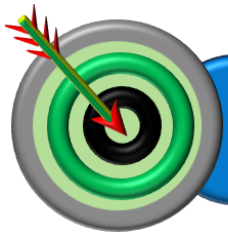
Chapter
13

Biodiversity and Conservation



OBJECTIVES

- **INTRODUCTION**
- **BIODIVERSITY**
- **BIODIVERSITY CONSERVATION**

INTRODUCTION

Earth is a diverse planet as it consists more than 20,000 species of ants, 3,00,000 species of beetles, 28,000 species of fishes and nearly 20,000 species of orchids. Ecologists and evolutionary biologists have been trying to understand the significance of such diversity.

13.1 BIODIVERSITY

Biodiversity is the variety of life on Earth, including all genes, species, and ecosystems. It's essential for life on Earth, including humans, and is vital for climate change mitigation.

Biodiversity is the term popularised by the sociobiologist Edward Wilson to describe the combined diversity at all the levels of biological organisation. In our biosphere immense diversity (or heterogeneity) exists not only at the species level but at all levels of biological organisation ranging from macromolecules within cells to biomes.

The most important of them are–

(i) Genetic diversity:

Genetic diversity is observed in a single species that shows high diversity at the genetic level over its distributional range.

Example- The genetic variation shown by the medicinal plant Rauwolfia vomitoria growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces.

India has more than 50,000 genetically different strains of rice, and 1.000 varieties of mango.

(ii) Species diversity: The species diversity is observed at the species level.

Example- the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.

(iii) Ecological diversity: Diversity at the ecosystem level is ecological diversity.

Example- India with its deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway.

13.1.1 How Many Species are there on Earth and How Many in India?

According to the International Union for Conservation of Nature and Natural Resources (IUCN) (2004), the total number of plant and animal species described so far is slightly more than 1.5 million. According to Robert May the global species diversity at about 7 million.

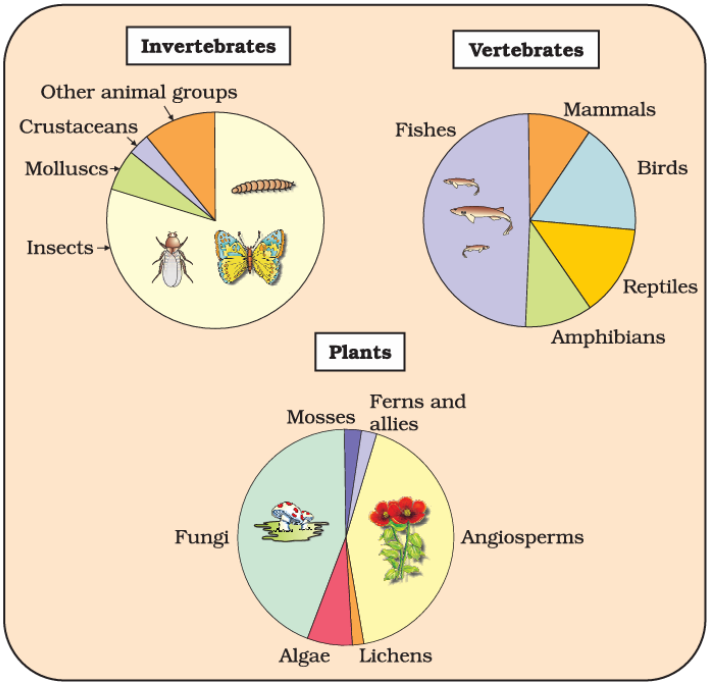


Fig.: Representing global biodiversity: proportionate number of species of major taxa of plants, invertebrates and vertebrates

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. 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. The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals.

India has only 2.4 per cent of the world's land area but its share of the global species diversity is 8.1 per cent. That makes our country one of the 12 mega diversity countries of the world. Nearly 45,000 species of plants and twice as many of animals have been recorded from India. There are probably more than 1,00,000 plant species and more than 3,00,000 animal species yet to be discovered and described.

Critical Thinking

Prokaryotes can-not be estimated as Biologists are not sure about how many prokaryotic species there might be and conventional taxonomic methods are not suitable for identifying microbial species and many species are simply not culturable under laboratory conditions. Their diversity alone might run into millions.

13.1.2 Patterns of Biodiversity

(i) Latitudinal gradients: The diversity of plants and animals shows 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.

Species diversity decreases as we move away from the equator towards the poles.

Tropics (latitudinal range of 23.5° N to 23.5° S) harbour more species than temperate or polar areas.

Example:

- 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.
- India, with much of its land area in the tropical latitudes, has more than 1,200 species of birds.
- A forest in a tropical region like Equador 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.
- The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth with more than 40,000 species of plants, 3,000 of fishes, 1,300 of birds, 427 of mammals, 427 of amphibians, 378 of reptiles and of more than 1,25,000 invertebrates.

Tropics have greater biological diversity and Ecologists and evolutionary biologists have proposed various hypotheses; some important ones are -

a) 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,
b) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity and
c) There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

(ii) Species-Area relationships: Species area relationship hypothesis was proposed by the great German naturalist and geographer Alexander von Humboldt during his pioneering and extensive explorations in the wilderness of South American jungles. Alexander von Humboldt observed that within a region species richness increased with increasing explored area, but only up to a limit.

In fact, the relation between species richness and area for a wide variety of taxa (angiosperm plants, birds, bats, freshwater fishes) turns out to be a rectangular hyperbola. On a logarithmic scale, the relationship is a straight line described by the equation

$$\log(S) = \log(C) + Z \log(A)$$

where S = Species richness A = Area

Z = slope of the line (regression coefficient) C = Y-intercept

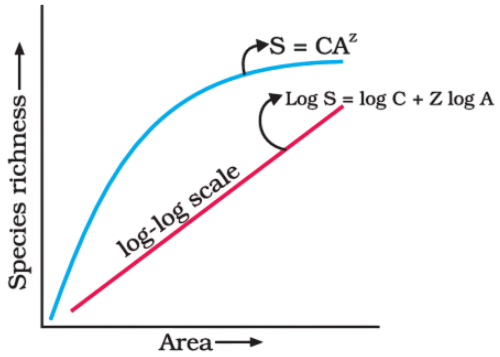


Fig.: Showing species area relationship

The value of Z lies in the range of 0.1 to 0.2, regardless of the taxonomic group or the region (whether it is the plants in Britain, birds in California or molluscs in New York state, the slopes of the regression line are amazingly similar).

The species-area relationships among very large areas like the entire continents, the slope of the line to be much steeper (Z values in the range of 0.6 to 1.2).

Example: For frugivorous (fruit-eating) birds and mammals in the tropical forests of different continents, the slope is found to be 1.15. In two areas, one small and one large, the larger area with the steeper slope would be expected to have significantly more species of fruit-eating birds and mammals.

13.1.3 The importance of Species Diversity to the Ecosystem

For many decades, ecologists believed that communities with more species, generally, tend to be more stable than those with less species.

A stable community should not show too much variation in productivity from year to year; it must be either resistant or resilient to occasional disturbances (natural or man-made), and it must also be resistant to invasions by alien species.

Tilman's long-term ecosystem experiments using outdoor plots and found that plots with more species showed less year-to-year variation in total biomass. He also showed that in his experiments, increased diversity contributed to higher productivity.

The rich biodiversity is not only essential for ecosystem health but imperative for the very survival of the human race on this planet.

The Rivet Popper Hypothesis:

The 'rivet popper hypothesis' is an analogy used by Stanford ecologist Paul Ehrlich.

According to this hypothesis, in an airplane (ecosystem) all parts are joined together using thousands of rivets (species). If every passenger travelling in it starts popping a rivet to take home (causing a species to become extinct), it may not affect flight safety (proper functioning of the ecosystem) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time.

Loss of rivets on the wings (key species that drive major ecosystem functions) is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.

13.1.4 Loss of Biodiversity

The biological wealth of our planet has been declining rapidly because of 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. The last twenty years alone have witnessed the disappearance of 27 species. 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.

