15

Biodiversity and Conservation

Multiple Choice Questions (MCQs)

Q. 1 Which of the following countries has the highest biodiversity?

(a) Brazil
(b) South Africa
(c) Russia
(d) India

Thinking Process

Tropical region (23.5°N–23.5°S) show the highest biodiversity as climatic conditions, temperature and moisture conditions favour variety of flora and fauna.

Ans. *(a)* Climate of countries tropical latitude like Brazil climate remain relatively undisturbed, constant and predictable giving tune for diversification, which favours rich biodiversity.

Q. 2 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

Ans. *(c)* Keeping animals in zoological parks is not a cause for loss of biodiversity.

Some of the major causes of biodiversity loss are

(i) Destruction of natural habitat (primary cause).
(ii) Introduction of exotic (alien species) with indigenous species.
(iii) Over exploitation of natural resources.
(iv) Co-extinction of species.

Q. 3 Which of the following is not an invasive alien species in the Indian context?

(a) *Lantana*
(b) *Cynodon*
(c) *Parthenium*
(d) *Eichhornia*

Ans. *(b)* *Cynodon* (doob grass) is not an invasive alien species. The other three *Parthenium* (congress or carrot grass), *Eichhornia* (water hyacinth) and *Lantana* are alien species which pose threat to native species.

Q. 4 Where among the following will you find pitcher plant?

(a) Rain forest of North-East India
(b) Sunderbans
(c) Thar desert
(d) Western ghats

Ans. *(a)* Pitcher plant (*Nepenthes*) an insectivorous plant is found in rain forest of North-East India. These type of plants generally grow in nitrogen deficient soil.

Sunderbans are rich in fauna and flora. Mangroove plants are the characteristic of Sunderbans.

Western ghats are rich in biodiversity. Xerophytes are more common in thar deserts.

Q. 5 Which one of the following is not a feature of biodiversity hotspots?

(a) Large number of species
(b) Abundance of endemic species
(c) Mostly located in the tropics
(d) Mostly located in the polar regions

Thinking Process

A biodiversity hotspot is a biogeographic region with a significant reservoir of biodiversity which is under threat from humans.

Ans. *(d)* Biodiversity hotspots are characterised by large number of flora and fauna, abundance of endemic species and also large number of alien or exotic species. They are mostly found in tropical and temperate regions. There are no biodiversity hotspots in polar regions.

Q. 6 Match the following columns.

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

Choose the correct match form the following

(a) i-a, ii-c, iii-b, iv-d
(b) i-d, ii-c, iii-a, iv-b
(c) i-c, ii-a, iii-b, iv-d
(d) i-c, ii-a, iii-d, iv-b

Thinking Process

These are the extinct species of particular countries.

Ans. *(d)* Dodo – *Mauritius*
Quagga – Africa
Thylacine – Australia
Stellar's sea cow – Russia
Rest of the given set of extinct animals matched with the provided countries are not true.

Q. 7 What is common to the following plants *Nepenthes*, *Psilotum*, *Rauwolfia* and *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

Ans. *(c)* All of the above plants are prone to over exploitation due to their respective properties. *Nepenthes* (pitcher plant) is an insectivorous plant. *Psilotum* is a pteridophyte and *Aconitum* is a medicinal plant.

Q. 8 The one-horned rhinoceros is specific to which of the following sanctuary?

(a) Bhitar Kanika
(b) Bandipur
(c) Kaziranga
(d) Corbett Park

Ans. *(c)* **Kaziranga National Park** is situated in Golaghat and Nagaon districts of (Asom). One horned rhinocerosis specific to this park.

While Corbett National Park is situated in district Nainital (Uttarakhand) and is specific for tiger. It is the first National Park of India, which is famous for tigers.

Bandipur National Park (Mysore) too is specific for tigers. Bhitar Kanika National Park is located in odisha and is specific for salt water crocodile.

Q. 9 Amongst the animal groups given below, which one has the highest percentage of endangered species?

(a) Insects
(b) Mammals
(c) Amphibians
(d) Reptiles

Ans. *(c)* Amphibians have the highest percentage presently, 32% of all amphibian species in the world face the threat of extinction. Other than these, 23% of all mammal species and 12% of all bird species also facing the risk.

