CUET (UG) Exam Paper 2025

National Testing Agency

BIOLOGY

(Solved)

[This includes Questions pertaining to Domain Specific Subject only]

Time Allowed: 60 Mins. **Total Questions: 50** **Maximum Marks: 250**

General Instructions :

(i) *This Test contains 50 questions.*

(ii) *Five (5) marks will be given for each correct answer.*

(iii) *One (1) mark will be deducted for each incorrect answer.*

(iv) *If more than one option is chosen, then it will be considered as an incorrect answer.*

(v) *Unanswered questions will be given no mark.*

1. Arrange the following stages of oogenesis in correct sequence of their formation.

(A) Secondary oocyte **(B)** Oogonium

(C) Ovum **(D)** Primary oocyte

Choose the **correct** answer from the options given below:

(1) (A), (B), (C), (D) **(2)** (C), (D), (B), (A)

(3) (A), (C), (B), (D) **(4)** (B), (D), (A), (C)

Ans. Option (4) is correct.

Explanation: Oogenesis is the process of female gamete formation. The stages occur in the following order:
Oogonia are primordial germ cells in the fetal ovary that undergo mitotic division to increase their number and eventually become primary oocytes. These primary oocytes enter meiosis-I but get arrested in prophase-I until puberty. After puberty, a primary oocyte completes meiosis-I, resulting in a large secondary oocyte and a smaller polar body. Secondary oocyte is arrested in metaphase-II until fertilisation. The secondary oocyte completes meiosis-II only upon fertilisation and form a mature ovum and a second polar body.

2. Identify the **incorrect** example of albuminous seed.

(1) Wheat **(2)** Castor

(3) Groundnut **(4)** Barley

Ans. Option (3) is correct.

Explanation: Albuminous seed are those that retain a part of the endosperm at maturity, as it is not completely consumed during embryo development. Examples include wheat, maize, barley and castor.

3. With reference to the microorganisms involved in production, identify the odd combination.

(1) Bread - house hold product

(2) Penicillin - antibiotic

(3) Lactic acid - industrial product

(4) Biogas - energy source

Ans. Option (4) is correct.

Explanation: Bread is indeed a household product and its production involves yeast. This is a correct combination.
Penicillin is an antibiotic produced by a fungus (Penicillium notatum).
Lactic acid is an industrial product used in various applications and is produced by lactic acid bacteria (LAB).
Biogas is an energy source, and its production involves microorganisms that break down organic matter in anaerobic condition.
Bread, penicillin and lactic acid are edible but Biogas is not.

4. Which one of the following is **not** a cause of loss of biodiversity?

(1) Afforestation

(2) Habitat loss

(3) Alien species invasions

(4) Co-extinction

Ans. Option (1) is correct.

Explanation: Afforestation refers to the establishment of a forest or plantation in an area that previously had no forest. Afforestation by increasing the number of trees and creating new habitats, generally increases biodiversity, rather than causing its loss.

5. Completion of the first meiotic division of the primary oocytes takes place -

(1) When acrosomal secretion of the sperm enters zona pellucida of the ovum

(2) Within the tertiary follicle

(3) When the ovum reaches the ampullary region of the fallopian tube

(4) During copulation

Ans. Option (2) is correct.

Explanation: During oogenesis, the first meiotic division is completed at the stage of primary oocyte within the tertiary (Graafian) follicle. Primary oocytes are formed during fetal development and remain arrested in prophase-I of meiosis until puberty. During each menstrual cycle, under the influence of hormones (primarily LH), one primary oocyte resumes meiosis-I. It completes the first meiotic division just before ovulation.

6. Match **List-I** with **List-II.**

List-I (Term)		List-II (Chromosome formulation)	
A.	Diploid	**I.**	$2n$-1
B.	Aneuploidy	**II.**	$4n$
C.	Haploid	**III.**	n
D.	Polyploidy	**IV.**	$2n$

Choose the **correct** answer from the options given below:

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

Ans. Option (4) is correct.