- According to analysis of records shows that extinctions across taxa are not random; some groups like amphibians appear to be more vulnerable to extinction and more than 15,500 species world-wide 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.
- The study of the history of life on earth through fossil records show that large-scale loss of species have happened earlier even before humans appeared. During the long period (> 3 billion years) since the origin and diversification of life on earth there have been five episodes of mass extinction of species.
- The 'Sixth Extinction' presently in progress with the current species extinction rates, estimated to be 100 to 1,000 times faster than in the pre-human times and human 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.

In general, loss of biodiversity in a region may lead to

(a) Decline in plant production
(b) Lowered resistance to environmental perturbations such as drought
(c) Increased variability in certain ecosystem processes such as plant productivity, water use, and pest and disease cycles.

Causes of biodiversity losses:

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).

(i) Habitat loss and fragmentation:

Habitat loss and fragmentation the most important cause driving animals and plants to extinction. Loss of habitat occur due to population expansion, urbanization, more agriculture area formation by human.

The most dramatic examples of habitat loss come from tropical rain forests. Amazon rain forest is so huge that it is called the 'lungs of the planet'. Once covering more than 14 per cent of the earth's land surface, these rain forests now cover no more than 6 per cent. The Amazon rain forest harbours probably millions of species is being cut and cleared for cultivating soya beans or for conversion to grasslands for raising beef cattle.

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.

(ii) Over-exploitation:

Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to 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.

(iii) Alien species invasions:

When alien (non-native) species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous (native) 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.

In India, invasive weed species like carrot grass (Parthenium), Lantana and water hyacinth (Eicchornia) caused and threat posed to native species by the environmental damage

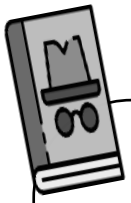
The African catfish Clarias gariepinus for aquaculture purposes is posing a threat to the indigenous catfishes in Indian rivers.

(iv) Co-extinctions:

When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. This represents the certain mutualistic relationship in nature.

When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate.

In the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other.



RED DATA BOOK / IUCN RED LIST

The IUCN Red List is a critical indicator of the health of the world's biodiversity. Far more than a list of species and their status, it is a powerful tool to inform and catalyse action for biodiversity conservation and policy change, critical to protecting the natural resources

Species are classified by the IUCN Red List into nine groups, specified through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation.

Extinct (EX) – Species completely disappeared from all the parts of earth.

Extinct in the wild (EW) –Species disappeared from natural habitat but survives only in captivity, cultivation and/or outside native range, as presumed after exhaustive surveys.

Critically endangered (CR) – Species facing a high risk of extinction and can become extinct in immediate future any moment.

Endangered (EN) –Species in very high risk of extinction in the wild in near future.

Vulnerable (VU) – Species considered to be at high risk of unnatural (human-caused) extinction without further human intervention.

Near Threatened (NT) – Species close to being endangered in the near future.

Lower Risk (LR) – Species unlikely to become endangered or extinct in the near future.

Data Deficient (DD) - IUCN having insufficient data for species to a proper assessment of conservation.

Not Evaluated (NE) - A species which has been categorised under the IUCN Red list of threatened species as not yet have been assessed by the International Union for Conservation of Nature.

In the IUCN Red List, "threatened" embraces the categories of Critically Endangered, Endangered, and Vulnerable.

TOPIC CENTRIC EXERCISE -01

Q1. Species area relationship on log scale is -

(a) Linear (b) Rectangular hyperbola

(c) J shaped (d) S shaped

Q2. Increased diversity contributed to higher productivity. Given statement was provided by-

(a) Darwin (b) Tilman

(c) Humboldt (d) May

Q3. How many fishes species are found in amazon rain forest?

(a) 1300 (b) 3000

(c) 40,000 (d) None of them

Q4. Which invertebrate group is highest in diversity?

(a) Crustacean (b) Molluscs

(c) Fishes (d) Insects

Q5. Different strains of rice variety show-

(a) Genetic diversity (b) Species diversity

(c) Both (d) None

13.2 BIODIVERSITY CONSERVATION

13.2.1 Why Should We Conserve Biodiversity?

The reasons to conserve biodiversity can be grouped into three categories:

1. **Narrowly Utilitarian Reasons**

   Biodiversity provides direct **economic benefits** to humans.

   It serves as a source of **food** (cereals, pulses, fruits), **firewood**, **fiber**, **construction materials**, and **industrial products** (tannins, lubricants, dyes, resins, perfumes).

   Many medicinal products are derived from biodiversity; over 25% of global drugs come from plants, and 25,000 plant species contribute to traditional medicine.

   Unexplored species in tropical rainforests may still hold valuable medicinal properties. Countries with rich biodiversity can benefit significantly from bioprospecting, exploring genetic and molecular diversity for products of economic value.

2. **Broadly Utilitarian Reasons**

   Biodiversity supports ecosystem services that are crucial for life on Earth.

   Example: The Amazon rainforest contributes to 20% of the total oxygen in Earth's atmosphere through photosynthesis.

   Natural pollinators (bees, bumblebees, birds, bats) play a vital role in pollination, essential for fruit and seed production. If these services were lost, artificial substitutes would be expensive and inefficient.

   Nature also provides intangible benefits, such as aesthetic pleasures, mental well-being, and recreational value. Enjoying nature, like walking through forests, seeing blooming flowers, or hearing birds sing, is **priceless**.

3. **Ethical Reasons**

   Every species, whether economically valuable or not, has intrinsic value and a right to exist. Humans have a moral responsibility to protect biodiversity. We must preserve species and ecosystems for future generations, ensuring they inherit a thriving natural world.

13.2.2 How do we conserve Biodiversity?

To conserve biodiversity, two strategies are involved-

(a) In-situ conservation

(b) Ex-situ conservation

There are situations where an animal or plant is endangered or threatened (organisms facing a very high risk of extinction in the wild in the near future) and needs urgent measures to save it from extinction, ex situ (off site) conservation is the desirable approach.

(a) In situ conservation-

Species are conserved inside their natural habitat. This practice can be performed in –

Hotspot- Biodiversity hotspots are regions with very high levels of species richness and high degree of endemism (that is, species confined to that region and not found anywhere else).

- Initially 25 biodiversity hotspots were identified but subsequently nine more have been added to the list, bringing the total number of biodiversity hotspots in the world to 34. These hotspots are also regions of accelerated habitat loss. Three of these hotspots Western Ghats and Sri Lanka, Indo-Burma and Himalaya - cover our country's exceptionally high biodiversity regions.
- Although all the biodiversity hotspots put together cover less than 2 per cent of the earth’s land area, the number of species they collectively harbour is extremely high and strict protection of these hotspots could reduce the ongoing mass extinctions by almost 30 per cent.

Protected areas- In India, ecologically unique and biodiversity-rich regions are legally protected as biosphere reserves, national parks and sanctuaries. India now has 14 **biosphere reserves**, 90 **national parks** and 448 **wildlife sanctuaries**.

India has also a history of religious and cultural traditions that emphasised 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 as **sacred groves**. Such sacred groves are found in Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and the Sarguja, Chanda and Bastar areas of Madhya Pradesh. In Meghalaya, the sacred groves are the last refuges for a large number of rare and threatened plants.

(b) Ex situ Conservation-

Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. ex situ conservation has advanced beyond keeping threatened species in enclosures.

Offsite conservation of species includes species conservation in Zoological parks, botanical gardens and wildlife safari parks. There are many animals that have become extinct in the wild but continue to be maintained in zoological parks.

Cryopreservation technique includes preservation of gametes of threatened species in viable and fertile condition at −196° using liquid nitrogen for long periods. Eggs can be fertilised in vitro.

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**.

International Efforts for Conserving Biodiversity

Biodiversity conservation is a collective responsibility of all nations. The historic Convention on Biological Diversity (The Earth Summit') held in Rio de Janeiro in 1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.

The World Summit on Sustainable Development held in 2002 in Johannesburg, South Africa, 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.