Q. 10 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 of the above

Ans. *(d)* All of the above mentioned plants are endangered plant species of India. *Rauwolfia serpentina* (sarpgandha), *Santalum album* (sandal wood) and *Cycas beddonei* are facing the threat of extinction due their medicinal and commercial importance.

Q. 11 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.

Ans. *(d)* All the three above mentioned species are neither threatned nor indigenous species of India. *Lantana*, *Eichhornia* (water hyacinth) and African catfish (*Clarias gariepinus*) all are alien (exotic species) which are invasive and have an harmful impact resulting in extinction of the indigenous species.

Q. 12 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

Ans. ***(b)*** Extinction of passenger pigeon (*Ectopistes migratorius*) was due to over exploitation by human beings. Factors like increase in number of predatory birds, non-availability of food and bird flu virus infection did not contribute to the extinction of passenger pigeon.

Q. 13 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 catifishes.
(c) Steller's sea cow is an extinct animal.
(d) *Lantana* is popularly known as carrot grass.

Ans. ***(c)*** Stellar's sea cow (from Russia) is a recently extinct animal.

Parthenium (carrot grass) is an exotic weed, which grows rapidly and adversly affects the native species.

African catfish is also an alien species which adversly affects the growth of indigenous *Clarias batrachus* - our local species.

Lantana camara, another alien species, is also strongly competing with native species.

Q. 14 Among the ecosystem mentioned below, where can one find maximum biodiversity?

(a) Mangroves (b) Desert (c) Coral reefs (d) Alpine meadows

Thinking Process

Formation of coral reef takes place in favourable climatic conditions in costal regions.

Ans. ***(c)*** Coral reefs are the most productive ecosystem (2000 - 6000 kcal/m^2/y) and form the most diverse part of costal region providing a home to fish molluscs, crustaceans sponges, cnidarians, etc.

Mangroves, found in coastal regions usually have plants growing in swampy and saline water, deserts have mostly xerophytic species and Alpine meadows are related to high altitudes and do not show much tree growth.

Q. 15 Which of the following forests is known as the 'Lungs of the planet Earth'?

(a) Taiga forest (b) Tundra forest
(c) Amazon rain forest (d) Rainforests of North-East India

Thinking Process

Tropics possess maximum biological diversity due to undisturbed climatic conditions.

Ans. ***(c)*** Amazon is a rain forest that covers most of the Amazon basin of South America and teritory including nine nations. It represents over half of the planet's rain forests and exhibits the largest and the most diversified tropical rainforest.

It is home to more than 40000 species of plants, 3000 of fishes, 1300 of birds, mammals, amphibians, reptiles and more than 125000 invertebrates. Amazon rainforest is popularly called the 'lungs of the planet earth' because its vegetation continuously recycles carbon dioxide into oxygen.

Taiga forest, present in broad belt of Northern hemisphere, represents the largest terrestrial biome.

Tundra forest is a biome where tree growth is hindered by low temperature and short growing season. Rain forests of North-East India are tropical forests with a natural reservoir of genetic diversity.

Q. 16 The active chemical drug reserpine is obtained form

(a) *Datura* (b) *Rauwolfia* (c) *Atropa* (d) *Papaver*

Ans. ***(b)*** *Rauwolfia vomitoria* is the source of active chemical drug reserpine, which is prescribed in hypertension and act as tranquilliser. *Datura* is a plant with hallucinogenic properties. Drug *belladonna* is obtained from *Atropa belladonna* and drug. Opium is obtained from *Papaver somniferum*.

Q. 17 Which of the following group exhibit more species diversity?

(a) Gymnosperms (b) Algae (c) Bryophytes (d) Fungi

Ans. ***(d)*** Fungi are group of eukaryotic heteromorphic organisms with diverse forms, sizes, physiology and mode of reproduction. They exhibits more specific diversity. This is followed by algae, bryophytes and then fens and alliles.

