XII
15

BIODIVERSITY AND ITS CONSERVATION

SYLLABUS

Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.

KEY CONCEPTS

BIODIVERSITY

* The term biodiversity refers to the totality of genes, species, and ecosystems of a region.
* Types of biodiversity described by Edward Wilson:

(i) Genetic diversity:

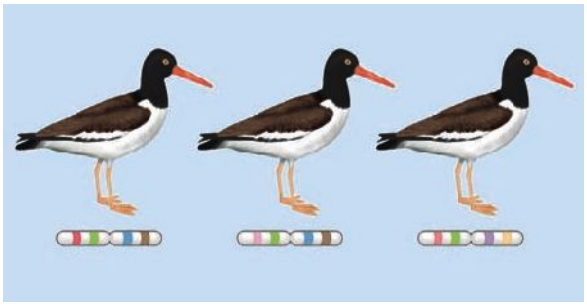
* A single species might show high diversity at the genetic level over its distributional range.
* Medicinal plant *Rauwolfia vomitoria* of Himalayan range produces active chemical reserpine shows genetic variation.
* India has more than 50000 different strain of rice,1000 varieties of mango.

(ii) Species diversity:

* The diversity at the species level. For example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.
* **Species richness:** It refers to the number of species per unit area.
* **Species Evenness:** It refers to the relative abundance with which each species is represented in an area.

(iii) Ecological diversity:

* Diversity in the ecosystem level like desert, rain forest, mangroves, coral reef, wetlands, estuaries etc.



Genetic diversity in an American oystercatcher population

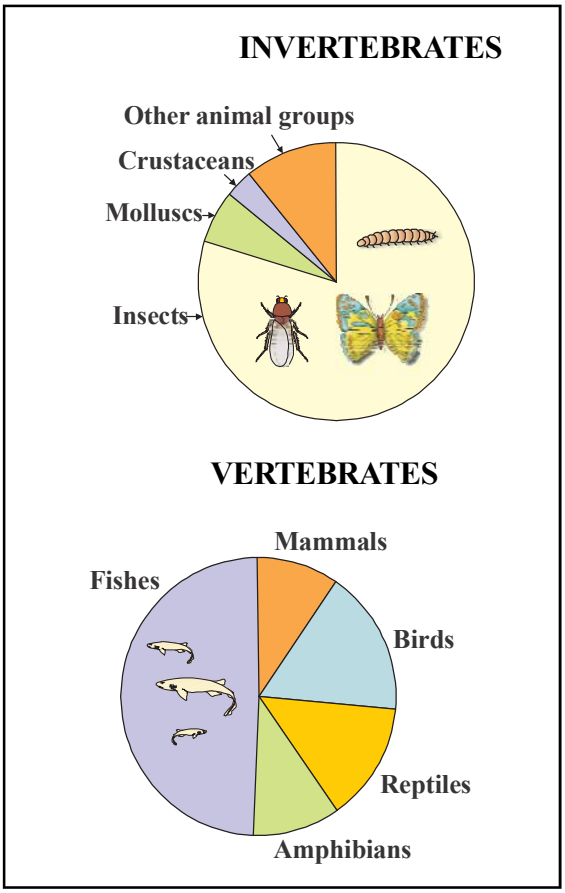
Species richness in an Eastern sandy shore ecosystem

Ecosystem diversity across an entire region (ocean and shore)

Figure : Levels of biodiversity
The single unduplicated chromosome below each oystercatcher represents the genetic variation among individuals within a population. Conservation at all three ecological levels must occur to protect biological diversity.

GLOBAL BIODIVERSITY

* According to **IUCN** (2004), 1.5 million of plants and animals are in our biosphere.
* Robert May places global species diversity at about 7 millions.
* More than 70% of the species recorded are animals and plants account for about 22%; 70% of the animals are insects.
* India has only 2.4 percent of the world's land area; its share of global species diversity is impressive 8.1 percent.
* India is considered one of the 12 mega diversity countries of the world.
* Applying Robert May's global estimate that only 22% of the total species have been recorded, India has probably more than 1,00,000 species of plants and 3,00,000 species of animals to be discovered and described.



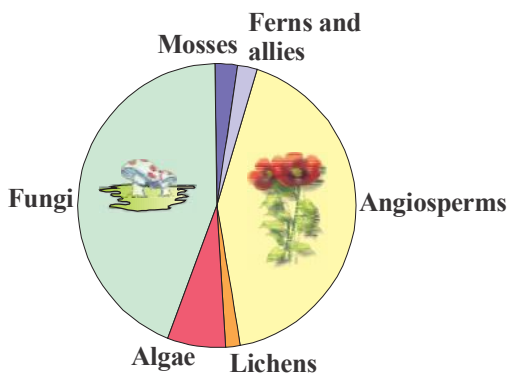


Figure : Representing global biodiversity: proportionate number of species of major taxa of plants, invertebrates and vertebrates

Pattern of Biodiversity:

* Biodiversity is not uniform throughout the world but varies with latitude and altitude.
* Favorable environmental conditions favor speciation and make it possible for a larger number of species to exist there, i.e., biodiversity is more in such areas than the others.

(i) Latitudinal gradients:

* Species diversity decreases as we move away from the equator towards the pole.
* Tropic (23.5° N to 23.5°S) harbors more species than temperate and pole
* Example- Colombia (near equator)has 1400 species of birds whereas New York(41° N) has 105 species, Greenland (71° N) has 56 species and India(equator region) has 1200 species.
* The number of species of vascular plants in tropics is about ten times more than that of temperate forests.
* Amazonian Rainforest has the greatest biodiversity on earth. It has more than 40000 species of plants, 1,25,000 invertebrates, 3000 species of fish, 427 of amphibian and 378 of reptiles, 1300 species of birds and 427 of mammals.

Why tropical rain forest has greater biodiversity:

* 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, promotes niche specialization and lead to greater species diversity.
* There is more solar energy available in the tropics, which contribute to higher productivity.

(ii) Species area relationship:

* German naturalist and geographer Alexander von Humboldt observed that within a region species richness increased with increasing explored area, but only up to a limit.
* 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 describe 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.
* Value of Z lies in the range of 0.1 to 0.2, regardless of the taxonomic group or the region.
* The species-area relationships among very large areas like the entire continents has much steeper slope of the line (Z values in the range of 0.6 to 1.2).

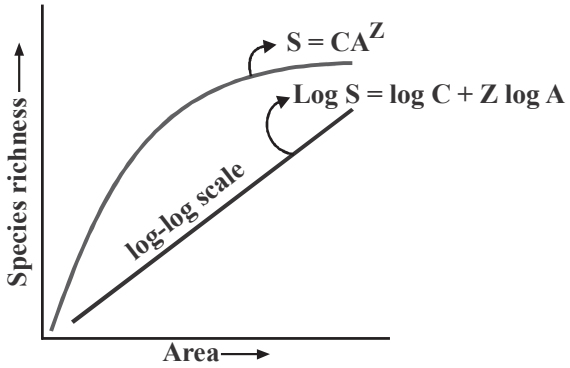


Figure : Showing species area relationship. Note that on log scale the relationship becomes linear.

Importance of species diversity to the Ecosystem:

* Community with more species generally tends 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 resistant or resilient to occasional disturbances (natural or man-made)
* Stable community must be resistant to invasion by alien species.
* **David Tillman's long-term field experiment finds that:**
  Plots with more species showed less year to year variation in biomass.
  Increased diversity contributed to higher productivity.

The rivet popper hypothesis:

* In an airplane (ecosystem) all parts are joined together by thousands of rivets (species).
* If every passenger starts popping a rivet to take home (species extinct), it may not affect flight safety initially but as more and more rivets are removed the plane becomes dangerously weak.
* Further more which rivet is removed may also be critical.
* Loss of rivets on the wings (key species) is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.

Loss of Biodiversity:

* 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.
* 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.

