Subject : Biology Set A

Total Time Allowed : 45 minutes	Maximum Marks : 200	Total Questions : 50	Questions to be answered : 40

Question 1. Analogous structures are a result of:
1. Convergent evolution
2. Divergent evolution
3. Parallel evolution
4. Retrogressive evolution

Correct Answer: 1. Convergent evolution

Solution: Analogous structures arise when unrelated organisms develop similar traits due to similar environmental pressures, a process known as convergent evolution.

Quick Tip

Analogous structures result from convergent evolution, where different species adapt similarly due to similar environments.

Question 2. Which of the following does not affect the Hardy-Weinberg equilibrium?
1. Natural selection
2. Genetic drift
3. Gene pool
4. Gene migration

Correct Answer: 3. Gene pool

Solution: The gene pool itself does not directly affect Hardy-Weinberg equilibrium. Factors like natural selection, genetic drift, and gene migration do affect the equilibrium.

Quick Tip

Hardy-Weinberg equilibrium is impacted by selection, drift, and migration but not by the presence of the gene pool itself.

Question 3. Which of the following primates was more like an ape?

1. Homo erectus
2. Dryopithecus
3. Australopithecines
4. Ramapithecus

Correct Answer: 2. Dryopithecus

Solution: Dryopithecus is considered more ape-like than other listed primates, as it shares more characteristics with early apes.

Quick Tip

Dryopithecus is often classified as more ape-like compared to other early primates.

Question 4. Nucleosome is associated with _____ molecules of histones.
1. Four
2. Nine
3. Two
4. Eight

Correct Answer: 4. Eight

Solution: Each nucleosome consists of eight histone proteins, forming an octamer around which DNA is wrapped.

Quick Tip

A nucleosome is associated with an octamer of histone proteins, totaling eight molecules.

Question 5. Select the observations drawn from the human genome project which are correct.
(A) The human genome contains 3164.7 million bp.
(B) The average gene consists of 3000 bases.
(C) Total number of genes is estimated at 30,000.
(D) The functions are unknown for over 50% of discovered genes.
(E) Less than 2% of the genome codes for proteins.

Choose the correct answer from the options given below:
1. (A), (B), (C) and (D) only
2. (A), (C), (D) and (E) only

3. (A), (C) and (E) only
4. (A), (B), (C), (D) and (E)

Correct Answer: 4. (A), (B), (C), (D) and (E)

Solution: All statements (A) to (E) are correct observations from the human genome project, including details on base pairs, gene count, and protein-coding portions.

Quick Tip

The human genome project revealed that less than 2% of the genome codes for proteins, among other key findings.

Question 6. Match List-I with List-II:

List-I (Placental Mammals)	List-II (Counterpart Marsupials)
(A) Anteater	(I) Spotted cuscus
(B) Bobcat	(II) Numbat
(C) Lemur	(III) Flying Phalanger
(D) Flying squirrel	(IV) Tasmanian tiger cat

Choose the correct answer from the options given below:
1. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
2. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
3. (A) - (IV), (B) - (I), (C) - (II), (D) - (III)
4. (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

Correct Answer: 1. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

Solution: In the correct pairing, (A) Anteater is matched with (II) Numbat
(B) Bobcat with (IV) Tasmanian tiger cat
(C) Lemur with (I) Spotted cuscus
(D) Flying squirrel with (III) Flying Phalanger.

Quick Tip

Marsupials often have counterparts among placental mammals with similar ecological roles.

Question 7. Identify the incorrect statement/s:
(A) Intestinal perforation and death may occur in severe cases of typhoid infection.
(B) Common cold is caused by Rhinoviruses.

(C) Lips and fingernails may turn grey to bluish colour in severe cases of pneumonia.
(D) Pneumonia is caused by Salmonella.
(E) Typhoid fever could be confirmed by Widal test.

Choose the answer from the options given below:
1. (A), (C) and (D) only
2. (B) and (E) only
3. (D) only
4. (A) and (D) only

Correct Answer: 3. (D) only

Solution: Statement (D) is incorrect because pneumonia is not caused by Salmonella; it is caused by bacteria such as Streptococcus pneumoniae.