Q. 18 Which of the below mentioned regions exhibit less seasonal variations?

(a) Tropics (b) Temperates
(c) Alpines (d) Both (a) and (b)

Ans. ***(a)*** Maximum biodiversity is observed in tropics as the tropical region exhibit less seasonal variations, *i.e.*, remain undisturbed.

The temperate region are more seasonal, less constant and exhibit less species diversity. Also, alpines with low temperature and high altitudes show less diversity.

Q. 19 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

Ans. ***(b)*** The historic convention on biological diversity held in Rio de Janeiro (Brazil) in 1992 is known as Earth Summit (Ist). The explanation for other options is CITES (Convention on International Trade in Endangered Species of wild flora and fauna) has helped in restricting poaching and loss of rare species.

MAB stands for Man and Biosphere Programme which undertakes establishment and maintenance of biosphere reserves.

Q. 20 What is common to the techniques

(i) *in vitro* fertilisation (ii) cryopreservation

(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.

Ans. *(b)* All the three above mentioned techniques are *ex-situ* conservation methods. At present gametes of threatened species can be preserved in viable conditions for longer duration by **cryopreservation method** (at very low temperature-196°C).

Fertilisation can be achieved in laboratory-*in vitro,* and species can be improved or propagated by tissue culture method, a plant breeding principle.

Very Short Answer Type Questions

Q. 1 What characteristics make a community stable?

Ans. *The characteristics that make a community stable are*

(i) Less variation in productivity from year to year.
(ii) Resistance or resilience to occasional disturbances (natural or man-made).
(iii) Resistance to invasions by alien species.

Q. 2 What could have triggered mass extinctions of species in the past?

Ans. Nobody knows the real reason but the scientists believe that any one of the following could have triggered mass extinction of species in the past.

(i) Fall of sea levels.
(ii) Change in temperature (freezing or warming).
(iii) Asteroid/meteorite hitting the planet.
(iv) Poisonous hydrogen sulphide emissions from the sea.
(v) Nova/super nova/gamma ray burst.
(vi) Plate tectonics.

Q. 3 What accounts for the greater ecological diversity of India?

Ans. The greater ecological diversity of India is because of the geographical diversity in terms of varying topography, *e.g.*, deserts, rain forests, mangroves, coral reefs, wetlands, estuaries and alpine meadows all are present in India. This results in building of different varieties of ecosystems with greater ecological diversity.

Q. 4 According to David Tilman, greater the diversity, greater is the primary productivity. Can you think of a very low diversity man-made ecosystem that has high productivity?

Thinking Process

Artificial or anthropogenic ecosystem are man-made terrestrial or aquatic ecosystems. The most important are agriculture field, generally called as agroecosystems.

Ans. The man-made ecosystems like agricultural field of paddy or wheat show very low diversity, but possess high productivity. These are also an example of monoculture.

Q. 5 What does 'Red' indicate in the IUCN Red list (2004)?

Ans. Red in the IUCN Red list (2004) refers to the taxa with the highest risk of extinction.

Q. 6 Explain as to how protection of biodiversity hot spots alone can reduce up to 30% of the current rate of species extinction.

Ans. The biodiversity hot spots are regions with very high level of species richness, especially those under threat from humans, thus their protection can reduce the current rate of extinction. These regions can be protected as biological reserves, national parks and sanctuaries.

Q. 7 What is the difference between endemic and exotic species?

Ans. **Endemic species** are **native** or **indigenous species,** which are restricted to a particular geographical region. **Exotic** or **alien species** are those species which are introduced from one geographical region to another geographical area. Exotic species may lead to disappearance of native species.

Q. 8 How does species diversity differ from ecological diversity?

Ans. **Species diversity** refers to the number and distribution of species in an area. It is expressed in terms of 'number of species per unit area' and also as number of individuals of different species in an area.

Ecological diversity refers to the diversity at ecosystem level. It is related to different types of ecosystem habitats *e.g.,* terrestrial (forests, grasslands, etc.) and aquatic (freshwater and marine) ecosystems.

