

CUET Biology Question Paper 2024 Set A with Solutions

1. Analogous structures are a result of:

- (1) Convergent evolution
- (2) Divergent evolution
- (3) Parallel evolution
- (4) Retrogressive evolution

Answer: (1) Convergent evolution

Solution:

Analogous structures arise due to **convergent evolution**, where different species evolve similar traits independently because they face similar environmental pressures or niches. For example, the wings of birds and bats are analogous structures.

Quick Tip

Analogous structures serve similar functions but have different evolutionary origins. Remember, analogous structures result from convergent evolution, not common ancestry.

2. Which of the following does *not* affect the Hardy-Weinberg equilibrium?

- (1) Natural selection
- (2) Genetic drift
- (3) Gene pool
- (4) Gene migration

Answer: (3) Gene pool

Solution:

The Hardy-Weinberg equilibrium is disturbed by factors such as natural selection, genetic drift, gene migration, and mutation. However, the **gene pool** refers to the total genetic diversity within a population and doesn't disturb the equilibrium by itself.

Quick Tip

Remember that factors like natural selection, mutation, migration, and genetic drift affect the Hardy-Weinberg equilibrium, but the gene pool itself is a neutral term.

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

- (1) Homo erectus
- (2) Dryopithecus
- (3) Australopithecines
- (4) Ramapithecus

Answer: (2) Dryopithecus

Solution:

Dryopithecus was an extinct genus of apes and is considered to have been more like modern apes. It lived during the Miocene and is believed to be an ancestor of modern great apes and humans.

Quick Tip

For primate evolution, remember that Dryopithecus is closely related to apes, while Australopithecines and Homo erectus are more closely linked to human ancestors.

4. Nucleosome is associated with _____ molecules of histones.

- (1) Four
- (2) Nine
- (3) Two
- (4) Eight

Answer: (4) Eight

Solution:

Each nucleosome consists of **eight histone proteins**, forming a core around which DNA is wrapped. These histones include two copies each of H2A, H2B, H3, and H4.

Quick Tip

Histone proteins help in the packing of DNA in the chromatin structure. Remember the "octamer" of histones in the nucleosome.

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)

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

Solution:

The Human Genome Project revealed that the human genome contains approximately 3164.7 million base pairs. It was also found that the average gene consists of around 3000 bases and that the total number of genes is around 30,000. Moreover, less than 2% of the genome codes for proteins, and over 50% of discovered genes have unknown functions.

Quick Tip

In questions related to the Human Genome Project, always focus on gene counts, protein-coding percentages, and base pair information.

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)

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

Solution:

The correct match is:

- (A) Anteater - (II) Numbat
- (B) Bobcat - (IV) Tasmanian tiger cat
- (C) Lemur - (I) Spotted cuscus
- (D) Flying squirrel - (III) Flying Phalanger.

Quick Tip

When dealing with match-the-following questions, focus on identifying species or relationships between groups.

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 correct 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

Answer: (3) (D) only

Solution:

Pneumonia is caused by bacterial strains like Streptococcus and not Salmonella. Hence, statement (D) is incorrect. Other statements are correct.

Quick Tip

When studying diseases, always associate the pathogen correctly with its disease.

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)

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

Solution:

The correct match is:

- (A) Cytokine barriers - (IV) Interferons
- (B) Physical barriers - (I) Mucus coating
- (C) Cellular barriers - (III) Phagocytosis
- (D) Physiological barriers - (II) Tears from eyes.

Quick Tip

When matching biological terms, focus on the specific roles and functions of barriers and immune responses.

9. Smack is chemically:

- (1) Diacetyl morphine
- (2) Cocaine
- (3) Benzodiazepine
- (4) Amphetamine

Answer: (1) Diacetyl morphine

Solution:

Smack is chemically known as **Diacetyl morphine**, which is a highly addictive opioid drug derived from morphine.

Quick Tip

Always remember the chemical names of commonly abused drugs for quick identification.