Quick Tip

Remember, Salmonella causes typhoid, not pneumonia, which is primarily caused by Streptococcus pneumoniae.

Question 8. Match List-I with List-II:

List-I (Types of Barriers)	List-II (Examples)
(A) Cytokine barriers	(I) Mucus coating
(B) Physical barriers	(II) Tears from eyes
(C) Cellular barriers	(III) Phagocytosis
(D) Physiological barriers	(IV) Interferons

Choose the correct answer from the options given below:
1. (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
2. (A) - (II), (B) - (IV), (C) - (III), (D) - (I)
3. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
4. (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

Correct Answer: 4. (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

Solution: In the correct pairing, (A) Cytokine barriers are matched with (IV) Interferons
(B) Physical barriers with (I) Mucus coating
(C) Cellular barriers with (III) Phagocytosis
(D) Physiological barriers with (II) Tears from eyes.

Quick Tip

Barriers in the immune system include cytokines, physical barriers, cellular barriers, and physiological responses.

Question 9. Smack is chemically:
1. Diacetyl morphine
2. Cocaine
3. Benzodiazepine
4. Amphetamine

Correct Answer: 1. Diacetyl morphine

Solution: Smack, also known as heroin, is chemically diacetyl morphine, a derivative of morphine that is highly addictive.

Quick Tip

Smack is another name for heroin, which is chemically diacetyl morphine.

Question 10. Antibodies are secreted by:
1. T-Cells
2. B-Cells
3. α-Cells
4. β-Cells

Correct Answer: 2. B-Cells

Solution: Antibodies are produced and secreted by B-cells, which play a key role in the adaptive immune response by targeting pathogens.

Quick Tip

B-cells are responsible for producing antibodies in the immune system.

Question 11. In sewage treatment, flocs are:
1. The solids that settle during sedimentation.
2. The supernatant that is formed above the primary sludge.
3. The masses of bacteria associated with fungal filaments.

4. The bacteria which grow anaerobically and are also called anaerobic sludge digesters.

Correct Answer: 3. The masses of bacteria associated with fungal filaments.

Solution: In sewage treatment, flocs are masses of bacteria associated with fungal filaments. These flocs help in the biological treatment of wastewater by breaking down organic matter.

Quick Tip

Flocs in sewage treatment consist of bacteria and fungal filaments that aid in breaking down organic material.

Question 12. Match List-I with List-II:

List-I (Products)	List-II (Organisms)
(A) Statin	(III) Monascus
(B) Clot buster	(I) Streptococcus
(C) Swiss cheese	(IV) Propionibacterium
(D) Cyclosporin-A	(II) Trichoderma

Choose the correct answer from the options given below:
1. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
2. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
3. (A) - (III), (B) - (IV), (C) - (II), (D) - (I)
4. (A) - (II), (B) - (III), (C) - (I), (D) - (IV)

Correct Answer: 2. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution: The correct matches are (A) Statin with (III) Monascus
(B) Clot buster with (I) Streptococcus
(C) Swiss cheese with (IV) Propionibacterium
(D) Cyclosporin-A with (II) Trichoderma.

Quick Tip

Remember the specific organisms associated with these biotechnological products.

Question 13. The beetle used as a biocontrol agent for aphids and mosquitoes is:
1. Trichoderma
2. Dragonflies

3. Ladybird
4. Silver fish

Correct Answer: 3. Ladybird

Solution: Ladybird beetles are commonly used as biocontrol agents against pests like aphids, which they feed on, helping to control pest populations.

Quick Tip

Ladybird beetles are natural predators of aphids, making them effective biocontrol agents.

Question 14. Downstream processing method involves:
1. Identification
2. Amplification
3. Fermentation
4. Purification

Correct Answer: 4. Purification

Solution: Downstream processing in biotechnology involves purification steps to isolate and refine the desired product after fermentation or synthesis.

Quick Tip

Downstream processing focuses on purification of the product to ensure its quality and suitability for use.

Question 15. Which of the following is not the correctly matched pair of organism and its respective cell wall degrading enzyme?
1. Fungi – Chitinase
2. Algae – Methylase
3. Plant cells – Cellulase
4. Bacteria – Lysozyme

Correct Answer: 2. Algae – Methylase

Solution: Methylase is not a cell wall-degrading enzyme associated with algae. Algae typically have cell wall-degrading enzymes specific to their cell wall composition, but methylase is involved in methylation processes rather than cell wall degradation.

