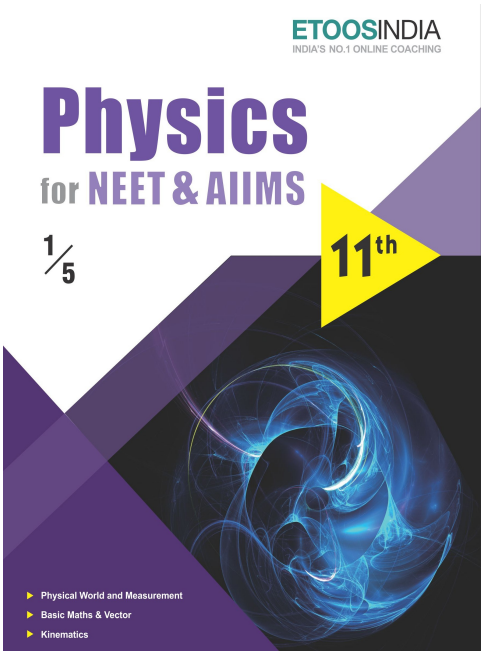
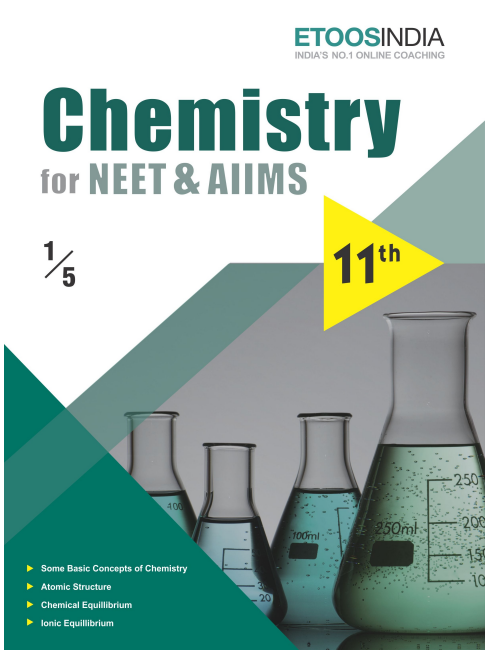
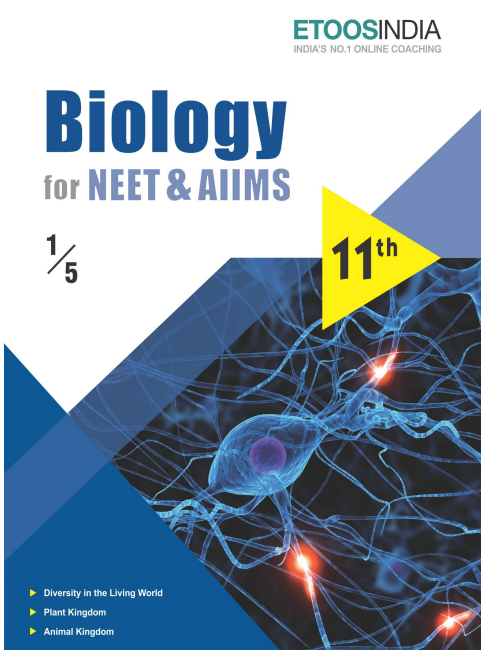
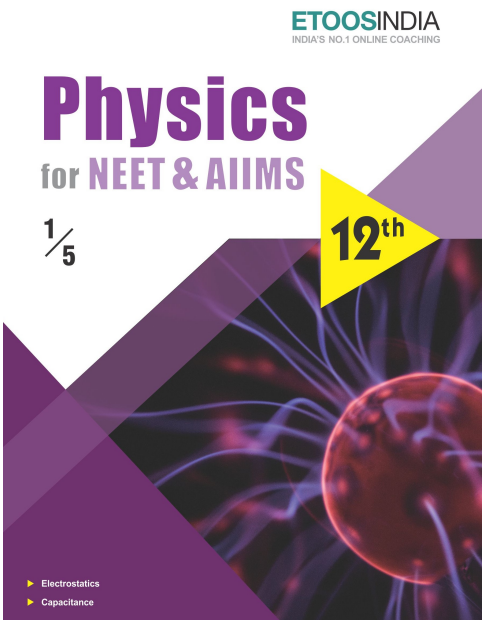
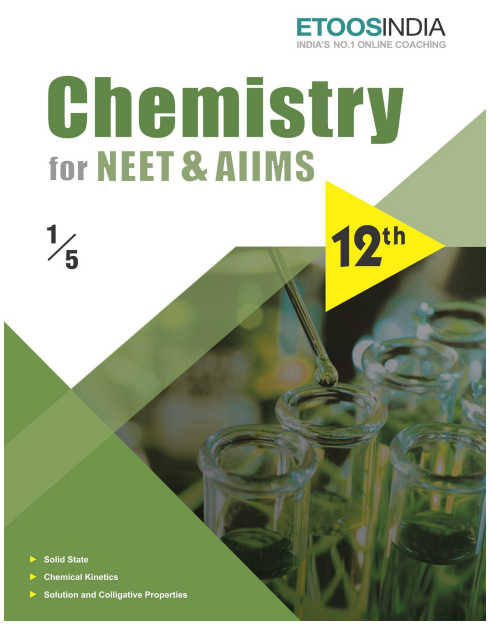
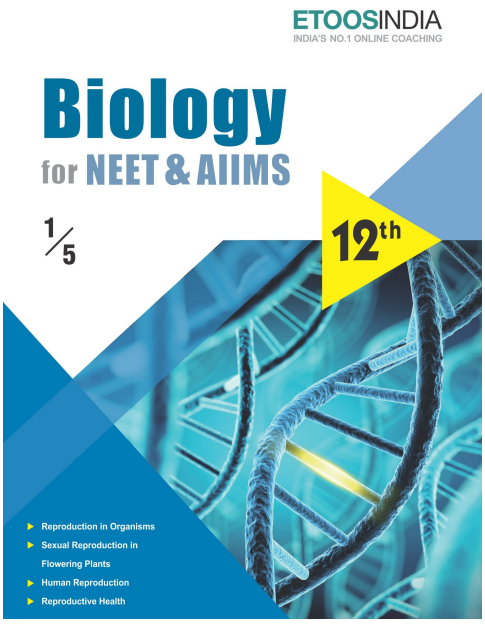












