ANSWERS & EXPLANATIONS
GENERAL STUDIES (P) TEST – 4133 (2024)

Q 1.C

- Solid wastes should be properly disposed by composting, land filling, thermal processes; and by re-cycling and re- use.
- **Composting** is the process of degrading decomposable solid waste in a properly dug pit, called as compost pit. Composting process involves both the aerobic and anaerobic processes. **Hence, statement 1 is correct.**
  - **In aerobic composting** the biodegradable wastes are filled in the compost pit which is left open from one or more sides.
  - On the other hand, in **anaerobic composting** the biodegradable wastes are allowed to degrade in sealed compost pits. The compost prepared through any one of these processes is very good manure for crops.
- **Land filling** is just the process of dumping wastes or other substances in low land areas and covering the same with soil. This is the age old practice of leveling low areas. But, in modern times waste materials are buried under soil after compacting them properly in a scientific manner. The provision of release of gases from the decomposing materials of the land fill is also made adequately. **Hence, statement 2 is correct.**
- In thermal process, the dried solid waste is safely burnt in closed compartments with proper provision of treatment of harmful gases, and utilization of heat energy evolved during the process. It is called as incineration**. Hence, statement 3 is correct.**
- Environmentalists do not favour this process of solid waste treatment in view of fear of air pollution, rather they advocate for r**e-cycling and re-use** for the disposal of non- biodegradable substances.

Q 2.A

- The term "**acid rain**" refers to the **precipitation of acid in the form of rain**. It usually occurs when atmospheric **pollutants** such as **oxides of nitrogen and sulphur**, i**nteract with rainwater** and fall as a result. **Hence statement 2 is correct.**
- These pollutants reach the atmosphere from vehicular emissions, industrial outlets, etc.
- The **Taj Mahal's white marble deteriorate**s due to this **acid rain**. Since acid rain also includes suspended materials such as ash, soot, and gases. SPM, or suspended particulate matter, these **adhere to the monument's surface**, turning it **pale and yellow (plaque). Hence statement 3 is correct.**
- **Acid rains** can occur **anywhere** with "**rain and pollution**". These are not necessarily limited to tropical areas. **Hence statement 1 is not correct.**

Q 3.C

- **Recent Context:** A five-judge Constitution Bench of the Supreme Court held that it can directly grant a divorce to couples on irretrievable breakdown of marriage under Article 142 of the Constitution.
- **What is the current procedure for divorce under the Hindu Marriage Act?**
  - The **Hindu Marriage Act, of 1955** lays down the law for divorce which applies to Hindus, Buddhists, Jains, and Sikhs. **Hence, statement 1 is not correct.**
  - Divorce by mutual consent is provided under Section 13B of the Act.
  - **Filing:** Both parties to the marriage must together file a petition to the district court on the ground that they have been living separately for a period of one year or more and have mutually agreed on a divorce.
  - The parties must move a second motion before the court between 6-18 months after the date of the presentation of the first petition.

- **Six-month period:** The mandatory six-month wait is intended to give the parties time to withdraw their plea. **Hence, statement 2 is correct.**
- **Condition for mutual divorce:** A petition for divorce by mutual consent can be moved **only after a year of the marriage. Hence, statement 3 is correct.**
- In case of 'exceptional hardship to the petitioner or of exceptional depravity on the part of the respondent', the petition can be moved earlier under Section 14 of HMA.
- A waiver of the six-month waiting period under Section 13B (2) can be sought in an exemption application filed before the family court.

Q 4.B

- **Recent Context: The World Bank Group is implementing a new corporate flagship, B-READY, to measure the business and investment climates in 180 economies worldwide annually.**
- **Business Ready (B-Ready) Project**
  - **Objective:** It assess the business and investment climate in up to 180 economies in a transparent and fair way
  - **Criteria: Business Entry, Business Location, Utility Services, Labor, Financial Services, International Trade, Taxation, Dispute Resolution, Market Competition, and Business Insolvency**
  - **Approach:** Reflects a more balanced and transparent approach towards evaluating a country's business and investment climate than earlier approach.
  - Initially it Covers 54 economies in Asia, Latin America, Europe, the Middle East and Sub-Saharan Africa, in the first year and expected to scale up to 180 economies by 2025-26.
- **Hence option (b) is the correct answer.**

Q 5.A

- **Recent Context:** Supreme Court Upholds Laws Allowing Jallikattu, Kambala & Bull-Cart Racing In Tamil Nadu, Karnataka & Maharashtra.
- It is a traditional buffalo race in paddy fields filled with slush and mud which generally takes place **in coastal Karnataka (Udupi and Dakshina Kannada) from November to March. Hence, statement 1 is correct.**
- Traditionally, it is sponsored by local Tuluva landlords and households **in the coastal districts.** Tuluva people are an ethnic group native to Southern India. They are native speakers of the Tulu language. **Hence, statement 2 is not correct.**
- During the race, the racers try to bring the buffaloes under control by holding their reins tight and whipping them.
- In its traditional form, Kambala was non-competitive and buffalo pairs raced one after another in paddy fields.
- It was also observed as thanksgiving to gods for protecting the animals from diseases.

Q 6.C

- **Nitrogen pollution** is the term used to describe the **harm that excess nitrogen and nitrogen compounds, such as nitrous oxides, nitrogen oxide, and ammonia, do to the environment, wildlife, and human health.**
- It is usually caused due to various **reasons** as emissions from **chemical fertilizers, livestock-rearing, manure-makin**g, and **burning of fossil fuel**s. The **overuse of nitrogen fertilizer** leads to nitrogen losses from the soil through **volatilization, denitrification, leaching to groundwat**er, and surface runoff and erosion. **Hence statement 2 is correct.**
- Such excess nitrogen from the fertilizers (in the form of **agricultural runoff), can reach the water bodies**. In this, the nitrogen is taken up by algae which then grows abundantly to cause **eutrophication**. **Hence, statement 3 is correct.**
- The maximum limit of nitrate in drinking water is 50 ppm. Excess nitrate in drinking water can cause diseases such as methemoglobinemia ('blue baby' syndrome). **Hence, statement 1 is correct.**
  - Infant methemoglobinemia is also called "blue baby syndrome." It is a condition where a baby's skin turns blue. This happens when there is not enough oxygen in the blood. Parents should immediately contact a physician if the baby's skin is unusually bluish in color.

Q 7.B

- **Bioremediation**: The application of biotic agents like microorganisms in the correction and recovery of environmental damage is called as bioremediation. **The removal of oil spilled on sea water by the help of bacteria is one example of bioremediation.**

- **Bioaccumulation:** Increase in concentration of a substance within a trophic level in certain tissues of organisms' bodies due to absorption from food and the environment is called bioaccumulation.
- **Biomagnification:** Increase in concentration of a substance in the bodies of consumers as one moves up the food chain is called biomagnification. For example, when chemicals or pesticides are let into rivers or lakes they are consumed by aquatic organisms like fish, which in turn are consumed by large birds, animals or humans.
- Biopiracy: The practice of commercial exploitation of biochemicals or genetic materials which occur naturally. It is the unethical or unlawful appropriation or commercial exploitation of biological materials
- **Hence, option (b) is the correct answer**.

Q 8.B

- The Environment Protection Act of 1986 is a significant legislation in India that focuses on the prevention, control, and abatement of environmental pollution.
- EPA empower the Government to:
  - Plan and execute a nation-wide programme for the prevention, control and abatement of environmental pollution. Lay down standards for the quality of the environment in its various aspects like emission or discharge of environmental pollutants from various sources.
- The Central government has notified **Solid Waste Management Rules 2016, Hazardous and Other Wastes (Management & Transboundary Movement) Rules 2016, Plastic Waste Management Rules 2016, E-Waste (Management) Rule 2016** and Bio-Medical Waste Management Rules, 2018 under Environment (Protection) Act, 1986. **Hence option (b) is the correct answer.**

Q 9.A

- **Recent Context:** The Supreme Court has held that the government, when entering into a contract under the President's name, cannot claim immunity from the legal provisions of that contract under Article 299 of the Constitution.
  - **What is Article 299 of the Indian Constitution?**
    - ✓ **Article 298** grants the Centre and the state governments the power to carry on trade or business, acquire, hold, and dispose of property, and make contracts for any purpose, while Article 299 delineates the manner in which these contracts will be concluded.
    - ✓ **Article 299** provides that **"all contracts made in the exercise of the executive power of the Union or of a State shall be expressed to be made by the President or by the Governor of the State"** and that all such contracts and "assurances of property made in the exercise of that power shall be executed" on behalf of the President or the Governor by persons in a manner as directed and authorized by them. **Hence option (a) is the correct answer.**
    - ✓ Further, the phrase 'expressed to be made and executed' under Article 299 (1) means that there must be a deed or contract in writing and that it should be executed by a person duly authorized by the President of the Governor on their behalf.
  - **Essential Requirements for Government Contracts under Article 299:** 1966 ruling in '**K.P. Chowdhry v. State of Madhya Pradesh. And Others',** laid down essential requirements for government contracts under Article 299. Three conditions to be met before a binding contract against the government could arise, namely:
    - ✓ the contract must be expressed to be made by the Governor or the Governor-General;
    - ✓ it must be executed in writing, and
    - ✓ the execution should be by such persons and in such a manner as the Governor or the Governor-General might direct or authorize.

Q 10.C

- **The 1972 United Nations Conference on the Human Environment in Stockholm was the first world conference to make the environment a major issue.** The participants adopted a series of principles for sound management of the environment including the **Stockholm Declaration and Action Plan for the Human Environment** and several resolutions. The Stockholm Declaration, which contained 26 principles, placed environmental issues at the forefront of international concerns and marked the start of a dialogue between industrialized and developing countries on the link between economic growth, the pollution of the air, water, and oceans and the well-being of people around the world.
- **In 1987 the Brundtland Report, also known as Our Common Future, alerted the world to the urgency of making progress toward economic development that could be sustained without depleting natural resources or harming the environment.** The Brundtland Report focused primarily on

the needs and interests of humans and was concerned with securing global equity for future generations by redistributing resources towards poorer nations to encourage their economic growth.

- **The United Nations Conference on Environment and Development (UNCED), also known as the 'Earth Summit', was held in Rio de Janeiro, Brazil, from 3-14 June 1992.** This global conference, held on the occasion of the 20th anniversary of the first Human Environment Conference in Stockholm, Sweden, in 1972, brought together political leaders, diplomats, scientists, representatives of the media and non-governmental organizations (NGOs) from 179 countries for a massive effort to focus on the impact of human socio-economic activities on the environment.
- **The Kyoto Protocol was adopted on 11 December 1997. Owing to a complex ratification process, it entered into force on 16 February 2005. Currently, there are 192 Parties to the Kyoto Protocol.** It operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gas (GHG) emissions in accordance with agreed individual targets. The Convention itself only asks those countries to adopt policies and measures on mitigation and to report periodically.
- **Hence, option (c) is the correct answer.**

Q 11.C

- The microbial action on solid wastes breaks it into simpler form. Some of the waste matter is converted into gases (mostly carbon dioxide, CO2) and the rest becomes simple to be taken in by plants.
- Aerobic bacteria decompose solid wastes in air and produce carbon dioxide. They absorb nitrogen, carbon and phosphorus from the decomposed wastes. **Anaerobic decomposition occurs in the absence of oxygen. Anaerobic bacteria give out enzyme which breaks down the wastes and produce Methane or Marsh Gas (CH4).** The sulphur content is converted into sulphur dioxide (SO2). **Hence, statement 1 is correct.**
- The nutrients like nitrogen, phosphorus and carbon etc. are then taken in by anaerobic bacteria. **Very much heat (upto 80°C) is produced due to anaerobic decomposition. It kills seeds of weeds and germs present in the waste. The solid waste, for this type of decomposition has to be covered in a pit properly to cut off oxygen supply from the air. Hence, statement 2 is correct.**

Q 12.B

- **Recent Context:** The Ministry of Home Affairs in India has directed central law enforcement agencies, including the CBI, NIA, and the Narcotics Control Bureau (NCB), to access and share their records with the national fingerprints database, **NAFIS (National Automated Fingerprint Identification System).**
- **About NAFIS:**
  - This database, known as NAFIS, is a web-based application that **serves as a central repository of criminal fingerprint data** collected from various states and Union territories. **Hence, statement 1 is correct.**
  - It aims to enhance the ability of these agencies to identify criminals and expedite investigations by leveraging the comprehensive fingerprint data available in the database.
  - It is conceptualized by National Crime Records Bureau (NCRB) in 2022. It is **managed by the Central Fingerprint Bureau (CFPB) at NCRB. Hence, statement 3 is not correct.**
  - **A unique 10-digit National Fingerprint Number (NFN) is assigned** to each person arrested for a crime. **Hence, statement 2 is correct.**
  - The NFN is used for the person's lifetime, and different crimes registered under different FIRs are linked to the same NFN in the Crime and Criminal Tracking Network & Systems (CCTNS) database
  - **Fingerprinting History:** First began automating the fingerprint database in 1992 with FACTS 1.0, recommended by the National Police Commission. FACTS 5.0 was upgraded in 2007 and later replaced by NAFIS in 2022

Q 13.D

- The biological wealth of our planet has been declining rapidly and the accusing finger is clearly pointing to human activities. The colonisation of tropical Pacific Islands by humans is said to have led to the extinction of more than 2,000 species of native birds. The IUCN Red List (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.
- **Some examples of recent extinctions include the dodo (Mauritius), quagga (Africa), thylacine (Australia), Steller's Sea Cow (Russia) and three subspecies (Bali, Javan, Caspian) of tiger. Hence option (d) is the correct answer.**
- Careful analysis of records shows that extinctions across taxa are not random; some groups like amphibians appear to be more vulnerable to extinction. Adding to the grim scenario of extinctions is the

fact that more than 15,500 species worldwide are facing the threat of extinction. Presently, 12 per cent of all bird species, 23 per cent of all mammal species, 32 per cent of all amphibian species and 31per cent of all gymnosperm species in the world face the threat of extinction.

Q 14.C

- **Project Hangul is a conservation and protection project for the critically endangered Kashmir Stag or Hangul. In the 1970s, the Jammu and Kashmir government prepared a project to protect Hangul and its habitat with the help of the IUCN and the World Wildlife Fund (WWF).** Hangul is commonly referred to as Kashmir Stag. Project Hangul was the name given to this ambitious project for the conservation and protection of Kashmir stags. As a result, by 1980, the population of this species had increased to 340. According to the IUCN Red List, Hangul is a Critically Endangered species.
- **Project Elephant was launched by the Government of India in the year 1992** as a Centrally Sponsored Scheme with the following objectives:
  - To protect elephants, their habitat & corridors.
  - To address issues of man-animal conflict.
  - The Welfare of captive elephants
- **The Ministry of Environment, Forest and Climate Change launched the "Asiatic Lion Conservation Project" in the year 2004.**
  - It will be funded from the Centrally Sponsored Scheme- Development of Wildlife Habitat (CSS-DWH) with the contributing ratio being 60:40 of Central and State share.
  - Focus: To cause habitat improvement, scientific interventions, disease control and veterinary care supplemented with adequate eco-development works for the fringe population in order to ensure a stable and viable Lion population in the country.
- **Project Snow Leopard was launched in 2009** to promote an inclusive and participatory approach to conserving snow leopards and their habitat.
  - The strategy document stresses knowledge-based, landscape-level and participatory management of wildlife in the region.
  - Each of the range states will identify one landscape under the project.
- **Hence, option (c) is the correct answer.**

Q 15.C

- **Irreparable computers and other electronic goods are known as electronic wastes (e-wastes).** E-wastes are burried in landfills or incinerated.
- **Over half of the e-wastes generated in the developed world are exported to developing countries**, mainly to China, India and Pakistan, where metals like copper, iron, silicon, nickel and gold are recovered during recycling process.
- Unlike developed countries, which have specifically built facilities for recycling of e-wastes, **recycling in developing countries often involves manual participation thus exposing workers to toxic substances present in e-wastes.**
- E-waste-connected health risks may result from direct contact with harmful materials such as **lead, cadmium, chromium, brominated flame retardants or polychlorinated biphenyls (PCBs),** from inhalation of toxic fumes, as well as from accumulation of chemicals in soil, water and food. In addition to its hazardous components, being processed, e-waste can give rise to a number of toxic by-products likely to affect human health. Furthermore, recycling activities such as dismantling of electrical equipment may potentially bear an increased risk of injury.
- **Hence option (c) is the correct answer.**

Q 16.B

- **Eutrophication is the natural aging of a lake by nutrient enrichment of its water. Hence statement 1 is not correct.**
  - In a young lake, the water is cold and clear, supporting little life. With time, streams draining into the lake introduce nutrients such as nitrogen and phosphorus, which encourage the growth of aquatic organisms.
  - As the lake's fertility increases, plant and animal life burgeons, and organic remains begin to be deposited on the lake bottom.
  - Over the centuries, as silt and organic debris pile up, the lake grows shallower and warmer, with warm-water organisms supplanting those that thrive in a cold environment.
  - Marsh plants take root in the shallows and begin to fill in the original lake basin.
  - Eventually, the lake gives way to large masses of floating plants (bog), finally converting into land.