Q. 9 Why is genetic variation important in the plant *Rauwolfia vomitoria*?

Ans. Plant *Rauwolfia vomitoria* is a source of drug reserpine which acts as tranqulliser. Genetic variation shown by this medicinal plant might be in terms of the potency and concentration of active chemical (resperin) that plant produces.

Q. 10 What is Red Data Book?

Ans. Red Data Book is a compilation of data or records of species threatened with risk of extinction (which are known to be endangered). The book is maintained by IUCN (headquartered at gland in Switzerland).

Q. 11 Define gene pool.

Ans. Gene pool refers to the sum total of all genes of every individual in an inbreeding population.

Q. 12 What does the term 'Frugivorous' mean?

Ans. Frugivorous term is used for those animals which eat only fruits or eat fruit as their staple diet.

Q. 13 What is the expanded form of IUCN?

Ans. IUCN stands for 'International Union for Conservation of Nature and Natural Resources'. Its headquarters are situated at gland in Switzerland.

Q. 14 Define the terms (i) Bioprospecting (ii) Endemism

Ans. (i) **Bioprospecting** is a term that describes the process of discovery and commercialisation of new products based on biological resources.

(ii) **Endemism** refers to presence of some species in particular regions only and now here else.

Q. 15 What is common to the species shown in figures A and B?

A

B

Ans. Both are angiospermic flowering plants.

Q. 16 What is common to the species shown in figures A and B?

A

B

Ans. Both the species are conserved in their natural habitats.

Short Answer Type Questions

Q. 1 How is the presently occurring species extinction different from the earlier mass extinctions ?

Ans. In earlier time extinction of species occurred due to natural causes or calamities like flood, volcanic eruption, prolonged drought and landslides, etc. While at present human activities are the major cause of species extinction.

Q. 2 Of the four major causes for the loss of biodiversity (Alien species invasion habitat loss and fragmentation, over-exploitation and co-extinctions) which according to you is the major cause for the loss of biodiversity ? Give reasons in support.

Ans. *Out of the four major causes for the loss of biodiversity, loss of habitat and fragmentation is the major cause as*

(i) Habitat loss and fragmentation caused by clearing and over-exploitation of forest areas for agriculture, urbanisation and industrialisation, results in destruction of natural habitats.

(ii) Increasing human population has overburdened the forest resources and have destroyed forest land, which means loss of habitat for several species.

(iii) In addition, large habitats are broken up into small fragments, because of which mammals and birds requiring large territories and migratory habits are badly affected, leading to decline inpopulation.

Q. 3 Discuss one example, based on your day-to-day observations, showing how loss of one species may lead to the extinction of another.

Ans. Co-extinction is the extinction of two mutually related or interelated species for instance a host fish extinction leads to the extinction of all those parasites exclusively found on it. Another example is plant pollinator mutualism, where extinction of one leads to the extinction of other.

Insect, aphids are polyphagous (feed on more than one plant species) or monophagous (feed on a particular species of plant). Monophagous insects may become extinct, if the plant species upon which they feed becomes extinct.

Q. 4 A species area curve is drawn by plotting the number of species against the area. How is it that when a very large area is considered the slope is steeper than that for smaller areas ?

Ans. In very large areas, the number of species is much more that is why the curve is much steeper. This is because the larger area has more, food availability and other resources, so obviously more species may thrive.

Q. 5 Is it possible that productivity and diversity of a natural community remain constant over a time period of, say one hundred years?

Ans. No, it is not possible that productivity and diversity of a natural community remain constant over a certain time period.
This is because

(i) The natural habitat is never maintained in real.

(ii) Abundant resources are never available, they are always in short supply or just enough.

(ii) Environmental conditions for survival and reproduction are continuously changing.

Q. 6 There is greater biodiversity in tropical/subtropical regions than in temperate region. Explain.

Ans. The tropical/subtropical region exhibit maximum biological diversity because these region remain undisturbed due to less variable climatic conditions. So, tropics had a longer evolutionary time for species diversification. The temperate environment are more seasonal, less constant and unpredictable, therefore less niche specialisation and lesser species diversity are observed.