Figure : Selected animal extinctions

Recent extinction includes:

* Dodo (Mauritius).
* Quake (Africa)
* Thylacine (Australia)
* Stiller's cow (Russia)
* Three subspecies of tiger (Bali, Java, Caspian).
* Since the origin and diversification of life on earth there were five episodes of mass extinction of species.
* **The sixth mass Extinctions** in progress now.

How the 'sixth Extinction' is different from the previous five extinctions.

* The current extinction rate is 100 to 1000 times faster.
* All others are pre-human period, this one is anthropogenic.

Effect of biodiversity loss:

* Decline in plant production.

* Lowered resistance to environmental perturbations such as drought.
* Increased variability in certain ecosystem processes such as plant productivity, water use, and pest and disease cycle.

Causes of biodiversity loss:

The present loss is all due to human activity (anthropogenic). There are four major causes **("The Evil Quartet") –**

(i) **Habitat loss and fragmentation :** This is most important cause of plants and animals extinction. For example : Tropical rain forest are being destroyed fast. The Amazonian rain forest is called the lungs of the planet. It is being cut for cultivating soyabeans.

(ii) **Over exploitation :** Many species extinctions are due to over exploitation by humans.
eg : extinction of steller's cow, passenger pigeon is last 500 years.

(iii) **Alien Species Invasions :** When alien species are introduced some of them turn invasive and cause decline or extinction of indigenous species. eg.: Carrot grass (Parthenium), Lantana and water hyacinth (Eichornia) posed threat to native species.

(iv) **Co-extinctions:** When a species becomes extinct, the plant and animal species associated with it in an obligating way also become extinct. eg., When a host fish species becomes extinct, its assemblage of parasites also becomes extinct.

THREATENED SPECIES CONCEPT

* The International Union for Conservation of Nature and Natural Resources (IUCN), having its head quarters at Morgis in Switzerland and maintains a **Red Data Book** providing a record of animals and plants which are known to be in danger. In India the Wildlife (Protection) Act, 1972 provides four schedules categorising the fauna of India based on their conservation status.

* **Threatened (T) :** The term is used in context with conservation of the species which are in anyone of the above 3 categores.
Threatened = Endangered + Vulnerable + Rare

* **Endangered (E) :** Those species which are in the immediate danger of extinction and whose survival is unlikely, whose number have been reduced to a critical level, if the casual factors continue to be operating.

* **Vulnerable (V) :** The species likely to move into the endangered category in the near future if the casual factors continue to operate. Their population is still abundant but are under threat throughout their range.

* **Rare (R):** These are species with small population in the world. These are not at present endangered and vulnerable, but are at risk due to their less number. These species are usually localised within restricted geographical areas or habitats.

Some important examples of threatened species in India :

	Category	Plants	Animals
(1)	Critically endangered	Barbeirs nilighiriensis	Sus salvanius (Pigmyhog)
(2)	Endangered	Bentinckia nicobarica	Ailurus fulgens (Red panda)
(3)	Vulnerable	Cupressus cashmeriana	Antilope cervicapra (Black buck)

BIODIVERSITY CONSERVATION

Reason for conservation biodiversity is grouped into three categories.

(i) **Narrowly utilitarian:**

* Human derive countless direct economic benefits from nature.
* Food (cereals, pulses, fruits), firewood, fiber, construction material.

* Industrial products (tannins, lubricants, dyes, resins, perfumes)
* Products of medicinal importance.
* **Bioprospecting:** exploring molecular genetic and species-level diversity for products of economic importance.

(ii) Broadly Utilitarian:

* Amazonian forest along produce 20% of oxygen during photosynthesis.
* **Pollinator layer:** bees, bumblebees, birds and bat that pollinate the plant without which seed cannot be produced by plants.
* Aesthetic pleasure we get from the biodiversity.

(iii) Ethical : Every species has an intrinsic value, even if it may not be of any current economic value to us. We have a moral duty to care for their well-being and pass on our biological legacy in good order to future generations.

Conservation of biodiversity:

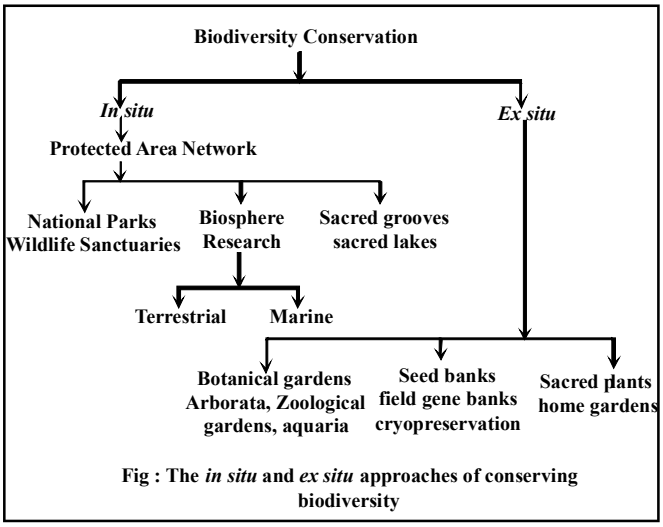


Fig : The *in situ* and *ex situ* approaches of conserving biodiversity

(a) In situ conservation(on site conservation):

* Conservation and protection of the whole ecosystem and its biodiversity at all levels in order to protect the threatened species.
* Endangered species protected in natural conditions.
* **Sacred Groves :** Tracts of forest are set aside and all the trees and wildlife within are venerated and given total protection. E.g., some forest 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.
* **Hot Spots :** Areas with high density of biodiversity or mega diversity. E.g., Out of 34 hot spots in world, 3 occur in India. i.e., Western Ghats and Sri Lanka, Indo-Burma (North-East India) and Himalaya.
* These reduce mass extinction by 30%.
* **Protected Areas:** Ecological or Biogeographical areas where biological diversity with natural and cultural resources are protected. E.g., National parks, sanctuaries and Biosphere reserves.
* **National Parks :** Areas reserved for wild life where they are able to obtain all the required natural resources and proper habitats. India has 90 national parks at present.
* The world's first National Park - Yellow stone National Park.
* India's first National Park - Jim Corbett National Park - Nainital (Uttaranchal)
* **India's Famous Tiger Reserve**

Jim Corbett National Park–Nainital (Uttaranchal)
Dudhwa National Park–Lakhimpur Kheri (U.P.)
Kanha National Park – Mandala and Salghat (Madhya Pradesh)
Indrawati National Park – Chattishgarh
Simli National Park – Orissa

* **Sanctuaries :** Tracts of land with or without lake where animals are protected from all types of exploitation and habitat disturbance. India has 448 wild life sanctuaries at present.
* **Biosphere Reserves :** Large tracts of protected land with multiple use preserving the genetic diversity of the representative ecosystem by protecting wild life, traditional life styles of the tribals and varied plant and animal genetic resources. India has 14 biosphere reserves.

(b) Ex situ conservation:

* Conservation and protection of selected rare plants or animals in places outside their natural homes.
* **Offsite collections :** Live collections of wild and domesticated species in Botanical gardens, Zoological parks.
* India has 35 botonical gardens and 275 zoological parks where animals which have become extinct in wild are maintained.

* **Gene Banks :** Institutes which maintain stock of viable seeds, live growing plants, tissue culture and frozen germplasm with the whole range of genetic variability.
* **Cryopreservation :** Preservation of seeds, embryos etc. at –196°C in liquid nitrogen.

International efforts for Biodiversity Conservation

* **World Conservation Union (formerly IUCN):** provides leadership, common approach and expertise in the area of conservation.
* **The Earth Summit :** Historical convention on Biological diversity held in 1992 at Rio de Janerio, Brazil.
* **The World Summit on Sustainable Development :** Held in 2002 in Johannesburg, South Africa to pledge to reduce biodiversity losses at global and local levels.

