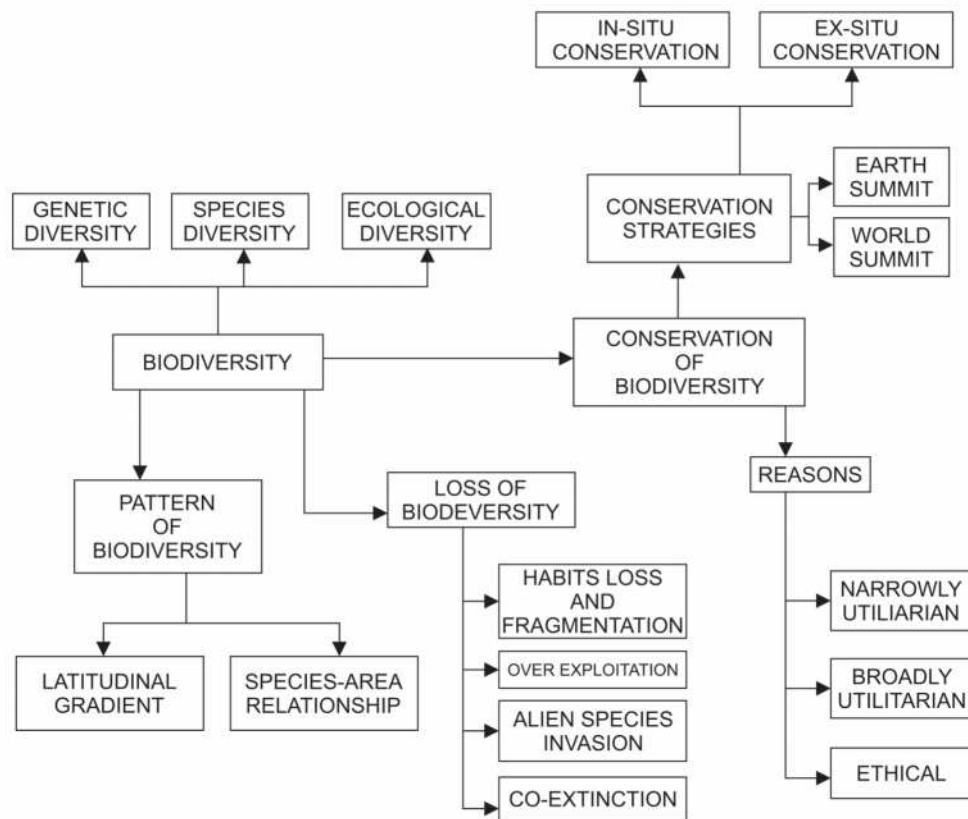


Chapter - 13

Biodiversity and Conservation



Biodiversity : Term coined by socio-biologist Edward Wilson and was also used by Walter G Rosen for the diversity of life forms. Biodiversity refers to the sum total of diversity that exists at genetic, species and ecosystem level of biological organisation.

Three inter-related levels of Biodiversity : Genetic diversity, Species diversity, Ecological diversity.

- **Genetic diversity :** 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. It helps in speciation.
- **Species diversity :** Varieties in the number and richness of the species of a region.
- **Ecological diversity :** Variety in the types of ecosystems.

IUCN : International Union for Conservation of Nature and Natural Resources. It is situated in Morges, Switzerland.

India has : More than 50,000 genetically different varieties of rice; 1000 varieties of mango;

- India has 1,42,000 known species of plants and animals (Around 45,000 species of plants and rest of animals).
- India has 8.1% share of global biodiversity.
- India is one of 12 Mega diversity countries of the world.

Patterns of Biodiversity : Biodiversity is not uniform but shows uneven distribution.

Altitudinal Patterns of Biodiversity

- In general, species diversity decreases as we move away from the equator towards the poles.
- With very few exceptions, tropics (latitudinal range of 23.5° N to 23.5°S) harbour more species than temperate or polar areas.
- Colombia located near the equator has nearly 1,400 species of birds while New York at 41° N has 105 species and Greenland at 71° N only 56 species.
- India has more than 1,200 species of birds.
- A forest in a tropical region like Equador has up to 10 times as many species of vascular plants as a forest of equal area in a temperate region like the Midwest of the USA.
- The largely tropical Amazonian rain forest in South America has the greatest biodiversity on the earth.

Reasons for greater biological diversity in tropics

- (a) Tropical latitudes have remained relatively undisturbed for millions of years and thus had a long evolutionary time for species diversification.
- (b) Tropical environments are less seasonal, relatively more constant and predictable which promote niche specialisation and lead to greater species diversity.
- (c) There is more solar energy available in the tropics, which contributes to higher productivity and indirectly leads to greater biological diversity.

The importance of species diversity to the ecosystem

- (1) Ecosystems with higher biodiversity are more productive than ecosystems with lower biodiversity. David Tilman showed in his experiments that increased diversity contributes to higher productivity.
- (2) Biodiversity is essential for the stability of an ecosystem. Communities with more species are more stable than those with less species.
- (3) Rich biodiversity is also essential to make an ecosystem more functional and survival of the human race on the earth.

(Rivet popper hypothesis proposed by Paul Ehrlich).

Species-Area relationships

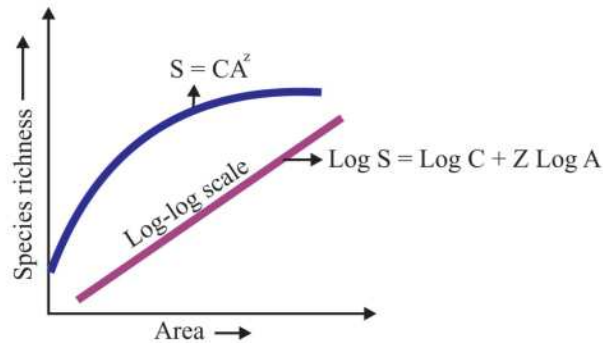
- German naturalist and geographer Alexander von Humboldt observed that within a region, species richness increases with increasing explored area, but only up to a limit.
- The relation between species richness and area for a wide variety of taxa (angiosperm plants, birds, bats, freshwater fishes) turns out to be a rectangular hyperbola.
- On a logarithmic scale, the relationship is a straight line described by the equation

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

Where S = Species richness, A = Area; Z = slope of the line (regression coefficient) C = Y-intercept.

- 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).



Causes of Biodiversity Losses [The Evil Quartet]

- Habitat loss and fragmentation :** This is most important cause of plants and animals extinction. For example: Tropical rain forest is being destroyed faster. The Amazonian rain forest is called the lungs of the planet. It is being cut for cultivating soyabeans.
- Over exploitation :** Many species extinctions are due to over exploitation by humans e.g. extinction of Steller's sea cow, passenger pigeon in last 500 years.
- Alien species invasions :** When alien species are introduced in new habitat, some of them turn invasive and cause decline or extinction of indigenous species, e.g. Carrot grass (*Parthenium*), *Lantana* and water hyacinth (*Eichhornia*) posed threat to native species.
- Co-extinctions :** When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct.

Example 1 : When a host fish species becomes extinct, its assemblage of parasites also becomes extinct.

Example 2 : This is true in case of plant pollinator mutualism where extinction of one species leads to extinction of other species in nature.

Reasons for Conservation of Biodiversity

1. Narrowly utilitarian : Humans derive countless direct economic benefits from nature food (cereals, pulses, fruits), firewood, fibre, construction material, industrial products (tannins, lubricants, dyes, resins, perfumes) and products of medicinal importance.

2. Broadly utilitarian : Biodiversity plays a major role in many ecosystem services that nature provides like oxygen, pollination, flood and soil erosion control.

3. 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.

Types of Conservation Strategies

In-situ 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.
- **Biodiversity Hot Spots :** An areas with high density of biodiversity or megadiversity (high level of species richness and high degree of endemism) *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.
- **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. Example Corbett national park, Kaziranga national park.