Q. 7 Why are the conventional methods not suitable for the assessment of biodiversity of bacteria?

Ans. Many bacteria cannot be cultured under normal conditions *in vitro,* which creates a problem in studying their morphological and biochemical characteristics.

Morphology and biochemistry along with some other characteristics are used for the assessment of biodiversity of bacteria. Thus, conventional methods are not suitable for the assessment of biodiversity of bacteria.

Q. 8 What criteria should one use in categorising a species as threatened?

Ans. *The criteria that should be used in categorising a species as threatened are*

(i) Number of the members of the species are declining at an alarming rate.

(ii) Their habitat is being modified or destroyed.

(iii) Predator or poacher activities are increasing.

Q. 9 What could be the possible explanation for greater vulnerability of amphibians to extinction as compared to other animal groups?

Ans. *Amphibians are more vulnerable to extinction*

(i) **Habitat Modification or Destruction** Amphibians generally need aquatic and terrestrial habitats to survive; threats to either habitat can affect populations. Hence, amphibians may be more vulnerable to habitat modification than organisms that require only one habitat type.

(ii) **Habitat Fragmentation** This means isolation of a few areas by habitat modification. Small populations that survive within such fragments are often susceptible to inbreeding, genetic drift or extinction due to small fluctuations in the environment.

(iii) **Large Scale Climate Changes** These changes can further modify aquatic habitats, preventing amphibians from spawning.

Q. 10 How do scientists extrapolate the total number of species on earth ?

Ans. *There are two methods to estimate and extrapolate the number of species on earth*

(i) The primary method used by the scientists to extrapolate the number of species on earth is the estimation rate of discovery of new species.

(ii) Total number of species can also be extrapolated by the statistical comparison of the tropical and temperate species richness of exhaustively studied groups of insects. The ratio is then extrapolated with existing species of plants and animals to predict the gross estimate of the number of species on earth.

Q. 11 Humans benefit from diversity of life. Give two examples.

Ans. (i) Humans derive numerous economic benefits directly from diversity of organisms.

(a) Food products (cereals, pulses and fruits).

(b) Firewood.

(c) Fibre (cotton, jute from plants and silk, wool from animals).

(d) Construction material (timber for making furniture, houses and sports goods).

(e) Industrial products (tannins, lubricants, dyes, resins and perfumes).

(f) Products of medicinal importance (about 25000 plants are used in traditional medicine).

(ii) There are huge intangible benefits that humans derive from the diversity of life.

(a) Pure oxygen.

(b) Natural pollinators.

(c) Flood and soil erosion control.

(d) Nutrient replenishment.

(e) Waste recycling by microbes and other insects, etc.

(f) Aesthetic pleasure and mental peace.

Q. 12 List any two major causes other than anthropogenic causes of the loss of biodiversity.

Ans. *The two major causes other than anthropogenic causes of the loss of biodiversity are*

(i) **Alien Species Invasions** When alien species are introduced unintentionally or deliberately in a habitat, some of them can cause decline or extinction of indigenous species.

(ii) **Co-extinctions** When a species becomes extinct, the plant and animal species associated with it, in an obligatory way, also become extinct.

Q. 13 What is an endangered species? Give an example of an endangered plant and animal species each?

Ans. *An endangered species is a population of organisms, which is facing a high risk of becoming extinct because*

(i) Its number being very low.

(ii) It is threatened by changing environment.

(iii) It is facing predator threat.

Endangered plant species-Venus fly trap

Endangered animal species-Siberian tiger

Q. 14 What are sacred groves and their role in biodiversity conservation?

Ans. Sacred groves are sacred tracts which are held in high esteem by local communities. The sacred groves are dedicated to local deities or ancestral spirits and are protected by local communities through social traditions and taboos that incorporate spiritual and ecological values.

Sacred groves represent native vegetation in a natural or near natural state and are thus, rich in biodiversity and harbour many rare species of plants and animals.

Such sacred groves are found in Meghalaya (Khasi and Jaintia hills), Aravalli hills of Rajasthan, Western Ghats, regions of Karnataka and Maharashtra and Madhya Pradesh (Bastar, Chanda and Sarguja region).