CONCEPT REVIEW

* **Biodiversity :** The totality of genes, species and ecosystem of a region.
* **Biosphere Reserve :** The area with objective to conserve biological diversity along with their natural ecosystem, ecological and environmental research, both within and adjacent to these reserves, and to provide facilities for education and training.
* **Biodiversity Hotspots :** Regions of high endemism and high level of species richness.
* **Bio prospecting :** Exploration of molecular, genetic and species level diversity for products of economic importance.
* **Co-extinction :** Extinction of a species can cause extinction of plants and species associated with it.
* **Cryopreservation :** Preservation in liquid nitrogen at –196°C.
* **Endangered :** Plant or animal species whose number is so few that it is at risk of becoming extinct.
* **Exotic or Alien Species :** New species which enter a geographical regions.
* **Extinct :** No reasonable doubt that the last individual has died.
* **Endemic :** species confined to that region and not found elsewhere.
* **Ex Situ :** Off the site.
* **IUCN :** International Union for Conservation of Nature and Natural Resources.
* **In Situ :** On the actual site.
* **MAB :** Man and Biosphere Program started by UNESCO in 1986.
* **National Park :** Area for wild life where forestry, grazing and cultivation is permitted. Private ownership is not allowed.
* **Protected Area :** An ecological and biographical area in which wild life is conserved, poaching is prevented, natural resources are protected.
* **Red Data Book :** Record of threatened species of plants and animals maintained by IUCN.
* **Sanctuary :** Protected area for wild life where harvesting of timber, collection of minor forest products and private ownership rights are permitted so long as wild life remains in perfect harmony with nature.

IMPORTANT POINTS

* National Park associated with Rhinoceros is *Kaziranga*.
* First National Park of India is Corbett National Park.
* 'Red Data Book' or IUCN Red List provides data on Threatened species.
* A species restricted to a given area is endemic species.
* Dachigam sanctuary is associated with conservation of Hangul/Kashmir Stag.
* National tree – *Ficus bengalensis*.
* *Ex situ* consevation is carried out in Zoo.
* A threatened species is endangered, vulnerable and rare species.
* Most biodiversity rich zone in India is Western Ghats.
* An *in situ* method of conservation is National Park.
* Cryopreservation/Seed bank is the *ex situ* conservation methods for endangered species.
* Dachigam sanctuary is located in Jammu and Kashmir.
* *Lantama camara* = Exotic species

Magnolia = Primitive genus
Yew Tree = Anti-cancer drug
Morphine = Papaver somniferum

* Chipko movement was launched for protection of forests.
* 'Project Tiger' in India was launched in 1973.
* *Nepenthes khasiana* is an endemic plant.
* Famous National Parks of World Created for Specific Endangered Species

S. No.	Name of National Park	Country	Specific Endangered Animal
(1)	Alberta National Parks	Congo, Africa	Mountain Gorilla
(2)	Mt. Simien National Park	Ethiopia, Africa	Abyssinian Ibex or Steinbok
(3)	Bontebok National Park	South Africa, Africa	Bontebok antelope
(4)	Everglades National Park	Florida, U.S.A.	Puma
(5)	Rifugio di Los Padres	California, U.S.A.	Californian Condor
(6)	Ordesa National Park	Spain, Europe	Steinbok of pyrenees
(7)	Bialowieska National Park	Poland, Europe	Europian Bison
(8)	Corbett National Park	Uttar Pradesh, India	Kashmir Stag
(9)	Dachigam National Park	Kashmir, India	Kashmir Stag
(10)	Gir National Park	Gujarat, India	Asiatic Lion
(11)	Kaziranga National Park	Assam, India	One-homed Rhinoceros
(12)	Ghana bird sanctuary (Keoladeo National Park)	Bharatpur, Rajasthan, India	Avifauna

* The world's first National Park - Yellow stone National Park
* India's first National Park - Jim Corbett National Park - Nainital (Uttaranchal)
* Smallest tiger reserve in India - Ranthambore National Park - Sawahimadhopur (Rajasthan). It is famous for Asiatic wild ass.
* Larger tiger reserve in India – Nagarjuna Sagar Saisailum Sanctuary - Guntoor - Andhra Pradesh.
* Nandan-Kanan zoo is known for - White tiger.
* **National Park and Sanctuaries:**
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. 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.

* **Red list categories**

SN	Red list category	Definition
(1)	**Extinct**	A taxon is Extinct when there is no reasonable doubt that the last individual has died. *e.g.* Dodo.
(2)	**Extinct in the wild**	A taxon is Extinct in the wild when exhaustive surveys in known and/or expected habitats, have failed to record an individual.
(3)	**Critically endangered**	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future. *e.g. Sus salvanius* (Pigmy hog) *Berberis nilghiriensus*.
(4)	**Endangered**	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future. *e.g. Ailurus fulgens* (Red panda), Blue whale, Largest Lemur Idri-Idri of Madagascar, etc.
(5)	**Vulnerable**	A taxon is Vulnerable when it is not Critically Endangered or Endangered, but is facing a high risk of extinction in the wild in the medium-term future. *e.g. Antilope cervicapra* (Black Buck).
(6)	**Lower risk**	A taxon is Lower Risk when it has been evaluated and does not satisfy the criteria for Critically Endangered, Endangered or Vulnerable.
(7)	**Data deficient**	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.
(8)	**Not evaluated**	A taxon is Not Evaluated when it has not yet been assessed.

* Some Important National Parks of India

S.No.	Name & Location	IMPORTANTANIMALSFOUND
1.	Kaziranga National Park District Sibsagar (Assam)	**Rhinoceros,** elephant, wild buffalo, bison, tiger, leopard, sloth, bear, sambhar, swamp deer, barking deer, wild bear, gibbon, python and birds like pelican, stork and ring-tailed fishing eagles. This is a famous National Park of famous one-homed rhinoceros-of India.
2.	Sundarbans (Tiger Reserve) 24-Pargana (West Bengal)	**Tiger,** wild boar, deer, gangetic dolphin, estuarine crocodile.
3.	Hazaribagh National Park Hazaribagh Jharkhand	**Tiger,** leopard, hyaena, wild bear, gaur, sambhar, nilgai, chital, sloth, bear, peafowl.
4.	Corbett National Park District Nainital (Uttaranchal)	**Tiger,** elephant, panther, sloth bear, wild bear, nilgai, sambhar, chital, crocodile, python, king cobra, peafowl, partridge. This is the first National Park of India which is famous for tigers.
5.	Gir National Park District Junagarh (Gujarat)	**Asiatic lion,** panther, stripped hyaena, sambhar, nilgai, chital, 4-horned antelope, chinkara, wild bear, langur, python, crocodile, green pigeon, partridge. This National park is famous for the Asiatic lions.
6.	Kanha National Park Mandla and Balaghat (M.P.)	**Tiger, panther, chital, chinkara,** deer, blue bull, **four horned deer,** langur, wild bear, black buck, nilgai, wild dog, sloth bear, sambhar, crocodile, grey horn bill, egret, pea-fowl.
7.	Tandoba National Park Chandrapur (Maharashtra)	**Tiger** sambhar, sloth bear, bison, chital, chinkara, barking deer, blue bull, four horned deer, langur, pea-fowl, crocodile.
8.	Bandipur National Park District Mysore (Karnataka)	**Elephant, tiger, leopard,** sloth bear, wild dog, chital, panther, barking deer, langur, porcupine, gaur, sambhar. malabar squirrel, green pigeon.
9.	Desert National Park Jaisalmer (Rajasthan)	**Great Indian Bustard, Black buck,** chinkara.
10.	Nannda Devi - Uttaranchal	**White Tiger.**

* Some Important Sancutaries of India

S.No.	Name & Location	Important Animals
1.	Keoladeo Ghana Bird Sanctuary Bharatpur (Rajasthan) Famous for birds	**Siberian crane,** egrets, herons spoon bill etc.
2.	Annamalai Sanctuary Coimbatore (Tamil Nadu)	**Tiger, elephant,** gaur, spotted deer, wilddog, sloth bear, sambhar, panther.
3.	Jaldapara Sanctuary Madarihat (West Bengal)	**Rhino, elephant, tiger,** leopard, deer, sambhar and different kinds of birds.
4.	Dachigam Sanctuary Srinagar (Jammu & Kashmir)	**Hangul or Kashmir stag, musk deer,** snow leopard, black bear, brown bear.
5.	Nagarjuna Sagar Sanctuary Guntur Kamool and Nalgonda (Andhra Pradesh)	**Tiger, panther,** wild bear, chital, nilgai, sambhar, black buck, fox, jackal, wolf, crocodile.
6.	Periyar Sanctuary (Kerala)	**Elephants,** gaur, **leopard,** sloth bear, sambhar, bison, black langur, **hornbill,** egret. **It** is famous for elephants.
7.	Chilka Lake Bird Sanctuary Balagaon (Orissa) (Largest brackish water lagoon in Asia)	An oasis of bird is like **water fowls, ducks, cranes,** Golden plovers, sand pipers, flamingoes.
8.	Manas WildlifeSanctuary Kamrup (Assam)	**Tiger, panther,** rhino, gaur, wild buffalo, sambhar, swamp deer, golden langur, wild dog wild bear.