Sanctuaries : An area where animals are protected from all types of exploitation and habitat disturbance. India has 492 sanctuaries at present.

Biosphere Reserve : 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.

Ex-situ conservation : Conservation and protection of selected rare plants or animals in places outside their natural habitat.

- **Offsite collections :** Live collections of wild and domesticated species in Botanical gardens, Zoological parks etc.
- **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.

Red Data Book : Record of threatened species of plants and animals maintained by IUCN. It has 8 categories → Extinct, Extinct in wild, critically endangered, Vulnerable, lowest risk, data deficient, Not evaluated.

Important Wild Life Protection in India :

- **Project tiger :** Started in 1973 to check depletion in population of tiger. Jim Corbett National Park.

Endemic Species : Species which are confined to a particular region and not found anywhere else.

Exotic or Alien Species : New species which enter a geographical regions.

Bioprospective : Exploration of molecular, genetic and species level diversity for products of economic importance.

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 Janeiro, 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.

The Biological Diversity Act, 2002 :

The Biological Diversity Act, 2002 is the Indian response to the conservation of biological diversity. The main objectives of the Act are :

1. Conservation of biological diversity.
2. Sustainable use of its components
3. Fair and equitable sharing of the benefits arising out of utilisation of genetic resources. In exercise of the powers conferred by Sec-62 of the Biological Diversity Act 2002 and in super session of the National Biodiversity authority Rules, 2003, the central government of India made some rules, which come into force on 15th April 2004.

Ramsar sites : Named after city Ramsar in Iran where the Ramsar convention was signed in 1971 to develop awareness about the importance of wetlands.

Wetlands : These are the areas where water is the primary factor, controlling the environment and the plants and animals life found there in. They occur where the water table is at or near the surface of land or where the land is covered by water.

- These sites are mentioned for the conservation and sustainable utilisation of wetlands and recognising their ecological function, economic, cultural, scientific and recreational values.

Ramsar site in India : Chandra Taal (H.P), Chilka lake (Odisha) Deepor beel (Assam), Loktak Lake (Manipur), Sambhar lake in Rajasthan and Wular lake (J and K) etc.

Threats to wetland : Loss of vegetation, Saliniation, excessive inundation, water pollution, invasive species, excessive development and road buildings.

Questions

VSA

(1 Mark)

1. Habitat loss and fragmentation has caused severe damage to a particular type of ecosystem. Name it.
2. What trend is observed in respect of species diversity when we move from equator to poles ?
3. Which region is considered as the one with highest biodiversity on earth? What is the name given to such region forests ?

Biodiversity and Conservation

M.C.Q.

4. The active chemical drug reserpine is obtained from.
 - a) Atropa
 - b) Papaver
 - c) Datura
 - d) Rouwolfia
5. Which technique can be used for preservation of gametes of threatened species.
 - a) PCR technique
 - b) CTAB
 - c) Cryopreservation
 - d) In site conservation.
6. Which of these are invasive weeds?
 - a) Carrot grass (Parthenium)
 - b) Gandhari (Lantana)
 - c) Water hyacinth (Eicchornia)
 - d) All of these.
7. Which group is most vulnerable to extinction?
 - a) Fishes
 - b) Reptiles
 - c) Amphibians
 - d) Birds

Assertion And Reason Questions:

Read the assertion and reason carefully and mark the correct option out of the options given below:

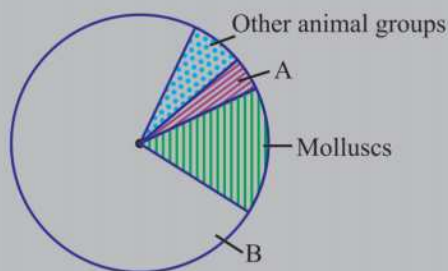
- a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.

- b) If both assertion and reason are true but reason is not a correct explanation of the assertion.
- c) If the assertion is true but the reason is false.
- d) If both the assertion and reason are false.
8. Assertion : Insects are the most diversified organisms on earth.
Reason : Insect have compound eyes.
9. Assertion : India is one of the 12 mega biodiversity countries of the world.
Reason : India has only 2.4% of the world's land area. It shares 8.1% of the global species diversity.
10. Assertion : Removal of key species from an ecosystem leads to destruction of ecosystem.
Reason : Key species drive major ecosystem functions.

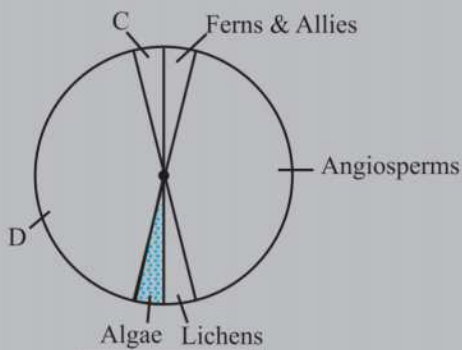
SA-I

(2 Marks)

11. Study the pie-diagram and answer the questions which follows :
What do A, B, C and D represent in these diagrams.



Invertebrates

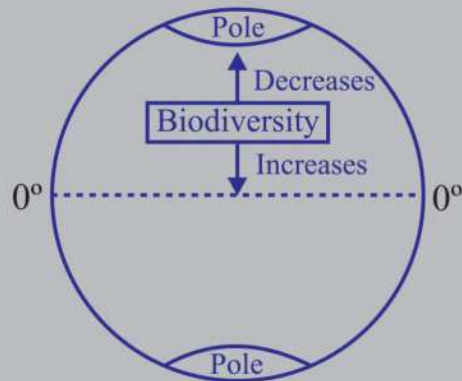


Taxa of Plants

SA-II

(3 Marks)

12. Hot spots are the regions of exceptionally high biodiversity. But they have become regions of accidental habitat loss too. Name the three hotspots of our country. Why are they called 'biodiversity hotspots' ?
13. Study the diagram of the earth given below. Give the name of the pattern of biodiversity therein. Suggest any two reasons for this type of occurrence.



14. What is so special about tropics that might account for their greater biological diversity ?

LA

(5 Marks)

15. Describe at least two approaches each for ex-situ conservation and in situ conservation as a strategy for biodiversity conservation.

Answers

VSA

(1 Marks)

1. Tropical Rain Forest.
2. In general, species diversity decreases as we move away from the equator towards poles.
3. Amazonian rain forests. They are also called the 'Lungs of the planet'.

Answer :

4. d) 5. c) 6. d) 7. c) 8. b) 9. a) 10. a)

SA-I

(2 Marks)

11. A → Crustaceans
 B → Insects
 C → Mosses
 D → Fungi

SA-II

(3 Marks)

12. Western Ghats and Sri Lanka; Indo-Burma; Himalaya called 'biodiversity hot spots' as they show
- High level of species richness
 - High degree of endemism
 - Under constant threat of extinction.
13. Latitudinal gradients
- More solar energy available in tropics, more productivity.
 - Tropical environments are less seasonal, so more predictable.
14. (a) Speciation is a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus had long evolutionary time for species diversification.
- Tropical environments are less seasonal, more constant and predictable.
 - More solar energy available in the tropics contributing to high productivity leading to greater diversity.

LA

(5 Marks)

15. In situ conservation :

- Identification and maximum protection of 'hotspots'
- Legal protection to ecologically rich areas.
- Biosphere reserves, national parks and sanctuaries
- Sacred groves.

Ex situ Conservation :

- Creation of zoological parks, botanical gardens, wild life sanctuaries.
- Cryopreservation
- Seed bank.