- Depending on the climate, size of the lake, and other factors, the natural aging of a lake may span thousands of years.

- **However, pollutants from man's activities like effluents from industries and homes can radically accelerate the aging process**. This phenomenon has been called **Cultural or Accelerated Eutrophication.**
  - During the past century, lakes in many parts of the earth have been severely eutrophied by sewage and agricultural and industrial wastes.
  - **The prime contaminants are nitrates and phosphates, which act as plant nutrients.** They overstimulate the growth of algae, causing unsightly scum and unpleasant odors, and robbing the water of dissolved oxygen vital to other aquatic life. **Hence statement 2 is correct.**
  - At the same time, other pollutants flowing into a lake may poison whole populations of fish, whose decomposing remains further deplete the water's dissolved oxygen content. In such a fashion, a lake can literally choke to death.

Q 17.B

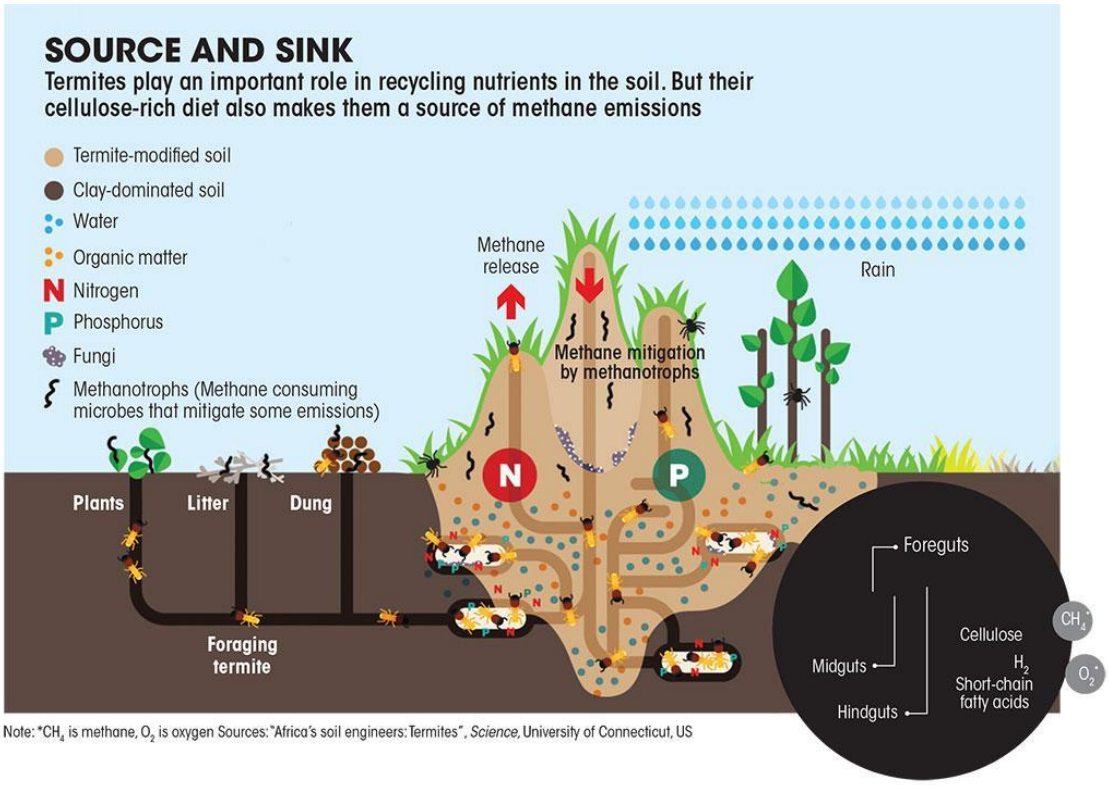
- A National Park is an area protected and preserved by law to protect and preserve flora and fauna within its boundary. Grazing of cattle and removal of any wildlife from its habitat is strictly prohibited in a national park and all rights are reserved with the government.
- A Sanctuary is a protected area where wild animals and birds are kept and encouraged to increase their population. In wildlife sanctuaries, rare and endangered species are encouraged to breed in human-controlled environments with restricted settings.
- **Differences between a National Park and Wildlife Sanctuary:**
  - A National Park is established by the government in view of the protection of all the flora and fauna of certain areas. But a Wildlife sanctuary is meant for the protection, breeding and propagation of individuals of an endangered species.
  - **The boundaries of a National Park are usually well-marked and circumscribed whereas those of sanctuaries are often not well-defined and human activities are permitted to a specified limit. Hence statement 2 is correct.**
  - A National Park is established under the provisions of Section 35, section 38(2), and Section 66(3) of the Wild Life (Protection) Act of 1972. On the other hand, a Wildlife Sanctuary is an area that is established under the provisions of Section 26-A, Section 38(1), and Section 66(3) of this Act.
  - An area can not be notified as a National Park if it is a reserve Forest. However, this is not the case with a Wildlife Sanctuary in which an area can directly be notified as a Wildlife Sanctuary even if it is a reserve forest.
  - **National parks are given a greater degree of protection, with human activity greatly restricted.** Sanctuaries have relatively less restrictions and are open to people, without the requirement of official permission. **Hence statement 1 is correct.**
- In spite of some differences, National Parks and Wildlife Sanctuaries have basic similarities.
  - The Wildlife (Protection) Act (WPA) of 1972 provided for the declaration of National Parks by the State Government in addition to the declaration of wildlife sanctuaries. The Central Government may also declare, Wild Life Sanctuary and National Park under certain conditions. **Hence statement 3 is not correct.**
  - It can be said that both the National Park and the Wildlife Sanctuary are protected areas, and no biotic interference is allowed in both of these areas.

Q 18.A

- **Recent studies have been published stating that termites emit methane. But the extent of their risk to global warming is uncertain.**
- **What are Termites?**
  - **These are small insects, who live in the mounds as colonies of 60,000-200,000, are not just skilled architects and engineers but also a surprising source of methane, a greenhouse gas more potent than carbon dioxide.**
  - Termites are known to wreak havoc on agriculture, forests and construction, due to their affinity for plants and wood. However, **only 10-15 per cent of 3,000 termite species identified globally are categorised as pests.**
- **Methane Emissions**
  - **Termites are counted among natural sources of methane** like wetlands, wild animals, livestock and geological features like volcanoes, and are estimated to account for 1-3 per cent of emissions globally. **Hence statement-I is correct.**

- In 2008-17, the world emitted 576 Tg (1 Tg or teragram is equal to 1012 g) of methane per year, of which termites contributed 9 Tg, says the Global Carbon Project, in its "Global Methane Budget" published in 2020. Other estimates put the emissions at 2-15 Tg per year.

- **Reason for Methane Emissions**
  - In natural ecosystems, they feed on and recycle the nutrients present in dead and decaying plant and animal matter. It is this cellulose-rich diet that causes their emissions.
  - **Methanogenic microorganisms that live in the gut of termites break down the cellulose entering the body and release methane. Hence statement-II is correct and the correct explanation for Statement-I.**



Q 19.A

- **Ionizing radiations:** Electromagnetic radiations such as **short wavelength ultra violet radiations (UV), X-rays and gamma rays** and energetic particles produced in nuclear processes, electrically charged particles like alpha and beta particles produced in radioactive decay and neutrons produced in nuclear fission, are highly damaging to living organisms. **Hence, statement 1 is not correct.**
- **Electrically charged particles produced in the nuclear processes can have sufficient energy to knock electrons out of the atoms or molecules of the medium, thereby producing ions**. The ionizing radiations cause damage to biological systems and are, therefore are pollutants. **Hence, statement 2 is correct.**
- **A gamma ray passing through a cell, can ionise the water molecules near the DNA. These ions might react with the DNA causing it to break. They can also cause chemical changes by breaking the chemical bonds, which can damage living tissues.Hence, statement 3 is correct.**

Q 20.B

- The gradual and fairly predictable change in the species composition of a given area is called ecological succession. **Hence statement 1 is not correct.**
- During succession, some species colonize an area and their population becomes more numerous whereas populations of other species decline and even disappear. The entire sequence of communities that successively change in a given area is called sere(s). The individual transitional communities are termed seral stages or seral communities.
- Ecological succession takes place in two kinds i.e. Primary Succession and Secondary succession.
- **Primary succession occurs in essentially lifeless areas and regions** (**created or exposed for the first time**) in which the soil is incapable of sustaining life as a result of such factors as lava flows, newly formed sand dunes, or rocks left from a retreating glacier. The species that invade a bare area are called pioneer species. **The pioneer species in secondary succession are plants such as grasses, birch trees, and fireweed. The first organisms to appear in areas of primary succession are often mosses or**

lichens. These organisms are known as pioneer species because they are the first species present. Hence statement 2 is correct.

- **Secondary succession occurs in areas where a community that previously existed** has been removed; it is typified by smaller-scale disturbances that do not eliminate all life and nutrients from the environment.
- **All succession whether taking place in water or on land, proceeds to a similar climax community the mesic**.
- **Hydrarch succession and xerarch succession** are the successions of plants. **Hydrarch succession takes place in wet areas and the successional series progress from hydric to the mesic conditions.** As against this, xerarch succession takes place in dry areas, and the series progress from xeric to mesic conditions. Hence, both hydrarch and xerarch successions lead to medium water conditions (mesic) – neither too dry (xeric) nor too wet (hydric).
- At any **time during primary or secondary succession, natural or human-induced disturbances** (fire, deforestation, etc.), can convert a particular seral stage of succession to an earlier stage. Also, such disturbances create new conditions that encourage some species and discourage or eliminate other species.

Q 21.D

- **Recent Context: RBI has approved the First Loss Default Guarantee (FLDG) programme,** which allows fintechs to partner with banks and NBFCs.
  - **It is a safety-net arrangement among banks, non-banking finance companies (NBFCs) and lending service providers (LSPs), whereby the LSP guarantees to compensate the regulated entities (banks, NBFCs etc) for loss due to default up to a certain threshold of the loan portfolio. Since losses only to a certain threshold are covered under this arrangement, it's called as first loss default guarantee or FLDG. Hence statements 1 and 2 are correct.**
  - This move is expected to strengthen the digital lending ecosystem and is seen as positive for data-tech NBFCs and fintechs.
- **RBI Guidelines regarding FLDG**
  - In guidelines issued in 2022, the RBI had indicated it was not in favour of such arrangements since they could encourage lenders to take on undue risk.
  - However, recently after extensive consultations with various stakeholders, the RBI allowed FLDG proposing regulatory framework with the objective of maintaining a balance between innovation and prudent risk management.
  - **New guidelines:**
    - ✓ **The LSP-providing default-loss-guarantee must be incorporated as a company under the Companies Act, 2013. Hence statement 3 is correct.**
    - ✓ Banks and NBFCs should ensure that the t**otal amount of DLG cover on any outstanding portfolio does not exceed 5% of the amount of that loan portfolio.**

Q 22.C

- **Recent Context: Quantum physics proposes a new way to study biology. The results of this quantum biology study could revolutionise our understanding of how life works.**
- **Quantum physics** is the **study of matter and energy at the most fundamental level. It aims to uncover the properties and behaviors of the very building blocks of nature**. While many quantum experiments examine very small objects, such as electrons and photons, **quantum phenomena** are all around us, acting on every scale. **Hence statement 1 is correct.**
- **Quantum effects only manifest at very small length and mass scales, or when temperatures approach absolute zero. This is because quantum objects like atoms and molecules lose their "quantumness" when they uncontrollably interact with each other and their environment. Hence statement 2 is correct.**
  - **Quantum physics describes matter and energy as quantum wavefunctions, which sometimes act like waves and sometimes act like particles, but are actually more complicated entities than just waves or particles.** In reality, every object in the universe (from atoms to stars) operates according to quantum physics.
  - A "quantum effect" is an effect that is not properly predicted by classical physics, but is properly predicted by quantum theory. Classical physics describes matter as composed of little, solid particles. Therefore, anytime we get the pieces of matter to act like waves, we are demonstrating a quantum effect. (Classical waves such as sound and sea waves don't count as quantum because the motion is a

wave, but the pieces are still little solid balls. In order to be a quantum effect, the particle itself must be acting like a wave.)
    - **Quantum mechanics (or physics) differs from classical physics** in that energy, momentum, angular momentum, and other quantities of a boundsystem are restricted to discrete values (quantization); objects have characteristics of both particles and waves (wave–particle duality); and there are limits to how accurately the value of a physical quantity can be predicted prior to its measurement, given a complete set of initial conditions (the uncertainty principle).
    - A quantum phenomenon where **particles can exist in multiple states simultaneously** until measured or observed, in contrast to classical physics where objects have definite properties is called **Superposition.**
- **Below are some examples of macroscopic quantum effects.**
    - **Superconductivity:** When a conducting material is cooled enough, its conduction electrons spread out into large-scale coherent wave states. These coherent wave states are able to flow past impurities and atoms without being perturbed, so that a material with zero electrical resistance results. Superconductivity leads to interesting macroscopic effects such as quantum levitation (the Meissner effect).
    - **Superfluidity:** When certain materials are cooled enough, their atoms can spread out into coherent wave states that resist surface tension, allowing the material to flow like a liquid with zero viscosity.
    - **Bose Einstein Condensates:** When certain materials are cooled enough, their atoms spread out completely into a single, giant, coherent wave state. A macroscopic chunk of matter that has condensed in this way acts like a wave and exhibits wave properties such as interference.