10. Antibodies are secreted by:

- (1) T-Cells
- (2) B-Cells
- (3) α -Cells
- (4) β -Cells

Answer: (2) B-Cells

Solution:

Antibodies are produced by **B-Cells**, a type of white blood cell, in response to the presence of antigens.

Quick Tip

Remember that B-cells are responsible for secreting antibodies in the immune response.

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.

Answer: (3) the masses of bacteria associated with fungal filaments.

Solution:

Flocs are masses of bacteria associated with fungal filaments in the secondary treatment of sewage. They help in breaking down organic matter in the sewage treatment process.

Quick Tip

Flocs are critical for the secondary treatment of sewage and are responsible for aerobic digestion.

12. Match List-I with List-II:

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

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)

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

Solution:

- Statin is produced by **Monascus**.
- Clot busters (streptokinase) are produced by **Streptococcus**.
- Swiss cheese is made using **Propionibacterium**.
- Cyclosporin-A is an immunosuppressant derived from **Trichoderma**.

Quick Tip

For matching questions, always associate the correct organisms with their products.

13. The beetle used as a biocontrol agent for aphids and mosquitoes is:

- (1) Trichoderma

- (2) Dragonflies
- (3) Ladybird
- (4) Silver fish

Answer: (3) Ladybird

Solution:

Ladybird beetles are used as biocontrol agents for aphids and mosquitoes, as they are natural predators of these pests.

Quick Tip

Biocontrol agents are natural predators that control pest populations without chemical intervention.

14. Downstream processing method involves:

- (1) Identification
- (2) Amplification
- (3) Fermentation
- (4) Purification

Answer: (4) Purification

Solution:

Downstream processing refers to the purification of biological products from the culture medium after fermentation.

Quick Tip

In bioprocessing, downstream processing is critical for obtaining the final purified product.

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

Answer: (2) Algae – Methylase

Solution:

Algae do not produce methylase as their cell wall-degrading enzyme. Methylase is not associated with algae.

Quick Tip

For cell wall degradation, different organisms produce specific enzymes like chitinase for fungi and cellulase for plants.

16. Arrange the following steps involved in the 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)

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

Solution:

The correct sequence of transformation involves treating bacteria with divalent cations, incubating on ice, heat shock, and finally selecting on an antibiotic plate.

Quick Tip

For bacterial transformation, always remember the order of steps: treatment, incubation, heat shock, and selection.

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

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

Solution:

(A) is incorrect because DNA fragments are separated by gel electrophoresis, not ELISA.

(C) is incorrect because recombinant DNA technology involves the isolation of a desired DNA fragment.

Quick Tip

When dealing with DNA technology, always link the correct method to its purpose.

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 authorization 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

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

Solution:

(C) and (D) are correct. GEAC is the body responsible for approving GMO research, and transgenic animals are used to study the effects of genes on diseases.

Quick Tip

Transgenic animals are critical in genetic research, and GEAC oversees the approval of such research in India.

19. Match List-I with List-II:

List-I Transgene	List-II Used for/Products
(A) α -1-antitrypsin	(I) <i>Meloidogyne incognita</i>
(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)

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

Solution:

- (A) α -1-antitrypsin is used to treat emphysema.
- (B) cryIAc is used against corn borers.
- (C) Antisense RNA is used to target *Meloidogyne incognita*.
- (D) cryIAb targets cotton bollworms.

Quick Tip

Genetically modified crops like Bt cotton use cry genes for pest resistance.

20. Expand “GEAC”:

- (1) Genetic and Environmental Advisory Committee
- (2) Gene Establishment Approval Committee
- (3) Genetic Engineering Advisory Committee
- (4) Genetic Engineering Approval Committee

Answer: (4) Genetic Engineering Approval Committee

Solution:

GEAC stands for **Genetic Engineering Approval Committee**, which is responsible for approving genetically modified organisms and related research.

Quick Tip

GEAC is an important regulatory body in India that oversees the approval of GMOs.

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.