PRACTICE QUESTION PAPER (SOLVED)
CLASS XII 2023-24

TIME: 3 HOURS

Maximum Marks: 70

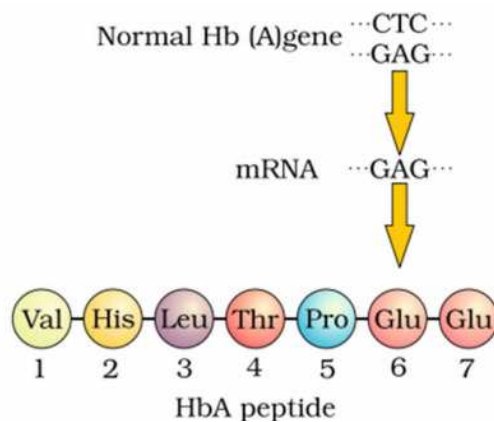
General Instructions

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section-A has 16 questions of 1 mark each; Section-B has 5 questions of 2 marks each; Section-C has questions of 3 marks each; Section-D has 2 case-based questions of 4 marks each; and Section-E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions.
5. A student has to attempt only one of the alternatives in such questions.
6. Wherever necessary, neat and properly labelled diagrams should be drawn.

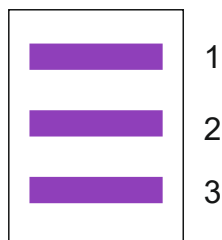
SECTION – A

1. Gynoecium of Michelia is
(a) Monocarpellary (b) Multicarpellary syncarpous
(c) Multicarpellary apocarpous (d) Absent.
2. What would be the number of chromosomes in the cells of the Aleurone layer in a plant species with 8 chromosomes in its synergids?
(a) 16 (b) 24
(c) 32 (d) 4
3. 10 E.coli cells with ^{15}N -ds DNA are incubated in medium containing ^{14}N (normal NHCl). After 80 minutes, how many E.coli will have DNA totally free from ^{15}N ?
(a) 80 cells (b) 60 cells
(c) 140 cells (d) 160 cells

4. Select the type of inheritance mismatched with example from the list given below:
- Incomplete dominance: Antirrhinum
 - Codominance: 'AB' blood group.
 - Polygenic inheritance: *Mirabilis jalapa*
 - Pleiotropy: phenylketonuria disease
5. Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action.
- Drawin's finches of Galapagos Islands
 - Herbicides resistant weeds
 - Antibiotic resistance in eukaryotes
 - Man created breeds of domesticated animals like dog.
- (A) & (B)
 - (B), (C) & (D)
 - Only (D)
 - Only (A)
6. Flippers of Penguins and Dolphins are examples of:
- Convergent
 - Industrial evolution
 - Natural selection
 - Adaptive radiation
7. In the figure given below what does (a) and (b) represents :



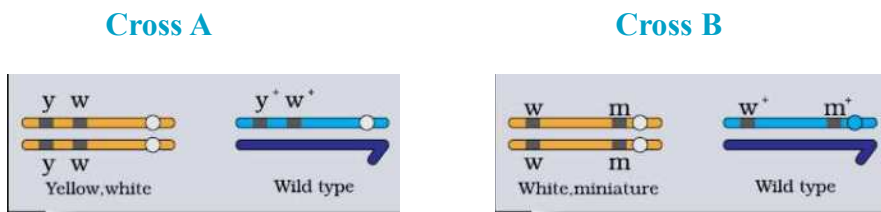
- (a) GAG, Glutamic acid (b) GUG, Valine
 (c) GAG, Valine (d) GUG, Glutamic acid
8. In E.coli, the lac Operon gets switched on when :
- (a) Repressor binds to operator
 (b) Lactose is present and binds to repressor
 (c) Lactose is present in binds to RNA polymerase
 (d) RNA polymers binds to operator.
9. Monascus purpureus is a yeast used commercially in the production of
- (a) Ethanol
 (b) Streptokinase for removing clots from the blood vessels.
 (c) Blood cholesterol lowering statins.
 (d) Lipase to formulate detergents.
10. DNA fragments separated by gel electrophoresis are shown in the figure.
 Mark the correct statement.



- (a) Band 3 contains more positively charged DNA molecule than band 1
 (b) Band 3 indicates more charge density than bands 1 and 2
 (c) Band 1 has longer DNA fragment than bands 2 and 3.
 (d) All bands have equal length and charges but differ in base composition.
11. Cry gene(s) that controls the Corn borer.
- (a) Cry I Ac & Cry II Ab (b) Cry I Ab & Cry II Ac.
 (c) Cry I Ab. (d) Cry II Ab

SECTION - B

17. Differentiate between spermatogenesis and oogenesis.
18. Study the figure given below and answer the following questions:



- (a) Identify in which of the above given crosses is the strength of linkage between the genes is higher and why?
(b) Out of cross 'A' and cross 'B', when would the proportion of non-parental gene combinations be higher?
19. Lymphoid organs are the main component of human immune system.
(a) Name the primary lymphoid organs present in human body.
(b) Expand MALT.
20. DNA is a hydrophilic molecule and can't pass through a cell membrane. So, the bacterial cell is made competent to take up the plasmid.
(a) What is the role of CaCl₂ in making the cell competent?
(b) How one can introduce alien DNA into host plant cell directly?
21. What will be the amount of energy available to the organisms of tertiary consumer level of a food chain, if the energy available at the producer level is 20,000 joules?

OR

"Decomposition is an Oxygen requiring process". Comment.

SECTION-C

22. (a) Write two ways of development of apomictic seeds.
(b) Write one advantage of apomictic seeds.

23. (a) Mention the relationships between pituitary and ovarian hormones during a menstrual cycle.
(b) How many primary follicles are left in each ovary in a human female at puberty.
24. (a) "A mother of 1 year old daughter wanted to space her second child. Which contraceptive method may be suggested by the doctor to her?
(b) How the action of LNG 20 is different from Cu-T?
(c) Name one non-medicated IUD.
25. (a) Name the primates that lived about 15 million years ago.
(b) Write the order in which Neanderthals, Homo habilis and Homo appeared on the earth, State the brain capacity of each of them erectus?
(c) How Homo habilis were different from Homo erectus? 26. Describe how do 'flocs' and 'activated sludge help in sewage treatment.
26. Describe how do 'flocs' and 'activated sludge' help in sewage treatment.
27. A vector is engineered with three features, which facilitate its cloning within the host cell. List down and mention the three features and explain each of them.

OR

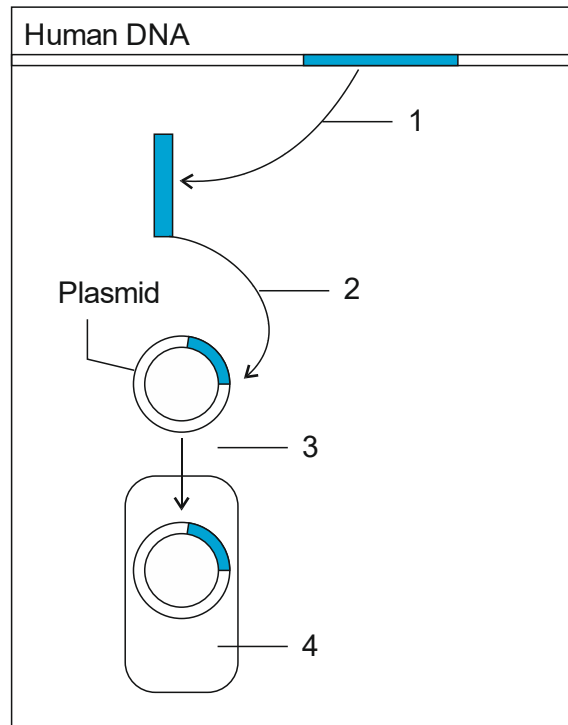
Explain with example how have transgenic animals proved to be beneficial in:

- (i) Production of biological products. (ii) Chemical safety testing.
28. (a) Why are mango trees unable to grow in temperate climate?
(b) Give an example of crop shows genetic diversity.
(c) Write the use of sacred groves.

SECTION-D

Q. No. 29 and 30 are case-based questions. Each question has 3 subparts with internal choice in one subpart.

29.