Q 23.A

- **Most herbicides are toxic to mammals but are not as persistent as organo-chlorides**. These chemicals decompose in a few months. **Like organo-chlorides, these too become concentrated in the food web**. Some herbicides cause birth defects. Studies show that cornfields sprayed with herbicides are more prone to insect attack and plant disease than fields that are weeded manually.
- Pesticides and herbicides represent only a very small portion of widespread chemical pollution. A large number of other compounds that are used regularly in chemical and industrial processes for manufacturing activities are finally released in the atmosphere in one or other form. **Hence, option (a) is the correct answer.**

Q 24.D

- **A higher-than-normal concentration of Ozone molecules called the Ozone layer, is found in Stratosphere.** It acts as a shield absorbing ultraviolet radiation from the sun. **Depletion of the Ozone layer or Ozone hole leads to more UV rays reaching the lower atmosphere.**
- Since ozone prevents high-intensity ultraviolet radiation from reaching the surface of the Earth and causing stratospheric warming, it can be assumed that the **formation of the ozone hole changes the total radiation budget of the Earth.** This is, indeed, the case. However, ozone depletion and the formation of the polar ozone holes don't lead to a further warming of the troposphere, but to a slight cooling.
- **The absorption of ultraviolet radiation by ozone molecules causes warming in the stratosphere. Some of this heat emitted in the stratosphere is transferred to the troposphere causing slight tropospheric warming as well. This warming gets lessened due to the formation of an ozone hole.**
- In the lower stratosphere, ozone can still act as a greenhouse gas and absorb infrared radiation coming from the Earth's surface. So a**bsorption of both ultraviolet and infrared radiation by ozone leads to a warming of the upper troposphere. If ozone levels decrease, the upper troposphere will, therefore, get cooler.**
- **The high levels of UV rays cause non-melanoma skin cancer. Additionally, it plays a major role in malignant melanoma development. UV is also linked to cataracts.**
- **Plant growth as well as its physiological and developmental process are all affected negatively**. These include the way plants form, the timing of development and growth, the distribution of plant nutrients and metabolism, etc. These changes can have important implications for plant competitive balance, animals feeding on these plants, plant diseases, and biogeochemical cycles.
- **Increased surface UV leads to increased tropospheric ozone**. Ground-level ozone is generally recognized to be a health risk, as ozone is toxic due to its strong oxidant properties. The risks are particularly high for young children, the elderly, and those with asthma or other respiratory difficulties. Ozone at ground level is produced mainly by the action of UV radiation on combustion gases from vehicle exhausts.
- **Hence, option (d) is the correct answer.**

Q 25.C

- An **ecotone is a zone of junction or a transition area between two biomes** (diverse ecosystems). Ecotone is the zone where two communities meet and integrate. For e.g. the mangrove forests represent an ecotone between marine and terrestrial ecosystems.
- The **edge effect refers to the changes in population or community structures** that occur at the boundary of two habitats (ecotone). Sometimes the number of species and the population density of some of the species in the ecotone is much greater than either community. This is called the edge effect. The organisms which occur primarily or most abundantly in this zone are known as edge species. **Hence, statement option (a) is not correct.**
- **Ecocline is a zone of gradual but continuous change from one ecosystem to another when** there is **no sharp boundary between the two in terms of species composition.** Ecocline occurs across the environmental gradient (gradual change in abiotic factors such as altitude, temperature (thermocline), salinity (halocline), depth, etc.). **Hence, option (c) is the correct answer.**
- **A niche refers to the unique functional role and position of a species** in its habitat or ecosystem. The functional characteristic of a species in its habitat is referred to as a "niche" in that common habitat. In nature, many species occupy the same habitat, but they perform different functions: **Habitat niche – where it lives, food niche – what it eats or decomposes & what species it competes with,** Reproductive niche – how and when it reproduces, Physical & chemical niche – temperature, land shape, land slope, humidity & another requirement. **Hence, option (b) is not correct.**
- **Biome is a large regional unit characterized by a major vegetation type** and associated fauna found in a specific climate zone. The biome includes all associated developing and modified communities occurring within the same climatic region, e.g., forest biomes, grassland and savanna biomes, desert biome, etc. **Hence, option (d) is not correct.**

Q 26.C

- **Conservation International** was a pioneer in defining and promoting the concept of hotspots. In 1989, just one year after scientist **Norman Myers** wrote the paper that introduced the hotspots concept, Conservation International adopted the idea of protecting them as the guiding principle of their investments.
- **Hot spots are regions with very high levels of species richness and a high degree of endemism (that is, species confined to that region and not found anywhere else) that are under constant threat.**
- 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 3**0% or less of its original natural vegetation**. In other words, it must be threatened.
- The mere **presence of invasive species is not a criteria to identify biodiversity hotspots.**
- **Hence option (c) is the correct answer.**

Q 27.A

- **Ozone** is a **gas** composed of **three atoms of oxygen**. It occurs **both in the Earth's upper atmosphere and at ground level**. Depending on its location in the atmosphere, it can be **good or bad.**
- **Stratospheric ozone** is **formed naturally** through the **interaction of solar ultraviolet (UV) radiation with molecular oxygen (O2**). Here, it forms the "**ozone layer,**" which is approximately 6-30 miles above the Earth's surface. This layer **shields us from the harmful UV** radiation emanating from the sun. **Hence, statement 2 is correct.**
- In the **troposphere**, **ozone is formed when heat and sunlight cause chemical reactions** between **oxides of nitrogen (NOX) and Volatile Organic Compounds (VOC**), which are also known as **Hydrocarbons**. This reaction can occur both near the **ground and high in the atmospher**e. This ground Ozone is the **"bad" ozone** and is a **secondary air pollutan**t. It damages crops, trees, and other vegetation and caused severe health problems. **Hence statement 3 is not correct.**
- In both these processes, Ozone is formed naturally. However, it **can also be artificially produce**d, so that it can be used **for water treatment.** Ozone generators can create ozone artificially by means of **extremely high voltages or by means of UV light**. Both methods involve the **decomposition of the oxygen molecule**. **Hence statement 1 is not correct.**

Q 28.A

- **Recent Context: The World Meteorological Congress has approved a new greenhouse gas (GHG) monitoring initiative in a landmark decision.**

- The initiative supports urgent action to reduce heat-trapping gases, which are fuelling temperature increases.

- **Need for GHG Watch**
  - Many of the existing international and national activities dealing with greenhouse gases are supported mainly by the research community.
  - At present, there is no comprehensive, timely international exchange of surface and space-based greenhouse gas observations or modelling products.
  - The new global GHG watch will fill critical information gaps and provide an integrated and operational framework.
  - The framework will bring all space-based and surface-based observing systems, as well as modelling and data assimilation capabilities, under one roof.
- **Features:**
  - **The GHG watch will consist of four main components:**
    - ✓ A comprehensive, sustained, global set of **surface-based and satellite-based** observations of **carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O)** concentrations.
    - ✓ **Prior estimates of the GHG emissions** based on activity data and process-based models;
    - ✓ A set of **global high-resolution Earth System models** representing GHG cycles;
    - ✓ Associated with the models, data assimilation systems that optimally combine the observations with model calculations to generate products of higher accuracy.
- **Hence option (a) is the correct answer.**

Q 29.C

- Polar regions are characterized by the presence of sub-zero temperatures which makes it difficult for a range of animals to survive in such harsh conditions. An overwhelming majority (99 percent) of animals and nearly all plants cannot maintain a constant internal environment in adverse conditions. Heat loss or heat gain is a function of surface area. **Since small animals have a larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside**; then they have to expend much energy to generate body heat through metabolism**. This is the main reason why very small animals are rarely found in polar regions. Hence statement 1 is correct and statement 2 is not correct.**
- Mammals from colder climates generally have shorter ears and limbs to minimize heat loss. This is called Allen's Rule. 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.

Q 30.A

- **Recent context:** The Chief Justice of India (CJI) DY Chandrachud condemned 'forum shopping'.
  - **Forum shopping is the practice of choosing the court which is likely to provide the most favorable outcome. Hence option (a) is the correct answer.**
  - Litigants or lawyers attempt to deliberately move their case to a particular judge or Court where they think the judgment could be more favorable.
  - In 2017 ruling of 'The Union of India & Ors. Vs. Cipla Ltd.' case, the court condemned forum shopping.
  - It laid down a 'functional test' to be adopted to determine whether a litigant is indulging in forum shopping or not.
  - Test: If there is any functional similarity in the proceedings between one court and another or there is some sort of subterfuge on the part of a litigant, then it is considered forum shopping.
  - Prevention: Most common law countries use the 'forum non-conveniens' principle to prevent forum shopping.
  - It is the discretionary power of a court to refuse to exercise its jurisdiction over a matter where another court, or forum, may more conveniently hear a case.
  - Using this power, the court can dismiss a case in the interests of justice and the parties while allocating it to the appropriate bench.

Q 31.C

- The two main factors taken into account when measuring diversity are richness and evenness. **Species richness and species evenness are two components important in measuring the biological diversity of an ecosystem.** Both measures describe the species living in a particular area.
  - **Species richness: It is the number of species within a defined region.** Generally, species richness counts the number of species in a particular ecosystem. However, it does not describe the abundance

of the species in that particular ecosystem. It's possible to measure the species richness through either sampling or a census. **Hence statement 2 is correct.**

- In addition, species richness can be divided into three components:
  - ✓ α-Diversity- Alpha diversity refers to diversity within a particular area, community or ecosystem, and is measured by counting the number of taxa (usually species) within the ecosystem.
  - ✓ β-Diversity- Beta diversity is species diversity between ecosystems; this involves comparing the number of taxa that are unique to each of the ecosystems.
  - ✓ Y -Diversity- Gamma diversity is a measurement of the overall diversity for different ecosystems within a region.
- Furthermore, species richness does not describe the distribution of the species within a particular geological area. It only describes the number of species in the above particular geological area.
- **Species Evenness:** It is the number of species and the **relative abundance of species in a particular community.** There are several indices to describe species evenness and the two most common measures of evenness are the Shannon index (H) and the Simpson index (D). **Hence statement 1 is correct.**
  - ✓ The Shannon index (H) is a measure of the information content of a community rather than that of a particular species. On the other hand, the Simpson index (D) measures the dominance of a multispecies community and can be thought of as the probability that two individuals selected from a community will be of the same species.

Q 32.B

- **Pair 1 is not correctly matched:** Kaziranga National Park is located on the bank of the river Brahmaputra in Assam. It is famous for one Horned Rhinoceros. Besides rhinos, other animals protected in the park are swamp deer, bison, tiger, leopard, hoolock gibbon, wild buffaloes, pythons, monitor lizards, elephants, etc. Principal plants found in the park are tall elephant grass, Sal trees, and different types of bushes. This national park was notified in the year 1974, and its area is 42, 996 hectares.
- **Pair 2 is correctly matched:** Ranthambore National Park is located in the Rajasthan state of India. Constituted in 1980, this park is spread in an area of 39, 200 hectares. The principal wildlife protected in this park is crocodile, nilgai, gazelle, sambhar, etc.
- **Pair 3 is correctly matched:** Kanha National Park is a Tiger Reserve. It is located in Madhya Pradesh. Some important animals kept in this park are –leopards, langurs, mongooses, Cats, hyenas, porcupines, etc. Sal and bamboos are the principal trees in this park besides a wide variety of other plants. This national park was notified in the year 1955 and its area is 94, 000 hectares.
- **Pair 4 is not correctly matched:** Simlipal National Park is located in the Mayurbhanj district of Orissa state of India. This National Park comprises dense Sal forest due to which this park has been chosen for the Project Tiger. The fauna of this national park includes tigers, elephants, deer, pea foul, talking mainas, chital, sambhar, panther, gaur, hyenas, and sloth beer. Notified in the year 1978, this national park is spread over an area of 135,500 hectares.

Q 33.D

- **Water pollution** is the **contamination of water sources by substances that make the water unusable for drinking**, cooking, cleaning, swimming, and other activities. Pollutants include **chemicals, trash, bacteria, parasites, chemicals, etc.**
- The processes that contribute to water pollution include-
  - **Agricultural runoff**- It includes contaminants such as f**ertilizers, pesticides, herbicide**s, etc.
  - **Open Defecatio**n- It can cause the release of harmful **pathogens** in the water body which then contribute to **diseases** like **Typhoid**, etc.
  - **Discharge of Industrial Effluents**- These consist of toxic c**hemicals, microfibre**s, and even oil and **petroleum**.
  - **Floods**- Floods are destructive in nature and they tend to carry all the material in their way including **plastics, mud,** etc.
  - **Discharge of coolant from Nuclear reactors**- The coolant so used tends to be radioactive and can thus result in **radioactivity** in the water body and aquatic life.
- **Hence, option (d) is the correct answer.**

Q 34.A

- Biotic Potential: The maximum rate at which a population can increase when resources are unlimited and environmental conditions are ideal is termed the population's biotic potential.
- Each species will have a different biotic potential due to variations in:

- the species' reproductive span (how long an individual is capable of reproducing)o the frequency of reproduction (how often an individual can reproduce)
- "litter size" (how many offspring are born each time)o survival rate (how many offspring survive to reproductive age) Carrying Capacity

- For a given region, carrying capacity is the maximum number of individuals of a given species that an area's resources can sustain indefinitely without significantly depleting or degrading those resources.
- **Hence, option (a) is the correct answer.**

Q 35.A

- One of the main problems affecting coastal waters is the high levels of nitrogen and phosphorous-based pollutants entering the water. These pollutants come mainly from human activities. Excessive discharge of nutrients into coastal water results in accelerated phytoplankton growth. Eutrophication is defined as 'enhanced plankton growth due to excess supply of nutrients. Large growths of phytoplankton are known as blooms and these large blooms can have undesirable effects.
- **Biological oxygen demand (BOD) is the amount of dissolved oxygen needed (i.e., demanded) by aerobic biological organisms to break down organic material present in a given water sample at a certain temperature over a specific time period.**
- **The common lake or stream contains small amounts of oxygen in the form of dissolved oxygen (DO). Dissolved oxygen is a crucial component of natural water bodies, maintaining the aquatic life and quality aesthetic of streams and lakes. So, BOD, indirectly, shows the extent of eutrophication in the water body. Hence, statement 1 is correct.**
- The decay of organic matter in water is measured as biochemical oxygen demand. Environmental stresses and other human-induced factors can lessen the amount of dissolved oxygen in a water body, however.
- **Biological oxygen demand is essentially a measure of the amount of oxygen required to remove waste organic matter from water in the process of decomposition by aerobic bacteria. Hence, the higher BOD means the presence of higher organic pollution and not inorganic pollution. Hence, statement 2 is not correct.**

Q 36.B

- According to the IUCN, the total number of plant and animal species described so far is slightly more than 1.5 million, but we have no clear idea of how many species are yet to be discovered and described.
- Some interesting aspects about the earth's biodiversity based on the currently available species inventories:
  - **More than 70 per cent of all the species recorded are animals,** while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than 22 per cent of the total. **Hence statement 1 is not correct.**
  - **Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total.** That means, out of every 10 animals on this planet, 7 are insects. **Hence statement 2 is correct.**
  - The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals.

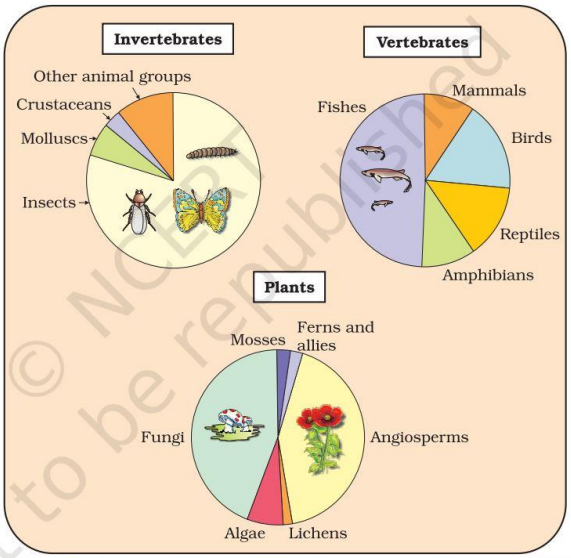


Figure 15.1 Representing global biodiversity: proportionate number of species of major taxa of plants, invertebrates and vertebrates

- It should be noted that these estimates do not give any figures for prokaryotes. Biologists are not sure about how many prokaryotic species there might be. The problem is that conventional taxonomic methods are not suitable for identifying microbial species and many species are simply not culturable under laboratory conditions. If we accept biochemical or molecular criteria for delineating species for this group, then their diversity alone might run into millions.