TOPIC CENTRIC EXERCISE -02

Q1. Biodiversity plays a major role in many ecosystem that nature provides. Given statement is from which argument?

(a) Narrowly utilitarian argument (b) Broadly utilitarian argument
(c) Ethical argument (d) None of them

Q2. Endemism in observed in -

(a) Zoological park (b) National park
(c) Biodiversity hotspot (d) Biosphere reserve

Q3. In Meghalaya, Sacred grooves are found in areas-

(a) Aravali hills (b) Western ghat regions
(c) Khasi (d) Chanda

Q4. Many extinct species in wild are maintained in-

(a) Cryopreservation (b) National park
(c) Seed bank (d) Zoological park

Q5. Earth summit was held in –

(a) Year 1982 (b) Rio de Janerio
(c) 2000 (d) South Africa

Difference between in-situ conservation and ex-situ conservation

Feature	In Situ Conservation	Ex Situ Conservation
Definition	Conservation of species in their natural habitat.	Conservation of species outside their natural habitat.
Examples	National parks, wildlife sanctuaries, biosphere reserves.	Zoos, botanical gardens, seed banks, gene banks.
Species Adaptation	Species remain in their natural environment and adapt naturally.	Species may require special care and artificial conditions for survival.
Cost and Maintenance	Generally less expensive and requires long-term habitat protection.	More expensive due to controlled conditions, feeding, and breeding programs.
Genetic Diversity	Maintains natural genetic variation and ecosystem interactions.	May have limited genetic diversity due to selective breeding and small population size.

Solved Examples

Ex: 1- 'Biodiversity' was popularized

(a) To describe the combined diversity (b) To describe individual diversity
(c) To describe plant diversity (d) None of the above

Sol. **(a):** Biodiversity refers to the total diversity of life across all levels—genes, species, and ecosystems.

Ex: 2- Ecological diversity can be observed in

(a) Deserts (b) Rain forests, Mangroves
(c) Coral reefs, Wetlands (d) All of the above

Sol. **(d):** Deserts, rainforests, mangroves, coral reefs, and wetlands all show varying ecosystems—hence ecological diversity.

Ex: 3- India is one of the …… mega diversity countries of the world

(a) 13 (b) 14
(c) 12 (d) 11

Sol. **(c):** India is among the 12 countries recognized as mega biodiversity-rich nations.

Ex: 4- How many species of birds found in India?

(a) 1500 (b) 14000
(c) 1200 (d) 1700

Sol. **(c):** Around 1200 species of birds have been recorded in India, contributing to its biodiversity.

Ex: 5- Which one is correct about a stable community?

(a) It should not show too much variation in productivity from year to year
(b) It must be either resistant or resilient to man-made disturbance
(c) It must also be resistant to invasions by alien species
(d) All of these are correct

Sol. **(d):** A stable community is productive, resistant/resilient, and resists alien species invasions.

Ex: 6- Subspecies of tiger which become recent extinct are from-

(a) Bali (b) Caspian
(c) Javan (d) All of these

Sol. **(d):** Tigers from Bali, Caspian, and Java are subspecies that have recently gone extinct.

Ex: 7- The Amazon rainforest harbouring probably millions of species to, is being cut and cleared for.

(a) For cultivating soya beans. (b) Conversion to grassland for raising beef cattle.
(c) Cultivating new forest. (d) Both (a) and (b) are correct.

Sol. **(d):** Amazon is being cleared for soya cultivation and cattle grazing land.

Ex: 8- More than 25% of the drugs currently sold in the market worldwide are derived from __i__ and __ii__ species of plants contribute to the traditional medicines used by native peoples around the world.

(a) i- plants, ii- 25,000 (b) i- Animals, ii- 25,000
(c) i- Animals, ii- 25,00 (d) i- plants, ii- 25,00

Sol. **(a):** Over 25% of medicines originate from plants; around 25,000 plant species are used in traditional medicine.

Ex: 9- Which one is not included under in-situ conservation?

(a) Biosphere reserves (b) National parks
(c) Zoological parks (d) Sacred graves

Sol. **(c):** Zoological parks are *ex-situ* conservation methods, as organisms are preserved outside their natural **ha**bitat.

Ex: 10- In recent years, which type of conservation has advanced beyond keeping threatened species in enclosures?

(a) In-situ conservation (b) Ex-situ conservation
(c) None of these (d) Both (a) & (b)

Sol. **(b):** Ex-situ conservation now includes advanced methods like gene banks, seed banks, and tissue culture.

Exercise-01 Level -01

1. Who popularized the term "biodiversity" to describe the combined diversity at all biological levels?
(a) Charles Darwin (b) Edward Wilson
(c) Carl Linnaeus (d) Alfred Wallace

2. What is an example of genetic diversity?
(a) The diversity of plant species in the Amazon rainforest
(b) The genetic variation in Rauwolfia vomitoria across Himalayan ranges
(c) The number of insects in tropical regions
(d) The variety of mammals in the polar regions

3. How many species of ants are estimated to exist on Earth?
(a) 5,000 (b) 10,000
(c) 20,000 (d) 50,000

4. According to the chapter, how many species of beetles are there on Earth?
(a) 20,000 (b) 50,000
(c) 100,000 (d) 300,000

5. What percentage of global species diversity is found in India despite its land area being only 2.4% of the world's total?
(a) 5.4% (b) 8.1%
(c) 10.2% (d) 12.1%

6. How many plant species have been recorded in India?
(a) 20,000 (b) 45,000
(c) 100,000 (d) 200,000

7. The total number of plant and animal species described by 2004 is slightly more than how many million?
(a) 1 million (b) 1.5 million
(c) 2 million (d) 2.5 million

8. What is the most species-rich taxonomic group among animals?
(a) Mammals (b) Amphibians
(c) Birds (d) Insects

9. The number of species of fungi exceeds the combined total of species in which groups?
(a) Mammals, birds, and amphibians
(b) Fishes, amphibians, reptiles, and mammals
(c) Insects, plants, and birds
(d) Fishes, insects, and fungi

10. What is the challenge regarding the number of prokaryotic species on Earth?
(a) They are difficult to identify using conventional taxonomic methods
(b) They are less diverse compared to eukaryotes
(c) They have already been fully catalogued
(d) They are not considered in biodiversity estimates

11. What is one of the primary factors contributing to the higher species diversity in tropical regions, according to the hypotheses?
(a) More extreme seasonal changes
(b) Less solar energy availability
(c) Longer evolutionary time without disturbances like glaciations
(d) Increased human intervention in the ecosystem

12. The diversity of species decreases as we move away from which geographical feature?
(a) The equator (b) The mountains
(c) The coastlines (d) The deserts

13. Rivet Popper Hypothesis is proposed by
(a) Paul Ehrich (b) David Tilman
(c) Robert May (d) Darwin

14. Which of the following is true regarding the biodiversity of tropical forests in comparison to temperate forests?
(a) Tropical forests have a lower species diversity than temperate forests
(b) Tropical forests have more species of vascular plants than temperate forests
(c) Temperate forests have more species of insects than tropical forests
(d) There is no significant difference in biodiversity between tropical and temperate forests

15. How many species of birds are found in Colombia, located near the equator?
(a) 500 (b) 1,200
(c) 1,400 (d) 2,000

16. What percentage of the world's land area is occupied by India?
(a) 5.4% (b) 8.1%
(c) 2.4% (d) 1.5%

17. The Amazon rainforest is estimated to have how many species of plants?
(a) 20,000 (b) 40,000
(c) 100,000 (d) 200,000

18. What is the estimated total number of species yet to be discovered in India, assuming global estimates hold?
(a) 50,000 species
(b) 100,000 plant species and 300,000 animal species

(c) 200,000 species
(d) 1,000 species

19. Why do tropical latitudes have higher biodiversity?
(a) They are warmer, which limits species growth
(b) They have more frequent glaciations than temperate regions
(c) They have relatively more constant and predictable environments
(d) They have less solar energy than temperate regions

20. Which country, according to the text, has more species of birds than New York and Greenland combined?
(a) Brazil (b) India
(c) Colombia (d) Australia