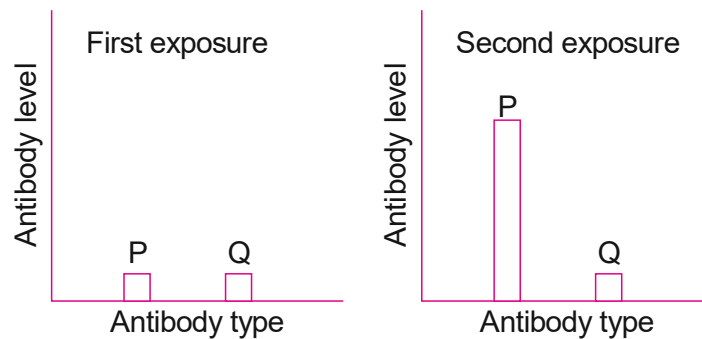


- (a) Name the technique in biotechnology whose steps are shown in the above figure.
- (b) Name the steps 1 to 4 marked in the figure.
- (c) Give an example where a human gene product is obtained from transgenic bacteria

OR

Draw the structure of immature insulin.

30. In a study to test a new vaccine against the viral disease, mouse model testing is done. In this process, mice were vaccinated and their blood samples were tested. After a few days those mice were again infected with the virus. This time they do not show any disease symptoms. Their blood samples were tested. Two graphs show antibody concentration for the first and second infection in mice blood.



- (a) Why the antibody concentration is high during second infection in mice?
- (b) Which of the following cells is involved in humeral immunity?
 - (i) T-cells
 - (ii) B-cells
 - (iii) Mast cells
 - (iv) Both T & B cells.
- (c) Which type of immunity is gained by the mice after second exposure with virus?

OR

Draw the labelled diagram of antibody.

SECTION-E

31. (a) Where does microsporogenesis occur in an angiosperm? Describe the process of microsporogenesis.
- (b) Draw a labelled diagram of the two-celled male gametophyte of an angiosperm. How is the three celled male gametophyte different from it?

OR

- (a) Explain the events taking place at the time of fertilization of an ovum in human female.
 - (b) Name and draw a labelled sectional view of the embryonic stage that gets implanted.
32. (a) State the reasons for which Hershey and Chase used different radioactive isotopes and explain how they used them.

(b) What is the use of blending and centrifugation of culture? c) Write the observation and conclusion they arrived at.

OR

Given below is a stretch of DNA showing the coding strand of a structural gene of a transcription unit.

5- ATG ACC GTA TTT TCT GTA GTG CCC GTA CTT CAG GCA TAA
- 3

(a) Write the corresponding template strand and the mRNA strand that will be transcribed, along with its polarity.

(b) If GUA of the transcribed mRNA is an intron, depict the sequence involved in the formation of hnRNA/the mature processed mRNA strand.

(i) In a bacterium

(ii) In humans

(c) Upon translation, how many amino acids will the resulting polypeptide have in case of humans?

33. (a) Tropical regions in the world account of greater biological diversity. Justify with two reasons.

(b) Why habitat loss and alien species invasion considered as the cause of biodiversity loss? Explain each with an example.

OR

(a) Name the cells that act as HIV factory in humans when infected by HIV.

(b) Explain the events that occur in these infected cells.

(c) How HIV causes the immune deficiency?

SAMPLE QUESTION PAPER

SOLUTION

SECTION - A

1. (c) multicarpellary apocarpus.
2. (b) 24
3. (c) 140 cells
4. (c) Polygenic inheritance: *Mirabilis jalapa*
5. (b) (B), (C) & (D)
6. (a) Convergent evolution
7. (b) GUG, Valine
8. (b) lactose is present in binds to repressor
9. (c) blood cholesterol lowering statins
10. (c) band I has longer DNA fragment than bands 2 and 3
11. (c) Cry I Ab
12. (d) A,C
13. (d) A is false but R is true.
14. (b) Both A and R are true and R is not the correct explanation of A.
15. (a) Both A and R are true and R is the correct explanation of A.
16. (a) Both A and R are true and R is the correct explanation of A.

Spermatogenesis	Oogenesis
The production of sperms from spermatogonia is known as spermatogenesis	The production of eggs from oogonia is known as oogenesis
Equal cytokinesis occurs during the spermatogenesis producing four sperms	Unequal cytokinesis occurs during oogenesis ultimately producing one large ovum and tiny polar bodies
Begins at puberty	Begins at foetal stage

18. (a) In cross 'A' as genes are closely placed. Less the distance between the genes greater is the strength of linkage.
(b) Non parental combinations be higher in case of cross 'B' as the distance between genes is more and chance of crossing over will be more which leads to new combinations.
19. (a) Bone marrow & Thymus
(b) Mucosal associated lymphoid tissue.
20. (a) increases the efficiency with which DNA enters the bacterium through pores in its cell wall.
(b) By gene gun (biolistics): cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA.
21. According to 10% law of energy entering a particular trophic level of organism is available for transfer to the next trophic level.

Producer level = 20,000 Joules

Primary Consumer level 10% of 20,000 = 2,000 Joules

Secondary Consumer level = 10% of 2,000 = 200 Joules

Tertiary consumer level = 10% of 200 = 20 Joules.

OR

Detritus is composed of nitrogen and water-soluble substances like sugars. In the presence of oxygen, complex carbon compounds are oxidized to produce carbon dioxide.

SECTION-C

22. (a) • Apomictic seeds developed by diploid egg cell if it is formed without reduction division.
• In some species like of citrus and mango, nucellar cells develop into embryos
(b) If hybrids are made into apomictic seeds, there is no segregation of characters in the hybrid and farmers can keep on using these seeds.

23. (a) FSH stimulate follicular development and secretion of estrogen.
LH induces ovulation and development of corpus luteum which secretes progesterone.
(b) 60000-80000 primary follicles
24. (a) IUDs (Intra Uterine Devices)
(b) LNG-20, a hormone releasing IUD make the uterus unsuitable for implantation and cervix hostile to sperms. While Cu ions of Cu-T suppress the motility of sperms.
(c) Lippes loop 25
25. (a) Dryopithecus & Ramapithecus
(b) Homo habilis (brain capacity-650-800cc) - Homo erectus (brain capacity - 900cc) - Neanderthal man (brain capacity - 1400cc).
(c) Homo habilis probably did not eat meat while Homo erectus probably ate meat.
26. 'Flocs' are masses of aerobic bacteria as associated with fungal filaments to form mesh like structures. These aerobic microbes consume the major part of the organic matter in the effluent. This significantly reduces biological oxygen demand (BOD) of the effluent. A small part of the activated sludge is used as inoculum and pumped back to aeration tank. The remaining major part of the sludge is pumped into anaerobic digester where microbes or bacteria grow anaerobically to produce CH_4 , H_2S and CO_2 or biogas.
27. Features that facilitate cloning of vectors
- Origin of Replication (Ori): sequence of DNA from where replication starts. Piece of foreign DNA linked to it is made to replicate within the host cell. It also decides copy number of linked DNA.
 - Selectable Marker: Antibiotic resistant genes that helps in selecting the host cells, which are transformants / recombinants from the non-recombinant ones.

- Cloning Site : unique recognition site in a vector to link the foreign DNA. It helps the particular restriction enzyme to cut the vector DNA.
- Small size of the vector : it facilitates the introduction of the DNA into the host easily.

OR

- (i) Transgenic animals produced by the introduction of the portion of DNA which codes for a particular product such as human protein (α -1- antitrypsin) used to treat emphysema, phenyl ketonuria and cystic fibrosis.
- (ii) Animals are made to carry genes which make them more sensitive to toxic substances or chemicals than non-transgenic animals and when they are exposed to the toxic substances, the effects can be studied. Toxicity testing takes less time in such animals.
28. (a) Temperature affects the kinetics of enzymes and through it the metabolic activity and other physiological functions of the organisms.
- (b) Rice/ Mango/ Rauwolfia vomitoria.
- (c) Sacred groves are tracts of forests which are regenerated around places of worship. This is in situ conservation of forests.