Quick Tip

Remember that methylase is related to DNA methylation, not cell wall degradation.

Question 16. Arrange the following steps involved in transformation of bacteria in a sequence from initiation to end.
(A) Incubation of rDNA with bacterial cell on ice
(B) Treatment with divalent cations
(C) Heat shock treatment
(D) Selection on antibiotic containing agar plate
(E) Placed them again on ice

Choose the correct answer from the options given below:
1. (A), (B), (D), (C), (E)
2. (B), (A), (C), (E), (D)
3. (B), (C), (D), (A), (E)
4. (A), (C), (B), (D), (E)

Correct Answer: 2. (B), (A), (C), (E), (D)

Solution: The correct sequence of steps in bacterial transformation is (B) Treatment with divalent cations
(A) Incubation of rDNA with bacterial cell on ice
(C) Heat shock treatment
(E) Placed them again on ice
(D) Selection on antibiotic-containing agar plate.

Quick Tip

The transformation process in bacteria typically begins with treating cells with divalent cations, followed by incubation and heat shock.

Question 17. Which of the following statements are incorrect?
(A) Fragments of DNA can be separated by ELISA.
(B) Transformation is a procedure through which a piece of DNA is introduced in a host bacterium.
(C) Recombinant DNA technology does not involve isolation of a desired DNA fragment.
(D) DNA ligases are used for stitching DNA fragments into a vector.

Choose the answer from the options given below:
1. (A) and (C) only
2. (A) and (B) only
3. (B) and (C) only
4. (A), (C) and (D) only

Correct Answer: 1. (A) and (C) only

Solution: Statements (A) and (C) are incorrect. ELISA is used for detecting proteins or antibodies, not for separating DNA fragments. Recombinant DNA technology involves the isolation of a desired DNA fragment.

Quick Tip

ELISA is specific for protein or antibody detection, and recombinant DNA technology requires DNA fragment isolation.

Question 18. Which of the following statements are true?
(A) Milk obtained from 'Rosie' is nutritionally more balanced for human babies than natural human milk.
(B) Biopiracy refers to the use of bioresources without proper authorisation from MNCs.
(C) GEAC is the decisive body for safety and validity of GMOs and GM research respectively.
(D) Transgenic animals help us to understand the contribution of genes in the development of disease.

Choose the correct answer from the options given below:
1. (A) and (C) only
2. (C) and (D) only
3. (A) and (D) only
4. (B) and (C) only

Correct Answer: 2. (C) and (D) only

Solution: Statements (C) and (D) are true. The Genetic Engineering Approval Committee (GEAC) is responsible for assessing the safety and validity of GMOs and related research. Transgenic animals are used to study the role of specific genes in the development of diseases.
Statements (A) and (B) are incorrect as biopiracy refers to the unauthorized use of bioresources by entities, not specifically MNCs, and there is no evidence that milk from 'Rosie' is more balanced for human babies than natural human milk.

Quick Tip

The GEAC oversees GMO safety, and transgenic animals aid in understanding gene roles in disease.

Question 19. Match List-I with List-II:

List-I (Transgene)	List-II (Used for/Products)
(A) α-1-antitrypsin	(I) Meloidegyne incognitia
(B) cryIAc	(II) Corn borer
(C) Antisense RNA	(III) Treat emphysema
(D) cryIAb	(IV) Cotton bollworms

Choose the correct answer from the options given below:
1. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
2. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
3. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
4. (A) - (I), (B) - (IV), (C) - (III), (D) - (II)

Correct Answer: 1. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Solution: The correct matches are (A) α-1-antitrypsin with (III) Treat emphysema
(B) cryIAc with (IV) Cotton bollworms
(C) Antisense RNA with (I) Meloidegyne incognitia
(D) cryIAb with (II) Corn borer.

Quick Tip

Remember that specific transgenes like cry proteins target specific pests, such as cotton bollworms and corn borers.