21. What was the main observation made by Alexander von Humboldt regarding species richness?
(a) It decreases with increasing area
(b) It increases with increasing area, up to a limit
(c) It remains constant regardless of area
(d) Species richness is not related to area

22. The relationship between species richness and area in a variety of taxa follows which type of curve?
(a) Parabolic
(b) Rectangular hyperbola
(c) Exponential
(d) Logarithmic

23. On a logarithmic scale, the relationship between species richness and area becomes a:
(a) Parabola (b) Line
(c) Hyperbola (d) Sine curve

24. What is the range of the slope (Z) of the species-area relationship in most taxonomic groups?
(a) 0.6 to 1.2 (b) 0.1 to 0.2
(c) 0.5 to 1.0 (d) 0.2 to 0.4

25. When analyzing species-area relationships on very large areas like continents, the slope of the regression line tends to be:
(a) Shallower (b) Steeper
(c) Horizontal (d) Equal to 1

26. What does a steeper slope in the species-area relationship imply?
(a) More species are lost with a decrease in area
(b) The number of species does not vary with area
(c) Species richness increases disproportionately with area
(d) Species richness decreases disproportionately with area

27. What does stability in a biological community refer to?
(a) High biodiversity
(b) Low species richness
(c) Resistance and resilience to disturbances
(d) High productivity only

28. David Tilman's long-term ecosystem experiments showed that increased species diversity led to:
(a) Higher resistance to climate change
(b) Lower productivity
(c) Higher productivity and less variation in biomass
(d) Decreased resistance to pests

29. The "rivet popper hypothesis" suggests that:
(a) Extinctions do not affect ecosystem function
(b) The loss of species is comparable to removing rivets from an airplane
(c) Species loss is beneficial in the long run
(d) All species are equally important for ecosystem function

30. What is a key feature of the "Sixth Extinction" compared to previous mass extinctions?
(a) It occurred naturally without human involvement
(b) It is happening at a much faster rate due to human activities
(c) It only affects marine species
(d) It is caused by natural climatic changes

31. What percentage of all bird species are currently facing the threat of extinction according to the IUCN Red List?
(a) 5% (b) 12%
(c) 20% (d) 50%

32. Which of the following is NOT one of the major causes of biodiversity loss, known as the "Evil Quartet"?
(a) Habitat loss and fragmentation
(b) Climate change
(c) Over-exploitation
(d) Alien species invasions

33. Habitat loss and fragmentation primarily affect:
(a) Species with large territorial needs and migratory species
(b) Marine species
(c) Species with high reproductive rates
(d) Desert species

34. Over-exploitation has contributed to the extinction of species such as:
(a) Cheetah (b) Passenger pigeon
(c) Blue whale (d) Panda

35. Which of the following species is an example of a species extinction due to alien species invasions?
(a) Passenger pigeon
(b) Nile perch in Lake Victoria
(c) Steller's Sea Cow
(d) Quagga

36. Co-extinctions refer to the extinction of:
(a) Species that occupy the same geographical region
(b) Species that are genetically similar
(c) Species that are ecologically linked, such as plant-pollinator pairs
(d) Species that are competitors

37. Why is the Amazon rainforest referred to as the "lungs of the planet"?
(a) Because it produces 20% of the earth's oxygen through photosynthesis
(b) Because it is the largest producer of carbon dioxide
(c) Because it absorbs the majority of global pollution
(d) Because it is the largest carbon sink

38. Which ecosystem service is provided by pollinators such as bees and bats?
(a) Soil fertility
(b) Pollination for fruit and seed production
(c) Water filtration
(d) Carbon sequestration

39. The ethical argument for conserving biodiversity suggests:
(a) Species are valuable only if they provide direct economic benefits
(b) Species have an intrinsic value, regardless of their economic worth to humans
(c) Only endangered species should be preserved
(d) Biodiversity conservation should be driven by market demand

40. In situ conservation refers to:
(a) Protecting species in their natural habitats
(b) Preserving species in botanical gardens
(c) Keeping species in zoos and aquariums
(d) Genetic preservation of species outside their habitat

41. The concept of "biodiversity hotspots" refers to regions that are:
(a) Low in species richness
(b) High in species richness and endemism, but undergoing accelerated habitat loss
(c) Free from human interference
(d) Mainly focused on plant species conservation

42. India's biodiversity is legally protected through:
(a) National parks, biosphere reserves, and wildlife sanctuaries
(b) Religious traditions alone
(c) Private sector initiatives
(d) Military interventions

43. Sacred groves in India are an example of:
(a) Ex situ conservation
(b) Traditional in situ conservation
(c) Modern zoo-based conservation
(d) Industrial conservation

44. Ex situ conservation includes all of the following except:
(a) Zoological parks
(b) Botanical gardens
(c) Cryopreservation of gametes
(d) Protecting ecosystems in their natural state

45. Cryopreservation techniques in ex situ conservation are used for:
(a) Preserving animal behavior
(b) Keeping gametes of threatened species viable for long periods
(c) Cloning species
(d) Growing plants in tissue culture

46. The World Summit on Sustainable Development in 2002 focused on:
(a) Increasing biodiversity loss
(b) Achieving a significant reduction in biodiversity loss
(c) Exploiting natural resources for economic growth
(d) Expanding agricultural lands

47. Which of the following is true about biodiversity hotspots?
(a) They cover more than 50% of the earth's land area
(b) They are regions with high levels of species richness and endemism
(c) They are located only in tropical regions
(d) They are unaffected by human activities

48. Which of the following methods is used in ex situ conservation to propagate plants?
(a) Pollination (b) Tissue culture
(c) Habitat restoration (d) Natural breeding

49. The rapid loss of biodiversity is most attributed to:
(a) Natural disasters (b)Human activities
(c) Climate fluctuations (d) Genetic mutations

50. Which of the following ecosystems provides 20% of the Earth's oxygen?
(a) The Amazon rainforest
(b) The Sahara desert
(c) The Arctic tundra
(d) The coral reefs

Exercise-02 Level -02

1. Read the following statements:
I. Biodiversity includes both living and non-living components of an ecosystem.
II. Ecosystem diversity refers to the variety of ecosystems present in a particular area.
III. The loss of biodiversity only affects plant species, not animals.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

2. Read the following statements:
I. The International Union for Conservation of Nature (IUCN) maintains the Red List.
II. The Red List categorizes species based on their risk of extinction.
III. The Red List includes only animal species.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

3. Read the following statements:
I. In-situ conservation involves the preservation of species in their natural habitat.
II. Ex-situ conservation involves the preservation of species outside their natural habitat.
III. Zoos and botanical gardens are examples of in-situ conservation.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

4. Read the following statements:
I. Biodiversity includes diversity at the species, genetic, and ecosystem levels.
II. The Amazonian rainforest has more than 100 species of birds.
III. India has 45,000 species of plants and twice as many animals.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

5. Read the following statements:
I. Tropics have more species than temperate and polar regions.
II. The Western Ghats have more amphibian species than the Eastern Ghats.
III. Species diversity increases as we move away from the equator.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

6. Read the following statements:
I. There are more insect species than any other type of animal species.
II. Fungi species outnumber the combined species of fishes, amphibians, reptiles, and mammals.
III. India's share of global species diversity is less than 1%.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

7. Read the following statements:
I. There are more than 20,000 species of ants on Earth.
II. Robert May estimates that global species diversity is around 7 million.
III. The majority of undiscovered species are in tropical regions.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

8. Read the following statements:
I. The National Wildlife Action Plan was first implemented in 1983.
II. The plan aims to increase the forest cover in India.
III. It also seeks to reduce human-wildlife conflict.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

9. Read the following statements:
I. Tropical regions are home to more species than temperate regions.
II. Tropical environments are less seasonal and more predictable.
III. The Amazon rainforest has fewer species than any other tropical forest.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) II and III are correct.

10. Read the following statements:
I. The number of species on Earth is easy to determine.
II. Insects make up over 70% of animal species on Earth.
III. More species are discovered in temperate countries.
Choose the correct option from below:
(a) I and III are correct.
(b) II and III are correct.
(c) I and II are correct.
(d) I, II, and III are correct.