SECTION - D

29. (a) Recombinant DNA technology/ genetic engineering
- (b) 1 - cutting & isolation of human gene
- 2 - incorporation of human gene into plasmid to produce recombinant DNA.
- 3 - transformation of plasmid into bacteria
- 4 - transformant bacteria with rDNA
- (c) Insulin obtained from transgenic bacteria

OR

Diagram on pg no. 211 of NCERT

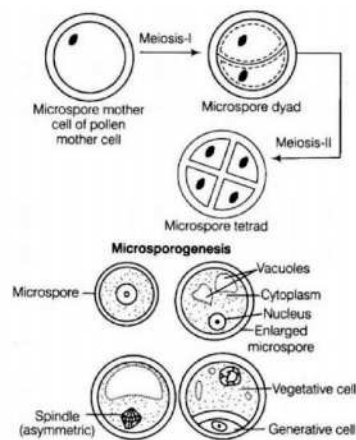
30. (a) Second encounter shows the secondary response. Memory of the first encounter leads to the production of higher amount of antibodies.
 (b) (b) B-cells
 (c) Acquired Active immunity

OR

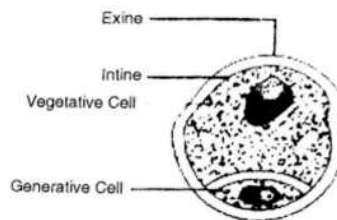
Diagram on pg no. 151 of NCERT

SECTION - E

31. (a) In pollen sacs or microsporangia of each another lobe.



(b)

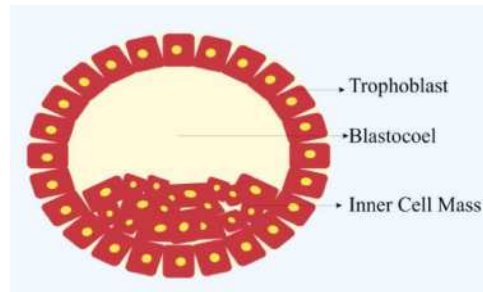


In Over 60% of angiosperms, pollen grains are shed at two-celled stage (one generative and other vegetative). In others, the generative cell divides mitotically to give rise to 2 male gametes before pollen grains are shed, called 3-celled stage.

OR

(a) Sperms comes in contact with zona pellucida layer of ovum, induces the changes in the membrane of ovum and block the entry of other sperms (prevent polyspermy), lytic enzymes/secretions of acrosome helps the entry of sperm head, completion of meiotic division of secondary oocyte, formation of second polar body and ovum/ootid, fusion of nuclei of sperm and ovum forming zygote.

(b) Blastocyst



32. (a) Some bacteriophages grown on medium having radioactive (^{35}S) to obtain radioactive protein coat and some bacteriophages grown on medium having radioactive (^{32}P) to obtain radioactive DNA.
- (b) Blending or agitating to remove viral coats from bacteria. Centrifugation to separate virus particles from bacteria by spinning them.
- (c) Bacteria which was infected with viruses that had radioactive DNA were radioactive, indicating that DNA was the material that passed from virus to bacteria/ bacteria that were infected with viruses that had radioactive proteins were not radioactive; indicating that protein did not enter the bacteria from viruses. Thus DNA is genetic material.

OR

(a) Template strand

3-TAC TGG CAT AAA AGA CAT CAC GGG CAT GAA GTC CGT
ATT— 5'mRNA Strand

5'-- AUG ACC GUA UUU UCU GUA GUG CCC GUA CUU CAG GCA
UAA - 3'

(b) GUA is intron
mRNA in bacterium
5'-AUG ACC GUA UUU UCU
GUA GUG CCC GUA CUU CAG GCA UAA-3'

Processed mRNA in humans after removal of introns :

5'-AUG ACC GUA UUU UCU GUA GUG CCC GUA CUU CAG GCA
UAA -3'

5'-AUG ACC UUU UCU GUG CCC CUU CAG GCA UAA -3'

(c) 9 amino acids forms polypeptide as UAA is stop codon.

33. (a) • Tropical regions relatively undisturbed for millions of years and had long evolutionary time for species diversification.

- Environment less seasonal/more constant and predictable and promotes niche specialisation.

- More solar energy available in tropics leads to higher productivity.

(b) Habitat loss : Amazon forests is being cut for cultivation of soyabeans/ degradation by pollution/clearing of forest for commercial or tourism purpose.

Alien species invasion : Nile perch introduced in Lake Victoria leads to extinction of cichlid fish/Introduction of African catfish *Clarias gariepinus* threat to indigenous catfish/carrot grass and water hyacinth causes threat to indigenous species.

OR

(a) Macrophages

(b) Diagram on pg no. 155 of NCERT

(c) Progeny HIV enters into helper T-lymphocytes, replicates, released in blood attack other helper T-lymphocytes, leads to immune deficiency.

PRACTICE QUESTION PAPER (UNSOLVED)
BIOLOGY THEORY (SUBJECT CODE 0-44)

TIME: 3 HOURS

Maximum Marks: 70

General Instructions

- (i) This Question paper contains 33 questions. All questions are compulsory.
- (ii) Question paper is divided into Five sections: Section A, B, C, D and E.
- (iii) In Section A - Question Number 1 to 16 b multiple choice (MCQ) type questions carrying 1 mark each.
- (iv) In Section B - Question number 17 to 21 are short answer (VSA) type questions carrying 2 marks each.
- (v) In Section C - Question number 22 to 28 are short answer (SA) type questions carrying 3 marks each.
- (vi) In Section D - question number 29 and 30 are case based questions carrying 4 marks each. Each question has subparts with internal choice in one subpart.
- (vii) In Section E - question number 31 to 33 are long answer type carrying 5 marks each.
- (viii) Wherever necessary, neat and properly labelled diagrams showed be drawn.
- (ix) There is no overall choice. However internal choice has been provided.

SECTION – A

1. Interferons are most effective in making non-infected cells resistant against the spread of which of the following diseases in humans?
 - (a) Asariasis
 - (b) ringworm
 - (c) Amoebasis
 - (d) AIDS
2. Sea Anemone gets attached to the surface of the hermit crab. The kind of population interaction exhibited in this case is.
 - (a) amensalism
 - (b) Commensalism
 - (c) Mutualism
 - (d) Parasitism

3. Which of the following is an ex-situ conservation?
- (a) Sacred groups (b) National Park
(c) Biosphere Reserve (d) Seed Bank
4. $\log S = \log C + Z \log A$. In the given equation of species - area relationship, the value of regression coefficient for a whole continent would be
- (a) 0.1 – 0.2 (b) 0.5 – 0.7
(c) 0.6 – 1.2 (d) 0.3 – 0.5
5. Identify the correct path of Milk secreted by the mammary glands.
- (a) Alveoli → mammary ducts → Ampullas → mammary tubules → Lactiferous ducts.
(b) Alveoli → Ampulla → mammary ducts → mammary tubules → Lactiferous ducts.
(c) Alveoli → mammary tubules → mammary ducts → Ampulla → Lactiferous ducts.
(d) Lactiferous duct → Alveoli → mammary tubules → Ampulla → mammary duct.
6. Which of the following statements about RNA interference (RNAi) is not correct?
- (a) Silencing of a specific mRNA by complementary is RNA
(b) Formation of both sense and Antisense RNA in the host cell.
(c) Silencing of a specific mRNA by complementary ssRNA
(d) Formation of dsRNA for the two complementary RNAs.
7. Which of the following is a wrongly matched pair?
- (a) Ampullary isthmus junction → site of fertilisation
(b) Perimetrium - Site of implantation of blastocyst
(c) Myometrium - involved in the contraction movement of uterine wall
(d) Endometrium - undergoes cyclic changes during Menstrual cycle.