Explanation: Diploid refers to a cell containing two complete sets of chromosomes. This is represented as $2n$. Aneuploidy is a condition involving an abnormal number of chromosomes in a cell, typically resulting in the gain or loss of one or more chromosomes such as monosomy ($2n - 1$) or trisomy ($2n + 1$). Haploidy refers to a cell having a single set of unpaired chromosomes. This is represented as n. Polyploidy is a condition wherein the cells of an organism have more than two paired sets of chromosomes ($4n$).

7. The density of population is decreased by the processes -

(A) Natality **(B)** Emigration
(C) Mortality **(D)** Immigration

Choose the most appropriate combination from the options given below.

(1) (A) and (B) only **(2)** (B) and (C) only
(3) (A), (B) and (D) only **(4)** (B), (C) and (D) only

Ans. Option (2) is correct.

Explanation: Emigration is the movement of individuals out of a population, leading to a decrease in its size and thus its density.

Mortality is the death rate within a population. It results in the direct reduction in the number of individuals and therefore the population density.

8. Which amino acids are present in the histone octamer that contribute to the stable packaging of DNA?

(1) Methionine and proline
(2) Valine and Arginine
(3) Methionine and lysine
(4) Lysine and arginine

Ans. Option (4) is correct.

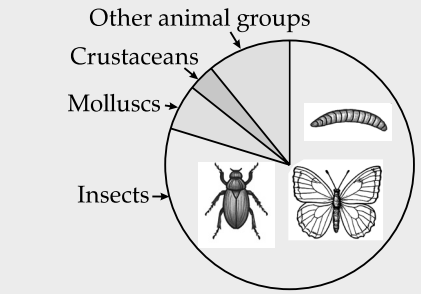
Explanation: Histones are positively charged proteins around which DNA wraps to form nucleosomes, the fundamental units of chromatin. The positive charge of histones is owing to the presence of basic amino acid like lysine and arginine, which have positively charged side chains at physiological pH. This positive charge allows them to interact strongly with a negatively charged phosphate group of DNA, leading to stable packaging.

9. Minimum percentage of global biodiversity in major invertebrate and plant taxa, is seen in:

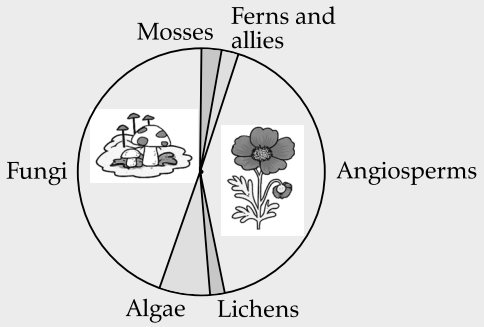
(1) Molluscs and algae
(2) Crustaceans and lichens
(3) Crustaceans and ferns
(4) Insects and mosses

Ans. Option (2) is correct.

Explanation: Crustaceans and lichen contribute less to global biodiversity compared to the other pairs listed. There are approximately 67,000 known species of crustaceans, which is less diverse than insects and molluscs. Lichens are symbiotic organisms (fungus + algae or cyanobacteria), with approximately 17,000–20,000 species worldwide.



Invetebrate



Plants

10. Arrange the following wall layers of microsporangium starting from outer to inner layer.

(A) Tapetum **(B)** Endothecium
(C) Middle layers **(D)** Epidermis

Choose the **correct** answer from the options given below:

(1) (A), (B), (C), (D) **(2)** (D), (B), (C), (A)
(3) (B), (A), (D), (C) **(4)** (A), (D), (B), (C)

Ans. Option (2) is correct.

Explanation: Epidermis is the outermost protective layer. Endothecium lies below the epidermis and helps in the dehiscence of the anther. Middle layers, are typically 2–3 layers, present between the endothecium and the tapetum. Tapetum is the innermost layer and provides nourishment to the developing pollen grain.

11. Host bacterium is made competent to accept DNA by treating it with:
(1) Prolonged heat shock
(2) Short exposure to cold temperature
(3) Divalent cation
(4) Monovalent anion

Ans. Option (3) is correct.