CHAPTER 15

BIODIVERSITY AND CONSERVATION

"Destroying rainforest for economic gain is like burning a Renaissance painting to cook a meal.".

"EDWARD WILSON (1929)"

INTRODUCTION

The rich variety of living organisms on this planet never ceases to astonish and fascinate us. Biodiversity is inherent in the occurence of vaious types of environmental conditions in different parts of an area as well as earth and the presence of various forms of life adapted to these different environmental regimes.

There are about 20,000 species of ants, 3,00,000 species of beetles, 28,000 species of fishes and nealy 20,000 species of orchids. Biodiversity is not uniform.It is low at certain regions, moderate in others and tremendous in some places.Ecologists and evolutionary biologists are trying to understand and get the significance of such a tremendous diversity. This chapter will help us to know the different levels of biodiversity,patterns of biodiversity, loss of biodiversity and their result. The various ways which can help us to prevent biodiversity and so on.

Biodiversity and Conservation

Biodiversity

- Term given by **Edward Wilson.**
- Combined diversity at all the levels of biological organization. The biodiversity can be studied at three levels.

(1) Genetic diversity (2) Species diversity (3) Community and Ecosystem diversity

(1) Genetic diversity :

- A species show high diversity at **gene level** over it's distributional range. For ex. Medicinal plant **Rauwolfia Vomitoria** growing in Himalayan range show diversity in synthesis of chemical **reserpine** in concentration and potential.
- **India has 50,000 genetically different spacies of rice and 1000 varieties of mangos.**
- Each species, varying from bacteria to higher plants and animals, stores an immense amount of genetic information. For example, the number of genes is about 450-700 in Mycoplasma, 4000 in Escherichia coli, 13000 in Drosophila melanogaster, 32000-50000 in Oryza sativa and 35000 to 45000 in Homo sapiens.
- Genetic diversity refers to the variation of genes within species; the differences could be in allels (different variants of same genes), in entire genes (the traits determining particular characteristics) or in chromosomal structures.
- The genetic diversity enables a population to adapt to its environment and respond to natural selection. If a species has more genetic diversity, it can adapt better to the changed environmental conditions.
- Lower genetic diversity in a species leads to uniformity, as in the case of large monocultures of genetically similar crop plants. This has advantage when increased crop production is a consideration, but can be a problem when an insect or a fungal disease attacks the field and posses a threat to the whole crop.
- The amount of genetic variation is the basis of **speciation** (evolution of new species). It has a key role in the maintenance of diversity at species and community levels. The total genetic diversity of a community will be greater if there are many species, as compared to a situation where there are only a few species. Genetic diversity within a species often increases with environmental variability.