8. Which one of the following is not a major characteristic feature of Biodiversity hotspots?
- (a) Large number of species (b) abundance of endemic species
(c) Large number of exotic species (d) Destruction of habitat
9. Which of the following statements is incorrect?
- (a) Genetically engineered insulin is produced in E coli
(b) In man, insulin is synthesised of proinsulin
(c) The proinsulin has three peptide chains A, B and C
(d) The functional insulin has two peptide chains, A and B hold together by hydrogen bonds.
10. The construction of the first recombinant DNA was achieved by using the native plasmid of:
- (a) Escherichia coli (b) Agrobacterium tumefaciens
(c) Salmonella typhi (d) Bacillus thuringiensis
11. Select the correct statement from the following.
- (a) Toddy is made by fermenting the sap of plants
(b) Brandy having high alcohol content is produced without distillation
(c) wine and beer are produced after distillation
(d) Citric acid is produced by using the bacterium, clostridium
12. Emasculation and bagging are the two steps in artificial hybridisation programs. Which of the following statements is incorrect regarding this programme?
- (a) These two steps ensure that only desired pollen grains are used to produce the hybrids.
(b) Emasculation is to prevent the contamination of the stigma with other pollen grains.
(c) Bagging is carried out to prevent the contamination of the stigma with unwanted pollen grains.

(d) Emasculation prevents contamination of the stigma with self pollen.

Question No. 13 to 16 consist of two statements.

Assertion (A) and Reason (R). Answer these questions selecting the Appropriate option given below:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (c) (A) is true, but (R) is false.
- (d) (A) is false, but (R) is true.

13. Assertion (A) : There is expression of only one of the parental character in F₁ progeny of Mendelian monohybrid cross.

Reason (R) : In a dissimilar pair of factors, one member of the pair dominates the other.

14. Assertion (A) : Apomictic embryos are genetically identical to the parent plant.

Reason (R) : Apomixis is the production of seeds without fertilisation.

15. Assertion (A) : Progesterone reaches its peak level in the Luteal phase.

Reason (R) : Corpus luteum that secretes progesterone is formed from the ruptured Graafian follicle of ovulation.

16. Assertion (A) : In Galapagos islands, the Abingdon tortoise became extinct within a decade after goats were introduced into the island.

Reason (R) : Competition is the process in which the fitness of the species is significantly reduced in the presence of another species.

SECTION - B

17. (a) Write the two crucial changes, the seeds undergo while reaching maturity that enable them to be in a viable state until the onset of favourable conditions.

(b) Name the oldest viable seed excavated from Arctic Tundra as per records.

18. A true breeding pea plant, homogenous dominant for inflated green pods crossed with another pea plant with constricted yellow pods (ffgg) with the help of punnett square shows the above cross and mention the results obtained phenotypically and genotypically in F1 generation?
19. During a field trip, one of your friend in the group suddenly become unwell, she started sneezing and hold trouble in breathing.

Name and Explain the term associated with such sudden responses. What would the doctor recommed for relief?

20. (a) A plasmid DNA and a linear DNA (both are of same size) here one site for a restriction endonuclease. When cut and separated on agarose gel electrophoresis, plasmid shows on DNA band, while the linear DNA shows two progmenits. Explain.
- (b) Name two restriction / cloning sites present in the ampR gene in the E. coli coloning vector, PBR322.
21. Given below is a pyramid of biomass is an

(a) Ecosystem where each bar represents the standing crop available in a trophic level. With the help of an example explain the conditions where this kind of pyramid is possible in nature.



(b) Will the pyramid of Energy be also of the same shape in this situation? Give reason for your respective.

OR

(a) Draw a pyramid of Number where a large number of insects or feeding on the leaves of a tree. What is the shape of this pyramid.

(b) Will the pyramid of Energy be also of the same shape in this situation? Give reason for your response.

SECTION - C

22. Explain the functions of the following structure in the human male reproductive system.
- (a) scrotum (b) leydig cells
(c) male accessory glands
23. State the agent (s) which helps in pollinating in the following plants. Explain the adaptations in these plants to ensure pollination?
- (a) Corn (b) Water hyacinth
(c) vallisneria
24. (a) Differentiate between humoral and cell mediated immune response.
(b) Why is a patient, who has undergone organ transplant put on Immunosuppressant ? Explain.

OR

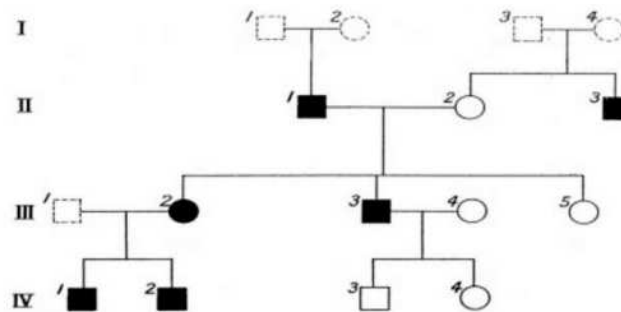
- (a) Explain the life cycle of plasmodium starting from its entry in the body of female anopheles till the completion of its life cycle in humans.
(b) Explain the course of periodic recurrence of chill and high fever during malarial attack in humans.
25. (a) How is Hardy weinberg expression $(p^2 + 2pq + q^2) = 1$ is derived?
(b) List any two factors that can disturb the genetic equilibrium.
26. (a) Identify the polarity of x to x¹ in the diagram below.
- C U C U U G U A G U C C A A
X X'
mRNA
- (b) Mention the codon and Anticodon for methionine
(c) Why are some untranslated sequences of bases seen in mRNA coding for a polypeptide? Where exactly are they present on mRNA?
27. (a) There was loss of biodiversity in an ecosystem due to a near construction project in that area. What would be its impact on the ecosystem. State any three.

- (b) List any three major causes of loss of Biodiversity?
28. (a) Give a schematic representation of the transformation of proinsulin into insulin.
- (b) Give an example of a transgenic animal that is being used to test vaccine safety for a specific human disease. Name the disease also.

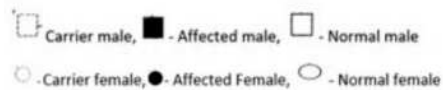
SECTION - D

Question No. 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.

29. Study the pedigree chart given below and answer the questions that follow.



Symbols used in the given Pedigree Chart are as follows:



- (a) On the basis of inheritance pattern in this pedigree chart, what conclusion can you draw about the pattern of inheritance?
- (b) If the Female homozygous for the affected trait then what percentage of her sons will be affected?
- (c) Give the genotype of offsprings 1, 2, 3 and 4 is III generation.

OR

- (c) In this type of inheritance pattern, out of male and female children which one has the probability of receiving the trait from the parents. Give a reason.
30. A youth in his twenties met with an accident and succumbed to the injuries. His parents decided to donate his organs.
- (a) List two essential clinical steps to be undertaken before any organ transplant.
- (b) How do the cells involved in the above function in our immune system?
- (c) Why is the organ transplant rejected sometimes? Name the kind of Immunity and the cells involved.

OR

- (c) Name the cells that produce antibodies. What types of acquired Immunity is constituted by antibodies? Why are they described as H_2L_2 ?

SECTION - E

31. Trace the events from copulation to zygote formation in a human female?

OR

Trace the development of a megaspore mother cell to the formation of mature Embryo sac in a following plant.

32. Observe the segment of mRNA given below.



- (a) Explain and illustrate the steps involved to make fully processed hnRNA.

(b) Gene encoding RNA polymerase I and III have been affected by mutation in a cell. Explain its impact on the synthesis of polypeptide, stating reasons.

OR

Study the schematic representation of the genes involved in the Lac operon. Given below and Answer the Questions :



- (a) The active site of enzyme permease present in the cell membrane of a bacteria has been blocked by an inhibitor, How will, it affect the operon.
- (b) The protein produced by the i gene has become abnormal due to unknown reasons. Explain its impact on lactose metabolism stating the reason.
- (c) If the nutrient medium for the bacteria contains only galactose, will operon be expressed? Justify your answer.
33. (a) 'In situ' conservation can help endangered/threatened species. Justify the statement.
- (b) List any four tech where the principle of Ex. situ conservation of biodiversity has been employed.