QUESTION BANK

EXERCISE - 1 (LEVEL-1) [NCERT EXTRACT]

SECTION - 1 (VOCABULARY BUILDER)

Choose one correct response for each question.
For Q.1-Q.4
Match the column I with column II.

Q.1

	Column I	Column II
a.	Species	i. Influences biotic interactions and stability of diversity the community.
b.	Genetic diversity	ii. is the variety of forms in the ecosystem.
c.	Ecological	iii. Influences adaptability and distribution of a diversity species in diverse habitats.
d.	Biodiversity	iv. Occurrence of different types in different ecosystem, species of organism with the wholer ange of their variants and genes.

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

Q.2

	Column I
a.	Hot spots
b.	Protected areas
c.	National parks
d.	Biosphere reserves

Column II
i. Areas maintained by government for the betterment of wildlife.
ii. Areas of high endemism and high level of species richness.
iii. Biogeographical areas where biological diversity along with natural and cultural resources is protected, maintained and managed.
iv. Multipurpose protected areas which are meant for preserving genetic diversity in the ecosystem of various natural biomass and unique biological communities.

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

Q.3

	Column I	Column II
(a)	Dodo	(i) Africa
(b)	Quagga	(ii) Russia
(c)	Thylacine	(iii) Mauritius
(d)	Stellar's sea cow	(iv) Australia

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

Q.4

	Column I	Column II
(a)	Ants	(i) ≈ 20,000 species
(b)	Beetles	(ii) >28,000 species
(c)	Fishes	(iii) >3,00,000 species
(d)	Orchids	(iv) >20,000 species

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

SECTION - 2 (BASIC CONCEPTS BUILDER)

For Q.5 to Q.10 :

Species, Core or Natural, Genetic, *ex-situ*

Q.5 ____ diversity enables a population to adopt its environment and helps in formation of ecotype.

Q.6 ____ zone of the biosphere reserve is managed to accommodate a greater research and educational activities.

Q.7 Botanical gardens and seed banks are _____ methods of biodiversity conservation.

Q.8 _____ diversity is highest in the tropics and decreases towards the poles.

Q.9 Alpha diversity refers to the diversity of organism sharing the same community. **[True / False]**

Q.10 *Ailurus fulgens* is a vulnerable animal species in India. **[True / False]**

SECTION - 3 (ENHANCE PROBLEM SOLVING SKILLS)

Choose one correct response for each question.

PART - 1 : BIODIVERSITY

Q.11 The term 'biodiversity' was given by
(A) Alexander von Humboldt
(B) Edward Wilson
(C) David Tilman
(D) Paul Ehrlich

Q.12 Three levels of biodiversity are
(A) genetic diversity, species diversity and ecological diversity.
(B) species diversity, ecological diversity and habitat diversity.
(C) geographical diversity, genetic diversity and habitat diversity.
(D) ecological diversity, species diversity and community diversity

Q.13 Which of the following group of plants exhibit more species diversity?
(A) Angiosperms (B) Algae
(C) Bryophytes (D) Fungi

Q.14 The term 'alpha diversity' refers to –
(A) species diversity
(B) genetic diversity
(C) community diversity
(D) diversity among the plants

Q.15 An endemic species is the one
(A) that has been introduced to a new geographic area.
(B) that is found in many different geographic area.
(C) that is found only on islands.
(D) that is found naturally in just one geographic area.

Q.16 The Western Ghats have a greater amphibians diversity than the Eastern Ghats. It is an example of
(A) species diversity (B) genetic diversity
(C) ecological diversity (D) None of these

Q.17 The greatest threat to genetic diversity in agricultural crops is –
(A) extensive use of insecticides and pesticides
(B) extensive mixed cropping
(C) introduction of high yielding varieties
(D) extensive use of fertilisers

Q.18 Which of the below mentioned regions exhibit less seasonal variations?
(A) Tropics (B) Temperates
(C) Alpines (D) Both (A) & (B)

PART - 2 : PATTERNS OF BIODIVERSITY

Q.19 From high latitude to low latitude, biodiversity
(A) decreases
(B) increases
(C) remains same
(D) first decreases then increases

Q.20 Which of the following countries has the highest biodiversity?
(A) Brazil (B) South Africa
(C) Russia (D) India

Q.21 A keystone species is the one that
(A) causes other species to become extinct
(B) exerts a strong influence on an ecosystem
(C) has a weak influence on an ecosystem
(D) has a higher likelihood of extinction than a non-keystone species.

Q.22 The species area relationship is a straight line described by the equation
(A) $\text{Log } S = \frac{\log C}{\log A}$
(B) $Z \log A = \frac{\log C}{\log S}$
(C) $\text{Log } S = \log C + Z \text{ Log } A$
(D) $\log S = \log C - Z \log A$

Q.23 Among the ecosystem mentioned below, where can one find maximum biodiversity?
(A) Mangroves (B) Desert
(C) Coral reefs (D) Alpine meadows

Q.24 The country whose tropical rain forests possess the greatest biodiversity on earth is
(A) New York (B) South America
(C) India (D) England

Q.25 Communities with more species tend to be more stable than those with less species. This was confirmed by
(A) Alexander von Humboldt
(B) David Tilman
(C) Paul Ehrlich
(D) Edward Wilson

PART - 3 : LOSS OF BIODIVERSITY

Q.26 Water hyacinth (*Eichhornia crassipes*) was introduced in Indian water to reduce pollution. It is an example of
(A) disturbance and degradation
(B) coextinctions
(C) alien species invasions
(D) over-exploitation

Q.27 Which of the following is not a cause for loss of biodiversity?
(A) Destruction of habitat
(B) Invasion by alien species
(C) Keeping animals in zoological parks
(D) Over-exploitation of natural resources

Q.28 *Pronuba* and *Yucca* exists in mutualistic relationship in nature. Which of the following term describes this situation?
(A) Pollution
(B) Coextinctions
(C) Alien species invasions
(D) Over-exploitation

Q.29 Which of the following is an exotic species?
(A) *Lantana* (B) *Parthenium*
(C) *Eichhornia* (D) All of these

PART - 4 : BIODIVERSITY CONSERVATION

Q.30 In India, hot spot area is found in –
(A) Eastern Himalaya (B) Tropical Andes
(C) Madagascar (D) America

Q.31 Core zone, buffer zone and manipulation zone are found in –
(A) national park (B) sanctuary
(C) tiger reserve (D) biosphere reserve

Q.32 Which one of the following is not a major characteristic feature of biodiversity hot spots?
(A) Large number of species
(B) Abundance of endemic species
(C) Large number of exotic species
(D) Destruction of habitat

Q.33 Identify the names of two hot spots of biodiversity in India.
(A) Himalayan and Deccan Plateau
(B) Western ghats and North Eastern Himalayas
(C) Deccan and Western ghats
(D) Western ghats and Gangetic plains

Q.34 The one-horned rhinoceros is specific to which of the following sanctuary
(A) Bhitar Kanika (B) Bandipur
(C) Kaziranga (D) Corbett park

Q.35 Biodiversity Act of India was passed by the Parliament in the year
(A) 1996 (B) 1992
(C) 2002 (D) 2000

Q.36 The historic convention on Biological Diversity held in Rio de Janeiro in 1992 is known as:
(A) CITES Convention (B) The Earth Summit
(C) G-16 Summit (D) MAB Programme

Q.37 Largest tiger population is found in
(A) Sunderban National Park
(B) Corbett-Netional Park:
(C) Ranthambhor National Park
(D) Kanha National Park

Q.38 Amongst the animal groups given below, which one has the highest percentage of endangered species?
(A) Insects (B) Mammals
(C) Amphibians (D) Reptiles

Q.39 Which of following is an *in situ* method of conservation?
(A) National park (B) Botanical garden
(C) Tissue culture (D) Genetic engineering

Q.40 Spot out the zone of our country considered as the hot spot of biodiversity and regarded as the cradle of speciation
(A) Western ghats (B) North east
(C) Himalayan base (D) Deccan plateau

Q.41 Which of the following is the first national park in India?
(A) Kanha National Park
(B) Periyar National Park
(C) Corbett National Park
(D) Bandipur National Park

EXERCISE - 2 (LEVEL-2)

Choose one correct response for each question.