(2) Species diversity :

- Diversity at species level.
  Ex.: Western Ghat have greater species diversity of amphibians than Eastern Ghat.
- Species are distinct units of diversity, each playing a specific role in an ecosystem. Therefore, loss of species has consequences for the ecosystem as a whole.
- Species diversity refer to the variety of species within a region. Simplest measure of species diversity is **species richness**, i.e., the number of species per unit area. The number of species increases per unit area of the site.
- Generally, greater the species richness, greater is the species diversity. However, number of individuals among the species may also vary, resulting into differences in **evenness** or **equitability** and **consequently** in diversity.
- Suppose, we are having three sample areas. In the sample area-I, there are three spacies of birds. Two species are represented by one individual each, while the third species has four individuals. In the sample area-2 that has the same three spacies, each spacies is represented by two individuals. This sample area show greater evenness, and there are equal chances for a species being represented in a sample. The sample area-2 will be considered more diverse than the first. In the sample area-3 the species are represented by an insect, a mammal and a birds. This sample area is most diverse as it comparises taxonomically unrelated species. In this example, we find equal number of spacies but varying number of individuals per species. In nature, both the number and kind of species, as well as the number of individuals per species vary, leading to greater diversity.

Etoos Tips & Formulas

→ Biodiversity is the term popularised by the sociologist Edward Wilson to describe the combined diversity at all the levels of biological organisation. The most important of them.

(i) Genetic diversity

(ii) Species diversity

(iii) Ecological diversity

→ According to the IUCN (2004), the total number of plant and animal species described so far is slightly more than 1.5 million.

→ Robert May places the global species diversity at about 7 million.

→ More than 70 percent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than 22 percent of the total. Out of every 10 animals on this planet, 7 are insects.

→ Although India has only 2.4 percent of the world's land area, its share of the global species diversity is an impressive 8.1 percent.

→ India, in the tropical latitudes, has more than 1,200 species of birds.

→ The largely torpical Amazonian rain forest in South America has the greatest biodiversity on earth.

→ Tropics that might account for their greater biological diversity ?

→ Tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification, (b) Tropical environments, unlike temperature 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.

→ 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 found that plots with more species showed less year-to-year variation in total biomass. Increased diversity contributed to higher productivity.

→ The IUCN Red List (2004) documents the extinction of 784 species (including 338 vertebrates, 359invertebrates and 87 plants) in the last 500 years. Some examples of recent extinctions include the dodo (Maurititus), quagga (Africa), thylacine (Australia). Steller's Sea Cow (Russia) and three subspecies (Bali, Javan, Caspian) of tiger.

→ Presently, 12 percent of all bird species, 23 percent of all mammal species, 32 percent of all amphibian species and 31 percent of all gymnosperm species in the world face the threat of extinction.

Causes of biodiversity losses

(i) Habitat loss and fragmentation

(ii) Over-exploitation : Steller's sea cow, passenger pigeon, were extinct due to overexploitation by humans.

→ Environmental damage was caused and threat was posed on our native species by invasive weed species like carrot grass (Parthenium), Lantana and water hyacinth (Eicchomia). The recent illegal introduction of the

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

→ Amazon forest is estimated to produce, through photosynthesis, 20 percent of the total oxygen in the earth's atmo sphere.

SOLVED EXAMPLE

Ex.1 One of the following plant species is in endagered list

(A) Eucalyptus **(B)** Nepenthes

(C) Ceratophyllum **(D)** Delonix

Sol. **(B)**

Ex.2 Biodiversity Act of India was passed by the parliament in the year

(A) 1992 **(B)** 1996

(C) 2000 **(D)** 2002

Sol. **(D)** : Biodiversity act of India – In september 202, India has 581 protected areas of National parks, Sanctuaries covering 4.7 % land surface against 10 % internationally through this act.