Explanation: To force bacteria to take up the plasmid, the bacterial cells must first be made competent to take up DNA. This is done by treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall.

12. Exponential growth rate of a population is graphically represented by -
(1) Bell shaped curve **(2)** Sigmoid curve
(3) C-shaped curve **(4)** J-shaped curve

Ans. Option (4) is correct.

Explanation: The exponential growth rate of a population is graphically represented by a J-shaped curve. This type of curve occurs with unlimited resources, allowing the population to grow without constraints at a continuous and rapid rate.

13. Arrange the evolutionary human species in their occurrence from recent to the oldest order.
(A) *Australopithecus* **(B)** *Homo erectus*
(C) *Homo sapiens* **(D)** Neanderthal man

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

Ans. Option (2) is correct.

Explanation: *Homo sapiens* are modern humans, the most recent species in the lineage. Neanderthal men are an extinct species of archaic human that lived in Eurasia until approximately 40,000 years ago.
Homo erectus, an extinct species of hominid that lived during much of the Pleistocene epoch considered an ancestor of modern humans. *Australopithecus*, an extinct genus of hominis that lived in Africa, considered a precursor to the genus *Homo*.

14. Baculoviruses are excellent candidates for species specific _____ application.
(1) Weedicide **(2)** Insecticidal
(3) General pest control **(4)** Pesticide

Ans. Option (2) is correct.

Explanation: Baculoviruses are a group of viruses that primarily infect insects, particularly those belonging to the order Lepidoptera. They are known for their specificity to particular insect species and are widely used as biocontrol agent in agriculture. This makes them ideal for targeted pest control, minimising harm to non-target organism and the environment. Therefore, their application is considered insecticidal, meaning they are used to kill insects.

15. Which one of the following is an example of man-made ecosystem ?
(1) Agricultural field **(2)** Forest
(3) Desert **(4)** River

Ans. Option (1) is correct.

Explanation: Agricultural field is an environment created and maintained by humans for the purpose of growing crops. Humans control various factors like water, fertilisation and pest control, making it a clear example of a man made or artificial ecosystem.

16. Match **List-I** with **List-II.**

List-I (Abbreviation)		**List-II (Relation)**	
A.	MTP	**I.**	Infertility
B.	AIDS	**II.**	Artificial insemination
C.	IUI	**III.**	Legal
D.	ART	**IV.**	Careless exchange of body fluids

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

Ans. Option (1) is correct.

Explanation: MTP stands for medical termination of pregnancy, which is legal in many contexts, referring to the legal aspect of abortion. Government of India legalised MTP in 1971 with some strict conditions to avoid its misuse. AIDS is primarily spread through the careless exchange of body fluid. IUI stands for intrauterine insemination, which is a form of artificial insemination. ART stands for assisted reproductive technology, a set of procedures used to address infertility.

17. Reproductive capacity of a flowering plant can be appreciated by finding out the:
(A) Size of the embryo sac in the ovule
(B) Number of eggs in the embryo sac
(C) Size of eggs in the embryo sac
(D) Number of ovules in the ovary

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

Ans. Option (2) is correct.

Explanation: The reproductive capacity of a flowering plant is directly related to the number of potential offspring it can produce. Each egg cell has the potential to develop into an embryo after fertilisation. Therefore, the number of egg cells directly contributes to the reproductive capacity.
Each ovule contains an embryo sac with an egg cell and has the potential to develop into a seed after fertilisation. The more ovules present, the higher the potential for seed production and thus reproductive capacity.
The sizes of the embryo sac or the egg cell do not directly indicate the reproductive potential as a larger size does not necessarily mean a greater number of viable offspring.

18. In plants, competency of the host to take up the recombinant DNA is enabled by using _____ technique.
(1) Insertional inactivation
(2) Micro injection

(3) Biolistics
(4) Gel electrophoresis

Ans. Option (3) is correct.