Answer: (1) Alkaline pH of the gut

Solution:

The Bt toxin, once ingested by the insect, becomes activated in the alkaline pH of the insect's gut. The activated toxin binds to the gut cells, causing cell lysis and eventually killing the insect.

Quick Tip

Bt crops are genetically engineered to produce toxins that specifically target certain insects, making them resistant to insect attacks.

22. Match List-I with List-II:

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

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)

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

Solution:

In commensalism, one species benefits while the other remains unaffected. In mutualism, both species benefit. In amensalism, one species is harmed, and the other is unaffected. In parasitism, one species benefits at the expense of the other.

Quick Tip

Understanding ecological relationships like mutualism, commensalism, and parasitism is key to understanding species interactions.

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

Answer: (3) Stable

Solution:

A stable population growth is indicated when the proportion of young individuals is equal to the number of mature individuals, meaning there is no significant population expansion or decline.

Quick Tip

A stable population pyramid has equal numbers of young and mature individuals.

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.

Answer: (2) Resource partitioning

Solution:

Two closely related species can co-exist indefinitely by dividing the resources they use, known as resource partitioning, thereby avoiding direct competition.

Quick Tip

Gause's principle is often violated through mechanisms like resource partitioning, where species share the same environment but use different resources.

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.

Answer: (1) Inorganic nutrients from detritus and formation of humus

Solution:

Mineralisation by microorganisms breaks down organic matter into inorganic nutrients and helps in the formation of humus, which contributes to soil fertility.

Quick Tip

Mineralisation plays a key role in nutrient cycling, as it releases inorganic nutrients from organic detritus.

26. In which ecosystem is the biomass of primary consumers greater than producers?

- (1) Forests

- (2) Grassland
- (3) Desert
- (4) Sea

Answer: (4) Sea

Solution:

In a marine ecosystem (sea), the biomass of primary consumers (herbivorous zooplankton) exceeds that of the producers (phytoplankton). This is because phytoplankton reproduce rapidly and are quickly consumed, but their total biomass at any given time is low compared to the consumers.

Quick Tip

In aquatic ecosystems, primary consumers often have a higher biomass than producers due to rapid producer turnover.

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

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

Solution:

Decomposition rate is influenced by the chemical composition of the detritus. Humification is the formation of humus, which occurs before mineralization. Hence, the correct statements are (B) and (D).

Quick Tip

Remember, humification happens before mineralization, and decomposition is not an anaerobic process.

28. Match List-I with List-II:

List-I (Concepts)	List-II (Explanation)
(A) Standing state	(IV) Amount of mineral nutrients in the soil at a given time
(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	(I) Available biomass for the consumption of heterotrophs

Choose the correct answer from the options given below:

- (1) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (2) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
- (3) (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
- (4) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

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

Solution:

The correct match is:

- (A) Standing state - (IV)
- (B) Secondary productivity - (II)
- (C) Standing crop - (III)
- (D) Net primary productivity - (I)

Quick Tip

Match the concepts in ecology with their definitions. The "standing state" refers to the amount of mineral nutrients, and "standing crop" refers to living biomass.

Read the passage carefully and give the answer 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.

29. Which of the following is *not* a Sexually Transmitted Disease?

- (1) Chlamydia
- (2) Filariasis
- (3) Genital herpes

(4) Trichomoniasis

Answer: (2) Filariasis

Solution:

Filariasis is not a sexually transmitted disease. It is caused by parasitic worms and transmitted by mosquitoes, whereas the other options are sexually transmitted diseases.

Quick Tip

Remember that Filariasis is transmitted by mosquitoes, not by sexual contact.

30. Which of the following statements is *incorrect* with respect to Medical Termination of Pregnancy (MTP)?

- (1) They are considered safe during the first trimester.
- (2) It is legalized in India from 1971.
- (3) MTP 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.

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

Solution:

The statement "About 20% of the total number of conceived pregnancies undergo

MTP in a year globally” is incorrect. The actual percentage is much lower, with MTP usually being performed in the first trimester.