Q 37.D

- The accelerated rates of species extinctions that the world is facing now are largely due to human activities. There are four major causes (' The Evil Quartet' is the sobriquet used to describe them).
  - **Habitat loss and fragmentation:** This is the most important cause driving animals and plants to extinction. The most dramatic examples of habitat loss come from tropical rainforests. Once covering more than 14 percent of the earth's land surface, these rainforests now cover no more than 6 percent. They are being destroyed fast. Besides total loss, the degradation of many habitats by pollution also threatens the survival of many species. When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories, and certain animals with migratory habits are badly affected, leading to population declines.
  - **Over-exploitation:** Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to the over-exploitation of natural resources. Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to overexploitation by humans. Presently many marine fish populations around the world are over-harvested, endangering the continued existence of some commercially important species.
  - **Alien species invasions:** When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause the decline or extinction of indigenous species. The Nile perch introduced into Lake Victoria in East Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake. One must be familiar with the environmental damage caused and the threat posed to native species by invasive weed species like carrot grass (Parthenium), Lantana and water hyacinth (Eicchornia). The recent illegal introduction of the African catfish Clarias gariepinus for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers.
  - **Co-extinctions:** When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. Another example is the case of a coevolved plant-pollinator mutualism where the extinction of one invariably leads to the extinction of the other.
  - **Hence option (d) is the correct answer.**

Q 38.C

- The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution. For many groups of animals or plants, there are interesting patterns in diversity, the most well-known being the latitudinal gradient in diversity.
- **In general, species diversity decreases as we move away from the equator towards the poles.** With very few exceptions, the tropics (latitudinal range of 23.5° N to 23.5° S) harbour more species than temperate or polar areas. **Hence statement 1 is correct.**
- Colombia located near the equator has nearly 1,400 species of birds while New York at 41° N has 105 species and Greenland at 71° N only 56 species. A forest in a tropical region like Ecuador has up to 10 times as many species of vascular plants as a forest of equal area in a temperate region like the Midwest of the USA.
- Ecologists and evolutionary biologists have proposed various hypotheses on why tropics might account for their greater biological diversity. ; some important ones are
  - Speciation is generally a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification.
  - **Tropical environments, unlike temperate ones, are less seasonal, relatively more constant, and predictable. Such constant environments promote niche specialization and lead to greater species diversity. Hence statement 2 is not correct.**
  - There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

Q 39.C

- **Recent Context:** The Rehabilitation Council of India (RCI) spearheads transformation in education with a national workshop on inclusive learning.
  - The Rehabilitation Council of India (RCI) is **a statutory body under the Ministry of Social Justice and Empowerment. Hence, statement 1 is correct.**
  - It was established in **1986 as a society and became a statutory body in 1993 by the Rehabilitation Council of India Act of 1992.**
  - Its main **mandate is to standardize, regulate, and monitor training programs in the field of special education and disability.**
  - RCI is also **responsible for maintaining the central rehabilitation register (CRR)** and promoting research in this domain.
  - The Council also **prescribes minimum standards of education and training for 16 categories of professionals and personnel** allocated to RCI. **Hence, statement 2 is correct.**
  - The RCI plans to initiate various national programs that promote flexible education, experiential learning, practical skill-based education, and ultimately, inclusive education.

Q 40.C

- Great Indian Bustard (hereafter GIB) is one of the rarest birds in the world.
- It's among the heaviest birds with a horizontal body and long bare legs giving it an ostrich-like appearance.
- **Habitat:** The species inhabits open habitats (short grasslands, open scrub, and rain-fed agriculture) and breeds in traditionally selected grasslands, where males display to attract females. It avoids irrigated areas.
- Great Indian Bustard is an indicator species for grassland habitats and its gradual disappearance from such environments shows their deterioration. Once the species is lost, there will be no other species to replace it, and that will destabilise the ecosystem of the grassland and affect critical biodiversities, as well as blackbucks and wolves, who share their habitat with the GIB.
- Excessive hunting in past and current levels of habitat loss, compounded with very slow life-history traits, has caused their decline.
- **It is endemic to the Indian Sub-continent, found in central India, western India and eastern Pakistan. Hence, statement 1 is correct.**
- The largest population occurs in the Thar Desert, Rajasthan. Other populations occur in Kachchh (Gujarat), Solapur and Chandrapur (Maharashtra), Kurnool (Andhra Pradesh), and Bellary (Karnataka).
- **Bustard Species Found in India:** Great Indian Bustard, the Lesser Florican, and the Bengal Florican; Houbara also belongs to the Bustard family but it's a migratory species.
- **Great Indian Bustard is Rajasthan's state bird.** The state government has started "Project Godawan" for its conservation at Desert National Park (DNP) in Jaisalmer. **Hence, statement 3 is correct.**
- **It's one of the Species for The Recovery Programme under the Integrated Development of Wildlife Habitats of the Ministry of Environment and Forests. Hence, statement 2 is correct.**
- Conservation status of Great Indian Bustard
  - IUCN Red List: Critically Endangered Wildlife Protection Act: Schedule I and
  - CITES: Appendix I. Conservation of Migratory Species or Bonn Convention: Appendix I

Q 41.D

- On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development — adopted by world leaders in September 2015 at an historic UN Summit — officially came into force. Over the next fifteen years, with these new Goals that universally apply to all, countries will mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind.
- While the SDGs are not legally binding, governments are expected to take ownership and establish national frameworks for the achievement of the 17 Goals. Countries have the primary responsibility for follow-up and review of the progress made in implementing the Goals, which will require quality, accessible, and timely data collection.
- **The 1992 Rio Declaration on Environment and Development defines the rights of the people to be involved in the development of their economies, and the responsibilities of human beings to safeguard the common environment.** The declaration builds upon the basic ideas concerning the attitudes of individuals and nations towards the environment and development, first identified at the United Nations Conference on the Human Environment (1972)**. Hence, statement 1 is not correct.**
- **NITI Aayog has the twin mandate to oversee the adoption and monitoring of the SDGs in the country, and also promote competitive and cooperative federalism among States and UTs.** The index

represents the articulation of the comprehensive nature of the Global Goals under the 2030 Agenda while being attuned to the national priorities. The modular nature of the index has become a policy tool and a ready reckoner for gauging the progress of States and UTs on the expansive nature of the Goals, including health, education, gender, economic growth, institutions, climate change, and environment. **Hence, statement 2 is not correct.**

- The SDG India Index and Dashboard is a crucial tool in India's SDG monitoring efforts. Designed and developed by NITI Aayog, the Index measures the progress at the national and sub-national levels in our journey towards meeting the Global Goals and targets. **It has also been successful as an advocacy tool to propagate the messages of sustainability, resilience, and partnerships. IMF has no role in releasing the Index but it collaborates with the NITI Aayog to estimate the financial cost of achieving the SDG. Hence, statement 3 is not correct.**

Q 42.C

- **Recent Context:** More than 30 large lakes in India have recorded a drying trend from 1992 to 2020, a new analysis published in journal Science revealed.
  - Of them,16 are the major lakes of southern India. Some of these include Mettur, Krishnarajasagar, Nagarjuna Sagar and Idamalayar.
- **Mettur Lake (Stanley Reservoir):**
  - Location: Mettur, **Tamil Nadu.** It was constructed in 1934 and serves as a major source of water for irrigation and drinking purposes in the region. The reservoir also plays a vital role in generating hydroelectric power. **Hence pair 1 is correctly matched.**
- **Krishnarajasagar Lake:**
  - Location: Mysore District, **Karnataka.** It is built across the **River Kaveri** and serves as a major water source for both irrigation and drinking purposes in the region. **Hence pair 2 is correctly matched.**
- **Nagarjuna Sagar Lake**:
  - Location: Nalgonda District, **Telangana.** It is formed by the construction of the Nagarjuna Sagar Dam across the **River Krishna.** The reservoir is **one of the largest man-made lakes in the world** and serves multiple purposes such as irrigation, hydroelectric power generation, and drinking water supply. **Hence pair 3 is not correctly matched**
- **Idamalayar Lake:**
  - Location: Ernakulam District, **Kerala.** It is formed by the Idamalayar Dam, **which is constructed across the Idamalayar River.** The reservoir serves as a **major water source for the city of Kochi** and is also used for hydroelectric power generation. **Hence pair 4 is correctly matched.**

Q 43.C

- The Indian experience with Environmental Impact Assessment began over 20 years back. It started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from an environmental angle.
- **Till 1994, environmental clearance from the Central Government was an administrative decision and lacked legislative support.**
- On 27 January 1994, the Union Ministry of Environment and Forests (MEF), Government of India, under the **Environmental (Protection) Act 1986, promulgated an EIA notification making Environmental Clearance (EC) mandatory for expansion or modernisation of any activity or for setting up new projects listed in Schedule 1 of the notification.** Since then there have been 12 amendments made in the EIA notification of 1994. **Hence, statement 1 is correct.**
- Issues with the Indian System
  - Screening
    - ✓ Even though some of the industrial set ups do not require EIA as per the statutory norms, they might involve certain technological processes which could be harmful to the environment, as a result of which such enlisted industries could have potential impacts on the environment and on public health.
    - ✓ **Exempting industries from the EIA requirements based on the investment value of specific projects is not acceptable. There are no specific studies conducted till now which demonstrate that environmental impacts are always inconsequential for projects under a given value.** It is a well established fact that the small scale industries are contributing more pollution with respect to the major industry**. Hence, statement 2 is correct.**

Q 44.C

- **Recently, the Allahabad High Court** ordered a "scientific survey", **including carbon dating, of a "Shivling"** said to have been found at the **Gyanvapi mosque complex in Varanasi.**
- Carbon dating is a widely-used method to establish the age of organic materials, things that were once living. The dating method is based on the fact that **Carbon-14 (C-14), an isotope of carbon with an atomic mass of 14, is radioactive, and decays at a well-known rate. Hence, statement 2 is not correct.**
- While **C-12 is stable**, the radioactive **C-14 reduces to one-half of itself in about 5,730 years — known as its 'half-life'.**
- Though extremely effective, **carbon dating cannot be used to determine the age of non-living things** like rocks, for example. **Hence, statement 1 is correct.**
- Also, the age of things that are more than 40,000-50,000 years old cannot be arrived at through carbon dating. This is because, after 8-10 cycles of half-lives, the amount of C-14 becomes almost very small and is almost undetectable.

Q 45.A

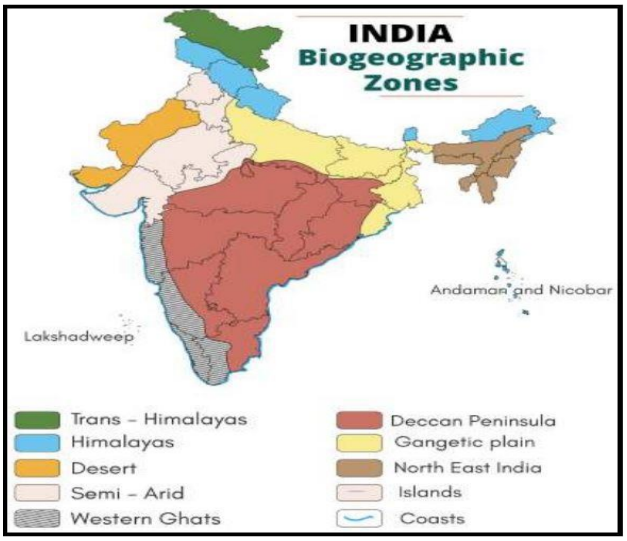
- **Recently, the Supreme Court has slammed the Kerala government** for doing "virtually nothing" for **Endosulfan pesticide exposure victims.**
- **Endosulfan is an organochlorine insecticide** considered to be carcinogen, neurotoxin and genotoxin. It is linked to a slew of grave medical conditions, such as neurotoxicity, physical deformities, poisoning, etc.
- It was used widely on crops like cashew, cotton, tea, paddy, fruits and others until 2011, when **SC banned its production and distribution.**
- **Hence, option (a) is the correct answer.**

Q 46.C

- Decomposers break down complex organic matter into inorganic substances like carbon dioxide, water, and nutrients, and the process is called decomposition. **Decomposition is largely an oxygen-requiring process.** Warm and moist environments favor decomposition whereas low temperatures and **anaerobiosis inhibit decomposition** resulting in the build-up of organic materials. **Hence, statement 1 is correct.**
- The **rate of decomposition is controlled by the chemical composition of detritus and climatic factors.** In a particular climatic condition, the **decomposition rate is slower if detritus is rich in lignin and chitin, and quicker if detritus is rich in nitrogen** and water-soluble substances like sugars. Temperature and soil moisture are the most important climatic factors that regulate decomposition through their effects on the activities of soil microbes.
- **Decomposition involves a series of processes including fragmentation, leaching, catabolism, humification, and mineralization** which act simultaneously on the detritus matter. Detritivores (e.g., earthworms) 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 catabolism.** Humification and mineralization occur during decomposition in the soil. Humification leads to the accumulation of a dark-colored amorphous substance called humus. **The humus is further degraded by some microbes and the release of inorganic nutrients** occurs by the process known as **mineralization.** Catabolism is essentially the breakdown of complex molecules in living organisms to form simpler ones, together with the release of energy**. Hence, statement 2 is correct.**

Q 47.D

- Biogeographic zones represent the major species groupings. In addition, each of these ten zones indicates a distinctive set of physical, climatic and historical conditions. The Himalayas and Gangetic Plains are examples of two adjacent but obviously extremely different zones. India has been divided into ten biogeographic zones.
- The Western Ghats represent one of the major tropical evergreen forest regions in India. In the west, the zone is bound by the coast and in the east, it shares a boundary with the Deccan peninsular zone. The tropical evergreen forests occupy about one-third of the total area of this zone.



- In recent years, a large chunk of the forest cover has been lost and this zone is now of great Student Notes: conservation concern, more so because of its exceptional biological richness. About two-thirds of India's endemic plants are confined to this region. However, the potential of many of these species is yet to be tapped. Besides harbouring diverse biological communities, the forests in this zone also play an important role in maintaining the hydrological cycle.
- The well-known species found exclusively in the Western Ghats include the following:
  - **Flora:** The various major vegetation types are tropical evergreen forests, moist deciduous forests, dry deciduous forests, scrub jungles, sholas, and savannas including high-rainfall savannas, peat bogs, and Myristica swamps. Four thousand species of flowering plants are known from the Western Ghats.
  - **Fauna:**
    - ✓ Primates – Nilgiri Langur and Lion-tailed Macaque
    - ✓ Squirrels – Several subspecies of Ratufa indica with separate forms in Maharashtra, Mysore, Malabar, and Tamil Nadu Ghats. **The Grizzled Squirrel is restricted to two localities in the drier Tamil Nadu forest.**
    - ✓ Carnivores – Malabar Civet in southern evergreen forests, Rusty-spotted Cat in northern deciduous forests.
    - ✓ Ungulates – Nilgiri Tahr in Nilgiris to Agastyamalai Montane grassland.
    - ✓ Hornbills – Malabar Grey Hornbill
- **Hence option (d) is the correct answer.**

Q 48.B

- **Recent Context:** The Centre has taken control of security in Manipur (by allegedly invoking Article 355), deploying 12 companies of the Border Security Force (BSF) and airlifting anti-riot vehicles to the northeastern state.
  - **Definition:** Article 355 empowers the Union government to protect every state in India against external aggression and internal disturbances.
  - **Article 356 Vs Article 355:** Article 356 empowers the President to impose President's Rule in a state in case of a failure or breakdown of constitutional machinery, while Article 355 empowers the Union government:
    - ✓ **To protect every state in India against external aggression and internal disturbances**
    - ✓ **To issue directions to any state to ensure compliance with the Union's laws and regulations. Hence only statements 1 and 2 are correct.**
  - **It is part of** Part XVIII of the Indian Constitution, titled "Emergency Provisions". It is based on the principle of "duty to protect" enshrined in the Constitution.
  - **Restrictions:** Directions can only be given when there is a failure of the state machinery to comply with or give effect to any Union law or regulation; should be of an urgent nature and may not extend beyond the necessary period for remedying the failure; state government should be given an opportunity to submit its views before issuance.
  - Its duration is not specified in the Constitution.
  - It can be withdrawn by the Union government when the situation is normalized or the state government requests it to do so.
  - **Circumstances of imposition:** Failure of the state to comply with the Union's directions; threat to the security of India; threat to unity and integrity of India due to violent activities by any group or organization; request for assistance from the Union to maintain public order when the situation in the state cannot be controlled by the state's own forces.
  - **Scope of judicial review:** The satisfaction of the President in invoking Article 355 is subject to judicial review and can be challenged in court if it violates any fundamental rights or constitutional provisions.