Q. 15 Suggest a place where one can go to study coral reefs, mangrove vegetation and estuaries.

Ans. Places to be suggested for studying coral reefs-Andaman and Nicobar Islands. Mangrove vegetation-Paschim Banga Sunderban, Estuaries-Coastal areas of Karnataka.

Q. 16 Is it true that there is more solar energy available in the tropics? Explain briefly.

Ans. *Yes, There is more solar energy available in the tropics because*

(i) The sun's rays are more concentrated.

(ii) The sun's rays have less atmosphere to pass through, so less energy is lost in absorption and reflection by the atmosphere.

(iii) Tropical rainforest areas absorbs radiations due to presence of dense vegetation. Availability of more solar energy in tropics contribute higher productivity which in turn might contribute greater maximum biodiversity.

Q. 17 What is co-extinction? Explain with a suitable example?

Ans. When a species becomes extinct, the plant and animal species associated with it, in an obligatory way, also become extinct, *e.g.*, when a host fish species becomes extinct, its parasites also vanish. This is called co-extinction.

Some other examples of co-extinction are; plant-pollinator mutualism where extinction of one leads to the extinction of other. Monophagous insect that feeds on particular plant species becomes extinct due to extinction of that plant species.

Long Answer Type Questions

Q. 1 Elaborate how invasion by an alien species reduces the species diversity of an area.

Ans. When alien species are introduced unintentionally or deliberately in a habitat, some of them can cause decline or extinction of indigenous species, *e.g.,* extensive environmental damage caused and threat posed to our native species by invasive weed species like carrot grass (*Parthenium*), *Lantana* and water hyacinth (*Eichhornia*). Another example of exotic species invasion is Nile perch, a large predator fish.

When this alien species was introduced into lake of Victoria in East Africa, it started feeding on native, cichlid fish. As a result indigenous cichlid fish became extinct and due to scarcity of food, predator Nile perch died too.

Q. 2 How can you, as an individual, prevent the loss of biodiversity?

Ans. Biodiversity is the occurrence of different type of species, habitat, ecosystem, gene, genepool in a particular place and various parts of earth.

As an individual, biodiversity can be conserved with conservation strategies and management of both biotic and abiotic resources.

Some of the conservation strategies are as follows

(i) Protection of useful animals and plants in their natural habitat or *in situ* conservation.
(ii) Preservation of critical habitats like feeding and breeding areas and resting area of endangered species to promote their growth and multiplication.
(iii) Hunting should be banned or regulated.
(iv) Habitat of migratory animals should be protected by bilateral or multilateral agreements.
(v) People should be made aware of the importance of biodiversity and its conservation.
(vi) Over exploitation of natural resources must be avoided.
(vii) Biodiversity plays an important role in maintaining and sustaining supply of goods and services.
(viii) Conservation of biodiversity ensures well being of all the living creatures and their future generations.

Q. 3 Can you think of a scientific explanation, besides analogy used by Paul Ehrlich, for the direct relationship between diversity and stability of an ecosystem?

Ans. *Scientific explanation for the direct relationship between diversity and stability of an ecosystem could be as follows*

Imagine a forest area, where diverse species of plants are growing. Plants harbour a variety of insects on which a lot of bird species would depend for their food.

If a specific plant species dies, the related insect population will be affected that would lead to food unavailability for the birds.

In addition, if the plant species was a nitrogen fixer, the death of these plants would mean no replenishment of soil with nitrogen. This will obviously affect the other plants as well. So, if the cycle continues, the whole habitat/ecosystem will be negatively affected.

Q. 4 Though the conflict between humans and wildlife started with the evolution of man, the intensity of conflict has increased due to the activities of modern man. Justify your answer with suitable examples.

Ans. The humans first evolved around 2.5 million years ago and agriculture began about 11 thousand years ago. It is since then that humans have started to exploit the forest land for agriculture. Development in medical technology has increased the lifespan of humans, decreased the mortality rate of mother and child, further aggravating the problem of human population.

Along with this, the industrial revolution caused enormous consumption of earth's resources but giving back nothing. The monumental amount of waste is destroying the natural habitat of other species, be it aquatic or terrestrial, endangering and later causing extinction thereof.