Ex.3 Which of the following regions of our country are known for their rich biodiversity

Or

Which of the following are considered hot-spot of biodiversity in India

(A) Weatern ghats and eastern himalayas

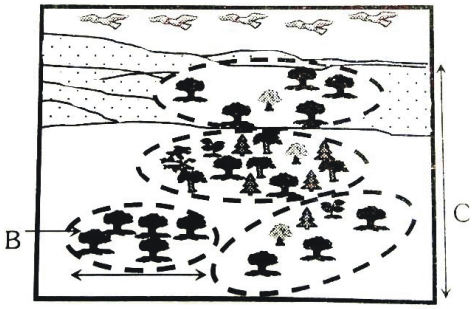
(B) Western ghats and deccan plateau

(C) Eastern himalayas and gangetic plane

(D) Trans himalayas and deccan peninsula

Sol. **(A)** : Largest region is Deccan, Peninsula and most biodiversity rich region is Weastern ghats (4 %) with a very large number of endemic amphibian species.

Ex.4 The following diagram shows different types diversity. Identify them



(A) A - Beta - diversity, B - Alpha - diversity, C - Gamma - diversity

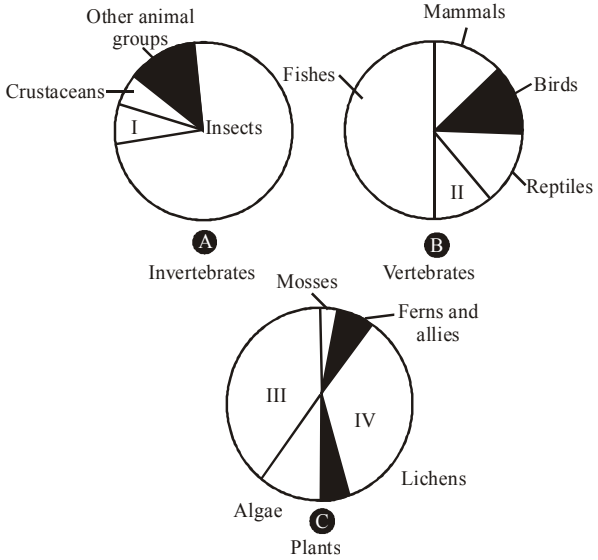
(B) A - Gamma - diversity, B - Beta - diversity, C - Alpha - diversity

(C) A - Gamma - diversity, B - Alpha - diversity, C - Beta - diversity

(D) A - Gamma - diversity, B - Beta - diversity, C - Alpha - diversity

Sol. **(A)**

Ex.5 The following are pie diagrams A, B and C related to proportionate number of species of major taxa of invertebrates, vertebrates and plants respectively. Study and select the right option in which all the blanks I, II, III and IV are correctly identified.



(A) I - Turtles, II - Amphibians, III - Fungi, IV - Angiosperms

(B) I - Hexapoda, II - Amphibians, III - Fungi, IV - Angiosperms

(C) I - Molluscs, II - Amphibians, III - Angiosperms, IV - Fungi

(D) I - Molluscs, II - Amphibians, III - Fungi, IV - Angiosperms

Sol. **(D)**

Ex.6 Total number of identified biodiversity hot spots in the world is

(A) 25 **(B)** 24

(C) 40 **(D)** 34

Sol. **(D)**

Ex.7 In India the horned rhinoceros is the most important protected species in

Or

The single horned rhinoceros is protecteed at

(A) Dachigam National Park (J & K)

(B) Kazriranga Nation Park (Assam)

(C) Sunderbans National Park (West Bengal)

(D) Dudhwa National National Park (U. P)

Sol. **(B)**

Exercise # 1 SINGLE OBJECTIVE NEET LEVEL

1. Endemic plants are those which are
(A) Cosmopolitan in distribution
(B) Restricted to certain area
(C) Found in arctic region
(D) Gregarious in habit

2. Earth Summit at Rio-de-Janero was related to
(A) Soil fertility
(B) Survey of natural resources
(C) Conservation of environment
(D) Prevention of afforestation

3. Each couple should produce only two children which will help in
(A) Checking pollution
(B) Stabilizing the ecosystem
(C) Fertility of soil
(D) Improving food web

4. One of the following is an endangered plant
(A) Lycopersicum (B) Dalbergia
(C) Cedrus (D) Rauwolffia

5. Red data book provides data on
(A) Red flowered plants
(B) Red coloured fishes
(C) Endangered plants and animals
(D) Red eyed birds

6. World Wild Life Week is
(A) First week of September
(B) First week of October
(C) Third week of October
(D) Last week of October