11. Read the following statements:
I. The concept of species-area relationships was introduced by Alexander von Humboldt.
II. Species richness decreases with increasing area.
III. Species-area relationships for large areas have much steeper slopes than for small areas.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

12. Read the following statements:
I. The latitudinal gradient hypothesis suggests that species diversity decreases as we move from the equator to the poles.
II. Colombia has more bird species than New York due to its tropical location.
III. The tropics are characterized by frequent glaciations in the past.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

13. Read the following statements:
I. The Western Ghats have fewer amphibian species than the Eastern Ghats.
II. India has more than 8% of global species diversity.
III. India has more than 1,200 species of birds.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

14. Read the following statements:
I. Biodiversity is only related to the number of species in an ecosystem.
II. The loss of a few species will not impact ecosystem functioning.
III. Biodiversity helps in maintaining ecosystem stability.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

15. Read the following statements:
I. David Tilman's experiments showed that ecosystems with more species are more stable.
II. Greater species diversity contributes to higher productivity in ecosystems.
III. All ecosystems with fewer species are more resilient to disturbances.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

16. Read the following statements:
I. The 'rivet popper hypothesis' suggests that the loss of species weakens ecosystems over time.
II. Removal of species like rivets from the wings of an airplane is less harmful than from the seats.
III. The rivet popper hypothesis was proposed by Paul Ehrlich.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

17. Read the following statements:
I. The number of species in a community does not matter for the ecosystem's functioning.
II. A stable community should resist disturbances and invasions by alien species.
III. Species diversity is important for maintaining ecosystem health.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

18. Read the following statements:
I. In-situ conservation takes place outside the natural habitats.
II. Biosphere reserves are a form of in-situ conservation.
III. The purpose of biosphere reserves is to conserve both biodiversity and cultural diversity.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

19. Read the following statements:
I. Insects make up more than 70% of animal species.
II. Fungi are more diverse than amphibians, reptiles, and mammals combined.
III. India has a lower percentage of global biodiversity than tropical countries.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

20. Read the following statements:
I. Species diversity increases with the area explored, but only up to a limit.
II. The relationship between species richness and area is described by a logarithmic equation.
III. The species-area relationship is the same for large and small areas.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

21. Read the following statements:
I. The species-area relationship is not consistent across different continents.
II. A species-area relationship can be represented by a rectangular hyperbola.
III. The species-area relationship has a much steeper slope for larger areas.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

22. Read the following statements:
I. Latitudinal gradient theory explains the uneven distribution of species globally.
II. Tropics are less disturbed by glaciations compared to temperate regions.
III. The tropical rainforest has a biodiversity much lower than temperate forests.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

23. Read the following statements:
I. Biodiversity is essential for maintaining the stability of ecosystems.
II. Reduced species diversity does not affect ecosystem productivity.
III. The relationship between biodiversity and ecosystem functioning is still being studied.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

24. Read the following statements:
I. India is home to approximately 45,000 plant species.
II. Biodiversity is concentrated in temperate regions of the Earth.
III. India's biodiversity contributes significantly to global species diversity.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

25. Read the following statements:
I. The stability of a community is linked to its species richness.
II. A species-rich community tends to show less variation in productivity.
III. A species-rich community is less resilient to disturbances.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

26. Read the following statements:
I. The extinction of species has been accelerated due to human activities.
II. The IUCN Red List of 2004 documents the extinction of 784 species over the last 500 years.
III. There have been five episodes of mass extinction of species during Earth's history.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

27. Read the following statements:
I. The disappearance of the dodo is an example of a recent extinction.
II. Some groups, like amphibians, are more vulnerable to extinction than others.
III. The quagga was a species found in the Americas.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

28. Read the following statements:
I. The extinction rates today are estimated to be 100 to 1,000 times faster than in pre-human times.
II. Habitat destruction and fragmentation is the least significant cause of biodiversity loss.
III. The 'Sixth Extinction' is primarily caused by human activities.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

29. Read the following statements:
I. The extinction of species has no impact on the ecosystem's functioning.
II. Loss of biodiversity leads to a decline in plant production and lowered resistance to environmental changes.
III. More than 15,500 species are facing the threat of extinction globally.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

30. Read the following statements:
I. Alien species invasions always harm the native species they come in contact with.
II. The Nile perch in Lake Victoria led to the extinction of over 200 species of cichlid fish.
III. Over-exploitation refers to the unsustainable use of natural resources.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

31. Read the following statements:
I. The introduction of alien species is always intentional.
II. The African catfish Clarias gariepinus poses a threat to indigenous catfish species in India.
III. Habitat loss due to deforestation is a significant cause of species extinction.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

32. Read the following statements:
I. India has 14 biosphere reserves, 90 national parks, and 448 wildlife sanctuaries.
II. India is home to three biodiversity hotspots: Western Ghats, Indo-Burma, and Himalaya.
III. Biodiversity hotspots cover over 50% of the earth's land area.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

33. Read the following statements:
I. Sacred groves are protected areas in India that have been venerated by cultural traditions.
II. Ex situ conservation refers to protecting species in their natural habitats.
III. The Western Ghats of India are part of a biodiversity hotspot.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

34. Read the following statements:
I. In situ conservation involves preserving species within their natural habitats.
II. Ex situ conservation involves relocating species to protected settings like zoos.

III. Both in situ and ex situ conservation are equally important for biodiversity.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

35. Read the following statements:
I. Biodiversity hotspots are areas with a high level of species richness and endemism.
II. India's biodiversity hotspots are crucial for reducing mass extinctions.
III. Hotspots cover over 10% of the earth's land area.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

36. Read the following statements:
I. The Amazon rainforest is crucial for producing oxygen and regulating the global climate.
II. The total oxygen produced by the Amazon rainforest is around 10% of the world's supply.
III. Deforestation of the Amazon is a significant threat to global biodiversity.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

37. Read the following statements:
I. Biodiversity conservation has economic benefits, such as the discovery of medicinal plants.
II. More than 25% of pharmaceutical drugs are derived from plant species.
III. There is no economic value in conserving biodiversity.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

38. Read the following statements:
I. The ethical argument for conserving biodiversity is based on the intrinsic value of species.
II. Humans have no moral responsibility to preserve other species.
III. Biodiversity should be preserved for future generations.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

39. Read the following statements:
I. Over-exploitation refers to using natural resources without exceeding their sustainable limits.
II. The extinction of the passenger pigeon is an example of over-exploitation.
III. Over-exploitation is a major threat to marine species.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

40. Read the following statements:
I. Pollination by natural agents such as bees is essential for plant reproduction.
II. The loss of pollinators will not affect food production.
III. Biodiversity provides essential ecosystem services like pollination.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

41. Read the following statements:
I. Biodiversity conservation is a responsibility of all nations.
II. The 1992 Earth Summit called for the conservation of biodiversity.
III. Conservation efforts are only the responsibility of developing countries.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

42. Read the following statements:
I. Cryopreservation techniques are used for the long-term storage of genetic material from threatened species.
II. Ex situ conservation is only about maintaining species in zoos.
III. Tissue culture methods are used to propagate plants for ex situ conservation.

Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

43. Read the following statements:
I. Habitat fragmentation affects species that require large territories or have migratory habits.
II. Deforestation is the main cause of habitat fragmentation.
III. Fragmented habitats do not pose any threat to species survival.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

44. Read the following statements:
I. In situ conservation is the most effective way to protect species and ecosystems.
II. Ex situ conservation is only used for animals but not for plants.
III. Both in situ and ex situ conservation have limitations and are complementary.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

45. Read the following statements:
I. The extinction of the dodo was due to over-exploitation by humans.
II. Co-extinctions occur when a species goes extinct along with its associated species.
III. Habitat loss has no direct impact on species extinction.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

46. Read the following statements:
I. Biodiversity hotspots are areas with high species richness and endemism.
II. Hotspots cover a significant percentage of the earth's land area.
III. Conservation of biodiversity hotspots can help reduce mass extinctions.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

47. Read the following statements:
I. The extinction of a species can lead to the extinction of its co-evolved species.
II. The survival of species like tigers depends on the conservation of their habitats.
III. Co-extinctions are caused when one species goes extinct due to the disappearance of another species.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

48. Read the following statements:
I. The Amazon rainforest is crucial for global oxygen production.
II. The loss of pollinators will have no impact on crop yields.
III. The ethical argument for conserving biodiversity focuses on the intrinsic value of species.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

49. Read the following statements:
I. Bioprospecting refers to exploring molecular and genetic diversity for economic benefits.
II. Biodiversity hotspots are located only in tropical rainforests.
III. India's biodiversity hotspots include the Western Ghats, Indo-Burma, and Himalayas.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

50. Read the following statements:
I. All species have an intrinsic value, even if they do not provide immediate economic benefits.
II. Biodiversity conservation is an ethical responsibility of humans.
III. The loss of biodiversity has no moral implications for future generations.
Choose the correct option from below:
(a) I and II are correct.
(b) II and III are correct.
(c) I and III are correct.
(d) I, II, and III are correct.

Exercise-03 Level -03

Assertion & Reason Based Questions

1. **Assertion (A):** Biodiversity includes species, genetic, and ecosystem diversity.
   Reason (R): Species diversity is considered the most common and measurable type of biodiversity.
   (a) A and R are correct, R is correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
2. **Assertion (A):** The Amazon rainforest has more than 100 species of birds.
   Reason (R): India has over 8% of global species diversity.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
3. **Assertion (A):** The diversity of life forms on Earth is constantly being reduced due to habitat loss.
   Reason (R): India is considered one of the 12 mega-diversity countries in the world.
   (a) A and R are correct and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
4. **Assertion (A):** Tropical regions have remained undisturbed for millions of years.
   Reason (R): This has led to greater species diversification in tropical regions.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
5. **Assertion (A):** Insects make up over 70% of animal species on Earth.
   Reason (R): Insects are the most diverse group of animals.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
6. **Assertion (A):** The Western Ghats have more amphibian species than the Eastern Ghats.
   Reason (R): The Western Ghats are home to a higher variety of ecosystems than the Eastern Ghats.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
7. **Assertion (A):** The number of species on Earth is easy to determine.
   Reason (R): Many species, especially insects, remain undiscovered.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
8. **Assertion (A):** Species diversity increases with the area explored.
   Reason (R): The species-area relationship suggests a logarithmic increase in species with larger areas.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
9. **Assertion (A):** Species diversity is higher in tropical regions compared to temperate regions.
   Reason (R): Tropical regions have more predictable and stable environments, which promotes greater species diversity.
   (a) A and R are correct, and R is the correct explanation of A.
   (b) A is correct, R is correct, but R is not the correct explanation of A.
   (c) A is correct, R is incorrect.
   (d) A and R are correct.
10. **Assertion (A):** The loss of a few species does not impact ecosystem functioning.
    Reason (R): Ecosystem functioning depends on the total number of species and their roles.

(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

11. **Assertion (A):** The extinction rate of species in the present time is much higher than in pre-human times.
Reason (R): Human activities such as habitat destruction, overexploitation are accelerating the rate of species extinction.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

12. **Assertion (A):** Amphibians appear to be more vulnerable to extinction than other taxa.
Reason (R): Amphibians are highly sensitive to environmental changes.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

13. **Assertion (A):** Biosphere reserves are designated areas meant to conserve biodiversity.
Reason (R): Biosphere reserve provide conservation to species in their natural habitat.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

14. **Assertion (A):** Habitat loss and fragmentation are the most important causes of species extinction.
Reason (R): Tropical rainforests, which once covered 14% of Earth's land surface, are now reduced to only 6%.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

15. **Assertion (A):** The introduction of alien species can lead to the extinction of indigenous species.
Reason (R): Alien species often outcompete native species for resources and alter the existing ecological balance.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

16. **Assertion (A):** The Amazon rainforest is referred to as the "lungs of the planet."
Reason (R): It produces nearly 20% of the total oxygen in the Earth's atmosphere through photosynthesis.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

17. **Assertion (A):** Ex situ conservation is a preferred method for conserving biodiversity over in situ conservation.
Reason (R): Ex situ conservation provides artificial habitats, which are better suited for species survival than natural habitats.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

18. **Assertion (A):** Bioprospecting involves the search for plant and animal species with commercial value.
Reason (R): It can lead to the discovery of new drugs, food sources, and other valuable products.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

19. **Assertion (A):** Co-extinction occurs when one species goes extinct, leading to the extinction of another associated species.
Reason (R): Certain species have a co-evolved mutualistic relationship, making them dependent on each other for survival.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

20. **Assertion (A):** The Earth has experienced five mass extinctions before the current biodiversity crisis.
Reason (R): The current extinction rate is 100 to 1,000 times faster than pre-human times due to natural activities.
(a) A and R are correct, and R is the correct explanation of A.
(b) A is correct, R is correct, but R is not the correct explanation of A.
(c) A is correct, R is incorrect.
(d) A and R are correct.

Statement Based Questions

21. **Statement I:** Biodiversity refers to the variety and variability of life forms at different levels.
Statement II: Biodiversity only includes plants and animals, excluding microorganisms.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

22. **Statement I:** In situ conservation refers to the conservation of species within their natural habitats.
Statement II: Ex situ conservation involves the conservation of species outside their natural habitats.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

23. **Statement I:** Red data books are published by the International Union for Conservation of Nature (IUCN) to document endangered species.
Statement II: Red data books focus only on plant species.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

24. **Statement I:** The latitudinal gradient hypothesis suggests that species diversity increases as we move from the equator to the poles.
Statement II: The tropics are considered to have the highest species diversity compared to temperate regions.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

25. **Statement I:** A biodiversity hotspot is a biogeographic region that is both a significant reservoir of biodiversity.
Statement II: India has no biodiversity hotspots.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

26. **Statement I:** Insects constitute over 70% of the animal species on Earth.
Statement II: Insects are considered one of the least diverse animal groups.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

27. **Statement I:** The species-area relationship suggests that the number of species increases with the size of the area.
Statement II: The species-area relationship is described by a logarithmic equation.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

28. **Statement I:** Invasive species are non-native species that cause harm to the environment, economy, or human health.
Statement II: Invasive species always benefit the ecosystems they invade.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

29. **Statement I:** The number of species on Earth can be easily determined.
Statement II: Many species, especially insects, are still undiscovered in tropical regions.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

30. **Statement I:** The term "endemic species" refers to species that are found only in a specific geographic area and are not found elsewhere.
Statement II: Endemic species are often more vulnerable to extinction due to their limited range.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

31. **Statement I:** The process of habitat fragmentation refers to the breaking up of continuous habitats into smaller, isolated patches.
Statement II: Habitat fragmentation has no significant impact on biodiversity.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

32. **Statement I:** The IUCN Red List documents the extinction of 784 species in the last 500 years.
Statement II: Species extinction has been an ongoing process even before the appearance of humans.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

33. **Statement I:** The overexploitation of natural resources has led to the extinction of many species.
Statement II: The Steller's sea cow and lantana became extinct due to excessive hunting.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

34. **Statement I:** Habitat loss is one of the primary reasons for species extinction.
Statement II: Deforestation and land conversion for agriculture reduce the available habitat for wildlife.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

35. **Statement I:** Biodiversity loss can lead to a decline in plant production.
Statement II: Biodiversity ensures ecological stability and ecosystem services.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

36. **Statement I:** The introduction of Nile perch into Lake Victoria caused the extinction of many native fish species.
Statement II: Alien species invasions can disrupt local ecosystems and lead to biodiversity loss.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

37. **Statement I:** IUCN has documented 359 vertebrate species extinction in 2004.
Statement II: IUCN 2004 has documented the extinction of 784 species.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

38. **Statement I:** Pollination is an ecosystem service.
Statement II: Pollination is important to plants for fruits and seed production.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

39. **Statement I:** Sacred groves are protected areas by religious and cultural tradition in India.
Statement II: All the trees and wildlife within sacred groves are venerated and given total protection.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

40. **Statement I:** Cryopreservation is used as ex-situ conservation method.
Statement II: Cryopreservation include conservation of seeds in banks.
(a) Both Statement I and Statement II are correct.
(b) Statement I is correct, Statement II is incorrect.
(c) Statement I is incorrect, Statement II is correct.
(d) Both Statement I and Statement II are incorrect.