Q 49.C

- Various sources produce various different types of pollutants.
- **Vehicular exhaus**t can release **Ozone d**ue to the combustion of Fossil Fuels and improper cleaning. **Hence pair 1 is correctly matched.**
- **Plutonium** is a byproduct of a **fission nuclear reactio**n. **Hence pair 2 is correctly matched.**
- **Mercury** is used in the **dental industry for amalgam** and in thermometers. **Hence pair 3 is correctly matched.**
- **Cadmium** is one of the major pollutants generated from the **Electronics and Electric indust**ry.

Q 50.A

- **Recently Government of India exercised the Green Shoe option in Coal India Offer For Sale (OFS) after 346% oversubscription.**
- **What is Green Shoe Option?**
  - A green shoe option Is **nothing but a clause contained in the underwriting agreement of an Initial Public Offer (IPO).**
    - ✓ **An initial public offering IPO or stock launch is a public offering in which shares of a company are sold to institutional investors and usually also to retail investors.**
    - ✓ Under a **green shoe option, the issuing company has the option to allocate additional equity shares up to a specified amount.**
  - This option permits the underwriters to buy up to an additional 15% of the shares at the offer price if public demand for the shares exceeds expectations and the share trades above its offering price. - Green shoe option is also known as an over-allotment provision. - This option is primarily used at the time of IPO or listing of any stock to ensure a successful opening price.
  - From the investor's point of view, an IPO with a green shoe option ensures that after listing the share price will not fall below its offer price.
  - The green shoe option **acts as a price stabilising mechanism.**
- **Hence option (a) is the correct answer.**

Q 51.A

- **Bioprospecting is the exploration of plant and animal species for the utilization of their genetic resources in pharmaceutical and biochemical industries and in the production of a wide array of commercially viable products. Hence option (a) is the correct answer.**
- It led to novel treatments for malaria, tuberculosis, HIV/AIDS, and cancer, highlighting yet again the interdependence between ecosystems and human health and wellbeing.
- Bioprospecting is based on a sustainable approach to bringing economic and social benefits to often poor communities who otherwise would resort to unsustainable use of land, consumption of environmental resources or other negative coping mechanisms such as economic migration.
- **Additional information:**
  - Biopiracy is defined as the unauthorized appropriation of knowledge and genetic resources of farming and indigenous communities by individuals or institutions seeking exclusive monopoly control through patents or intellectual property.
  - Biosparging is an in situ remediation technique that supplies oxygen and nutrients (if needed) to contaminated soils to promote aerobic biodegradation of contaminants (i.e. petroleum hydrocarbons) by indigenous microorganisms.
  - A biopile is a type of ex-situ treatment that uses biological processes to transform pollutants into low-toxic byproducts. It is often used to lower petroleum component concentrations in soils by utilizing the bioremediation process. Biopiles are a type of remediation system that is used for a short period.

Q 52.D

- The steel industry is one of the major contributors to air pollution in India. The pollutants released by the steel industry can have serious health and environmental impacts. Some of the important pollutants released by the steel industry in India are:
  - **Oxides of sulfur**: The burning of coal and coke in the steel industry releases oxides of sulfur into the air. These pollutants can cause respiratory problems and acid rain.
  - **Particulate Matter**: The combustion of coal releases Particulate Matter including **PM 10, PM 5, and PM 2.5**.
  - **Oxides of nitrogen**: The high-temperature processes used in the steel industry pollutants can contribute to smog and respiratory problems.
  - **Carbon monoxide**: The incomplete burning of coal and coke in the steel industry can release carbon monoxide into the air. This pollutant is toxic and can cause headaches, dizziness, and even death.
  - **Carbon dioxide**: The steel industry is a major contributor to greenhouse gas emissions, releasing large amounts of carbon dioxide into the atmosphere. This pollutant contributes to climate change and global warming.
- All of the above pollutants are released by the steel industry in India, making it a major contributor to air pollution and climate change. It thus needs to adopt cleaner production processes and reduce its emissions to protect public health and the environment.
- **Hence option (d) is the correct answer.**

Q 53.B

- **National Adaptation Fund on Climate Change (NAFCC) was launched in 2015 with an initial outlay of Rs. 350 crores to meet the cost of adaptation to climate change for the State and Union Territories of India that are particularly vulnerable to the adverse effects of climate change. Hence statement 1 is not correct.**
- The overall aim of the fund is to support concrete adaptation activities which are not covered under ongoing activities through the schemes of the State and National Governments that reduce the adverse effects of climate change facing communities, sectors, and states. **The Scheme has been taken as Central Sector Scheme with National Bank for Agriculture and Rural Development (NABARD) as the National Implementing Entity (NIE). Hence statement 2 is correct.**
- Objectives of NAFCC include:
    - Funding concrete adaptation projects/programs aligned with the relevant Missions under National Action Plan on Climate Change (NAPCC) and the State Action on Climate Change (SAPCCs) in agriculture, horticulture, agro-forestry, environment, allied activities, water, forestry, urban, coastal and low-lying system, disaster management, human health, marine system, tourism, habitat sector and other rural livelihood sectors to address climate change related issues.
    - Preparing and updating climate scenarios, assessing vulnerability, and climate impact assessment
    - Capacity building of various stakeholders on climate change adaptation and project cycle management and developing a knowledge networkMainstreaming the approaches/ learnings from project/program implementation through knowledge Management

Q 54.A

- **Recent Context:** Researchers at the Pune-based Agharkar Research Institute (ARI) have discovered **a new species of single-cell algae,** known as diatoms, from the northern Western Ghats — and **named it after a veteran geo-archaeologist from the city, the late Professor S N Rajaguru.**
- **About Diatoms:**
    - Diatoms can be found in freshwater and brackish water, and are commonly traced in lakes, rivers, streams, rivulets and the sea.
    - Similar to plants and trees that produce oxygen during the process called photosynthesis, **diatoms, too, supply oxygen to the atmosphere.**
- **About Professor S N Rajaguru.**
    - Rajaguru was a former faculty member of Deccan College and known for his attempts to link biological and archaeological remains during excavations.
    - **It was through Rajaguru's extensive studies that researchers today have a clear time-frame of India's paleo-environment.**
- **Hence option (a) is the correct answer.**

Q 55.A

- Although ozone depletion is occurring widely in the stratosphere, the depletion is particularly marked over the Antarctic region. This has resulted in the formation of a large area of the thinned ozone layer, commonly called the ozone hole. It is only under certain meteorological conditions that ozone holes form. The conditions required to form the ozone hole are:
    - **Cold temperatures during the polar winter**
    - **Ice cloud formation**
    - **Special meteorological conditions to form the polar vortex**
    - **Followed by the polar sunrise in the spring**
- The ozone hole occurs during the Antarctic spring, from September to early December, as strong westerly winds start to circulate around the continent and create an atmospheric container. Within this polar vortex, over 50% of the lower stratospheric ozone is destroyed during the Antarctic spring.
- **Reactions that take place on polar stratospheric clouds (PSCs) dramatically enhance ozone depletion. PSCs form more readily in the extreme cold of the Arctic and Antarctic stratosphere. Sunlight-less polar winters contribute to a decrease in temperature and the polar vortex traps and chills air.** These low temperatures form cloud particles. These clouds provide surfaces for chemical reactions whose products will, in the spring lead to ozone Destruction. **Hence, statement 1 is correct.**
- T**he role of sunlight in ozone depletion is the reason why the Antarctic ozone depletion is greatest during spring. During winter, even though PSCs are at their most abundant,** there is no light over the pole to drive chemical reactions. During the spring, however, the sun comes out, providing energy to drive photochemical reactions and melt the polar stratospheric clouds, releasing considerable ClO, which drives the whole mechanism. Warming temperatures near the end of spring break up the vortex around mid-

December. As warm, ozone and NO2-rich air flows in from lower latitudes, the PSCs are destroyed, the enhanced ozone depletion process shuts down, and the ozone hole closes. **Hence, statement 2 is not correct.**

Q 56.C

- The **grazing food chain begins with autotrophs.** In this, energy and nutrients move from plants to the herbivores consuming them, and to the carnivores or omnivores preying upon the herbivores. **The detritus food chain (DFC) begins with dead organic matter. Hence, statement 1 is not correct.**
- In an aquatic ecosystem, **Grazing Food Chain (GFC) is the major conduit for energy flow.** As against this, in a terrestrial ecosystem, a much larger fraction of energy flows through the detritus food chain than through the GFC. The Detritus food chain may be connected with the grazing food chain at some levels: **some of the organisms of DFC are prey to the GFC animals. Hence, statement 2 is not correct.**
- In a natural ecosystem, some animals like cockroaches, crows, etc., are omnivores. An omnivore is an animal that has the ability to eat and survive on both plant and animal matter. Thus, **Omnivores can occupy two trophic levels in the food chain first as primary consumer feeding on grass/plants and as carnivores feeding on insects.**
- The **detritus food chain (DFC) is made up of decomposers** which are **heterotrophic organisms**, mainly fungi, and bacteria. They meet their energy and nutrient requirements by degrading dead organic matter or detritus. These are **also known as saprotrophs** (sapro: to decompose). Decomposers secrete digestive enzymes that break down dead and waste materials into simple, inorganic materials, which are subsequently absorbed by them. **Hence, statement 3 is correct.**

Q 57.C

- **The main source of halogen atoms in the stratosphere that break ozone molecules is the photo-dissociation of man-made halocarbon refrigerants, solvents, propellants, and foam-blowing agents (CFCs, HCFCs, freons, halons) – popularly called as ODS (Ozone Depleting Substance). Apart from these, Carbon tetrachloride, Methyl Bromide, and Methyl Chloroform are also potent ozone-depleting substances.**
- These compounds are transported into the stratosphere by winds after being emitted at the surface. UV rays act on them releasing Chlorine atoms. Cl degrades ozone releasing molecular oxygen, with these atoms acting merely as catalysts. Thus Cl atoms are not consumed in the reaction. Hence, whatever CFCs are added to the stratosphere, they have permanent and continuing effects on Ozone levels.
- **Hydrofluorocarbons, though included in the Montreal Protocol for curbing Ozone-depleting substances, are not Ozone-depleting substances. It is a potent greenhouse gas. Hence, option (c) is the correct answer.**

Q 58.D

- **Carbon sequestration – the practice of removing carbon from the atmosphere and storing it – is one of the many approaches being taken to tackle climate change**.
- It can be done in the following ways:
  - **Afforestation**: Plants remove carbon dioxide from the air naturally, and trees are especially good at storing CO2 removed from the atmosphere by photosynthesis. Expanding, restoring and managing tree cover to encourage more carbon uptake can leverage the power of photosynthesis, converting carbon dioxide in the air into carbon stored in wood and soils.
  - **Wetland Restoration**: Wetlands are vital natural assets, capable of taking up atmospheric carbon and restricting subsequent carbon loss to facilitate long-term storage. They can be deliberately managed to provide a natural solution to mitigate climate change, as well as to help offset direct losses of wetlands from various land-use changes and natural drivers.
  - **Sustainable Agriculture**: Soils naturally sequester carbon, but agricultural soils are running a big deficit due to frequent plowing and erosion from farming and grazing, all of which release stored carbon.
  - **Growing Seaweed:** Kelp is a type of seaweed that grows in the ocean. globally, seaweeds (including kelp) are thought to sequester nearly 200 million tonnes of carbon dioxide every year
  - **Biochar**: Biochar produced by pyrolysis of biowaste. It can be used as a landfill and increase soil fertility.
  - **Subterranean injection**: It involves injecting CO2 into depleted oil and gas reservoirs and other geological features, or into the deep ocean.

- **Iron Fertilization**: Iron fertilization of Oceans encourages the growth of plankton and thus helps in capturing CO2.
- **Hence, option (d) is the correct answer.**

Q 59.B

- **Recently, the Ministry of Minority Affairs (MoMA)** has approved a grant under **Pradhan Mantri Jan Vikas Karyakram (PMJVK)** to support the upgradation of Unani Medicine facilities at Hyderabad, Chennai, Lucknow, Silchar, and Bengaluru.
- Pradhan Mantri Jan Vikas Karyakram (PMJVK) is a **Centrally Sponsored Scheme (CSS). Hence, statement 1 is not correct.**
- It is being implemented by the **Ministry of Minority Affairs**, with the objective to develop infrastructure projects in identified areas, for the socio-economic development of said areas **for the minority communities.** The priority sectors under PMJVK are **education, health, skill development, women-centric projects etc. Hence statement 2 is correct.**
- Projects under PMJVK are **implemented and managed by the concerned State/ UT Government. Hence, statement 3 is correct.**
- The proposals under PMJVK are sent by the States/Union Territories (UTs) **as per demand for infrastructure** in the identified areas, which are considered and approved by the Empowered Committee (EC) of PMJVK, after due consultation with the concerned Central Ministries.

Q 60.A

- The **Central Pollution Control Board (CPCB**) is responsible for m**onitoring India's Air and Water Quality and pollution-related issue**s. It is a **statutory organization under the Ministry of Environment Forest and Climate Change. Hence, statement 1 is correct.**
- The Board was established in September **1974 under the Water (Prevention and Control Pollution) Act 1974** (Not Air Act). **Hence, statement 2 is not correct.**
- Later on, it was **entrusted with the functions and powers of the Air (Prevention and Control Pollution) Act 1981**. Hence it also **aims to enhance air quality** and prevent or control air pollution apart from the **prevention and control of water pollution** in India.

Q 61.C

- **Recent Context:** In recent years, debt-for-climate swaps have gained popularity among low- and middle-income countries as a debt-relief tool. Multilateral development banks and organizations like the UNDP have been promoting this approach to ease the burden of debt for these nations.
- **Debt-for-climate swaps are a financial approach that helps alleviate this problem by freeing up funds for climate investments. They are a form of debt relief that transforms debt into a grant committed to undertaking climate-related investments. Hence statement-I is correct.**
  - Both commercial and official bilateral debts can be included in such swaps, with the latter allowing for redirected debt service payments towards projects mutually agreed upon by both parties, such as those related to climate action.
- **Debt-for-climate swaps originated from debt-for-nature swaps, which were introduced in the 1980s to promote biodiversity conservation and tropical forest protection in exchange for debt relief.**
  - **Bolivia and Conservation International** executed the **first debt-for-nature swap in 1987.** Debt-for-climate swaps became a more extensive concept in the 2000s, encompassing not only nature conservation but also climate change mitigation and adaptation.
  - **In 2006, Germany and Indonesia implemented the first debt-for-climate swap,** with the latter pledging to reduce greenhouse gas emissions through REDD+ (Reducing Emissions from Deforestation and Forest Degradation) initiatives in return for debt relief.
- Debt-for-climate swaps provide **benefits for both creditors and debtors.** Creditors can advance their development cooperation and climate finance goals, improve their chances of debt recovery, and strengthen their diplomatic ties with debtor nations
- **Steps in Debt-for-climate swaps:**
  - Suppose a developing country is indebted to a bilateral creditor that wants to offer debt relief and encourage the developing country to pursue climate-friendly policies or projects.
  - The creditor agrees that the developing country no longer needs to service its debt.
  - In return, the developing country agrees with the lender either (i) to spend the money that would have been spent on debt service on climate-friendly projects or (ii) to adopt climate-friendly policies.