Question 20. Expand "GEAC":
1. Genetic and Environmental Advisory Committee
2. Gene Establishment Approval Committee
3. Genetic Engineering Advisory Committee
4. Genetic Engineering Approval Committee

Correct Answer: 4. Genetic Engineering Approval Committee

Solution: GEAC stands for Genetic Engineering Approval Committee, which is responsible for evaluating the safety and validity of genetically modified organisms (GMOs) and GM research in India.

Quick Tip

The Genetic Engineering Approval Committee (GEAC) oversees GMO-related approvals in India.

Question 21. When an insect feeds on the Bt plant, the insect dies due to the conversion of inactive protein to active protein in:
1. Alkaline pH of the gut.
2. Acidic pH of the gut.
3. Acidic pH of saliva.
4. Alkaline pH of saliva.

Correct Answer: 1. Alkaline pH of the gut.

Solution: When an insect consumes parts of a Bt plant, the Bt toxin (inactive protein) is converted into its active form in the insect's gut, which has an alkaline pH. This active toxin then binds to gut cells, creating pores that eventually kill the insect.

Quick Tip

Bt toxin is activated in the alkaline conditions of the insect gut, leading to the insect's death.

Question 22. Match List-I with List-II:

List-I (Interspecies Relationships)	**List-II (Features)**
(A) Commensalism	(IV) One species benefits and the other remains unaffected
(B) Mutualism	(III) Both species are benefitted
(C) Amensalism	(II) One species is harmed and the other is unaffected
(D) Parasitism	(I) One species is benefitted at the expense of the other

Choose the correct answer from the options given below:
1. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
2. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
3. (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
4. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: 2. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Solution: The correct matches are: (A) Commensalism with (IV) One species benefits and the other remains unaffected
(B) Mutualism with (III) Both species are benefitted
(C) Amensalism with (II) One species is harmed and the other is unaffected
(D) Parasitism with (I) One species is benefitted at the expense of the other.

Quick Tip

Commensalism benefits one species without affecting the other, while parasitism harms the host.

Question 23. In a country, at any time, the population has the same number of young and mature ones. What type of growth does it reflect?
1. Expanding
2. Declining
3. Stable
4. S-shaped

Correct Answer: 3. Stable

Solution: When a population has an equal number of young and mature individuals, it reflects a stable growth rate, indicating neither an increase nor a decrease in population size.

Quick Tip

A stable population has equal proportions of young and mature individuals.

Question 24. Two closely related species can co-exist indefinitely and violate the Gause's 'Competitive Exclusion Principle' by:
1. eliminating the inferior species.
2. resource partitioning.
3. interacting with each other symbiotically.
4. changing the area of grazing.

Correct Answer: 2. resource partitioning.

Solution: Resource partitioning allows two closely related species to co-exist by dividing resources, thus avoiding direct competition and enabling them to occupy the same area without excluding each other.

Quick Tip

Resource partitioning helps species share habitats and resources without direct competition.

Question 25. The process of mineralisation by microorganisms helps in the release of:
1. inorganic nutrients from detritus and formation of humus.
2. organic nutrients from humus.
3. inorganic nutrients from humus.
4. organic and inorganic nutrients from detritus

Correct Answer: 1. inorganic nutrients from detritus and formation of humus.

Solution: Mineralisation by microorganisms releases inorganic nutrients from detritus and contributes to the formation of humus, enriching the soil.

Quick Tip

Mineralisation releases essential inorganic nutrients from detritus, promoting soil health.

Question 26. In which ecosystem is the biomass of primary consumers greater than producers?
1. Forests
2. Grassland
3. Desert
4. Sea

Correct Answer: 4. Sea

Solution: In marine ecosystems (sea), the biomass of primary consumers (like zooplankton) is often greater than that of producers (like phytoplankton) due to rapid reproduction and consumption cycles of phytoplankton.

Quick Tip

In marine ecosystems, primary consumers can exceed producers in biomass due to fast consumption rates.

Question 27. Choose the correct statements with respect to decomposition from the following:
(A) Decomposition is an anaerobic process.
(B) Decomposition rate of detritus depends upon the chemical nature of it.
(C) Water-soluble organic nutrients go into the soil and get precipitated in the process of leaching.
(D) Humification follows mineralisation.