Q.1 When large habitats are broken up in to small fragments due to human activities, which of the following get badly affected -
(A) Mammals and birds requiring large territories
(B) Animals with migratory habitats
(C) Animals with large bodysize
(D) Both (A) and (B)

Q.2 Aline species invasion is one of the cause of Biodiversity loss. Introduction of Nile perch in victoria lake lead to extinction of more than 200 species of -
(A) Cichlid fish (B) Gambusia
(C) Salmon fish (D) Cat fish

Q.3 In Bioshpere, diversity (Heterogeneity) exist at -
(A) Species level (B) Micromolucule level
(C) Biomass level (D) All the above

Q.4 In equation $\log S = \log c + Z \log a$, what is Z -
(A) Species richness (B) Area
(C) Regression coefficient (D) y-intercept

Q.5 Regardless of taxonomic group or region, what is the value of Z (Regression coefficient), discovered by ecologist –
(A) 0.6 - 1.2 (B) 1.15
(C) 1 - 2 (D) 0.1 - 0.2

Q.6 Where among the following will you find pitcher plant?
(A) Rain forest of North-East India
(B) Sunderbans
(C) Thar Desert
(D) Western Ghats

Q.7 First biosphere reserve was established in 1986 at-
(A) Nilgiri (B) Nanda Devi
(C) Little Rann of Kutch (D) Sunderbans

Q.8 "Sariska National park" situated in –
(A) Madhya pradesh (B) Assam
(C) Gujrat (D) Rajasthan

Q.9 Find out the write one -
(A) India has 7.1% species diversity
(B) India is one of the 22 megadiversity countries of the world.
(C) According to Mary's global estimate only 22% of the total species have been recorded so far.
(D) According to may's estimation, more than 3,00,000 plant species yet to be discovered

Q.10 Pattern of Biodiversity depends upon -
(A) Latitudinal gradient
(B) Altitudinal gradient
(C) Species - area relationship
(D) All of these

Q.11 Which statement is incorrect -
(A) There is increase in biodiversity from pole to equator
(B) Their is increase in biodiversity from low altitude to high altitude.
(C) There is directly proportional relationship between area & biodiversity.
(D) Tropics has less seasonal, relatively more constant and predictable environment.

Q.12 The most dramatic examples of habitat loss come from tropical rain forests. Once covering more that 14 present of earths land surface and now cover no more than -
(A) 5% (B) 6%
(C) 10% (D) 13%

Q.13 The Amazon rain forest "lungs of Planet" harbouring probably millions of species is being cut & cleared for which purpose -
(A) For cultivation of soyabeans.
(B) For conservation of grasslands for raising beef cattles.
(C) For cultivation of Medicinal plants.
(D) Both (A) and (B).

Q.14 In species area relationship, on a logarithmic scale. The relationship is –
(A) Rectangular hyperbola
(B) Rectangular parabola
(C) Straight line
(D) Sigmoid

Q.15 In India how many Genetically different strains of rice & mango varieties present -
(A) 50,000 and 1,0000 respectively.
(B) 1000 & 50000 respectively.
(C) 50.000 & 1.000 respectively.
(D) 50,000 & 5,000 respectively.

Q.16 Select the wrong match for extinction of species as per the IUCN red list 2004 -
(A) Vertibrates - 338 (B) Invertebrates - 359
(C) Plants - 87 (D)Prokaryotes - 2001

Q.17 The extinction of passenger pigeon was due to:
(A) Increased number of predatory birds.
(B) Over exploitation by humans.
(C) Non-availability of the food.
(D) Bird flu virus infection.

Q.18 What is the contribution of India in global species diversity
(A) 2.4 % (B) 12 %
(C) 8.1 % (D) 7.1 %

Q.19 Careful analysis of records shows that extinction across taxa are not random, some groups like ___ appear to be more vulnerable to extinction.
(A) Reptiles (B) Mammals
(C) Aves (D) Amphibians

Q.20 According to Ecological warn that if the present trends continue. Nearly half of the species on earth might be wiped out within how many years
(A) 100 (B) 1000
(C) 50 (D) 500

Q.21 Which one of the following expanded form of the following acronyms is correct?
(A) UNEP- United Nations Environmental Policy
(B) IUCN-International Union for Conservation of Nature and Natural Resources.
(C) EPA - Environmental Pollution Agency
(D) IPCC - International Panel for Climate Change

Q.22 What is common to the following plants: *Nepenthes*, *Psilotum*, *Rauwolfia* & *Aconitum*?
(A) All are ornamental plants
(B) All are phylogenic link species
(C) All are prone to over exploitation
(D) All are exclusively present in the Eastern Himalayas.

Q.23 Which of the following statements is correct?
(A) *Parthenium* is an endemic species of our country.
(B) African catfish is not a threat to indigenous catfishes.
(C) Steller's sea cow is an extinct animal.
(D) *Lantana* is popularly known as carrot grass.

Q.24 What is common to *Lantana*, *Eichhornia* and African catfish?
(A) All are endangered species of India.
(B) All are key stone species.
(C) All are mammals found in India.
(D) All the species are neither threatened nor indigenous species of India.

Q.25 Which of the following is not an invasive alien species in the Indian context?
(A) *Lantana* (B) *Cynodon*
(C) *Parthenium* (D) *Eichhornia*

Q.26 According to the species-area relation concept
(A) most species within any given area are endemic.
(B) the larger the area, the greater the extinction rate
(C) larger species requires larger habitat area than do the smaller species.
(D) the number of species in an area increases with the size of that area.

Q.27 Which of the following forests is known as the 'lungs of the planet Earth'?
(A) Tiaga forest
(B) Tundra forest
(C) Amazon rain forest
(D) Rain forests of North East India

Q.28 Which one of the following is an endangered plant species of India?
(A) *Rauwolfia serpentina*
(B) *Santalum album* (Sandal wood)
(C) *Cycas beddonei*
(D) All the above

EXERCISE - 3 (LEVEL-3)

Choose one correct response for each question.

