique coffee is made from coffee cherries that the civet consumes, digests, and then excretes.
- Selection of Coffee Cherries: The civet cat has a natural inclination for choosing the ripest and best-quality coffee cherries. It consumes the cherries for their pulp, and during digestion, the beans go through a unique fermentation process in the civet's stomach.
- Fermentation Process: Inside the civet's digestive tract, enzymes break down certain proteins in the coffee beans. This fermentation process alters the beans' chemical composition, which reduces their acidity and bitterness. The civet then excretes the beans, which still retain their hard outer shell.
- Collection and Cleaning: After the beans are excreted, they are collected by farmers, thoroughly cleaned, dried, and roasted. This process yields beans with a smoother, richer flavor compared to traditional coffee.
- Kopi Luwak is known for its smooth, less acidic flavor with a rich, earthy aroma and chocolate-like notes. The fermentation process inside the civet's digestive system gives the coffee beans a unique flavor profile, which many coffee enthusiasts find desirable.
- The Asian Palm Civet (*Paradoxurus hermaphroditus*), also called the Common Palm Civet or Toddy Cat, is a small, nocturnal mammal native to South and Southeast Asia.
 - The Asian Palm Civet is widely distributed across tropical forests, plantations, and even urban areas in South and Southeast Asia, including countries like India, Sri Lanka, Nepal, China, the Philippines, and Indonesia.
 - The Asian Palm Civet is currently listed as Least Concern on the IUCN Red List due to its wide distribution and adaptability.
- **Hence option (b) is the correct answer.**

Q 95.B

- **Chemosynthesis:** Chemosynthesis is the process by which food (glucose) is made by bacteria using chemicals as the energy source, rather than sunlight. Chemosynthesis occurs around hydrothermal vents and methane seeps in the deep sea where sunlight is absent. During chemosynthesis, bacteria living on the seafloor or within animals use energy stored in the chemical bonds of hydrogen sulfide and methane to make glucose from water and carbon dioxide (dissolved in seawater). Pure sulfur and sulfur compounds are produced as by-products. **Hence option (b) is the correct answer.**
- **Photosynthesis** uses water, sunlight and carbon dioxide, and it makes glucose and oxygen.
- **Cellular respiration** uses glucose and oxygen, and it makes water and carbon dioxide and energy.
- **Carbon sequestration** is the process involved in carbon capture and the long-term storage of atmospheric carbon dioxide or other forms of carbon to mitigate or defer global warming.

Q 96.B

- **IL-35 protein:**
 - The Institute of Advanced Study in Science and Technology (IASST) in Guwahati has recently identified the IL-35 protein as a promising treatment for managing Type 1 diabetes and autoimmune diabetes mellitus. **Hence option (b) is the correct answer.**
- **IL-35 Protein and its Role:**
 - IL-35 is a regulatory cytokine, a type of protein that plays a crucial role in moderating immune responses. It consists of two chains, IL-12 α and IL-27 β , which work together to influence immune system activities, particularly in autoimmune conditions like Type 1 diabetes.
- **How IL-35 Aids in Autoimmune Diabetes:**
 - Type 1 diabetes is an autoimmune disorder where the immune system erroneously attacks insulin-producing beta cells in the pancreas, resulting in insulin deficiency.
 - IL-35 has shown potential in slowing this autoimmune reaction by suppressing the specific immune cells responsible for attacking these beta cells. This process not only helps reduce inflammation but also preserves the body's natural insulin production over time.
- **Significance of this Discovery:**
 - The discovery of IL-35's effects on autoimmune diabetes is groundbreaking, as it directly targets the autoimmune mechanisms involved. While traditional treatments focus on managing insulin levels through external sources, IL-35 offers hope for treatments that may preserve or even restore the pancreas's natural insulin production, thereby reducing the dependency on external insulin.