Explanation: Biolistic is widely used and effective method for introducing DNA into plant cells, particularly in cases involving the presence of cell walls. It involves coating DNA onto microscopic particles and then accelerating them into the plant cells. This process directly enables the cells to take up the recombinant DNA.

19. Match **List-I** with **List-II.**

List-I (Term)		List-II (Feature)	
A.	Multiple alleles	**I.**	Variation in DNA
B.	Mendelian disorder	**II.**	Non segregation of chromatids during cell division
C.	Chromosomal disorder	**III.**	Pedigree analysis
D.	Mutation	**IV.**	Population study

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

Ans. Option (2) is correct.

Explanation: Multiple alleles refers to the existence of more than two alleles for a gene in a population, which is studied in population genetics. Mendelian disorders are inherited in a pattern consistent with Mendel's law and their inheritance pattern are typically analysed using pedigree chart. Chromosomal disorders often arise from errors during cell division, such as non-disjunction of chromatids leading to an abnormal number of chromosomes. A mutation is a change in the DNA sequence leading to variation in the genetic material.

20. Find out the odd one out among the following structures in relation to evolution.

(1) Sweet potato and potato
(2) Penguin and Dolphin flippers
(3) Mammals and Octopus Eyes
(4) Thorns of *Bougainvillea* and tendrils of *Cucurbita*

Ans. Option (4) is correct.

Explanation: The flippers of penguins and dolphins, eyes of octopuses and mammals and sweet potatoes and potatoes are examples of analogous structures. In contrast, the thorns and tendrils of *Bougainvillea* and *Cucurbita* are examples of homologous structures, meaning they have the same evolutionary origin but have evolved to serve different functions.

21. Cloning of alien DNA by the host involves -

(1) Attaching at the specific sequence site (ori) in the host
(2) Complementing recombinant with non recombinant fragments
(3) Ligating at multiple recognition sites
(4) Insertion activation technique

Ans. Option (1) is correct.

Explanation: Cloning of alien DNA refers to the process of inserting foreign DNA into a host organism and having it replicated. The origin of replication is a specific DNA sequence in the whole genome where replication is initiated. For successful cloning, the alien DNA must be integrated into the host genetic material and contain an origin of replication (Ori) or be able to utilise the host Ori sequence to ensure its replication along with the host DNA. This attachment at the Ori site is crucial for the propagation of the alien DNA within the host.

22. Disturbance in the value of allele frequency in Hardy Weinberg equilibrium is directly proportional to the:

(1) Disturbance in gene flow
(2) Extent of evolutionary change in a population
(3) Gene pool of a population
(4) Retention of original gene in new population

Ans. Option (2) is correct.

Explanation: The Hardy–Weinberg equilibrium describes a state where alleles and genotype frequencies in a population remain constant from generation to generation in the absence of evolutionary influences. When these frequencies are disturbed, it indicates a departure from this equilibrium, which is a direct measure of evolutionary change within the population.

23. Depending upon the immediate urgency of the need to conserve biodiversity, arrange the options given below in a descending order.

(A) Hot spots **(B)** Sacred groves
(C) *Ex situ* method **(D)** Bioreserves

Choose the **most appropriate** answer from the options given below:

(1) (A), (B), (C), (D) **(2)** (A), (C), (B), (D)
(3) (B), (A), (D), (C) **(4)** (C), (B), (D), (A)

Ans. Option (2) is correct.

Explanation: Hotspots are areas with high biodiversity and facing a significant threat of habitat loss, there by making their conservation highly urgent (A).
Ex situ methods like zoos and botanical gardens are used to conserve species outside their natural habitat, often for critically endangered species, indicating a high level of urgency (C). Sacred groves are traditionally protected areas, often with cultural or religious significance. They contribute to biodiversity conservation but are generally not facing the same immediate threat as hotspots or species requiring *ex situ* conservation (B). Bioreserves are large, protected areas aimed at conserving ecosystem and genetic resources representing a border long–term conservation strategy rather than addressing immediate urgency for specific species or highly threatened areas (D).