- **Benefits of such agreements.**
  - International organisations and multilateral development banks exercise multiple types of measures to help highly vulnerable countries survive financial catastrophes caused by climate change impacts.
  - However, in the past decade, debt-for-climate swaps has grown relatively popular among low- and middle-income countries.
  - They offer an innovative way to make climate investments while creating the much-needed fiscal space.
  - At the same time, they support climate investment by committing a country to swing their spending from debt service to an agreed public investment. **Hence statement II is not correct.**

Q 62.A

- **The Asian Development Bank** unveiled a new flagship initiative called **Innovative Finance Facility for Climate in Asia and the Pacific (IF-CAP). Hence option (a) is the correct answer.**
  - **The IF-CAP is a multi-donor facility that provides guarantees *f*or parts of the Bank's sovereign portfolios to enable it to free up capital and increase loans for climate investment.**
- **Features of Innovative Finance Facility:**
  - IF-CAP's initial partners are Denmark, Japan, the Republic of Korea, Sweden, the United Kingdom, and the United States.
  - The **reduced risk exposure created by the guarantees** will allow ADB to free up capital to accelerate new loans for climate projects.
  - With a **model of '$1 in, $5 out',** the initial ambition of $3 billion in guarantees could create up to $15 billion in new loans for much-needed climate projects across Asia and the Pacific.
  - **A leveraged guarantee mechanism for climate finance has never before been adopted by a multilateral development bank.**

Q 63.B

- The **National Green Tribunal has been established under the National Green Tribunal Act 2010** for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to the environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. **Hence, statement 1 is not correct.**
- The Tribunal is mandated to make and endeavour for disposal of applications or appeals finally within 6 months of the filing of the same.
- NGT has not been vested with powers to hear any matter relating to the Wildlife (Protection) Act, 1972, the Indian Forest Act, 1927 and various laws enacted by States relating to forests, tree preservation, etc.
- **The NGT is not bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided by principles of natural justice. Hence, statement 2 is correct.**
- Further, NGT is also not bound by the rules of evidence as enshrined in the Indian Evidence Act, 1872. Thus, it will be relatively easier (as opposed to approaching a court) for conservation groups to present facts and issues before the NGT, including pointing out technical flaws in a project or proposing alternatives that could minimize environmental damage but which have not been considered.
- While passing Orders/decisions/awards, the NGT will apply the principles of sustainable development, the precautionary principle and the polluter pays principles.
- However, it must be noted that if the NGT holds that a claim is false, it can impose costs including lost benefits due to any interim injunction.

Q 64.C

- Initially, nuclear energy was hailed as a non-polluting way for generating electricity. Later on, it was realised that the use of nuclear energy has two very serious inherent problems. The first is **accidental leakage, as occurred in the Three Mile Island and Chernobyl incidents** and the second is safe disposal of radioactive wastes.
- **Three Mile Island, Pennsylvania, United States**
  - Loss of coolant and partial core meltdown due to operator errors and technical flaws. There was a small release of radioactive gases.
- **Chernobyl, Kiev Oblast, Ukraininan SSR, Soviet Union** A flawed reactor design and inadequate safety procedures led to a power surge that damaged the fuel rods of reactor no. 4 of the Chernobyl power plant. This caused an explosion and meltdown, necessitating the evacuation of 300,000 people and dispersing radioactive material across Europe.

- **Fukushima, Japan** The Fukushima **nuclear disaster** was triggered by a tsunami that flooded and damaged the 3 active reactors at the Fukushima Daiichi nuclear power plant, drowning two workers. Loss of backup electrical power led to overheating, meltdowns, and evacuations.
- **Deepwater Horizon oil spill, also called Gulf of Mexico oil spill**
  - It is **largest marine oil spill** in history, caused by an April 20, 2010, explosion on the Deepwater Horizon oil rig—located in the Gulf of Mexico, approximately 41 miles (66 km) off the coast of Louisiana—and its subsequent sinking.
- **Hence, option (c) is the correct answer.**

Q 65.A

- **Increased carbon dioxide in the atmosphere is one of the recognized causes of our changing climate and it is also problematic for coral reefs.** The ocean absorbs approximately one-third of the atmosphere's excess carbon dioxide, resulting in a more acidic ocean. In order for a coral reef to grow, it must produce limestone (or calcium carbonate) at a rate that is faster than the reef is being eroded. **Ocean acidification slows the rate at which coral reefs generate calcium carbonate**, thus slowing the growth of coral skeletons.
- Climate change can cause sea level rise; changes in the frequency, intensity, and distribution of tropical storms; and altered ocean circulation. All of these impacts can have negative consequences for the health and diversity of reefs around the world. **Hence, statement-I and statement II are correct. Also, statement II is the correct explanation for statement-I.**
- A 20 percent increase above current carbon dioxide levels, which could occur within the next two decades, could significantly reduce the ability of corals to build their skeletons and some could become functionally extinct within this timeframe.
- **In real terms, this does not just mean corals grow more slowly, but also that they will be less able to overcome typical pressures. Tropical coral reefs are constantly engaging in a battle to grow.** Many reef dwellers actually break apart pieces of the corals' skeletons, either to feed upon or to create homes.

Q 66.B

- **Recently, a new small savings scheme** called **Mahila Samman Savings Certificate** was launched specifically for female investors **to promote investment among women.** Accounts opened under this scheme will be **single-holder accounts** that can be opened at the Post Office or any registered bank.
- Any woman can open a Mahila Samman account that can be opened for herself or on behalf of a minor girl. **Hence, statement 1 is correct.**
- An account can be opened with a one-time **deposit of a minimum of Rs. 1,000** and any sum in multiples of Rs. 100 in multiple accounts. However, the aggregate deposit amount across all accounts **cannot exceed Rs. 2 lakhs** for an individual. **Hence, statement 2 is not correct.**
- The Government has **not mentioned any tax benefits for the Mahila Samman Savings Certificate. Hence, statement 3 is not correct.**
- An **interest of 7.5% p.a.** will be paid on deposits under this scheme. The interest will be compounded quarterly and credited to the account.
- An account holder can make a **partial withdrawal from the account** of **up to 40%** of the eligible balance after the expiry of one year from the date of account opening. **Hence, statement 4 is correct.**

Q 67.C

- **The Kyoto Protocol is an agreement made under the UNFCCC. Countries that ratify this protocol commit to reduce their emissions of carbon dioxide and five other greenhouse gases (Methane, Nitrous Oxide, Sulphur Hexafluoride, Hydrofluorocarbons and Perfluorocarbons), or engage in emissions trading if they maintain or increase emissions of these gases.**
- Under the protocol, Governments are separated into two general categories: countries among the developed nations, referred to as Annex 1 countries (who have accepted GHG emission reduction obligations and must submit an annual greenhouse gas inventory); and countries among developing or least developed nations, referred to as Non-Annex 1 countries (who have no GHG emission reduction obligations but may participate in the Clean Development Mechanism).
- **The Kyoto Protocol introduced three mechanisms in order to achieve its goals: the Clean Development Mechanism (CDM), Joint Implementation (JI), and Emissions Trading (ET).**
  - The CDM allows countries with commitments under the Kyoto Protocol to invest in emission-reduction projects in developing countries. These projects can involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers. **Hence option 1 is correct.**

- JI mechanism allows a country with a Kyoto Protocol emission reduction target to invest in a project to reduce emissions in any other country with a commitment (as opposed to a developing country). **Hence option 2 is correct.**
- The Emissions Trading (The International Emission Trading) scheme under the Kyoto Protocol set up a platform where carbon units, or units generated by projects registered under the JI or the CDM, or from removals through forestry activities, can be exchanged, i.e. sold and purchased, according to a country's needs. The scheme made carbon a commodity and created a carbon market. **Hence option 4 is correct.**

- **Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of its long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. Article 4 of the Paris Agreement requires each party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve.** Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions. Hence, INDCs are not the market mechanisms under the Kyoto Protocol**. Hence option 3 is not correct.**

Q 68.B

- The size of a population for any species is not a static parameter. It keeps changing in time, depending on various factors including food availability, predation pressure, and adverse weather. The density of a population in a given habitat during a given period fluctuates due to changes in four basic processes, **two of which (natality and immigration) contribute to an increase in population density and two (mortality and emigration)** to a decrease.
- **Natality refers to the number of births during** a given period in the population that are added to the initial density. **Hence option 1 is correct.**
- **Mortality is the number of deaths in the population** during a given period. **Hence option 2 is not correct.**
- **Immigration is the number of individuals of the same species that have come into the habitat** from elsewhere during the time period under consideration. **Hence option 3 is correct.**
- Emigration is the number of individuals in the population who left the habitat and went elsewhere during the time period under consideration.

Q 69.A

- In September 2015, the heads of nations agreed to set the world on a path toward sustainable development through the adoption of the 2030 Agenda for Sustainable Development. This **agenda includes 17 Sustainable Development Goals, or SDGs,** which set out quantitative objectives across the social, economic, and environmental dimensions of sustainable development **all to be achieved by 2030.**
- The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability. There are 169 targets under the 17 goals.
- Image showing 17 SDGs

- **Thus, only pair 4 is correctly matched. Hence option (a) is the correct answer.**

Q 70.B

- "Biodiversity Heritage Sites" (BHS) are well-defined areas that are unique, ecologically fragile ecosystems - terrestrial, coastal and inland waters and, marine having rich biodiversity comprising of any one or more of the following components:
  - the richness of wild as well as domesticated species or intra-specific categories,
  - high endemism,
  - presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic/cultivated species or their varieties,
  - past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical, or aesthetic values are important for the maintenance of cultural diversity, with or without a long history of human association with them.
- Under **Biological Diversity Act, 2002 (BDA) the State Government in consultation with local bodies may notify the official gazette, of areas of biodiversity importance as Biodiversity Heritage Sites (BHS). Hence, statement 1 is not correct.**
- State Government in consultation with the Central Government may frame rules for the management and conservation of BHS.
- State Governments shall frame schemes for compensating or rehabilitating any person or section of people economically affected by such notification.
- **Nallur Tamarind Grove in Bengaluru, Karnataka was the first Biodiversity Heritage Site of India, declared in 2007. Hence, statement 2 is correct.**

Q 71.A

- An ecological pyramid is a graphical representation of the relationship between different organisms in an ecosystem.
- Types of Ecological Pyramids:
- **The pyramid of Numbers** is the graphic representation of the number of individuals per unit area of various trophic levels.
  - **Upright Pyramid of Numbers:** In an upright pyramid of numbers, the number of individuals decreases from the lower level to the higher level. This type of pyramid is usually found in the grassland ecosystem and the pond ecosystem. The grass in a grassland ecosystem occupies the lowest trophic level because of its abundance.
  - **Inverted Pyramid of Numbers:** Here, the number of individuals increases from the lower level to the higher trophic level. For example, the tree ecosystem. Thus, the Pyramid of Numbers can be inverted and Upright. **Hence option 1 is not correct.**
- **Pyramid of Biomass as the name suggests shows the amount of biomass** (living or organic matter present in an organism) present per unit area at each trophic level.
  - **Upright Pyramid of Biomass:** Ecosystems found on land mostly have pyramids of biomass with large bases of primary producers with smaller trophic levels perched on top, hence the upright pyramid of biomass.
  - **Inverted Pyramid of Biomass:** A reverse pyramidal structure is found in most aquatic ecosystems. Here, the pyramid of biomass may assume an inverted pattern. This is because, in a water body, the producers are tiny phytoplankton that grow and reproduce rapidly. In this condition, the pyramid of biomass has a small base, with the producer biomass at the base providing support to consumer biomass of large weight. Hence, it assumes an inverted shape. The pyramid of Biomass can be inverted and Upright. **Hence, option 2 is not correct.**
- The **pyramid of Energy** is a graphical structure representing the flow of energy through each trophic level of a food chain over a fixed part of the natural environment. An energy pyramid represents the amount of energy at each trophic level and the loss of energy at each is transferred to another trophic level.
- The energy pyramid, sometimes called the trophic pyramid or ecological pyramid, is used in quantifying the energy transfer from one organism to another along the food chain. **Energy decreases as one moves through the trophic levels from the bottom to the top of the pyramid.** Thus, **the energy pyramid is always upright**. **Hence, option 3 is correct.**

Q 72.B

- The **movement of nutrient elements** through the **various components of an ecosystem is called nutrient cycling.** Another name for nutrient cycling is biogeochemical cycles (bio: living organism, geo: rocks, air, water). Nutrient cycles are of two types: (a) gaseous and (b) sedimentary.

- The **reservoir for the gaseous type of nutrient cycle** (e.g., nitrogen, carbon cycle) **exists in the atmosphere** and for the sedimentary cycle (e.g., **sulphur and phosphorus cycle), the reservoir is located in Earth's crust.** Environmental factors, e.g., soil, moisture, pH, temperature, etc., regulate the rate of release of nutrients into the atmosphere. The function of the reservoir is to meet the deficit which occurs due to an imbalance in the rate of influx and efflux. **Hence, option (b) is the correct answer.**
- **Carbon Cycle: Carbon enters the living world in the form of carbon dioxide** through the process of **photosynthesis as carbohydrates.** These organic compounds (food) are then passed from the producers to the consumers (herbivores & carnivores). This carbon is finally returned to the surrounding medium by the process of respiration or decomposition of plants and animals by the decomposers.
- **Nitrogen Cycle: Nitrogen is present in the atmosphere in an elemental form** and as such it cannot be utilized by living organisms. This elemental form of nitrogen is converted into a combined state with elements such as H, C, and O by certain bacteria so that it can be readily used by plants. Nitrogen is continuously expelled into the air by the action of microorganisms such as denitrifying bacteria and finally returned to the cycle through the action of lightening and electrification.
- **Sulphur Cycle: Sulphur occurs in all living matter as a component of certain amino acids.** It is abundant in the soil in proteins and, through a series of microbial transformations, ends up as sulphates usable by plants. Sulphur-containing proteins are degraded into their constituent amino acids by the action of a variety of soil organisms. The sulphur of the amino acids is converted to hydrogen sulphide (H2S) by another series of soil microbes. In the presence of oxygen, H2S is converted to sulphur and then to sulphate by sulphur bacteria. Eventually, the sulphate becomes H2S.
- **Phosphorus cycle: Phosphorus is a major constituent of biological membranes**, nucleic acids and cellular energy transfer systems. Many animals also need large quantities of this element to make shells, bones and teeth. The natural reservoir of phosphorus is rock, which contains phosphorus in the form of phosphates. When rocks are weathered, minute amounts of these phosphates dissolve in soil solution and are absorbed by the roots of the plants. Herbivores and other animals obtain this element from plants. The waste products and the dead organisms are decomposed by phosphate-solubilising bacteria releasing phosphorus. Unlike the carbon cycle, there is no respiratory release of phosphorus into the atmosphere.