7. Black buck in India is protected by
(A) Bhils (B) Bishnois
(C) Phasis (D) All tribals

8. Which of the following is most dangerous to wild life
(A) Over exploitation
(B) Man made forest
(C) Habitat destruction
(D) Introduction of foreign species

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

10. One of the following plant species is in endangered list
(A) Eucalyptus (B) Nepenthes
(C) Ceratophyllum (D) Delonix

11. Plant genes of endangered species are stored
(A) Gene library (B) Gene bank
(C) Herbarium (D) None above

12. Red data book is maintained by
(A) IUCNNR
(B) The Bombay Natural History Society
(C) WPSI
(D) IUCN

13. Kew, London is famous for
(A) Being the largest biological reserve
(B) Herbarium
(C) Being the largest botanical garden
(D) Diverse flora and fauna

14. Which of the following species are restricted to a given area
(A) Sympatric species (B) Allopatric species
(C) Sibling species (D) Endemic species

15. New approach to conservation is the establishment of
(A) Sancturies (B) Reserve forests
(C) National parks (D) Biosphere reserves

16. The presence of diversity at the junction of territories of two different habitats is known as
(A) Bottle neck effect (B) Edge effect
(C) Junction effect (D) Pasteur effect

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

18. The most biodiversity rich zone in India
(A) Gangetic planes (B) Trans himalayas
(C) Western Ghats (D) Central India

19. The Environment Protection Act was passed in
(A) 1968 (B) 1974
(C) 1981 (D) 1986

Exercise # 2 SINGLE OBJECTIVE AIIMS LEVEL

1. Which bird is symbol of `Bombay Natural History Society'
(A) Horn bill (B) Egret
(C) Spoon bill (D) Sun bird

2. 'Central Public Health Engineering Research Institute' is situated at
(A) Delhi (B) Bombay
(C) Nagpur (D) Bihar

3. 'Central Ganga Water Pollution Board' was established in
(A) 1982 (B) 1985
(C) 1987 (D) 1989

4. At a time, a lioness usually gives birth to
(A) One cub (B) Two cubs
(C) Three cubs (D) Four cubs

5. National bird of India is
(A) Hornbill
(B) Black swan
(C) Peacock (Pava cristatus)
(D) House sparrow

6. The bird 'Dodo' became extinct because of
(A) Its beautiful feathers
(B) Its fearlessness
(C) Its curved beak
(D) Its melodious songs

7. The lion tailed monkeys 'Malaca Malaca Silenus' are found only in these regions
(A) Khaziranga and other parts of Assam
(B) Eastern ghats and Madras
(C) Western ghats including Travancore-Mysore
(D) Himalayan mountains

8. What is the generic name of Indian peacock
(A) Pavo cristatus (B) Milvus migrans
(C) Paradise flycatcher (D) Parser domesticus

9. The largest Indian poisonous snake is
(A) Python (B) Krait
(C) Cobra (D) Sea snake

10. Which of the following animal has become almost extinct in India
(A) Wolf (B) Rhinoceros
(C) Hippopotamus (D) Cheetah

11. Wh ich of the following types of animals does man chiefly protect
(A) Harmless animals (B) Economically useful
(C) Those likely to perish (D) Feeble animals

12. Animals species should be preserved mainly because
(A) They are lovely creatures
(B) They are useful to mankind
(C) Man cannot recreate a species of animals if it be destroyed
(D) Zoologists want to study them

13. Hippopotamus is found in
(A) America (B) Africa
(C) Asia (D) Australia

14. Elephant has very fews hairs while bear has a thick fur because the bear
(A) Has much more natural enemies
(B) Has not been domesticated
(C) Lives in cold climate
(D) Has to regulate body temperature more accurately

15. In nature, which of the following animals has the power of killing the snakes
(A) Falcon (B) Peacock
(C) Squirrel (D) Pangolin

16. In India, commonly available Rhesus monkey is
(A) Macaca mulatta (B) Alouatta
(C) Ateles paniscus (D) Ateles geoffroyi

17. Indian elephant is
(A) Elephas maximus (B) Elephas africana
(C) Loxodonta africana (D) Loxodonta indicus

18. Now-a-days rhino is present in
(A) Asia (B) Africa
(C) America (D) Africa and Asia

19. The leopard or 'tendwa' is zoologically named as
(A) Panthera tigris (B) Panthera leo
(C) Panthera uncia (D) Panthera pardus