OR

Define Decomposition and Describe the process and products of Decomposition.

PRACTICE PAPER (UNSOLVED) – II

TIME: 3 HOURS

Maximum Marks: 70

General Instructions

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section-A has 16 questions of 1 mark each; Section-B has 5 questions of 2 marks each; Section-C has questions of 3 marks each; Section-D has 2 case-based questions of 4 marks each; and Section-E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
6. Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION – A

1. Match column I and select the correct option.

Column I

- A. Baculoviruses
- B. Methanogens
- C. Glomus
- D. Anabaena

Column II

- 1. Nitrogen-fixing cyano bacterium
- 2. Mycorrhiza
- 3. Blood clot-remover
- 4. Biogas plant
- 5. IPM programmes

(a) A – 5, B – 4, C – 1, D – 1

(b) A – 5, B – 4, C – 2, D – 1

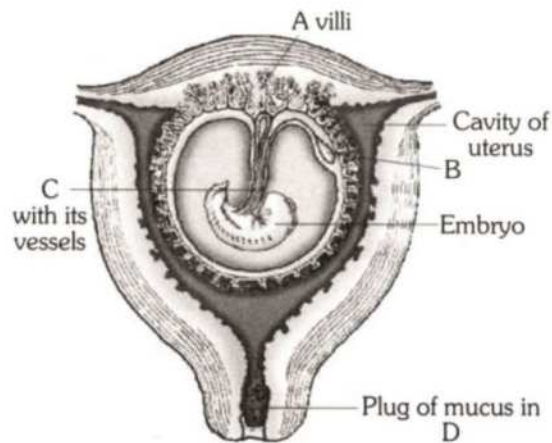
(c) A – 4, B – 5, C – 2, D – 1

(d) A – 3, B – 4, C – 2, D – 1

2. The theory of evolution supported by the experiment conducted by Louis Pasteur, is

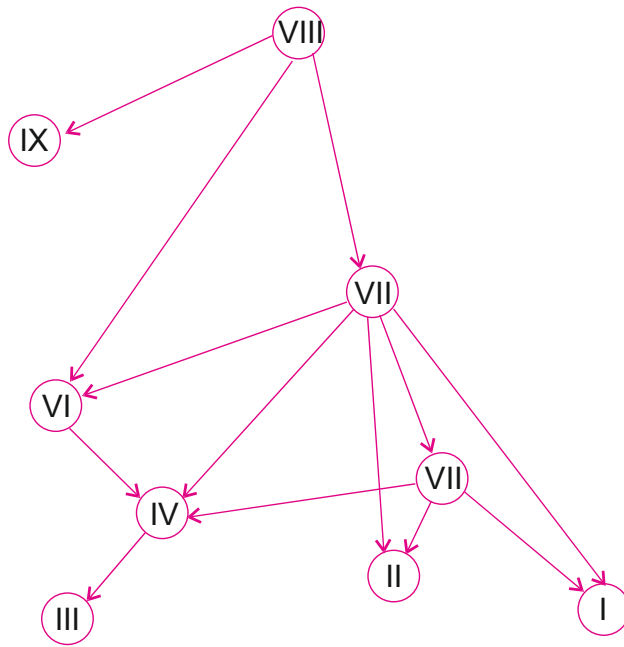
(a) Spontaneous generation theory (b) Life comes from pre-existing life

- (c) Abiogenesis of life (d) Big Bang theory
3. In angiosperms, after double fertilisation
- (a) the zygote and the primary endosperm nucleus cell start dividing simultaneously
 - (b) both the zygote and the primary endosperm nucleus cell undergo a period of rest before they start dividing simultaneously
 - (c) the primary endosperm cell starts dividing to form the endosperm before the zygote starts dividing
 - (b) the egote starts dividing before the primary endosperm cell and forms the embryo.
4. Penetration of the sperm in the ovum is followed by
- (a) formation of first polar body (b) completion of meiosis II.
 - (c) first meiosis (d) dissolution of zona pellucida.
5. A botanist studying Vista (common pansy) noticed that one of the two flower types withered and developed no further due to some unfavorable condition, but the other flower type on the same plant survived and it resulted in an assured seed set. Which of the following will be correct?
- (a) The flower type which survived is Cleistogamous and it always exhibits autogamy
 - (b) The flower type which survived is Chasmogamous and it always exhibits geitonogamy.
 - (c) The flower type which survived is Cleistogamous and it exhibits both autogamy and geltonogamy.
 - (d) The flower type which survived is Chasmogamous and it never exhibits autogamy.
6. Concentration of which of the following substances will decrease in the maternal blood as it flows from embryo to placenta through the umbilical cord?



The human foetus within the uterus

- | | |
|----------------------|-------------------|
| (i) Oxygen | (ii) Amino Acids |
| (iii) Carbon dioxide | (iv) Urea |
| (a) (i) and (ii) | (b) (ii) and (iv) |
| (c) (iii) and (iv) | (d) (i) and (iv) |
7. Identify the correctly matched pair
- | |
|--|
| (a) Free-living N_2 – fixing bacterium-Frankia |
| (b) Free-living N_2 – fixing cyanobacterium-Azospirillum |
| (c) Symbiotic fungus – Glomas |
| (d) Mycorrhizae – Nostoc |
8. In the illustration given below of a simplified food web on an island, the arrows indicate the direction of energy flow and the Roman numbers indicate species within the food web.
- At which trophic level or levels does the species VIII function?
- | | | |
|--|----------|--|
| (a) 2 nd and 3 rd consumer | Producer | (b) 1st consumer |
| (c) Producer | | (d) 3 rd and 4 th consumer |



9. Asymptote in a logistic growth curve is obtained when
- (a) the value of approaches zero (b) the value of K is equal to N
 (c) the value of K is greater than N (d) the value of K is less than N
10. The repetitive/satellite DNA is separated from the bulk genomic DNA for genetic experiments, by
- (a) gel electrophoresis (b) elution
 (c) density gradient centrifugation (d) chromatography
11. Which of the following statements is incorrect?
- (a) Patients who have undergone surgery are given morphine as painkiller.
 (b) Malignant tumours exhibit the property of metastasis.
 (c) Heroin accelerates the brain functions.
 (d) The plant *Erythroxylum coca* that yields cocaine. is a native of South America.

12. A frog that feeds on the insects, which in turn feed on plants, is a
- (a) primary consumer (b) primary carnivore
(c) secondary carnivore (d) tertiary carnivore

Question No. 13 to 16 consist of two statements-Assertion (A) and Reason (R). Answer these questions selecting the “appropriate option given below:

- (a) Both A and R are true and R is the correct explanation of A.**
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false. (d) A is false, but R is true.

13. Assertion (A): Parturition is induced by a complex neuro-endocrine mechanism.

Reason (R): At the end of the gestation period, the maternal pituitary releases prolactin which causes uterine contractions.

14. Assertion (A): In the dihybrid crosses conducted by Morgan on *Drosophila*, the results deviated from those of Mendel.

Reason (R): The genes studied by Morgan in *Drosophila* showed linkage and did not segregate independently of each other.

15. Assertion (A): Retroviruses are used efficiently as vectors in DNA technological experiments.

Reason (R): *Agrobacterium tumefaciens* is the most commonly used vector for transformation of plant cells.

16. Assertion (A): When certain exotic species are introduced into a geographical area, they become invasive, start spreading fast and cause damage to the native species.

Reason (R): The new geographical area invaded by the species does not have their natural predators.

SECTION - B

17. Why does the son of a carrier mother and a normal father suffer from haemophilia, whereas the son of a haemophilic father and a normal mother would not? Explain.
18. Name the type of immunity a baby is born with. How is it different from the one he gets from the mother's milk after birth?
19. Name and explain the interaction that is seen between clown fish and sea anemone.