Q 73.C

- A mass extinction is a short period of geological time in which a high percentage of biodiversity, or distinct species—bacteria, fungi, plants, mammals, birds, reptiles, amphibians, fish, invertebrates—dies out. In this definition, it's important to note that, in geological time, a 'short' period can span thousands or even millions of years.
- The planet has experienced five previous mass extinction events, the last one occurring 65.5 million years ago which wiped out the dinosaurs from existence**. Experts now believe we are in the midst of a sixth mass extinction. Hence statement 1 is correct.**
- The 'Sixth Extinction' is presently in progress different from the previous episodes. **The difference is in the rates; the current species extinction rates are estimated to be 100 to 1,000 times faster than in pre-human times and our activities are responsible for the faster rates.** Ecologists warn that if the present trends continue, nearly half of all the species on Earth might be wiped out within the next 100 years. **Hence statement 2 is correct.**
- Unlike previous extinction events caused by natural phenomena, the sixth mass extinction is driven by human activity, primarily (though not limited to) the unsustainable use of land, water and energy use, and climate change.

Q 74.A

- **Greenhouse Gases (GHGs)** are the gases that lead to the **warming of the Earth**. Even though these are **naturally present in the Earth's atmosphere**, their **quantity** is **increasing** exponentially due to the **burning of Fossil Fuels, Crop/Biomass Residue,** etc.
- The following are **examples of GHGs**-
    - **Carbon Monoxide**- Carbon monoxide (**CO)** is a **colorless, odorless, and tasteles**s gas.- It is formed as a result of **incomplete combustion of carbon-containing materials.**
    - **Methane-** Methane **(CH4)** is a potent greenhouse gas that contributes t**o global warming.-** Methane is produced by the **anaerobic decomposition of organic matter.**
    - **Carbon Dioxide:** Carbon dioxide **(CO2)** is a **colorless, odorless, and tasteless gas.-** It is formed as a natural outcome of **combustion of carbon-containing materials.**
    - **Hydrofluorocarbons:** Potent greenhouse gases (GHG) that have global warming potentials that range from hundreds to thousands of times that of carbon dioxide.

- **Nitrous oxide** molecules stay in the atmosphere for an average of 121 years before being removed by a sink or destroyed through chemical reactions.

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

Q 75.C

International Organizations for Control of Wildlife Trafficking:

- **TRAFFIC:** Trade Records Analysis of Flora and Fauna in International Commerce (TRAFFIC) established in 1976, is a wildlife trade monitoring network and a joint programme of WWF and IUCN. **Hence statement 1 is correct.**
  - It works closely with the National and State Governments and various agencies to help study, monitor and influence action to curb illegal wildlife trade and bring wildlife trade within sustainable levels.
- **CITES (the Washington Convention):** CITES signed in 1973 provides a mechanism to regulate the trade in wildlife. Under its guidance, governments all over the world have taken steps to prevent this illegal trade and bring it under control.
  - The CITES is concerned with the international co-operation to control only the illegal trade in endangered species whereas the **TRAFFIC is concerned with the monitoring of both the legal as well as the illegal trade in wildlife across the world. Hence statement 2 is correct.**

Q 76.B

- **Recent Context: In Monetary Policy Committee's (MPC) latest policy review the RBI decided to maintain the status quo. In other words, it changed nothing. This gave the economists to think whether India has reached its Goldilocks Scenario.**
- **What Is a Goldilocks Economy?**
  - A Goldilocks economy is not too hot or too cold but just right ie. describing situations that are "just right" amid two extremes —to steal a line from the popular children's story Goldilocks and the Three Bears.
  - The term describes an ideal state for an economic system. In this perfect state, there is full employment, economic stability, and stable growth. **The economy is not expanding or contracting by a large margin. Hence statement (b) is the correct answer.**
  - A Goldilocks state is also **ideal for investing** because as companies grow and generate positive earnings growth, stocks perform well.
  - Goldilocks economies are **temporary in nature**, as seen by the boom and bust cycles.
- **Inflation in Goldilocks Economy:**
  - A Goldilocks economy has steady economic growth, preventing a recession, but not so much growth that inflation rises by too much.
  - **The inflation in such a scenario will neither be too hot (implying high inflation) nor too cold (referring to faltering GDP growth).**
  - It implies idle inflation i.e. not too low nor too high.

Q 77.B

- The amount of **pollution in a water body** can be **quantified** by the **amount of oxygen required** to decompose the pollutants. For this, two parameters are considered- The **Biological Oxygen Demand** and the **Chemical Oxygen Demand.**
- **Chemical oxygen demand or COD** is the **amount of oxygen required to break down organic and inorganic material via oxidation**. **Hence option (b) is the correct answer.**
- It is frequently stated as the mass of oxygen consumed over the volume of the solution, expressed in milligrams per liter (mg/L), in SI units. Quantifying the number of oxidizable contaminants present in surface water (such as lakes and rivers) or wastewater is the most typical application of COD. Chemical Oxygen Demand is helpful for assessing the quality of water by providing a metric to assess how an effluent will affect the receiving body.

Q 78.C

- **Wildlife Sanctuary:** A Sanctuary is a protected area where wild animals and birds are kept and encouraged to increase their population. Presently, there are more than 551 sanctuaries in India covering a total area of 1,19,775.80 sq km.
- **In wildlife sanctuaries, rare and endangered species are encouraged to breed in human controlled environments with restricted settings.** This is called as captive breeding. This is a successful technique to increase the populations of rare and endangered species of animals. **Hence statement 1 is correct.**

- **Human activities like harvesting or timber collection of minor forest products and private ownership rights are allowed. Hence statement 2 is correct.**The examples are:1. Periyar (Kerala)2. Ranipur (Uttar Pradesh)3. Chilka Lake (Orissa)4. Sariska (Rajasthan).
- **National Park, Wildlife Sanctuary and Biosphere Reserve - a comparison**

National Park	Wildlife Sanctuary	Biosphere Reserve
1. It is associated with the habitat of wild animal species like rhino, tiger, etc.	It is species oriented pitcher plant, Great Indian Bustard	It takes into consideration the entire ecosystem
2. Its boundaries are marked by legislation	Its boundaries are not sacrosanct.	Its boundaries are marked by legislation
3. Disturbance only limited to buffer zone.	Limited disturbance	Disturbance only limited to buffer zone.
4. Tourism is allowed	Tourism is allowed	Tourism is generally not allowed
5. Scientific management is lacking	Scientific management is lacking	Scientifically managed
6. No attention is paid to gene pool conservation	No attention is paid to gene pool conservation	Attention is paid to gene pool conservation

Q 79.A

- Measuring the diversity of a species generally incorporates estimates of "richness". Also referred to as alpha-diversity, species richness is a common way of measuring biodiversity and involves counting the number of individuals - or even families - in a given area. **Hence, pair 1 is correctly matched.**
- At the ecosystem-level, measures of biodiversity are often used to compare two ecosystems or to determine changes over time in a given region. Describing changes in biodiversity within or between ecosystems is called beta-diversity. Measures of beta-diversity indicate the difference in species richness between two different habitats or within a single community at different points in time. The resulting number indicates to researchers whether there is any overlap in the species found in each group. **Hence, pair 2 is not correctly matched.**
- Gamma-diversity, on the other hand, estimates the total biodiversity within an entire region. **Hence, pair 3 is not correctly matched.**

Q 80.C

- **Radioactive Pollution**
  - Radioactive wastes are generated during various operations of the nuclear fuel cycle. Mining, nuclear power generation, and various processes in industry, defence, medicine and scientific research produce by-products that include radioactive wastes. They cause Radioactive Pollution and expose people living nearby to radiation hazards.
  - Radioactive waste **can be in gas, liquid or solid form, and its level of radioactivity can vary. Hence, statement 1 is correct.**
  - The waste can **remain radioactive for a few hours or several months or even hundreds of thousands of years**. Depending on the **level and nature of radioactivity**, radioactive wastes can be classified as exempt waste, Low & Intermediate level waste and High-Level Waste. **Hence, statement 2 is correct.**

Q 81.D

- Acidification of a water body is a phenomenon where there is a decrease in the pH level of the water body which is harmful to the biodiversity residing in it. Ocean acidification refers to a reduction in the pH of the ocean over an extended period of time, caused primarily by the uptake of carbon dioxide (CO_2) from the atmosphere.
- **A sudden increase in the level of acidity of surface waters (lakes, streams, and rivers) in mid-latitude areas, caused by the melting in spring of snow that has accumulated through the winter, and stored dry fallout of acidic precipitation is called spring shock. An acid shock can cause significant damage to freshwater species and habitats. Also known as the acid surge.**
- **Hence, option (d) is the correct answer.**

Q 82.C

- **Regulations for Noise Pollution**
  - The **Central Pollution Control Board (CPCB)** has laid down the **permissible noise levels in India for different areas**. Noise pollution rules have defined the acceptable level of noise in different zones for both daytime and night time.
  - In **industrial** areas, the permissible limit is **75 dB for daytime and 70 dB at night**.
  - In **commercial** areas, it is 65 dB and 55 dB, while in **residential** areas it is **55 dB and 45 dB**during daytime and night respectively.
  - Additionally, state governments have declared '**silent zones**' which includes areas that lie within 100 meters of the premises of schools, colleges, hospitals and courts. The permissible noise limit in this zone is **50 dB during the day and 40 dB during the night**.
  - **Hence, option (c) is the correct answer.**

Q 83.C

- Smog is a combination of **smoke and fog (smoky fog**) caused by the b**urning of large amounts of coal, vehicular emission, and industrial fumes**. It usually contains particulates like **smoke, sulfur dioxide, nitrogen dioxide, and other components.**
- At least two distinct types of smog are recognized: **Sulfurous smog and Photochemical Smog.**
  - **The Sulfurous smog or "London smog**," results from a high concentration of sulfur oxides in the air caused by the use of sulfur-bearing fossil fuels, particularly coal (Coal was the mains source of power in London during the 19th century, the effects of which started becoming evident in the early twentieth century).
  - **The Photochemical smog or "Los Angeles smog"**
    - ✓ It is sometimes called **Oxidizing smog** as it contains high concentrations of **oxidizing agents like Ozone, HNO3** whereas Classical Smog is called Reducing as it contains high concentrations of sulphur dioxide, which is a reducing agent. **Hence, statement 1 is correct.**
    - ✓ It occurs most prominently in urban areas with **anthropogenic air pollutants**, including **ozone**, **nitric acid, and organic compounds. S**uch pollutants are the large numbers of automobiles. These are "**Secondary pollutants**" which occur as a result of the reaction between primary pollutants. **Hence, statement 2 is correct.**
    - ✓ [**Primary pollutants**: It is any **pollutant emitted directly from a source**]
    - ✓ It is caused by the a**ction of solar ultraviolet radiation on polluted air. Hence, statement 3 is not correct.**

Q 84.A

- **Recently,** The sea phase of bilateral exercise **'Al Mohed Al Hindi 23'**, between the **Indian Navy and Royal Saudi Naval Force (RSNF)** was held from 23 - 25 May 23 off Al Jubail, Saudi Arabia. **Hence pair 3 is not correctly matched.**
- The fourth edition of the **Indo-Indonesia bilateral Exercise Samudra Shakti-23** concluded in the South China Sea in May 2023. **Hence pair 2 is not correctly matched.**
- The 4th edition of a joint military exercise, **"Ex Dharma Guardian ", between India and Japan** was conducted at Camp Imazu in Shiga province, Japan in February 2023. **Hence pair 1 is correctly matched.**

Q 85.B

- **After a spate of helicopter crashes in recent times, a government regulatory body** has called for a **safety upgrade** of the **Dhruv Helicopter.**
- The **Hindustan Aeronautics Limited's (HAL) indigenously designed and developed Advanced Light Helicopter (ALH-DHRUV) is a twin-engine, multi-role, multi-mission new generation helicopter in the 5.5-ton weight class. Hence statement 1 is not correct.**
- Features of Dhruv:
  - Capable of operating in all weather **conditions with a high degree of reliability & survivability. Hence statement 2 is correct.**
  - Powered with **twin Shakti engines** for exceptional high-altitude performance.
    - ✓ Twin Shakti engines are 12 % Higher power than TM 333 2B2 engines; have dual centrifugal compressor assembly and single crystal blades.
  - Equipped with **glass cockpit** and **advanced avionics** for enhanced mission effectiveness including night flying capability.

- Dhruv is incorporated with state of art technologies such as Hingeless Interchangeable Main Rotor Blades, Bearingless Tail Rotor Blades, Anti resonance vibration isolation system,s and redundancies built in for critical systems.
- Dhruv is an **ideal platform for operating at various altitudes** from sea level to high altitudes of the Himalayas as well as in Desert and saline atmospheric conditions at extreme temperature ranges.
- Dhruv has evolved from basic utility version to a weaponized platform called Rudra in the 5.8-ton class with the fitment of Mission and Weapon systems.
- Weapon fitted on Rudra comprises of 20 mm Turret Gun, 70 mm Rocket, Air to Air Missile, and Anti-Tank Guided Missiles.
- It is incorporated with other systems such as Digital Moving Map On Board Inert Gas Generation System etc.,

- It is a multi-role, multi-mission new generation helicopter **certified for both civil and military roles. Hence statement 3 is correct.**

Q 86.A

- Thomas Robert Malthus was an influential British economist who is best known for his theory on population growth, outlined in his 1798 book 'An Essay on the Principle of Population'.
- **In it, Malthus argued that populations inevitably expand until they outgrow their available food supply, causing the population growth to be reversed by disease, famine, war, or calamity. He states that while the human population grows in a geometric progression, subsistence can only grow in an arithmetic progression. Hence, statement 1 is correct.**
- **'Limits to Growth' was published was commission by the Club of Rome. Published 1972 – The message of this book still holds today: The earth's interlocking resources – the global system of nature in which we all live – probably cannot support present rates of economic and population growth much beyond the year 2100, if that long, even with advanced technology.** An international team of researchers at the Massachusetts Institute of Technology began a study of the implications of continued worldwide growth. They examined the five basic factors that determine and, in their interactions, ultimately limit growth on this planet-population increase, agricultural production, nonrenewable resource depletion, industrial output, and pollution generation. The Malthusian **theory was developed in the 19th century. Hence, statement 2 is not correct.**

Q 87.D

- **Principles and Philosophy of Radioactive Waste Management followed in India.**
- The **Atomic Energy Regulatory Board (AERB)** of India calls for reprocessing of the spent fuel and then disposing the waste to a repository. In managing the radio-active wastes, given principles are followed:
  - **Principle 1**: **Protection of Human Health and Environment**- Radioactive waste shall be managed in such a way as to provide an acceptable level of protection for human health and the environment.
  - Principle 2: **Concern for Future Generations**- Radioactive waste shall be managed in such a way that it will not impose undue burden on future generations and its predicted impact on the health of future generations will not be greater than relevant levels of impact that are acceptable today.
  - Principle 3: **Establishing Legal Framework**- Radioactive waste shall be managed within an appropriate legal framework including clear allocation of responsibilities and provision for independent regulatory functions.
  - Principle 4: **Waste Minimisation, Management Interdependency and Safety of Facilities**- Generation of radioactive waste shall be kept to the minimum practicable. Interdependency among all steps in radioactive waste generation and management shall be taken into account. The safety of facilities for radioactive waste management shall be assured during their lifetime.
  - **Hence, option (d) is the correct answer.**