20. In elephants the tusks are

Exercise # 3

PART - 1 MATRIX MATCH COLUMN

1. Match the animals given in Column - I with their location in column - II

Column - I	Column - II
(A) Dodo	**(i)** Africa
(B) Quagga	**(ii)** Russia
(C) Thylacine	**(iii)** Mauritius
(D) Stellar's sea cow	**(iv)** Australia

(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)

2. Match Column - I with Column - II and select the correct option from the codes given below.

Column - I	Column - II
(A) Lungs of the planet	**(i)** Lantana camara
(B) Reserpine	**(ii)** Amazon rain forests
(C) Anti-cancer drug	**(iii)** Yew tree
(D) Exotic species	**(iv)** Rauwolfia

(A) A - (ii), B - (iv), C - (iii), D - (i) **(B)** A - (ii), B - (iii), C - (iv), D - (i)

(C) A - (iv), B - (iii), C - (i), D - (ii) **(D)** A - (ii), B - (iv), C - (i), D - (iii)

3. Match Column - I with Column - II and select the correct option from the codes given below.

Column - I	Column - II
(A) Rivet Popper hypothesis	(i) Paul Ehrlisch
(B) Long-term ecosystem experiments using outdoor plots	(ii) David Tilman
(C) Species-area relationships	(iii) Alexander von Humboldt

(A) A - (iii), B - (i), C - (ii) **(B)** A - (i), B - (ii), C - (iii)

(C) A - (i), B - (iii), C - (ii) **(D)** A - (ii), B - (iii), C - (i)

4. Match the countries in Column - I with their respective symbols based on animals in Column -II and select the correct option from the codes given below.

Column - I	Column - II
(A) New Zealand	**(i)** Tiger
(B) India	**(ii)** Kangaroo
(C) Australia	**(iii)** Kiwi
(D) U.S.A	**(iv)** Giant Panda
(E) China	**(v)** Bald eagle

(A) A - (ii), B - (i), C - (iii), D - (v), E - (iv) **(B)** A - (iii), B - (i), C - (ii), D - (v), E - (iv)

(C) A - (iii), B - (i), C - (ii), D - (iv), E - (v) **(D)** A - (iv), B - (i), C - (ii), D - (iii), E - (v)

Exercise # 4 PART - 1 PREVIOUS YEAR (NEET/AIPMT)

1 The endangered largest living lemur Idri idri is inhabitant of
(A) Madagascar (B) Mauritius
(C) Sri Lanka (D) India

2. Which group of vertebrates comprises the highest number of endangered species?
(A) Reptiles (B) Birds
(C) Mammals (D) Fishes

3. Which endangered animal is the source of the world's finest, lightest, warmest and most expensive wool - the shahtoosh?
(A) Kashmiri goat (B) Chiru
(C) Nilgai (D) Cheetal

4. In your opinion which is the most effective way to conserve the plant diversity of an area?
(A) By tissue culture method
(B) By creating biosphere reserve
(C) By creating botanical gardens
(D) By developing seed banks

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

6. One of the most important function of botanical garden is that
(A) One can observe tropical plants there
(B) They allow ex situ conservation of germplasm
(C) They provide the natural habitat for wild Life
(D) They provide a beautiful area for recreation

7. According to IUCN Red List, what is the status of red panda (Athurus fulgens) ?
(A) Vulnerable species
(B) Critically endangered species
(C) Extinct species
(D) Endangered species

8. Which of the following is considered a hotspot of biodiversity in India?
(A) Western ghats
(B) Indo-Gangetic plain
(C) Eastern ghats (D) Aravalli hills

9. Which of the following pairs of an animal and a plant represents endangered organisms in India?
(A) Bentinckia nicobarica and red panda
(B) Tamarind and rhesus monkey
(C) Cinchona and leopard
(D) Banyan and black buck

10. Which one of the following is not included under in situ conservation?
(A) Sanctuary (B) Botanical gardens
(C) Biosphere reserve (D) National park

11. Identify the odd combination of the habitat and the particular animal concerned.
(A) Dachigam National Park - Snow leopard
(B) Sunderbans - Bengal tiger
(C) Periyar - Elephant
(D) Rann of Kutch - Wild ass