Quick Tip

MTP is a legal procedure in India since 1971 and is mostly safe in the first trimester. Beyond 24 weeks, it requires medical justification and consent from registered practitioners.

31. Match List-I with List-II:

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

Choose the correct answer from the options given below:

- (1) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)
- (2) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
- (3) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (4) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

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

Solution:

(A) ZIFT involves transferring fertilized egg (up to 8 blastomeres) into the fallopian tube.

- (B) ICSI involves injecting sperm directly into the ovum *in vitro*.
- (C) IUI refers to the artificial insemination of sperm into the uterus.
- (D) IUT involves transferring embryos with more than 8 blastomeres into the uterus.

Quick Tip

Remember the differences in techniques for assisted reproductive technologies like ZIFT, ICSI, IUI, and IUT.

32. Which of the following methods of contraception is *not* meant for females?

- (1) IUDs
- (2) Lactational amenorrhea
- (3) Vasectomy
- (4) Condoms

Answer: (3) Vasectomy

Solution:

Vasectomy is a method of male sterilization that involves cutting the vas deferens. All other options refer to contraception methods used by or for females.

Quick Tip

Vasectomy is a male sterilization procedure, while IUDs, lactational amenorrhea, and condoms are forms of contraception applicable to females or both genders.

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

Answer: (3) CDRI

Solution:

The oral contraceptive pill ‘Saheli’, taken once a week, was developed by CDRI (Central Drug Research Institute) in India.

Quick Tip

Remember that ‘Saheli’ is the only non-steroidal oral contraceptive pill developed in India by CDRI.

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.

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 the absence of any one leads to its unsustainability.
- (4) It is resilient to occasional disturbances, whether natural or man-made.

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

Solution:

In a stable community, species interactions may buffer the community from collapse when a single species is absent. Therefore, the absence of one species does not necessarily lead to unsustainability. The other statements are characteristics of a stable biological community.

Quick Tip

Stable communities have complex interactions that ensure resilience even when certain species are missing or impacted by disturbances.

35. In 'rivet popper hypothesis' the 'rivet' signifies:

- (1) Key species
- (2) Endemic species
- (3) Community
- (4) Species

Answer: (4) Species

Solution:

In the rivet popper hypothesis, the 'rivet' represents individual species within an ecosystem. The hypothesis suggests that each species plays a crucial role in the stability of an ecosystem, much like rivets holding an airplane together.

Quick Tip

The 'rivet popper hypothesis' highlights the importance of species diversity in maintaining ecosystem stability.

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

Answer: (2) David Tilman

Solution:

David Tilman demonstrated through his experiments that species richness contributes to greater stability and productivity in ecosystems, thereby supporting the biodiversity-stability hypothesis.

Quick Tip

David Tilman's research highlighted the positive relationship between species diversity and ecosystem stability.

37. Among the vertebrates, which of the following is the most species-rich group?

- (1) Reptiles
- (2) Fishes
- (3) Insects
- (4) Mammals

Answer: (2) Fishes

Solution:

Fishes represent the largest number of species among vertebrates, with an estimated 33,000 species, making them the most diverse vertebrate group.

Quick Tip

Fishes have the most species diversity among vertebrates, surpassing reptiles, birds, and mammals.

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 re-

mained 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.

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

Solution:

While all the other statements contribute to biodiversity in the tropics, the increased humidity and moisture in tropical regions is not the key factor for greater species diversity.

Quick Tip

Tropical biodiversity is largely attributed to stable environments, constant solar energy, and the absence of glaciation events.

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 micropyl cell

Answer: (3) Vegetative cell and generative cell

Solution:

In a mature pollen grain, the vegetative cell is responsible for forming the pollen tube, while the generative cell divides to form two sperm cells that participate in fertilization.

Quick Tip

Remember, the generative cell divides to form two sperm cells, while the vegetative cell aids in pollen tube formation.

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) - (III), (B) - (I), (C) - (IV), (D) - (II)
- (2) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
- (3) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
- (4) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

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

Solution:

(A) Filiform apparatus guides the pollen tube into the synergid.