Q 88.B

- **Tropical Monsoon Forests** are also known as drought-deciduous forests; dry forests; dry- deciduous forests; tropical deciduous forests. Teak, neem, **bamboo**, sal, shisham, sandalwood, khair, and **mulberry** are some of the important species.
- **Tropical Rain Forest Biome**
  - High temperatures and abundant rainfall support a luxuriant tropical rainforest.
  - The equatorial vegetation comprises a multitude of evergreen trees, e.g. mahogany, **ebony**, dyewoods etc.
- **Hence, option (b) is the correct answer.**

Q 89.A

- Maharashtra has about 4,000 such groves, scattered in the wildlife regions. Bhimashankar wildlife sanctuary is located in the northern Western Ghats in Pune and Thane districts include about 14 sacred groves, including a large grove surrounding a Shiva temple, which is one of the twelve Jyotirlingams in India.
- The **groves in Maharashtra are called deorais or devrais** and are concentrated in Pune, Ratnagiri, Raigad and Kolhapur. A rare variety of biodiversity prevails in these areas.
- The different names for Devrai are used in different parts of the country, such as Pavithra Vana, Kovikaadugal, Jahera, Devgudi, Banis, Haritan, Sarna, Lai Umang, Kovil Kadu, etc. Etymologically the word "Devrai" is derived from two words; that is Dev (which means God in Marathi) and rai (which means forest in Marathi).
- These Devrais have been entirely or partially restricted from any human interference, which provided habitat for rare species of animals, arboreal birds, mammals and vegetation.
- Due to limited resource extraction from such Devrais, they prove to be rich resources for fruit-bearing trees, small water bodies, habitats, and other factors responsible for biodiversity enrichment.
- Some essential functions such as maintaining local ecological balance, conserving watersheds for birds and animals, preserving bio-resources, sustainable use of resources, etc., which are crucial steps for maintaining forests, are frequently followed here in this traditional system.
- Due to the abundance of diversity in species of trees, Devrais often preserve certain plant species which may have medicinal purposes for the communities or tribes. Such plants possess medicinal properties and can also have commercial value if studied properly and exploited.
- **Hence, option (a) is the correct answer.**

Q 90.C

- **Biodiversity conservation:** When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected - we save the entire forest to save the tiger. This approach is called in situ (on-site) conservation. However, when there are situations where an animal or plant is endangered or threatened and needs urgent measures to save it from extinction, ex-situ (off-site) conservation is the desirable approach.
- In-situ conservation is the on-site conservation of genetic resources in natural populations of plant or animal species. In India, ecologically unique and biodiversity-rich regions are legally protected as biosphere reserves, national parks, sanctuaries, reserved forests, protected forests, and nature reserves. India has also a history of religious and cultural traditions that emphasized the protection of nature. In many cultures, tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection. In Meghalaya, the sacred groves are the last refuge for a large number of rare and threatened plants. **Sacred groves are a fine example of in-situ conservation.**
- **Ex situ Conservation–**In this approach, threatened animals and plants are taken out from their natural habitat and placed in special settings where they can be protected and given special care. **Zoological parks, botanical gardens, and wildlife safari parks serve this purpose.** In recent years ex-situ conservation has advanced beyond keeping threatened species in enclosures. Now gametes of threatened species can be preserved in viable and fertile conditions for long periods using cryopreservation techniques, eggs can be fertilized in vitro, and plants can be propagated using tissue culture methods. Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.
- **Hence option (c) is the correct answer.**

Q 91.D

- **Municipal Solid Waste**: The urban India generates 62 million tonnes of municipal solid waste per annum. Only 43 million tonnes (MT) of the waste are collected, 11.9 MT is treated and 31 MT is dumped in landfill sites. Plastic bags made from low density polyethylene (LDPE) are virtually indestructible and create colossal environmental hazard. The discarded bags block drains and sewage systems. Leftover food, vegetable waste etc. on which cows and dogs feed may die due to the choking by plastic bags. Burning of solid waste release highly toxic and poisonous gases like carbon monoxide, carbon dioxide, phosgene, dioxins and other poisonous chlorinated compounds.
- **Agricultural Waste**: India is estimated to produce around 620 Million tonne per annum of agricultural wastes, 43 per cent of which is animal dung and slaughter wastes. Agriculture and livestock activities pollute soil through excessive application of pesticides and fertilizers, the use of untreated wastewater for irrigation, and the use of manure and sewage sludge with high antibiotic, antimicrobial-resistant bacteria and heavy metal content.

- **Industrial hazardous waste**: India produces approximately 51.1 MMT (million metric tonnes) of waste annually, with around 7.46 MMT of hazardous waste. Approximately 3.41 MMT (46%) is landfilled, 0.69 MMT (9%) is incinerated, and 3.35 MMT (45%) is recycled. Gujarat is the highest producer of hazardous wastes in India. Industrial wastes include chemical residues, metallic and nuclear wastes. Large number of industrial chemicals, dyes, acids, etc. find their way into the soil and are known to be carcinogenic.
- **Bio-Medical waste**: As per Assocham, the total quantity of medical waste generated in India is 550 tonnes per day (TPD) and by 2022, it is likely to increase to 775.5 TPD.
- **Electronic Waste**: India generates about 1.85 million tonnes per annum of e-waste and ranks fifth in the world among top e-waste producing countries. E-waste can be toxic, is not biodegradable and accumulates in the environment, in the soil, air, water and living things.
- **Hence, option (d) is the correct answer.**

Q 92.C

- **Recently, Sudan's eruption into conflict has left international consumer goods makers racing to shore up supplies of gum arabic.**
- **'Gum Arabic'** is a **natural gum** derived from the **hardened sap of two species of the Acacia tree** – Senegalia Senegal and Vachellia seyal. The gum is harvested commercially from wild trees, mostly in **Sudan (80%) and throughout the Sahel (from Senegal to Somalia).**
- In their manufacturing process, food and drink companies use a spray-dried version of the gum that is powder-like. While cosmetics and printing manufacturers may be able to use substitutes, there is **no alternative to gum arabic in fizzy drinks, where it prevents ingredients from separating.**
- **Hence, option (c) is the correct answer.**

Q 93.C

- **Bishnoi Tribe of Rajasthan**: Bishnois consider trees as sacred and protect the entire ecosystem including animals and birds that exists in their villages. The tribe has organized their own Tiger Force which is a brigade of youth actively pursuing wildlife protection.
- **Chenchu Tribe of Andhra Pradesh**: They are involved in **tiger conservation at Nagarjunasagar Srisailam Tiger Reserve (NSTR)**. The tribe has been coexisting with tigers and wild animals for a long without disturbing the ecological balance, which ensures enough water and fodder for the herbivores.
- **Maldhari Tribe in Junagadh (Gujarat)**: The success of lion conservation in the Gir forest area is due to the peaceful coexistence of tribes with lions.
- **Bugun Tribe of Arunachal Pradesh:** The tribe using Community-led conservation initiatives and traditional knowledge helped to protect the critically endangered bird Bugun Liocichla. For its efforts, Singchung Bugun Community Reserve won the India Biodiversity Award 2018.
- **Nyishi tribe of Arunachal Pradesh** in conserving hornbills in the Pakke/Pakhui Tiger Reserve. Recently, the government of Arunachal Pradesh declared the Pakke Paga Hornbill Festival (PPHF)–the state's only conservation festival, as a 'state festival'.
- **Hence, option (c) is the correct answer.**

Q 94.A

- Parasitism involves a parasite living in or on another living species called the host. **Parasitism is beneficial to one species (parasite) and harmful to the other species (host).** The parasite gets its nourishment and often shelter from its host.
- Parasites that feed on the external surface of the host organism are called ectoparasites. The most familiar examples of this group are the lice on humans and ticks on dogs. **Cuscuta, a parasitic plant that is commonly found growing on hedge plants, has lost its chlorophyll and leaves in the course of evolution.** It derives its nutrition from the host plant which it parasitizes. **Hence option 1 is correct.**
- Endoparasites are those that live inside the host body at different sites (liver, kidney, lungs, red blood cells, etc.). Brood parasitism in birds is an example of parasitism in which the parasitic bird lays its eggs in the nest of its host and lets the host incubate them.
- **Commensalism is the interaction in which one species benefits and the other is neither harmed nor benefited.**
- **The cattle egret and grazing cattle in close association, is a classic example of commensalism.** The egrets always forage close to where the cattle are grazing because the cattle, as they move, stir up and flush out insects from the vegetation that otherwise might be difficult for the egrets to find and catch. **Hence option 2 is not correct.**
- **Mutualism confers benefits on both interacting species.** Lichens represent an intimate mutualistic relationship between a fungus and photosynthesizing algae or cyanobacteria. Similarly, the mycorrhizae

are associations between fungi and the roots of higher plants. Another example of Mutualism is a **symbiotic relationship between an anemone and a clownfish** the anemone provides the clownfish with protection and shelter, while the clownfish provides the anemone nutrients in the form of waste while also scaring. **Hence option 3 is not correct.**

Q 95.B

- **Sikkim Integration**
- **Why in the news?**
  - The 22nd Sikkim Day was celebrated on May 16, 2023, recalling the history of the former kingdom's integration with India in 1975.
  - **Sikkim Kingdom:**
    - ✓ The kingdom of Sikkim was established in 1642.
    - ✓ Phuntsong Namgyal was the first ruler of Chogyal (king) of Sikkim. **Hence, statement 1 is correct.**
    - ✓ Sikkim's Chogyal dynasty was of Tibetan origin.
    - ✓ Sikkim often saw conflicts over land with Bhutan and Nepal.
    - ✓ The Namgyal dynasty came to an end with the statehood of Sikkim and the position of Chogyal was abolished.
  - **Sikkim in the British era:**
    - ✓ The British saw Sikkim as a buffer state against China and against Nepal, with whom they fought in the Anglo-Gorkha War of 1814-16.
    - ✓ In the Anglo-Gorkha War, the British helped Sikkim secure a number of territories that Nepal had previously captured.
    - ✓ The monarchy of the Namgyal dynasty was maintained for the next 333 years, until its integration with India in 1975.
    - ✓ The Treaty of Tumlong in 1861 gave the British control over Sikkim but the Chogyals continued to hold onto power.
  - **Post-Independence:**
    - ✓ After India's independence, princely states had the option to accede to India or Pakistan.
    - ✓ In 1950, the Indo-Sikkim Treaty was signed, making Sikkim an Indian protectorate.
    - ✓ India controlled Sikkim's defense, external affairs, and strategic communications.
    - ✓ In 1974, a new constitution for Sikkim was adopted, which restricted the role of the monarch to a titular post.
    - ✓ A referendum was held in Sikkim in 1975 and the majority of people voted in favor of joining India. **Hence, statement 2 is not correct.**
    - ✓ The 36th Constitutional Amendment Act was passed in Parliament to recognize Sikkim as a state in the Union of India. **Hence, statement 3 is correct.**
    - ✓ With the assent of then President Fakhruddin Ali Ahmed, Sikkim became the 22nd Indian state on May 16, 1975.

Q 96.A

- Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of weight (gm–2) or energy (kcal m–2). **The gross primary productivity (GPP) of an ecosystem is the rate of production of organic matter** during photosynthesis. **Hence, statement 1 is correct.**
- A considerable amount of GPP is utilized by plants in respiration. Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP). **Net primary productivity is the available biomass for the consumption** of **heterotrophs** (herbivores and decomposers). **Secondary productivity** is defined as the **rate of formation of new organic matter by consumers**. **Hence, statement 2 is not correct.**
- Primary productivity varies in different types of ecosystems. The **annual net primary productivity of the whole biosphere is approximately 170 billion tons (dry weight) of organic matter.** Of this, despite occupying about 70 percent of the surface, the productivity of the oceans are only 55 billion tons (only 32 %). The rest of the 115 billion tons (67% of the total) is on land.

Q 97.A

- **Water pollutants** can be of multiple types including- **Biological, Chemical, Thermal**, etc.
- The **Biological pollutants** include pathogens such as ***Escherichia coli, Enterococcus faecalis (formely known as Streptococcus faecalis), Salmonella typhi,*** etc. **Hence, option (a) is the correct answer.**

- **Pathogens** include **bacteria** and other **organisms** that enter the water from domestic sewage and animal excreta.
- **Human excreta** contains bacteria such as *Escherichia coli* and *Streptococcus faecalis* which cause **gastrointestinal diseases.**

Q 98.C

- **Agenda 21, established at the 1992 United Nations Conference on Environment and Development, or "Earth Summit", in Rio de Janeiro, Brazil, is the blueprint for sustainability in the 21st century.** Agenda 21 is a commitment to sustainable development, which was agreed by many of the world's governments. Nations that have pledged to take part in Agenda 21 are monitored by the International Commission on Sustainable Development and are encouraged to promote Agenda 21 at the local and regional levels within their own countries. Agenda 21 addresses the development of societies and economies by focusing on the conservation and preservation of our environments and natural resources. **Hence, option (c) is the correct answer.**
- Agenda 21, the Rio Declaration on Environment and Development, and the Statement of Principles for the Sustainable Management of Forests were adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992.
- The Commission on Sustainable Development (CSD) was created in December 1992 to ensure effective follow-up of UNCED and to monitor and report on the implementation of the agreements at the local, national, regional, and international levels. It was agreed that a five-year review of Earth Summit progress would be made in 1997 by the United Nations General Assembly meeting in a special session.
- The full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21, and the Commitments to the Rio principles were strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa from 26 August to 4 September 2002.

Q 99.A

- **Recent Context:** Calling it an attempt to indulge in 'bench hunting', a former Supreme Court judge refused to recuse himself from hearing a plea.
- **What is recusal?** It is the act of declining to take part in an official activity, such as a court case because the administrative or court authority presiding over it has a conflict of interest. **Hence, statement 1 is correct.**
  - This conflict of interest can arise in many ways: from holding shares in a litigant company to having a prior or personal association with a party.
  - The practice of judicial recusals stems from:
    - ✓ The cardinal principles of due process of law
    - ✓ Nemo judex in sua causa – no person shall be a judge in his own case.
- **Why do judges recuse?** To prevent the perception that the judge was biased while deciding a case.
- **What is the procedure for recusal?**
  - Although several SC judgments have dealt with the issue, **India has no codified rules governing recusals. Hence, statement 2 is not correct.**
  - There are two kinds of recusals: automatic (where a judge himself withdraws from the case) or when a party raises a plea for recusal.
  - The decision to recuse rests solely on the conscience and discretion of the judge and no party can compel a judge to withdraw from a case.
  - If a judge recuses himself, the case is listed before the Chief Justice for allotment to an alternate Bench.

Q 100.C

- A specified area in which multiple use of land is allowed by dividing it into different zones and each zone, which remains specified for a particular activity, is called a Biosphere Reserve.
- A number of biosphere reserves have been established by United Nations Educational Scientific and Cultural Organisation (UNESCO) under its Man And Biosphere Programme (MAB)-1986 in different countries. The biosphere reserves have international networks.
- **Each of the biosphere reserves has been divided into three zones**. **Hence statement 1 is not correct.**
  - **Core Zone, where human interference is banned completely**
  - Buffer Zones, where human interference is allowed up to a limited extent.
  - **Manipulated Zone or Transition Zones, where humans are free to perform their activities. Hence statement 2 is not correct.**

- The biosphere reserves are planned, managed and protected through joint efforts of the government, non-governmental organizations and the local people. India has declared 18 areas as biosphere reserves. These areas are aimed at
  - Conservation of biodiversity (species, ecosystem, and landscapes).
  - Development of economic and human infrastructures.
  - Promotion of education, information – exchange and research pertaining to conservation and development.
- The Biosphere Reserves have the following functions:
  - The biosphere reserves are helpful in the conservation of ecosystems, species and other resources.
  - The biosphere reserves are helpful in the promotion of economic development.
  - **Biosphere reserves are helpful in promoting scientific research and education. Hence statement 3 is correct.**