Q.1 The recent illegal introduction of which African fish becomes severe cause of threatening of indigenous cat fishes -
(A) Gambusia (B) Cailochorus
(C) Clarias gariepinus (D) Perisierola

Q.2 Find out the following w.r.t. Economic importance of biodiversity -
(A) Production of oxygen (B) Pollination
(C) Medicinal utility (D) All

Q.3 When we conserve and protect the whole ecosystem, its biodiversity at all levels is called -
(A) In situ conservation
(B) Ex -situ conservation
(C) On site conservation
(D) Both (A) and (C)

Q.4 Which among the following is the criterion for determination of 'Biodiversity hot spot' -
(A) Very high level of species richriess
(B) High degree of habitat loss and fragmentation
(C) High degree of Endemism
(D) All of the above

Q.5 For frugivorous birds the value of Z (Regression coefficient) suggested -
(A) 0.1 - 0.2 (B) 0.6 - 1.2
(C) 1.15 (D) 11.5

Q.6 More species in community, tends to more stability than communities with less species. It was supported by-
(A) David Tilman (B) Paul Ehrlich
(C) Humboldt (D) Both (A) and (B)

Q.7 Find out the odd one with respect to 'Biodiversity hot spots'
(A) Western Ghats & srilanka
(B) Indo - Burma
(C) Himalaya
(D) Gangatic plains

Q.8 Sacred groves is also one of the important mean of Biodiversity conservation. In respect of this find out the odd one -
(A) Khasi & Jaintia - Meghalaya
(B) Aravalli hills - Rajasthan
(C) Sarguja, Chanda, Bastar - Mesorum
(D) Western Ghat - Maharasahtra

Q.9 The term hot spot for high diversity ecological regions was coined by –
(A) IUCN (B) Myers
(C) Odum (D) Kormandy

Q.10 For amazonian forest find out wrong match-
(A) Plants - > 40,000 species
(B) Fishes - 3,000 species
(C) Birds - 13,00 species
(D) Mammals - 378 species

Q.11 Which of the following is not the reason of great biodiversity in tropics -
(A) Undisturbed climate for millions of years
(B) Less seasonal variations
(C) More nutritive soil
(D) More solar energy

Q.12 In India, Red Panda/Ailurus fulgens is-
(A) Vulnerable (B) Endangered
(C) Critically endangered (D) Extinct in the wild

Q.13 Find out incorrect statement -
(A) Biodiversity exists at all levels of Biological organisation.
(B) A single Species can not show more diversity at genetic level.
(C) Western ghats have a greater amphibian species diversity.
(D) India has greater ecological diversity than Scandinavian country.

Q.14 The loss of biodiversity in a region may not lead to -
(A) Decline in plant production.
(B) Lowered resistance to environmental perturbations.
(C) Constant pest and disease cycles.
(D) Increased variability in cartain ecosystem processes productivity.

Q.15 From 'The Evil Quartet' which of the following is most important cause of biodiversity loss -
(A) Habitat loss and fragmentation
(B) Over - exploitation
(C) Aline species invasion
(D) Co-extinctions

Q.16 According to IUCN (2004) how many plant and animal species have been described so far -
(A) 1.5 billion (B) 1.5 million
(C) 7.1 million (D) 7.1 billion

Q.17 Which is preserved in National Park –
(A) Flora (B) Fauna
(C) Both (A) and (B) (D) None of these

Q.18 One of the ex-situ conservation methods for endangered species is –
(A) Wildlife Sanctuaries (B) Biosphere Reserves
(C) Cryopreservation (D) National parks

Q.19 One of the most important functions of botanical gardens is that –
(A) They provide a beautiful area for recreation.
(B) One can observe tropical plants there
(C) They allow ex-situ conservation of germ plasm.
(D) They provide the natural habitat for wild life.

Q.20 **Statement 1 :** A sanctuary is formed for the conservation of animals only.
Statement 2 : Restricted human activities are allowed in sanctuaries.
(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.
(B) Statement -1 is True, Statement -2 is True ; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False.
(D) Statement-1 is False, Statement -2 is False.

Q.21 What is common to the techniques (i) in vitro fertilisation, (ii) Cryo preservation and (iii) tissue culture?
(A) All are *in situ* conservation methods.
(B) All are *ex situ* conservation methods.
(C) All require ultra modern equipment and large space.
(D) All are methods of conservation of extinct organisms.

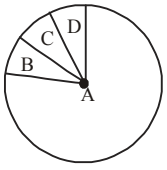
EXERCISE - 4 (PREVIOUS YEARS AIPMT/NEET EXAM QUESTIONS)

Choose one correct response for each question.

Q.1 Which one of the following is not used for ex situ plant conservation ? **[NEET 2013]**
(A) Botanical Gardens (B) Field gene banks
(C) Seed banks (D) Shifting cultivation

Q.2 Which of the following represents maximum number of species among global biodiversity ? **[NEET 2013]**
(A) Mosses and Ferns (B) Algae
(C) Lichens (D) Fungi

Q.3 The representation of the extent of global diversity of invertebrates is shown. What groups the four portions (A-D) represent respectively?



[AIPMT 2014]
(A) A-insects, B-Crustaceans, C-Other animal Groups, D-Molluscs
(B) A-Crustaceans, B-insects, C-Molluscs, D- Other animal Groups
(C) A-Molluscs, B-Other animal Groups, C-Crustaceans, D-insects
(D) A-insects, B-Mollusc, C-Crustaceans, D-Other animal Groups

Q.4 An example of ex situ conservation is – **[AIPMT 2014]**
(A) National Park (B) Seed Bank
(C) Wildlife Sanctuary (D) Sacred Grove

Q.5 A species facing extremely high risk of extinction in the immediate future is called **[AIPMT 2014]**
(A) Vulnerable (B) Endemic
(C) Critically Endangered (D) Extinct

Q.6 The organization which publishes the Red List of species is – **[AIPMT 2014]**
(A) ICFRE (B) IUCN
(C) UNEP (D) WWF

Q.7 In which of the following both pairs have correct combination ? **[AIPMT 2015]**
(A) *in situ* conservation : Cryopreservation
Ex situ conservation : Wildlife Sanctuary
(B) *in situ* conservation : Seed Bank
Ex situ conservation : National Park
(C) *in situ* conservation : Tissue culture
Ex situ conservation : Sacred groves
(D) *in situ* conservation : National Park
Ex situ conservation : Botanical Garden

Q.8 Cryopreservation of gametes of threatened species in viable and fertile condition can be referred to as : **[AIPMT 2015]**
(A) Advanced ex-situ conservation of biodiversity.
(B) In situ conservation by sacred groves.
(C) In situ cryo-conservation of biodiversity.
(D) In situ conservation of biodiversity.

Q.9 The species confined to a particular region and not found elsewhere is termed as : **[RE-AIPMT 2015]**
(A) Alien (B) Endemic
(C) Rare (D) Keystone

Q.10 Which is the National Aquatic Animal of India? **[NEET 2016 PHASE 1]**
(A) Gangetic shark (B) River dolphin
(C) Blue whale (D) Sea-horse

Q.11 Which of the following is the most important cause of animals and plants being driven to extinction? **[NEET 2016 PHASE 1]**
(A) Over-exploitation
(B) Alien species invasion
(C) Habitat loss and fragmentation
(D) Co-extinctions

Q.12 Joint Forest Management Concept was introduced in India during **[NEET 2016 PHASE 1]**
(A) 1960s (B) 1970s
(C) 1980s (D) 1990s

Q.13 Which of the following is correctly matched? **[NEET 2016 PHASE 2]**
(A) Aerenchyma – *Opuntia*
(B) Age pyramid – Biome
(C) *Parthenium hysterophorus* – Threat to biodiversity
(D) Stratification – Population

Q.14 Red list contains data or information on
(A) All economically important plants
(B) Plants whose products are in international trade **[NEET 2016 PHASE 2]**
(C) Threatened species
(D) Marine vertebrates only

Q.15 Which one of the following is related to Ex-situ conservation of threatened animals and plants?
(A) Wildlife Safari parks **[NEET 2017]**
(B) Biodiversity hot spots
(C) Amazon rainforest
(D) Himalayan region

Q.16 The region of Biosphere Reserve which is legally protected and where no human activity is allowed is known as : **[NEET 2017]**
(A) Core zone (B) Buffer zone
(C) Transition zone (D) Restoration zone

Q.17 Alexander Von Humboldt described for the first time: **[NEET 2017]**
(A) Ecological Biodiversity
(B) Laws of limiting factor
(C) Species area relationships
(D) Population Growth equation

Q.18 Niche is **[NEET 2018]**
(A) the range of temperature that the organism needs to live.
(B) the physical space where an organism lives.
(C) all the biological factors in the organism's environment.
(D) the functional role played by the organism where it lives.