Q 97.C

- Ecological succession is the process by which the species and habitat in an area change over time. It can occur when a new habitat is colonized or when a disturbance alters an existing habitat.
 - Ecological succession is a series of predictable changes that lead to a stable condition. The process involves the gradual replacement of one community by another until a climax community is reached, like a mature forest. However, a disturbance, such as a fire, can prevent the process from reaching a climax community.
 - Actually, succession and evolution would have been parallel processes at that time. Succession is hence a process that starts where no living organisms are there – these could be areas where no living organisms ever existed, say bare rock; or in areas that somehow, lost all the living organisms that existed there. The former is called primary succession, while the latter is termed secondary succession. Examples of areas where primary succession occurs are newly cooled lava, bare rock, newly created pond or reservoir. The establishment of a new biotic community is generally slow. Before a biotic community of diverse organisms can become established, there must be soil. Depending mostly on the climate, it takes natural processes several hundred to several thousand years to produce fertile soil on bare rock.
 - Succession is nothing but the evolution of a community caused by the activity of vegetation in the environment, which results in the emergence of new species. Also, the animals or plants that usually colonise a barren land first are termed pioneer species.
 - During succession some species colonise an area and their populations become more numerous, whereas populations of other species decline and even disappear. The entire sequence of communities that successively change in a given area are called sere(s). The individual transitional communities are termed seral stages or seral communities.
 - **This change is orderly and sequential, parallel with the changes in the physical environment. These changes lead finally to a community that is in near equilibrium with the environment and that is called a climax community.**
- Hence option (c) is the correct answer.

Q 98.D

- Decomposers break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients and the process is called decomposition. Dead plant remains such as leaves, bark, flowers and dead remains of animals, including fecal matter, constitute detritus, which is the raw material for decomposition. The important steps in the process of decomposition are fragmentation, leaching, catabolism, humification and mineralisation. **Detritivores (e.g., earthworm) break down detritus into smaller particles. This process is called fragmentation.**
- By the process of leaching, water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts. **Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called as catabolism.** It is important to note that all the above steps in decomposition operate simultaneously on the detritus. Humification and mineralisation occur during decomposition in the soil.
- Humification leads to accumulation of a dark coloured amorphous substance called humus that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate. Being colloidal in nature it serves as a reservoir of nutrients. **The humus is further degraded by some microbes (e.g., bacteria) and release of inorganic nutrients occur by the process known as mineralisation.**
- Hence, all the given pairs are correctly matched.

Q 99.D

- **Recently, a report has been published by United Nations Environment Programme's (UNEP) International Methane Emissions Observatory (IMEO).** IMEO, a core implementing partner of Global Methane Pledge, provide open, reliable, and actionable data on methane emissions.
- Methane is a major greenhouse gas and 86 times more potent than CO₂ in the short term but easier and faster to mitigate.
- It is also a Short-Lived Climate Pollutant (SLCP) having an atmospheric lifetime of 12 years.
- It acts as a precursor for toxic air pollutant tropospheric ozone, contributing to respiratory problems, crop losses etc.
- **Over 60% of methane emissions come from human activity including agriculture, fossil fuels, and waste.** Natural causes account for less than 40 percent of the total emissions. **Hence statement 1 is not correct.**

- The **Global Methane Pledge was launched at COP (Conference of Parties) 26 in November 2021 in Glasgow**, Scotland to catalyse action to reduce methane emissions and is led by the United States and the European Union.
- India has not signed the Global Methane Pledge because of its concerns over the impact on trade, on the country's vast farm sector, and the role of livestock in the rural economy. **Hence statement 2 is not correct.**

Q 100.D

- **Bhoj Wetland consists of two lakes located in the city of Bhopal. The two lakes are the Bhojtal and the Lower Lake. It is a manmade reservoir.**
- Rudrasagar Lake in Tripura is a natural sedimentation reservoir, which receives flow from three perennial streams namely, Noacherra, Durlavnaraya cherra and Kemptali cherra.
- Loktak Lake is the largest freshwater lake in the north-eastern region.
- Chilka Lake is a natural brackish water lagoon in Odisha. Geological evidence indicates that Chilika Lake was part of the Bay of Bengal during the later stages of the Pleistocene period.