12. One of endangered species of Indian medicinal plants is that of
(A) Podophyllum (B) Ocimum
(C) Garlic (D) Nepenthes

13. Which one of the following pairs of organisms are exotic species introduced in India?
(A) Ficus religiosa, Lantana carnara
(B) Lantana camara, water hyacinth
(C) Water hyacinth, Prosopis cineraria
(D) Nile perch, Ficus religiosa

14. ICBN stands for
(A) Indian Congress of Biological Names
(B) International Code of Botanical Nomenclature
(C) International Congress of Biological Names
(D) Indian Code of Botanical Nomenaclature

15. World Summit on Sustainable Development (2002) was held in
(A) Brazil (B) Sweden
(C) Argentina (D) South Africa

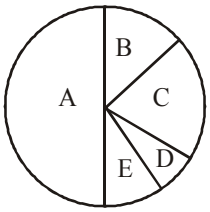
16. Which one of the following is not observed in biodiversity hot spots?
(A) Endemism
(B) Accelerated species loss
(C) Lesser interspecific competition
(D) Species richness

MOCK TEST

1. Which is the National Aquatic Animal of India ?
(A) Blue whale (B) Sea-horse (C) Gangetic shark (D) River diolphin

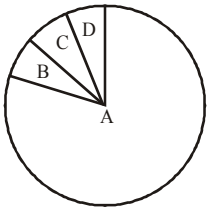
2. The species confined to a particular region and not found elsewhere is termed as
(A) endemic (B) rare (C) keystone (D) alien

3. Given below is the representation of the extent of global diversity of vertebrates. What groups does the portions represent ?



	A	B	C	D	E
(A)	Birds	Reptiles	Fishes	Mammals	Amphibians
(B)	Mammals	Birds	Fishes	Amphibians	Reptiles
(C)	Fishes	Amphibians	Mammals	Birds	Reptiles
(D)	Fishes	Mammals	Birds	Reptiles	Amphibians

4. Given here is a pie chart representation of the extyent of global diversity of invertebrates. What groups the four portions (A-D) represent respectively ?

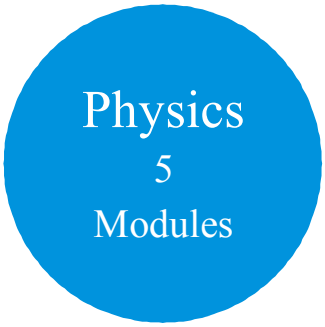


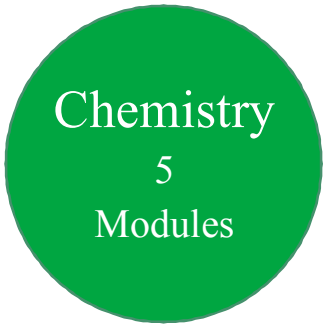
	A	B	C	D
(A)	Insects	Crustaceans	Other animal groups	Molluscs
(B)	Crustaceans	Insects	Molluscs	Other animal groups
(C)	Molluscs	Other animal groups	Crustaceans	Insects
(D)	Insects	Molluscs	Crustaceans	Other animal group

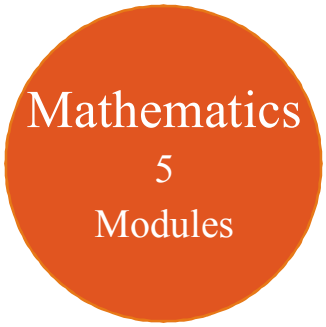
5. Choose the right one which denotes gentic diversity.
(A) Chromosomes → Nucleotides → Genes → Individuals → Populations
(B) Populations → Individuals → Chromosomes → Nucleotides → Genes
(C) Genes → Nucleotides → Chromosomes → Individuals → Populations
(D) Nucleotides → Genes → Chromosomes → Individuals → Populations

6. Biodiversity of a geographical region represents
(A) endangered species found in the region
(B) the diversity in the organisms living in the region
(C) genetic diversity in the dominant species of the region
(D) species endemic to the region