Match up Based Questions

41. Match the following terms related to biodiversity conservation:

Column-I		Column-II	
A.	In-situ conservation	I	National Parks and Sanctuaries
B.	Ex-situ conservation	II	Botanical Gardens and Zoos
C.	Biodiversity hotspot	III	Areas with high species richness

Match the correct option.

(a) A-II, B-III, C-I
(b) A-III, B-I, C-II
(c) A-III, B-II, C-I
(d) A-I, B-II, C-III

42. Match the following types of diversity with their characteristics:

Column-I		Column-II	
A.	Genetic Diversity	I	The pattern where species diversity decreases as one moves from the equator towards the poles
B.	Species Diversity	II	Variation in ecosystems such as forests, coral reefs, or wetlands.
C.	Ecological Diversity	III	Diversity of species within a specific geographical area.
D.	Latitudinal Gradient	IV	Variation in the genetic makeup of individuals within a species.

Match the correct option.

(a) A-II, B-III, C-IV, D-I
(b) A-III, B-IV, C-II, D-I
(c) A-III, B-I, C-IV, D-II
(d) A-IV, B-III, C-I, D-II

43. Match the biodiversity facts in Column I with the corresponding information in Column II:

Column-I		Column-II	
A.	India's species diversity	I	Estimated 7 million species globally.
B.	Insects' species richness	II	India holds 8.1% of global species diversity.
C.	Robert May's estimate	III	Insects make up more than 70% of animal species on Earth

Match the correct option.

(a) A-II, B-III, C-I
(b) A-III, B-I, C-II
(c) A-III, B-II, C-I
(d) A-I, B-II, C-III

44. Match the biodiversity types in Column I with examples from Column II:

Column-I		Column-II	
A.	Genetic Diversity	I	India's forests, wetlands, coral reefs, and alpine meadows.
B.	Species Diversity	II	The Western Ghats having more amphibian species than the Eastern Ghats
C.	Ecological Diversity	III	India's 50,000 genetically different rice strains.

Match the correct option.

(a) A-II, B-III, C-I
(b) A-III, B-I, C-II
(c) A-III, B-II, C-I
(d) A-I, B-II, C-III

45. Match the species diversity patterns in Column I with their descriptions in Column II:

Column-I		Column-II	
A.	Species-Area Relationship	I	Species diversity decreases as we move away from the equator.
B.	Latitudinal Gradient	II	The most biodiverse region on Earth with more than 40,000 species of plants
C.	Amazon Rainforest Diversity	III	Species richness increases with area explored, but only up to a limit.

Match the correct option.

(a) A-II, B-III, C-I
(b) A-III, B-I, C-II
(c) A-III, B-II, C-I
(d) A-I, B-II, C-III

46. Match the following extinct species with their locations:

Column-I (Species)		Column-II (Location)	
A.	Dodo	I	Russia
B.	Quagga	II	Australia
C.	Thylacine	III	Mauritius
D.	Steller's Sea Cow	IV	Africa

Match the correct option.

(a) A-II, B-III, C-IV, D-I
(b) A-III, B-IV, C-II, D-I
(c) A-III, B-I, C-IV, D-II
(d) A-IV, B-III, C-I, D-II

47. Match the cause of biodiversity loss with its description:

Column-I		Column-II	
A.	Habitat loss and fragmentation	I	Introduction of non-native species disrupting ecosystems.
B.	Over-exploitation	II	Extinction of species due to disappearance of another species with which it coexists.
C.	Alien species invasions	III	Excessive harvesting of natural resource leading to depletion of species.
D.	Co-extinctions	IV	Destruction of large habitats, such as tropical rainforests.

Match the correct option.
(a) A-II, B-III, C-IV, D-I
(b) A-III, B-IV, C-II, D-I
(c) A-III, B-I, C-IV, D-II
(d) A-IV, B-III, C-I, D-II

48. Match the argument for biodiversity conservation with its type:

Column-I (Argument)		Column-II (Type)	
A.	Economic benefits from food, firewood, and drugs	I	Broadly utilitarian
B.	Ethical duty to preserve species for future generations	II	Ethical
C.	Pollination by bees, birds, and bats	III	Narrowly utilitarian

Match the correct option.
(a) A-II, B-III, C-I
(b) A-III, B-I, C-II
(c) A-III, B-II, C-I
(d) A-I, B-II, C-III

49. Match the following endangered species with their current status:

Column-I		Column-II	
A.	Sacred groves	I	Offsite conservation
B.	National parks	II	Cultural conservation of biodiversity
C.	Botanical garden	III	Onsite conservation

Match the correct option.
(a) A-II, B-III, C-I
(b) A-III, B-I, C-II
(c) A-III, B-II, C-I
(d) A-I, B-II, C-III

50. Match the following terms related to ex-situ biodiversity conservation with their examples:

Column-I		Column-II	
A.	Cryopreservation	I	Conservation of genetically different seeds
B.	Zoological parks	II	Preservation of gametes in viable condition
C.	Tissue culture	III	Extinct wild species conservation
D.	Seed banks	IV	Propagation of plants

Match the correct option.
(a) A-II, B-III, C-IV, D-I
(b) A-III, B-IV, C-II, D-I
(c) A-III, B-I, C-IV, D-II
(d) A-IV, B-III, C-I, D-II

Exercise-04 Previous Year Questions

1. These are regarded as major causes of biodiversity loss: **(2024)**

A. Over exploitation
B. Co-Extinction
C. Mutation
D. Habitat loss and fragmentation
E. Migration

Choose the correct option:

(a) A, B, C and D only (b) A, B and E only
(c) A, B and D only (d) A, C and D only

2. List of endangered species was released by- **(2024)**

(a) WWF (b) FOAM
(c) IUCN (d) GEAC

3. Tropical regions show greatest level of species richness because **(2024)**

A. Tropical latitudes have remained relatively undisturbed for millions of years, hence more time was available for species diversification
B. Tropical environments are more seasonal
C. More solar energy is available in tropics.
D. Constant environments promote niche specialization
E. Tropical environments are constants and predictable

Choose the correct answer from the options given below:

(a) A and B only (b) A, B and C only
(c) A, B and D only (d) A, C, D and E only

4. The type of conservation in which the threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care is called; **(2024)**

(a) Biodiversity conservation
(b) Semi-conservation method
(c) Sustainable development
(d) In-situ conservation

5. Match the List – I with List – II **(2024)**

List -I		List –II	
A.	Robert May	I.	Species –areas relationship
B.	Alexander von Humboldt	II.	Long term ecosystem experiment using out door plots
C.	Paul Ehrlich	III.	Global species diversity at about 7 million
D.	David Tilman	IV.	Rivet popper hypothesis

Choose the correct answer from the option as given below:

(a) A-III, B-I, C-IV, D-II (b) A-I, B-III, C-II, D-IV
(c) A-III, B-IV, C-II, D-I (d) A-II, B-III, C-I, D-IV

6. Among The Evil Quartet', which one is considered the most important cause driving extinction of species? **(2023)**

(a) Co-extinctions
(b) Habitat loss and fragmentation
(c) Over exploitation for economic gain
(d) Alien species invasions

7. The historic Convention on Biological Diversity, 'The Earth Summit' was held in Rio de Janeiro in the year **(2023)**

(a) 2002 (b) 1985
(c) 1992 (d) 1986

8. Which of the following is/are cause(s) of biodiversity losses? **(2023)**

(a) Over-exploitation, habitat loss and fragmentation.
(b) Climate change only
(c) Over-Exploitation only
(d) Habitat loss and fragmentation only