Choose the correct answer from the options given below:
1. (B) and (D) only
2. (A) and (C) only
3. (B) and (C) only
4. (A) and (D) only

Correct Answer: 1. (B) and (D) only

Solution: Statement (B) is correct as decomposition rate depends on the chemical composition of detritus. Statement (D) is also correct because humification, which results in the formation of humus, generally follows mineralisation.
Statement (A) is incorrect as decomposition is typically an aerobic process, and statement (C) is incorrect regarding nutrient precipitation in leaching.

Quick Tip

Decomposition usually occurs aerobically, and humification occurs after mineralisation.

Question 28. Match List-I with List-II:

List-I (Concepts)	List-II (Explanation)
(A) Standing state	(I) Available biomass for the consumption of heterotrophs
(B) Secondary productivity	(II) Rate of formation of organic matter by consumers
(C) Standing crop	(III) Mass of living matter in a trophic level at a given time
(D) Net primary productivity	(IV) Amount of mineral nutrients in the soil at a given time

Choose the correct answer from the options given below:
1. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
2. (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
3. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
4. (A) - (I), (B) - (IV), (C) - (II), (D) - (III)

Correct Answer: 3. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)

Solution: The correct matches are: (A) Standing state with (IV) Amount of mineral nutrients in the soil at a given time
(B) Secondary productivity with (II) Rate of formation of organic matter by consumers
(C) Standing crop with (III) Mass of living matter in a trophic level at a given time
(D) Net primary productivity with (I) Available biomass for the consumption of heterotrophs.

Quick Tip

The standing state relates to nutrient content in the environment, while standing crop refers to biomass at a given time.

Read the passage carefully and give the answers to the next five questions :
India was amongst the first countries in the world to initiate action plans and programmes at a national level to attain total reproductive health as a social goal. These programmes called 'family planning' were initiated in 1951 and were periodically assessed over the past decades. Improved programmes covering wider reproduction-related areas are currently in operation. Creating awareness among the people about various reproduction-related aspects and providing facilities and support for building up a reproductively healthy society are the major tasks under these programmes.

Question 29. Which of the following is not a Sexually Transmitted Disease?
1. Chlamydiasis
2. Filariasis
3. Genital herpes
4. Trichomoniasis

Correct Answer: 2. Filariasis

Solution: Filariasis is a parasitic disease transmitted by mosquitoes and is not classified as a sexually transmitted disease (STD), unlike Chlamydiasis, Genital herpes, and Trichomoniasis.

Quick Tip

Filariasis is transmitted by mosquito bites and is not an STD.

Question 30. Which of the following statements is incorrect with respect to Medical Termination of Pregnancy?

1. They are considered safe during the first trimester.
2. It is legalised in India from 1971.
3. MTPs can be performed even after 24 weeks, but with the opinion of 2 registered medical practitioners on specific grounds.
4. About 20% of the total number of conceived pregnancies undergo MTP in a year globally.

Correct Answer: 4. About 20% of the total number of conceived pregnancies undergo MTP in a year globally.

Solution: The statement that "About 20% of the total number of conceived pregnancies undergo MTP in a year globally" is incorrect, as this percentage is not representative of the global rate for MTPs.

Quick Tip

MTP is legal and typically safe in the first trimester, but its global rate is less than 20%.

Question 31. Match List-I with List-II:

List-I (Various Assisted Reproductive Technologies)	**List-II (Process Involved)**
(A) ZIFT	(I) Formation of embryo in vitro by injecting sperm directly into ovum
(B) ICSI	(II) Transferring of embryo with more than 8 blastomeres into the uterus
(C) IUI	(III) Transferring of fertilised egg up to 8 blastomeres into fallopian tube
(D) IUT	(IV) Transfer of semen from a healthy donor into the uterus artificially

Choose the correct answer from the options given below:
1. (A) - (III), (B) - (I), (C) - (II), (D) - (IV)
2. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
3. (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
4. (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

Correct Answer: 2. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution: The correct matches are: (A) ZIFT with (III) Transferring of fertilised egg up to 8 blastomeres into fallopian tube
(B) ICSI with (I) Formation of embryo in vitro by injecting sperm directly into ovum

(C) IUI with (IV) Transfer of semen from a healthy donor into the uterus artificially
(D) IUT with (II) Transferring of embryo with more than 8 blastomeres into the uterus.