Q.19 All of the following are included in 'ex-situ conservation' except **[NEET 2018]**
(A) Botanical gardens (B) Sacred groves
(C) Wildlife safari parks (D) Seed banks

Q.20 The Earth Summit held in Rio de Janeiro in 1992 was **[NEET 2019]**
(A) to reduce CO_2 emissions and global warming.
(B) for conservation of biodiversity and sustainable utilization of its benefits.
(C) to assess threat posed to native species by invasive weed species.
(D) for immediate steps to discontinue use of CFCs that were damaging the ozone layer.

Q.21 Which of the following is the most important cause for animals and plants being driven to extinction? **[NEET 2019]**
(A) Habitat loss and fragmentation
(B) Drought and floods
(C) Economic exploitation
(D) Alien species invasion

Q.22 Which one of the following is not a method of *in situ* conservation of biodiversity? **[NEET 2019]**
(A) Biosphere Reserve (B) Wildlife Sanctuary
(C) Botanical Garden (D) Sacred Grove

ANSWER KEY

EXERCISE-1 (SECTION-1&2)

(1) (D) **(2)** (A) **(3)** (D) **(4)** (D)
(5) Genetic **(6)** Core or Natural
(7) *ex-situ* **(8)** Species
(9) True **(10)** False

EXERCISE - 1 [SECTION-3]

Q	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
A	B	A	A	C	D	A	C	A	B	A	B	C	C	B	B	C	C	B	D	A	D	C	B	C	C	B	A	C	A	B	C

EXERCISE - 2

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A	D	A	D	C	D	A	A	D	C	D	B	B	D	C	C	D	B	C	D	A	B	C	C	D	B	D	C	D

EXERCISE - 3

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A	C	C	D	D	C	D	D	C	B	D	C	B	B	C	A	B	C	C	C	A	B

EXERCISE - 4

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A	D	D	D	B	C	B	D	A	B	B	C	C	C	C	A	A	C	D	B	B	A	C

SOLUTIONS

EXERCISE-1

(1) **(D).** Species diversity-Influences biotic interaction and stability of the community.
Genetic diversity - Influences adaptability and distribution of a species in diverse habitats.
Ecological diversity - Is the variety of forms in the ecosystem.
Biodiversity - Occurrence of different types of ecosystem, species of organisms with the whole range of their variants and genes.

(2) (A) **(3)** (D) **(4)** (D)

(5) Genetic **(6)** Core or Natural

(7) *ex-situ* **(8)** Species

(9) True **(10)** False

(11) **(B).** The term biodiversity was given by Edward Wilson.

(12) **(A).** Immense diversity (heterogeneity) exists in our biosphere, not only at the species level but at all the levels of biological organisation ranging from the macromolecules within cells to biomes.
Sociobiologist Edward Wilson described the combined diversity at all the levels of biological organisation. These are genetic diversity, species diversity and ecological diversity.

(13) **(A).**

(14) **(C).** Alpha diversity is one of the three types of ecological diversity (community and ecosystem diversity). It is the species diversity in a given community or habitat

(15) **(D).** An endemic species is the one found naturally in just one geographic area.

(16) **(A).** The diversity at the species level is measured as species diversity. It is the variety in the number and richness of the species of a region. For example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.

(17) **(C).** Genetic diversity is the diversity in the number and types of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species. Introduction of high yielding varieties is the greatest threat to genetic diversity in agricultural crops.

(18) **(A).** There are no unfavourable seasons in tropics. Continued favourable environment has helped tropical organisms to gain more niche specialisation and increased diversity. Hence, tropics exhibit lesser seasonal variations.

(19) **(B).** From high latitude to low latitude, biodiversity increases.

(20) **(A).** The environment of Brazil is characterized by high biodiversity. Brazil's large area comprises' different ecosystems, which together sustain some of the world's greatest biodiversity. It has the most known species of plants (55,000), freshwater fish (3,000) and mammals (700). Birds and reptiles are also found in abundance.

(21) **(B).** A keystone species is the one that exerts a strong influence on an ecosystem.

(22) **(C).** On a logorithmic scale, the species area relationship is a straight line described by the equation

$$\text{Log } S = \text{Log } C + Z \log A$$

Where, S = species richness
A = area, Z = slope of the line,
C = Y-intercept

(23) **(C).** Coral reefs have the highest biodiversity with its macrobiota representing about 4-5% of the described global biota.

(24) **(B).** Tropical rain forests of Amazon in South America possess the greatest biodiversity on earth with more than 40000 species of plants, 3000 of fishes, 1300 birds, 427 of mammals, 427 of amphibians, 378 of reptiles and more than 125000 invertebrates.

(25) **(B).** Ecologists believe that the communities with more species tend to be more stable than those with less species. This was confirmed by David Tilman.

(26) **(C).** Water hyacinth (*Eichhornia crassipes*) was introduced in Indian waters to reduce pollution, is an example of alien species invasions.

(27) **(C).** Keeping animals in zoological parks is not a cause for loss of biodiversity rather it is a method of conservation of biodiversity.

(28) **(B).** Certain obligatory mutualistic relationships exist in nature, e.g., *Pronuba* and *Yucca*. Extinction of one will automatically cause the extinction of the other. It is an example of co-extinctions.

(29) **(D).** All of these are exotic species. An exotic species is one that is not native to a given area. It is a plant, animal or insect that has been brought to an area, often by immigrants.

(30) **(A).** Out of the 25 hot spots of the world, two are found in India. These are Western Ghats and Eastern Himalayas and they extends to the neighbouring countries also. These areas show high degree of endemism and are inhabited by a wide variety of flowering plants, swallow-tailed butterflies, amphibians, reptiles and mammals.

(31) **(D).** Biosphere reserves are the special category of protected areas of land and/or coastal environments where in people are an integral component of the ecosystem. It represents a specified area zonated for particular activities and consists of a core zone without any human activity, butter zone is the area with limited human activities and manipulation zone is associated with several manipulating human activities.

(32) **(C).** Hot spots are areas of high endemism and high species richness. Allover the world, some 34 such spots have been identified, including 3 in India (Western Ghats, Indo-Burma and Himalayas). The environmental conditions in polar regions do not favour large number of species or species richness.

(33) **(B).** Hot spots are the areas of high endemism and high level of species richness. Three of them occurs in India - Western Ghats and Sri Lanka/Indo-Burma (North-East India) and Himalaya.

(34) **(C).**

(35) **(C).** The World Summit of Sustainable Development was held in Johanesberg, South Africa in 2002 in which 190 countries pledged to reduce the current rate of biodiversity loss of global, regional and local levels by 2010. Regarding the same of the Biodiversity Act was pased in India in the year 2002.

(36) **(B).** Earth Summit at Rio de Janeiro (1992), Brazil, promoted Convention on Biological Diversity (CBD) which was signed by 152 nations. Its recommendations came into effect on 29th Dec. 1993. India became a party to this Convention on Biological Diversity in May, 1994.

(37) **(A).** Sunderban National Park has the largest tiger population. It also reserves the salt water crocodiles, gangetic dolphins, cheetahs, wild boars, rhesus macaques, etc.

(38) **(C).** The percentage number of endangered species in the list of threatened ones is 19% mammals, 17% birds, 21% reptiles, 22% amphibians.

(39) **(A).** *In situ* (on-site) conservation refers to the protection and the maintenance of biological diversity through a network of protected areas. Here, the selected flora/fauna are naturally conserved in their natural homes. It includes national parks, sanctuaries, biosphere reserves, etc.

(40) **(B).** The Eastern Himalayas hot spots of our country extends to the North-East India and Bhutan. The Indo-Burma region covering the Eastern Himalayas is also known as the cradle of speciation.

(41) **(C).** Jim Corbett was the first National Park of India, formerly called Hailey National Park, established in 1935.

EXERCISE-2

(1) (D)

(2) **(A).** Nile perch were introduced to Lake Victoria in the 1950s to boost the fishing industry. The introduction of Nile perch caused an economic boom, but almost caused cichlids, a native fish, to go extinct.