OR

Apart from plants and animals, microbes form a permanent biotic component in an ecosystem. While plants have been referred to as autotrophs and animals as heterotrophs, what are microbes referred to as? How do microbes fulfil their energy requirements?

20. Match the items in Column I with those in Column II.

Column I	Column II
A. Rosie	1. Polio vaccine safety
B. T ₁ plasmid	2. Human alpha-lactalbumin
C. RNAi	3. Agrobacterium tumefaciens
D. ELISA	4. Meloidogyne incognita
	5. Antigen-antibody interaction

21. State two advantages of an apomictic seed to a farmer.

SECTION - C

22. Explain the characteristic features of flowers that facilitate self-pollination.
23. Draw a schematic diagram of the E. coli vector pBR 322 and mark the following in it:
 - (a) Ori
 - (b) rop
 - (c) ampicillin-resistant gene
 - (d) tetracycline-resistant gene
 - (e) restriction site BamHI
 - (f) restriction site EcoRI

OR

Draw a schematic sketch of pBR 322 plasmid and label the following in it:

- (a) Any two restriction sites.
 - (b) Ori and rop genes.
 - (c) An antibiotic resistant gene.
24. Draw a labelled diagrammatic view of human male reproductive system.
25. (a) Explain the cause in a human to have sex chromosomes as 'XXY' instead of 'XX' or 'XY'.
- (b) What are true-breeding lines that are used to study inheritance pattern of traits in plants?
26. Write the three basic facts that are highlighted in Mendel's Law of Dominance.
27. Baculoviruses are good examples of biocontrol agents. Justify giving three reasons.

OR

- (a) A patient had suffered myocardial infarction and clots were found in his blood vessels. Name a 'clot buster' that can be used to dissolve the clots and the microorganism from which it is obtained.
- (b) A woman had just undergone a kidney transplant. A bioactive molecular drug is administered to oppose kidney rejection by the body. What is the drug? Name the molecule and the microbe from which this is extracted.
28. Name the different types of polymerases in a eukaryotic cell. Write their roles in transcription.

SECTION - D

Question No. 29 and 30 are case based questions with subparts with internal choice in one subpart.

29. Sickle cell anemia is a genetic disorder where the body produces an abnormal hemoglobin called hemoglobin S. Red blood cells are normally flexible and round, but when the hemoglobin is defective, blood cells take up a "sickle" or crescent shape. Sickle cell anemia is caused by mutations in a gene called HBB.

It is an inherited blood disorder that occurs if both the maternal and paternal copies of the HBB gene are defective. In other words, if an individual receives just one copy of the defective HBB gene, either from mother or father, then the individual has no sickle cell anemia but has what is called "sickle cell trait". People with sickle cell trait usually do not have any symptoms or problems but they can pass the mutated gene onto their children. There are three inheritance scenarios that can lead to a child having sickle cell anemia:

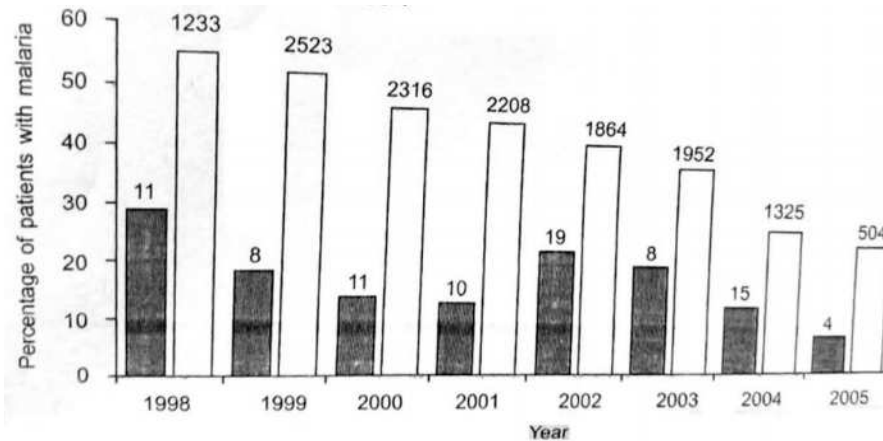
- Both parents have sickle cell trait
- One parent has sickle cell anemia and the other has sickle cell trait
- Both parents have sickle cell anemia

(a) What type of inheritance is shown by this disorder? Name another disease of this category.

(b) If both the parents have the sickle trait, what per cent of their children will have

(i) sickle-cell anaemia (ii) sickle-cell trait, respectively?

(c) Write any two conclusions that can be drawn from the data given.



OR

(c) How does sickle-cell anaemia differ from haemophilia?

30. There is growing public awareness and anger that certain companies are being granted patents for products and technologies that make use of the genetic materials, plants and other biological resources that have long been identified, developed and used by the farmers and indigenous people of a particular Country In 1997 an American company got patent rights on Basmati rice through the US patent and Trademark office this allowed the company to sell a new variety of Basmati in the US and abroad Several attempts have been made to patent the processes, products and uses of Indian traditional herbal medicines.

Answer the following questions.

- (a) What term is given to such an act by the countries?
- (b) What is the new variety of Basmati developed by the US company?
- (c) Mention the efforts of the Indian Government to prevent such deeds.

OR

(c) Indian Government has set up organisations like GEAC. Mention two objectives of setting up GEAC by our government.

SECTION - E

31. (a) List any four major goals of Human Genome project.
- (b) Write any four ways the knowledge from HGP is of significance for humans.
- (c) Expand BAC and mention its importance.

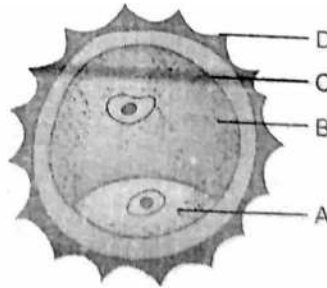
OR

State what is disturbance in Hardy-Weinberg equilibrium indicative of. Write any four factors that affect the equilibrium. Explain how?

32. The pollen grains represent the partially developed male gametophyte of angiosperms. They show an amazing variety of architecture, when observed under a microscope. They are generally spherical and measure about 25-50 micrometres in diameter. Each pollen grain has a prominent two-layered wall. Pollen grains are well-preserved as.

(a) How many cells are present in a pollen grain, at the time of its release from the anther? Name them.

(b) Refer to the figure given and match the parts (with their names) labelled with their characteristics mentioned.



1. It is made of a highly-resistant organic material.
2. It is spindle-shaped in time and has dense cytoplasm with a prominent nucleus.
3. It has vacuolated cytoplasm and an irregularly-shaped nucleus.
4. It is made of pectin and cellulose

(c) What are germ pores?

OR

Study the flow chart given below. Name the hormones involved at each stage and explain the functions.

Hypothalamus



Pituitary



Ovary



Pregnancy

33. Cowdung is mixed with water and the durry is fed into the biogas plant for digestion by mcbes. The person in charge of the biogas plant shares that there is no need to provide any inoculum to it.
- (a) Give reason, why no inoculums needed.
 - (b) What is the role of the microbes at the source?
 - (c) Mention the condition under which they will be most active and effective.
 - (d) Who developed the technology of biogas production in India?
 - (e) Why are biogas plants more often buit in rural areas?

OR

The use of chemical fertilisers to meet the ever-increasing demand of agricultural prodiace to feed the ever- increasing human population, has contributed significantly to environmental pollution. Now that we have realised the problems associated with the overuse of chemical fertilisers, there is large pressure to switch over to organ farming there is a need these days to push for the use of biofertilisers. Currently, in our country a biofertilisers are available in the market and farmers do use them regularly in their field.

- (a) What are biofertilisers?
- (b) Name (i) two free-living bacteria and (ii) two canobacteria that are nitrogen fixers.
- (c) Name the fungal genus that often forms mycorrhizal association with higher plants. Mention any three advantages, the mycorrhizal association provides to the plants.