Quick Tip

ZIFT, ICSI, IUI, and IUT are different techniques in assisted reproductive technologies.

Question 32. Which of the following methods of contraception is not meant for females?
1. IUDs
2. Lactational amenorrhea
3. Vasectomy
4. Condoms

Correct Answer: 3. Vasectomy

Solution: Vasectomy is a surgical contraceptive method for males, whereas IUDs, lactational amenorrhea, and condoms (which are used by both genders) are contraceptive methods for females.

Quick Tip

Vasectomy is a permanent contraceptive procedure specifically for males.

Question 33. 'Saheli' – an oral contraceptive pill, also known as the 'Once a week' pill, was developed by:
1. AIIMS
2. NBRI
3. CDRI
4. NBPGR

Correct Answer: 3. CDRI

Solution: 'Saheli' was developed by the Central Drug Research Institute (CDRI) in India. It is a non-hormonal oral contraceptive pill taken once a week.

Quick Tip

'Saheli' is a unique non-hormonal contraceptive pill developed by CDRI, India.

Read the passage carefully and give the answers to the next five questions :
Does the number of species in a community really matter to the functioning of the ecosystem ? This is a question for which ecologists have not been able to give a definitive answer. For many decades, ecologists believed that communities with more species, generally, tend to be more stable than those with less species. According to the International Union for Conservation of Nature and Natural Resources (IUCN) (2004), the total number of plant and animal species described so far is more than 1.5 million.

Question 34. Which of the following is not a characteristic of a stable biological community?
1. It must be resistant to invasions by alien species.
2. It should not show too much variation in productivity from year to year.
3. All the species are equally important in a stable community and absence of any one leads to its instability.
4. It is resilient to occasional disturbances, whether natural or man-made.

Correct Answer: 3. All the species are equally important in a stable community and absence of any one leads to its instability.

Solution: In a stable community, while each species plays a role, not all species are equally critical for stability. Certain key species may be more influential in maintaining community stability, making statement 3 incorrect.

Quick Tip

In stable communities, not all species have equal importance; some are more crucial for ecosystem stability.

Question 35. In 'rivet popper hypothesis' the 'rivet' signifies:
1. Key species
2. Endemic species
3. Community
4. Species

Correct Answer: 4. Species

Solution: In the 'rivet popper hypothesis,' each species is likened to a rivet in an airplane, where the loss of too many rivets (species) could lead to system failure.

Quick Tip

The rivet popper hypothesis likens each species to a rivet, where losing too many can destabilize the system.

Question 36. The scientist who proved that species richness directly correlates with the stability of a community, was _____ .
1. Paul Ehrlich
2. David Tilman
3. Robert May
4. Edward Wilson

Correct Answer: 2. David Tilman

Solution: David Tilman conducted experiments demonstrating that species richness is directly related to the stability of ecological communities.

Quick Tip

David Tilman's work linked species richness to community stability.

Question 37. Among the vertebrates, which of the following is the most species-rich group?
1. Reptiles
2. Fishes
3. Insects
4. Mammals

Correct Answer: 2. Fishes

Solution: Fishes are the most species-rich group among vertebrates, with an immense diversity in both marine and freshwater environments.

Quick Tip

Fishes, especially due to marine diversity, represent the largest group of vertebrates.

Question 38. The following are the various hypotheses proposed in explaining the greatest biological diversity in tropics except:

1. Temperate regions are subjected to glaciations, but tropical latitudes have remained relatively undisturbed.
2. Tropical environments have more humidity/moisture which helps the diversity to flourish.
3. Tropical environments are less seasonal and more constant.
4. There is more solar energy available in the tropics which contributes to higher productivity and hence, biodiversity.

Correct Answer: 2. Tropical environments have more humidity/moisture which helps the diversity to flourish.

Solution: The statement regarding humidity and moisture (Option 2) is not a commonly cited hypothesis for higher biodiversity in tropical regions. Other factors like consistent climate, solar energy, and lack of glaciations are recognized as major contributors.

Quick Tip

Tropical biodiversity is typically attributed to stable climates, solar energy, and historical factors.