This is how human activities have led to the increase in conflict between humans and wildlife.

Q. 5 What is an ecosystem service? List any four important ecosystem services provided by the natural ecosystems. Are you in favour or against levying a charge on the service provided by the ecosystem?

Ans. **Ecosystem Services**

The products of ecosystem processes are termed as ecosystem services. Forests are the major sources of ecological services. *Some of the ecosystem services they provide are*

(i) Purification of air and water. (ii) Mitigating droughts and floods.
(iii) Cycling nutrients. (iv) Generating fertile soils
(v) Providing wildlife habitat. (vi) Maintenance of biodiversity.
(vii) Pollination of crops. (vii) Providing storage site for carbon.
(ix) Providing aesthetic, cultural and spiritual values.

Robert Constanza and his colleagues tried to put price tags on nature's life support services, which was about US $ 33 trillion a year. No, i am not in favour of levying a charge on ecological services but it is very important, to understand how much nature is providing us for free and if we overuse or misuse its resources, we'll have to pay a heavy price for it.

Q. 6 Describe the consumptive use value of biodiversity as food, drugs and medicines, fuel and fibre with suitable examples.

Ans. Biological resources are the basis of life forms on this planet. The countries with maximum biodiversity possess better potential to compete with the rest of the world. Biodiversity has great economic importance to mankind due to its many uses, some of, *which with consumptive value are following*

Food is obtained from biodiversity sources like livestock, forestry and fish. Biodiversity in modern agriculture is beneficial due as a source of new crops. *e.g.,* just three cereals crop like wheat, rice and maize account for about 55% of protein and 60% of calories in humans.

Drugs such as morphine (*Papaver somniferum*), quinine (*Cinchona ledgeriana*), reserpine (*Rauwolfia vomitaria*), *belladonna (Atropa belladonna*), aconite (*Aconitum, napellus*), wintergreen and birth bark (*Gaultheria procumbens*) are derived from plants.

About 70-80% of entire population is dependent on plants or its extract for medicine. penicillin (*Penicillium notatum*), tetracycline (bacteria), digitalin (*Digitalis*) are some examples of medicinal plants.

Plant like *Chorchorus, Gossypium* are sources of fibre while *Jatropha* is a source of biofuels. Fossils fuels (*e.g.,* petrolum) are obtained from fossils of organisms.

Q. 7 Species diversity decreases as we move away from the equator towards the poles. What could be the possible reasons?

Ans. *Species diversity decreases as we move towards the poles, because*

(i) Temperature decreases and conditions become harsh.

(ii) Both the amount and intensity of solar radiation decreases.

(iii) Vegetation decreases.

(iv) Less resources available to support species.

Speciation is generally a function of time and environmental stability, so if conditions are too harsh, it is difficult for the species to survive and adapt. This results in decrease in biodiversity towards the poles.

Q. 8 Explain briefly the 'rivet popper hypothesis' of Paul Ehrlich.

Ans. Ecologist **Paul Ehrlich** gave rivet popper hypothesis to help understand the contribution species richness. He compared each species with rivet in the body of an airplane.

(i) This hypothesis explains that ecosystem to be an airplane and the species to be the rivets joining all parts together.

(ii) If every passenger travelling in the airplane start taking rivets home (causing a species to become extinct), initially it may not affect flight safety (proper functioning of ecosystem), but over a period of time the plane becomes weak and dangerous (species become endangered and then extinct.

Q. 9 The relation between species richness and area for a wide variety of taxa turns out to be a rectangular hyperbola. Give a brief explanation.

Ans. According to **AV Humboldt**, a German scientist within, a region, species richness increased with increasing explored area (only upto a limit). Accordingly the relation between species richness and area for a wide variety of taxa (birds, bat, angiosperms, aquatic fishes) turns out to be a rectangular hyperbola.

The relationship depicts a straight line on a logaithimic scale described by the following equation

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

Where, 'S' stands for species richness, 'A' is area and 'Z' and 'C' are slope of line (regression coefficient) and y intercept respectively.