(3) (D) **(4)** (C) **(5)** (D)

(6) **(A).** Pitcher plant is mainly found in rain forest of North-East India. This plant grows in the soil which has low nitrate. Hence, they obtain nutrients by trapping insects.

(7) (A)

(8) **(D).** The Sariska Tiger Reserve is an Indian national park and wildlife refuge located in the Alwar district of the state of Rajasthan.

(9) (C) **(10)** (D) **(11)** (B)

(12) (B) **(13)** (D) **(14)** (C)

(15) (C) **(16)** (D)

(17) **(B).** Passenger pigeons (*Ectopistes migratorious*) were once one of the most abundant birds on our planet, living in United States. But hunting on a very massive scale as well as deforestation, lead to their extinction. Many cruel ways were used for their hunting. The last individual of this species died in 1914 in Cincinnati Zoo.

(18) **(C).** India has about 8 percent of the world's biodiversity on 2 percent of the earth's surface, making it one of the 12 mega-diversity countries in the world. The country has 10 different bio geographic zones and 26 biotic provinces gifted with unique and rare species of flora and fauna.

(19) (D) **(20)** (A)

(21) **(B).** IUCN or IUCNNR (International Union for Conservation of Nature and Natural Resources) is now known as WCU (World Conservation Union). It's headquarter is at Morges, Switzerland. It studies the threat to biodiversity in all the parts of the world by gathering information about the geographical distribution, population size and population changes of various taxa. It prepares a red list or Red Data Book.

(22) **(C).** *Nepenthes, Psilotum, Rauwolfia* and *Aconitum* have either medicinal or ornamental importance. Hence, they are prone to over exploitation.

(23) **(C).** Steller's sea cow became extinct due to over exploitation by humans.

(24) **(D).** *Lantana, Eichhornia* and African catfish are exotic species. Non-native or exotic species are often introduced inadvertently for their economic and other uses. They often become invasive and drive away the local species. These species are considered to be second major cause of extinction of species. Exotic species have proved harmful to both aquatic and terrestrial ecosystems.

(25) **(B).** *Lantana*, *Eichhornia* and *Parthenium* are all exotic species,which had been introduced in India. *Lantana camara* has replaced many species in forests of Uttar Pradesh and Madhya Pradesh. *Eichhornia* (water hyacinth) has clogged water bodies including wetlands resulting in death of several aquatic plants and animals. *Parthenium* has pushed out several herbs and shrubs from open places in the plains.

(26) **(D).** According to the species area relations concept, the number of species in an area increases with the size of that area.

(27) **(C).** Amazon rain forests are also called as the lungs of the planet earth. This rain forest in South America is the largest and most diverse tropical rain forest on our planet. It contributes around 20% of the total oxygen in our planet.

(28) **(D).**

EXERCISE-3

(1) (C) **(2)** (C) **(3)** (D)

(4) (D) **(5)** (C) **(6)** (D)

(7) **(D).** The political boundaries of India encompass a wide range of ecozones-desert, high mountains, highlands, tropical and temperate forests, swamplands, plains, grasslands, areas surrounding rivers, as well as island archipelago. It hosts 3 biodiversity hotspots: the Western Ghats, the Himalayas and the Indo-Burma region.

(8) (C) **(9)** (B)

(10) (D) **(11)** (C)

(12) **(B).** The red panda has been classified as Endangered by the IUCN.

(13) (B)

(14) (C)

(15) (A)

(16) (B)

(17) (C)

(18) **(C).** Ex situ conservation literally means, "off-site conservation". It is the process of protecting an endangered species of plant or animal outside its natural habitat; for example, by removing part of the population from a threatened habitat and placing it in a new location, which may be a wild area or within the care of humans.

(19) (C)

(20) **(A).** A sanctuary is an area which is reserved for the construction of wild animals only operations such as harvesting of timber, collection of minor forest products and private ownership rights are allowed, however, such activities should not have any adverse effect on animals.

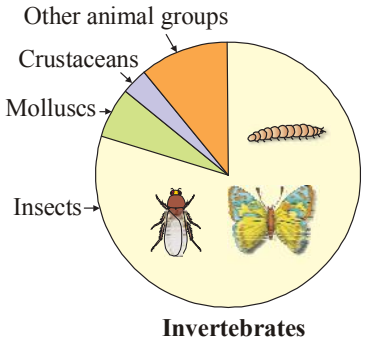
(21) **(B).** Conservation of biodiversity can be broadly classified into two types: *In situ* (on-site) and *ex situ* (off site). Examples of *in situ* strategies includes national parks, sanctuaries, biosphere reserves ete. It is the preferred method to maintain species of wild animals in their natural habitats. This approach helps in conservation of total ecosystem. *Ex situ* approaches include conservation of those organisms, whose species may become extinct or decline heavily in number (due to a variety of reasons) in their natural habitat. This includes seed banks, cryopreservation, tissue culture, *in vitro* fertilisation etc.

EXERCISE-4

(1) **(D).** Shifting cultivation results into deforestation.

(2) **(D).** The no. of species of fungi is 72000 that is maximum in respect to other options.

(3) **(D).** A - Insects ; B - Molluscs
C - Crustaceans, D - Other animal groups



(4) **(B).** In situ conservation strategies – National park,
biosphere reserve, sanctuaries, sacred groves.

(5) **(C).** A taxon facing extremely high risk of extinction in the immediate future is called critically endangered.

(6) **(B).** The IUCN Red List of threatened species (also known as the IUCN Red List or Red Data List), founded in 1964, is the world's most comprehensive inventory of the global conservation status of biological species.

(7) **(D).** The process of protecting an endangered plants and animals species into its natural habitat is known as in situ conservation. It involves the creation of protected areas such as national parks, nature parks, biosphere reserves, wetlands protection zones, SPZ (Special Protection Zones) SCZ(Special Conservation Zones) etc.
Ex situ conservation is the technique of conservation of all levels of biological diversity outside their natural habitat through different techniques like zoo, captive breeding aquarium, botanical garden and gene bank.

(8) **(A).** Preservation at –196°C in liquid nitrogen is an advanced method for ex situ conservation of gametes, tissue culture, embryos, etc., for indefinite periods. To prevent extinction of threatened species, cryopreservation is done.

(9) **(B).** The species confined to a particular region and not found elsewhere is termed as Endemic.

(10) **(B).** River Dolphin is the national aquatic animal of India. This mammal can only survive in pure and fresh water.

(11) **(C).** There are four major causes of biodiversity loss in which most important cause driving animals and plants to extinction is "habitat loss and fragmentation".

(12) **(C).** Joint Forest Management Concept was introduced in India during 1980s by the Government of India to work closely with the local communities for protecting and managing forests.

(13) **(C).** *Parthenium hysterophorus* is an exotic or alien species which causes extinction of native (or) indegenous species.

(14) **(C).** IUCN [International Union Conservation of Nature and Natural Resources] (or) WCU [World Conservation Union] maintains red list which is a catalogue for threatened species.

(15) **(A).** Ex.situ conservation is offsite strategy for conservation of animals and plants in zoological park and botanical gardens respectively.

(16) **(A).** Biosphere reserve is protected area with multipurpose activities. It has three zones
(a) Core zone – without any human interference
(b) Buffer zone – with limited human activity
(c) Transition zone – human settlement, grazing cultivation etc. are allowed.

(17) **(C).** Alexander Von Humboldt observed that within a region species richness increases with the increases in area.

(18) **(D).** Ecological niche was termed by J. Grinnel. It refers the functional role played by the organism where it lives.

(19) **(B).** Sacred groves – *in-situ* conservation. Represent pristine forest patch as protected by Tribal groups.

(20) **(B).** Earth Summit (Rio Summit)-1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.

(21) **(A).** Habitat loss and fragmentation is the most important cause driving animals and plants to extinction. eg: Loss of tropical rainforest reducing the forest cover from 14 % to 6 %.

(22) **(C).** Botanical garden- *ex-situ* conservation (offsite conservation) i.e. living plants (flora) are conserved in human managed system.