Question 39. Cells present in the mature pollen grains are _____.
1. Central cell and generative cell
2. Antipodal cell and vegetative cell
3. Vegetative cell and generative cell
4. Filiform cell and micropylar cell

Correct Answer: 3. Vegetative cell and generative cell

Solution: In mature pollen grains, the two cells present are the vegetative cell, which supports pollen tube growth, and the generative cell, which divides to form sperm cells for fertilization.

Quick Tip

The mature pollen grain typically contains a vegetative cell and a generative cell.

Question 40. Match List-I with List-II:

List-I (Structures)	List-II (Functions)
(A) Filiform apparatus	(I) Made up of sporopollenin
(B) Tapetum	(II) Attachment of ovule to the placenta
(C) Exine	(III) Guides pollen tube into the synergid
(D) Funicle	(IV) Nourishes the pollen grain

Choose the correct answer from the options given below:
1. (A) - (IV), (B) - (I), (C) - (II), (D) - (III)
2. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
3. (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
4. (A) - (I), (B) - (III), (C) - (IV), (D) - (II)

Correct Answer: 2. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Solution: The correct matches are: (A) Filiform apparatus with (III) Guides pollen tube into the synergid
(B) Tapetum with (IV) Nourishes the pollen grain
(C) Exine with (I) Made up of sporopollenin
(D) Funicle with (II) Attachment of ovule to the placenta.

Quick Tip

The filiform apparatus guides pollen tubes, and the tapetum provides nourishment to developing pollen grains.

Question 41. Primary Endosperm Nucleus is the product of:
1. Double fusion
2. Triple fusion
3. Parthenogenesis
4. Apomixis

Correct Answer: 2. Triple fusion

Solution: The Primary Endosperm Nucleus is formed by the fusion of a male gamete with two polar nuclei, a process called triple fusion, which contributes to endosperm formation in flowering plants.

Quick Tip

Triple fusion, involving one sperm cell and two polar nuclei, creates the primary endosperm nucleus.

Question 42. In humans, mammary gland is divided into _____ lobes.
1. 10 – 12
2. 25 – 30
3. 30 – 35
4. 15 – 20

Correct Answer: 4. 15 – 20

Solution: Human mammary glands are typically divided into 15–20 lobes, each containing alveoli that produce milk.

Quick Tip

The human mammary gland is organized into 15-20 lobes for efficient milk production.

Question 43. Sex in human embryo is determined by:
1. 'X' chromosome of egg
2. 'X' or 'Y' chromosome of sperm
3. Only 'Y' chromosome of sperm
4. Health of mother

Correct Answer: 2. 'X' or 'Y' chromosome of sperm

Solution: Sex determination in humans depends on the sperm cell, which can carry either an X or a Y chromosome. If the sperm carries an X chromosome, the offspring will be female (XX); if it carries a Y chromosome, the offspring will be male (XY).

Quick Tip

In humans, the Y chromosome from the sperm determines male sex (XY), while XX results in female.

Question 44. Arrange the following stages of oogenesis in order of their occurrence.
(A) Ovum
(B) Oogonia
(C) Primary oocyte
(D) Secondary oocyte

Choose the correct answer from the options given below:
1. (C), (B), (D), (A)

2. (B), (C), (D), (A)
3. (D), (C), (A), (B)
4. (A), (D), (C), (B)

Correct Answer: 2. (B), (C), (D), (A)

Solution: The stages in oogenesis occur in the order: (B) Oogonia
(C) Primary oocyte
(D) Secondary oocyte
(A) Ovum.

Quick Tip

Oogenesis progresses from oogonia to primary oocyte, secondary oocyte, and culminates in ovum formation.

Question 45. Which of the following pair of contrasting traits was not studied by Mendel?
1. Pink and white flowers
2. Inflated and constricted pods
3. Axial and terminal flowers
4. Green and yellow pods

Correct Answer: 1. Pink and white flowers

Solution: Mendel did not study the trait of pink and white flowers in his experiments. He primarily studied simple, contrasting traits like flower position, pod shape, and pod color.

Quick Tip

Mendel's experiments focused on traits with clear contrasts, such as flower position and pod shape.