9. The World Summit on sustainable development held in 2002 in Johannesburg, South Africa pledged for **(2022)**

(a) Collection and preservation of seeds of different genetic strains of commercially important plants.
(b) A significant reduction in the current rate of biodiversity loss,
(c) Declaration of more biodiversity hotspots.
(d) Increase in agricultural production

10. Match List - I with List - II: **(2022)**

List – I		LIst – II	
A	Sacred groves	(i)	Alien species
B	Zoological-park	(ii)	Release of large quantity of oxygen
C	Nile perch	(iii)	Ex-situ conservation
D	Amazon forest	(iv)	Khasi Hills in Meghalaya

Choose the correct answer from the options given below:

(a) (A) - (iv), (B) - (iii), (C) - (ii), (D) - (i)
(b) (A) - (iv), (B) - (iii), (C) - (i), (D) (ii)
(c) (A) - (ii), (B) - (iv), (C) - (i), (D) - (iii)
(d) (A) - (iv), (B) - (i), (C) - (ii), (D) - (ii)

11. Frugivorous birds are found in large numbers in tropical forests mainly because of: **(2022)**
(a) Temperature conducive for their breeding
(b) Lack of niche specialisation
(c) Higher annual rainfall
(d) Availability of fruits throughout the year

12. Panspermia, an idea that is still a favourite for some astronomers, means: **(2022)**
(a) Transfer of spores as unit of life from other planets to Earth
(b) Creation of life from dead and decaying matter
(c) Creation of life from chemicals
(d) Origin of sperm in human testes

13. Why CNG is considered better fuel than diesel?
(A) It cannot be adulterated.
(B) It takes less time to fill the fuel tank
(C) It burns more efficiently.
(D) It is cheaper.
(E) It is less inflammable.
Choose the most appropriate answer from the options given below: **(2022)**
(a) (C), (D), (E) only
(b) (A), (B), (C), (E) only
(c) (A), (C), (D) only
(d) (A), (B), (D), (E) only

14. Western Ghats have a large number of plants and animal species that are not found anywhere else. Which of the following term is used to notify such species? **(2022)**
(a) Vulnerable species
(b) Threatened species
(c) Keystone species
(d) Endemic species

15. Which of the following are true about the taxonomical aid 'key'?
(A) Keys are based on the similarities and dissimilarities.
(B) Key is analytical in nature.
(C) Keys are based on the contrasting characters in pair called couplet.
(D) Same key can be used for all taxonomic categories.
(E) Each statement in the key is called Lead.
Choose the most appropriate answer from the options given below: **(2022)**
(a) (A), (C), (D) and (E) only
(b) (A), (B) and (C) only
(c) (B), (C), and (D) only
(d) (A), (B), (C) and (E) only

16. Which of the following is not a method of ex situ conservation? **(2023)**
(a) An In vitro fertilization
(b) National Parks
(c) Micropropagation
(d) Cryopreservation

17. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for: **(2023)**
(a) Population explosion
(b) Competition
(c) Biodiversity loss
(d) Natality

18. In-situ conservation refers to: **(2023)**
(a) Protect and conserve the whole ecosystem
(b) Conserve only high-risk species
(c) Conserve only endangered species
(d) Conserve only extinct species

19. Which of the following regions of the globe exhibits highest species diversity? **(2020)**
(a) Madagascar
(b) Himalayas
(c) Amazon forests
(d) Western ghats of India

20. According to Robert May, the global species diversity is about: **(2020)**
(a) 20 million (b) 50 million
(c) 7 million (d) 1.5 million

21. In the following in each set a conservation approach and an example of method of conservation are given: **(2020)**
In situ conservation – Biosphere Reserve
Ex situ conservation – Sacred groves
In situ conservation – Seed bank
Ex situ conservation – Cryopreservation
Select the option with correct match of approach and method:
(a) A and D (b) B and D
(c) A and B (d) A and C

22. According to Alexander von Humboldt: **(2020)**
(a) Species richness increases with increasing area, but only up to limit
(b) There is no relationship between species richness and area explored
(c) Species richness goes on increasing with increasing area of exploration
(d) Species richness decreases with increasing area of exploration

Answer keys

TOPIC CENTRIC EXERCISE-01 Answer Key

1. (a)	**2.** (b)	**3.** (b)	**4.** (d)	**5.** (a)

TOPIC CENTRIC EXERCISE-02 Answer Key

1. (b)	**2.** (c)	**3.** (c)	**4.** (d)	**5.** (b)

Exercise-01 Level -01 Answer Key

1. (b)	**6.** (b)	**11.** (c)	**16.** (c)	**21.** (b)	**26.** (c)	**31.** (b)	**36.** (c)	**41.** (b)	**46.** (b)
2. (b)	**7.** (b)	**12.** (a)	**17.** (b)	**22.** (b)	**27.** (c)	**32.** (b)	**37.** (a)	**42.** (a)	**47.** (b)
3. (c)	**8.** (d)	**13.** (a)	**18.** (b)	**23.** (b)	**28.** (c)	**33.** (a)	**38.** (b)	**43.** (b)	**48.** (b)
4. (d)	**9.** (b)	**14.** (b)	**19.** (c)	**24.** (b)	**29.** (b)	**34.** (b)	**39.** (b)	**44.** (d)	**49.** (b)
5. (b)	**10.** (a)	**15.** (c)	**20.** (c)	**25.** (b)	**30.** (b)	**35.** (b)	**40.** (a)	**45.** (b)	**50.** (a)

Exercise-02 Level -02 Answer Key

1. (a)	**6.** (a)	**11.** (c)	**16.** (c)	**21.** (b)	**26.** (d)	**31.** (b)	**36.** (c)	**41.** (a)	**46.** (c)
2. (a)	**7.** (d)	**12.** (a)	**17.** (b)	**22.** (a)	**27.** (a)	**32.** (a)	**37.** (a)	**42.** (c)	**47.** (d)
3. (a)	**8.** (a)	**13.** (b)	**18.** (b)	**23.** (c)	**28.** (c)	**33.** (c)	**38.** (c)	**43.** (a)	**48.** (c)
4. (c)	**9.** (a)	**14.** (b)	**19.** (a)	**24.** (c)	**29.** (b)	**34.** (d)	**39.** (b)	**44.** (c)	**49.** (c)
5. (a)	**10.** (a)	**15.** (a)	**20.** (a)	**25.** (a)	**30.** (b)	**35.** (a)	**40.** (c)	**45.** (a)	**50.** (a)

Exercise-03 Level -03 Answer Key

1. (b)	**6.** (b)	**11.** (a)	**16.** (a)	**21.** (b)	**26.** (a)	**31.** (b)	**36.** (a)	**41.** (d)	**46.** (b)
2. (b)	**7.** (a)	**12.** (a)	**17.** (a)	**22.** (a)	**27.** (a)	**32.** (a)	**37.** (c)	**42.** (b)	**47.** (d)
3. (b)	**8.** (a)	**13.** (a)	**18.** (a)	**23.** (b)	**28.** (b)	**33.** (b)	**38.** (a)	**43.** (a)	**48.** (c)
4. (a)	**9.** (a)	**14.** (b)	**19.** (a)	**24.** (c)	**29.** (c)	**34.** (a)	**39.** (a)	**44.** (c)	**49.** (a)
5. (a)	**10.** (a)	**15.** (a)	**20.** (c)	**25.** (b)	**30.** (a)	**35.** (a)	**40.** (b)	**45.** (b)	**50.** (a)

Exercise-04 Previous Year Questions

1. (c)	**4.** (a)	**7.** (c)	**10.** (b)	**13.** (c)	**16.** (b)	**19.** (c)	**22.** (a)
2. (c)	**5.** (a)	**8.** (a)	**11.** (d)	**14.** (d)	**17.** (c)	**20.** (c)	
3. (d)	**6.** (b)	**9.** (b)	**12.** (a)	**15.** (d)	**18.** (a)	**21.** (a)	