11th Class Modules Chapter Details

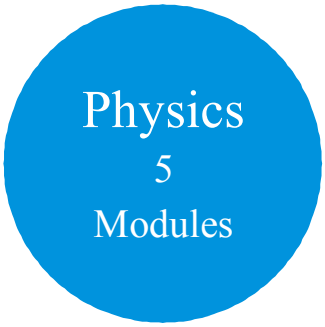


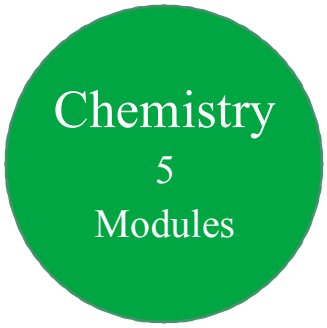


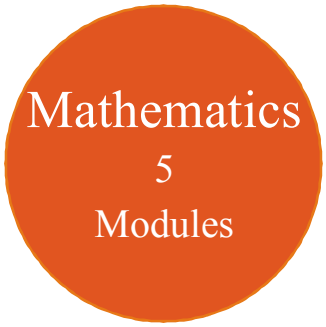


PHYSICS	CHEMISTRY	BIOLOGY
Module-1 1. Physical World & Measurements 2. Basic Maths & Vector 3. Kinematics **Module-2** 1. Law of Motion & Friction 2. Work, Energy & Power **Module-3** 1. Motion of system of particles & Rigid Body 2. Gravitation **Module-4** 1. Mechanical Properties of Matter 2. Thermal Properties of Matter **Module-5** 1. Oscillations 2. Waves	**Module-1(PC)** 1. Some Basic Conceps of Chemistry 2. Atomic Structure 3. Chemical Equilibrium 4. Ionic Equilibrium **Module-2(PC)** 1. Thermodynamics & Thermochemistry 2. Redox Reaction 3. States Of Matter (Gaseous & Liquid) **Module-3(IC)** 1. Periodic Table 2. Chemical Bonding 3. Hydrogen & Its Compounds 4. S-Block **Module-4(OC)** 1. Nomenclature of Organic Compounds 2. Isomerism 3. General Organic Chemistry **Module-5(OC)** 1. Reaction Mechanism 2. Hydrocarbon 3. Aromatic Hydrocarbon 4. Environmental Chemistry & Analysis Of Organic Compounds	**Module-1** 1. Diversity in the Living World 2. Plant Kingdom 3. Animal Kingdom **Module-2** 1. Morphology in Flowering Plants 2. Anatomy of Flowering Plants 3. Structural Organization in Animals **Module-3** 1. Cell: The Unit of Life 2. Biomolecules 3. Cell Cycle & Cell Division 4. Transport in Plants 5. Mineral Nutrition **Module-4** 1. Photosynthesis in Higher Plants 2. Respiration in Plants 3. Plant Growth and Development 4. Digestion & Absorption 5. Breathing & Exchange of Gases **Module-5** 1. Body Fluids & Its Circulation 2. Excretory Products & Their Elimination 3. Locomotion & Its Movement 4. Neural Control & Coordination 5. Chemical Coordination and Integration

12th Class Modules Chapter Details







PHYSICS

Module-1

1. Electrostatics
2. Capacitance

Module-2

1. Current Electricity
2. Magnetic Effect of Current and Magnetism

Module-3

1. Electromagnetic Induction
2. Alternating Current

Module-4

1. Geometrical Optics
2. Wave Optics

Module-5

1. Modern Physics
2. Nuclear Physics
3. Solids & Semiconductor Devices
4. Electromagnetic Waves

CHEMISTRY

Module-1(PC)

1. Solid State
2. Chemical Kinetics
3. Solutions and Colligative Properties

Module-2(PC)

1. Electrochemistry
2. Surface Chemistry

Module-3(IC)

1. P-Block Elements
2. Transition Elements (d & f block)
3. Co-ordination Compound
4. Metallurgy

Module-4(OC)

1. HaloAlkanes & HaloArenes
2. Alcohol, Phenol & Ether
3. Aldehyde, Ketone & Carboxylic Acid

Module-5(OC)

1. Nitrogen & Its Derivatives
2. Biomolecules & Polymers
3. Chemistry in Everyday Life

BIOLOGY

Module-1

1. Reproduction in Organisms
2. Sexual Reproduction in Flowering Plants
3. Human Reproduction
4. Reproductive Health

Module-2

1. Principles of Inheritance and Variation
2. Molecular Basis of Inheritance
3. Evolution

Module-3

1. Human Health and Disease
2. Strategies for Enhancement in Food Production
3. Microbes in Human Welfare

Module-4

1. Biotechnology: Principles and Processes
2. Biotechnology and Its Applications
3. Organisms and Populations

Module-5

1. Ecosystem
2. Biodiversity and Conservation
3. Environmental Issues