Question 46. Failure of chromatids to segregate during cell division cycle results in:
1. Polyploidy
2. Euploidy
3. Aneuploidy
4. Autopolyploidy

Correct Answer: 3. Aneuploidy

Solution: Aneuploidy occurs when chromatids fail to segregate properly during cell division, leading to an abnormal number of chromosomes in the resulting cells.

Quick Tip

Aneuploidy results from improper segregation of chromatids, leading to chromosomal abnormalities.

Question 47. Select the correctly matched pair about sickle cell anaemia:
Genotype : Phenotype
(A) Hb^A Hb^A : Diseased phenotype
(B) Hb^A Hb^S : Diseased phenotype
(C) Hb^S Hb^S : Diseased phenotype
(D) Hb^S Hb^A : Carrier of disease

Choose the correct answer from the options given below:
1. (C) and (D) only
2. (A) and (C) only
3. (B), (C) and (D) only
4. (A), (B), and (C) only

Correct Answer: 1. (C) and (D) only

Solution: In sickle cell anaemia, individuals with the genotype Hb^S Hb^S exhibit the diseased phenotype, while those with Hb^A Hb^A are normal.
Heterozygous individuals (Hb^A Hb^S) are carriers and typically do not show symptoms of the disease. Thus, (C) and (D) are correctly matched.

Quick Tip

Hb^S Hb^S individuals exhibit sickle cell disease, while Hb^A Hb^S individuals are carriers without symptoms.

Question 48. Match List-I with List-II:

List-I (Scientists)	**List-II (Discovery)**
(A) Sutton and Boveri	(I) X-Body
(B) Sturtevant	(II) Chromosomal Theory of Inheritance
(C) Henking	(III) Transformation in bacteria
(D) Griffith	(IV) Genetic maps

Choose the correct answer from the options given below:
1. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
2. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
3. (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
4. (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

Correct Answer: 1. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

Solution: The correct matches are: (A) Sutton and Boveri with (II) Chromosomal Theory of Inheritance
(B) Sturtevant with (IV) Genetic maps
(C) Henking with (I) X-Body
(D) Griffith with (III) Transformation in bacteria.

Quick Tip

The Chromosomal Theory of Inheritance was proposed by Sutton and Boveri, while Griffith discovered bacterial transformation.

Question 49. Which of the following statements are incorrect with respect to nucleotides?
(A) Purines and pyrimidines are nitrogenous bases.
(B) Nucleotides are non-enzymatic molecules.
(C) Phosphate group is linked to – OH of 5' C of a nucleoside through phosphoester linkage.
(D) In RNA, every nucleotide residue has an additional – OH group present at 2' position in the ribose.
(E) Thymine is an example of Pyrimidine.

Choose the correct answer from the options given below:
1. (A), (B) and (E) only
2. (D) and (E) only
3. (B) and (D) only
4. (B) and (E) only

Correct Answer: 4. (B) and (E) only

Solution: Statement (B) is incorrect as nucleotides can play enzymatic roles, especially in RNA-based enzymes. Statement (E) is also incorrect because thymine is a pyrimidine found in DNA, while in RNA, uracil replaces thymine.

Quick Tip

Thymine is a pyrimidine in DNA, and nucleotides can have enzymatic roles, particularly in RNA.

Question 50. Arrange the given steps of DNA fingerprinting in the sequence from initiation to end.
(A) Digestion of DNA by restriction endonuclease
(B) Isolation of DNA
(C) Hybridisation using labelled VNTR probe
(D) Transferring (blotting) of separated DNA fragments to synthetic membrane

Choose the correct answer from the options given below:
1. (A), (B), (C), (D)
2. (A), (D), (C), (B)
3. (B), (A), (D), (C)
4. (C), (A), (B), (D)

Correct Answer: 3. (B), (A), (D), (C)

Solution: The correct order of steps in DNA fingerprinting is: (B) Isolation of DNA
(A) Digestion of DNA by restriction endonuclease
(D) Transferring (blotting) of separated DNA fragments to synthetic membrane.
(C) Hybridisation using labelled VNTR probe.

Quick Tip

DNA fingerprinting begins with isolation, followed by digestion, blotting, and hybridisation.