- (B) Tapetum nourishes the pollen grain.
- (C) Exine is made up of sporopollenin.
- (D) Funicle attaches the ovule to the placenta.

Quick Tip

Learn the structures and their corresponding functions in pollen and ovule formation.

41. Primary Endosperm Nucleus is the product of:

- (1) Double fusion
- (2) Triple fusion
- (3) Parthenogenesis
- (4) Apomixis

Answer: (2) Triple fusion

Solution:

The primary endosperm nucleus is formed as a result of triple fusion during double fertilization in angiosperms. It involves the fusion of two polar nuclei with one sperm cell.

Quick Tip

Remember that triple fusion gives rise to the primary endosperm nucleus in flowering plants.

42. In humans, mammary gland is divided into _____ lobes:

- (1) 10 – 12
- (2) 25 – 30
- (3) 30 – 35
- (4) 15 – 20

Answer: (4) 15 – 20

Solution:

In humans, the mammary gland is typically divided into 15 to 20 lobes, each consisting of several smaller lobules.

Quick Tip

For human anatomy, remember that the mammary glands in females are usually divided into 15 to 20 lobes.

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

Answer: (2) 'X' or 'Y' chromosome of sperm

Solution:

The sex of a human embryo is determined by the chromosome carried by the sperm.

If the sperm carries an X chromosome, the offspring will be female (XX), and if it carries a Y chromosome, the offspring will be male (XY).

Quick Tip

Remember, the sperm determines the sex of the baby, depending on whether it carries an X or Y chromosome.

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)

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

Solution:

The correct order of oogenesis is:

- (B) Oogonia
- (C) Primary oocyte
- (D) Secondary oocyte
- (A) Ovum

Quick Tip

Oogenesis follows the sequence: Oogonia, Primary oocyte, Secondary oocyte, and then Ovum.

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

Answer: (1) Pink and white flowers

Solution:

Mendel studied seven pairs of contrasting traits, but he did not study the contrasting traits of pink and white flowers. He focused on traits such as flower position, pod shape, and seed color.

Quick Tip

Mendel's experiments focused on traits like flower position, pod shape, and seed color, not flower color.

46. Failure of chromatids to segregate during cell division cycle results in:

- (1) Polyploidy
- (2) Euploidy
- (3) Aneuploidy
- (4) Autopolyploidy

Answer: (3) Aneuploidy

Solution:

Aneuploidy occurs when chromosomes fail to segregate properly during cell division, leading to an abnormal number of chromosomes.

Quick Tip

Aneuploidy is the result of improper segregation of chromatids, leading to an incorrect number of chromosomes.

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

Answer: (3) (B), (C) and (D) only

Solution:

The genotype $Hb^S Hb^S$ leads to the diseased phenotype of sickle cell anaemia, while $Hb^A Hb^S$ results in a carrier state. $Hb^A Hb^A$ is the normal, healthy phenotype.

Quick Tip

Sickle cell anaemia is associated with the Hb^S allele, and individuals with one copy are carriers, while those with two copies have the disease.

48. Match List-I with List-II:

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

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)

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

Solution:

- (A) Sutton and Boveri proposed the Chromosomal Theory of Inheritance.
- (B) Sturtevant created the first genetic maps.
- (C) Henking discovered the X-body (sex chromosome).
- (D) Griffith discovered the process of transformation in bacteria.

Quick Tip

Remember these key scientists and their major discoveries related to genetics.

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

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

Solution:

Nucleotides are enzymatic molecules, and thymine is a pyrimidine, not an incorrect statement. However, option (B) stating that nucleotides are non-enzymatic is

incorrect, and option (E) is incorrect because thymine is indeed a pyrimidine.

Quick Tip

Nucleotides consist of a nitrogenous base, a phosphate group, and a sugar molecule. Purines and pyrimidines are the nitrogenous bases.

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)

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 involves isolation of DNA, digestion, blotting, and hybridisation as the key steps.