24. In agarose gel electrophoresis, the separated DNA fragments can be visualised by staining the DNA with a compound, known as -

(1) Ethidium bromate **(2)** Ethidium chloride
(3) Ethidium bromide **(4)** Ethidium bromine

Ans. Option (3) is correct.

Explanation: Agarose gel electrophoresis is a technique used to separate DNA fragment based on their size once they are separated by an electric field. The DNA fragments are not visible to the naked eye. To visualise them, staining compound is used that intercalates with the DNA. Ethidium bromide is a commonly used fluorescent dye for this purpose. It binds to the DNA and fluoresces under UV light, making the DNA bands visible.

25. Choose the most appropriate option about the presence of nitrogenous bases;Cytosine, 5-methyl uracil and Uracil.

(1) Cytosine only in DNA, 5-Methyl uracil in both; DNA and RNA, Uracil only in RNA
(2) Cytosine only in RNA, 5-Methyl uracil only in DNA, Uracil in both DNA and RNA
(3) Cytosine in both; DNA and RNA, 5-Methyl uracil only in DNA and Uracil only in RNA
(4) Cytosine only in RNA, 5-Methyl uracil in both; DNA and RNA, Uracil only in DNA

Ans. Option (3) is correct.

Explanation: Cytosine is a pyrimidine base found in both DNA and RNA. 5-Methyl uracil is the chemical name for thymine. Thymine is a pyrimidine base found exclusively in DNA. Uracil is a pyrimidine base found exclusively in RNA, where it replaces thymine.

26. Meiotic division of the secondary oocyte takes place in the:

(1) Isthumus of oviduct **(2)** Ampulla
(3) Uterus **(4)** Cervix

Ans. Option (2) is correct.

Explanation: The secondary oocyte is arrested in metaphase-II and is released during ovulation. It completes meiosis-II only if fertilisation occurs. Fertilisation usually takes place in the ampulla region of the fallopian tube (oviduct). Hence, meiosis-II of the secondary oocyte is completed in the ampulla after the sperm enters.

27. Match **List-I** with **List-II.**

List-I (Structure)		**List-II (Relation)**	
A.	Thalamus	**I.**	Seed
B.	Nucellus	**II.**	Fruit
C.	Ovule	**III.**	Germination
D.	Micropyle	**IV.**	Perisperm

Choose the **correct** answer from the options given below:

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

Ans. Option (1) is correct.

Explanation: Thalamus is the part of the flower that bears the organ of the flower and can sometimes develops into the fleshy part of the fruit, as seen in apples. The nucellus is the central part of the ovule that contains the embryo sac. In some seeds, the nucellus persists and forms a nutritive tissue called perisperm. After fertilisation, the ovule develops into the seed. The micropyle is a small opening in the oval/ seed coat that allows for the entry of water and oxygen, which are essential for seed germination.

28. Pyramid of energy is always upright because :

(1) Energy flows unidirectionally
(2) The number of organisms at different trophic levels do not affect energy
(3) Some energy is lost when we move from one trophic level below to next trophic level above
(4) Energy largely depends on the biomass at the base trophic level

Ans. Option (3) is correct.

Explanation: In an ecosystem, energy flows from a producers to a consumers through different trophic levels. At each transfer of energy from one trophic level to next, a significant amount of energy is lost. This is primarily because of heat owing to metabolic activities and inefficiencies in energy transfer. This continuous loss of energy at each successive trophic level means that the amount of energy available decreases as you move up the pyramid As a result, the pyramid has a broad base and a narrow top, making the pyramid of energy always upright.

29. Population density at time t+1 is typically expressed as:

$N_{t+1}=N_t+(\{B+I\}-\{D+E\})$, where B+I is,

(1) Inversely proportional to B+I
(2) Inversely proportional to D+E
(3) Directly proportional to E
(4) Directly proportional to D

Ans. Option (2) is correct.

Explanation: The equation for population density at time t+1 is:
$N_{t+1}=N_t+[(B+I)-(D+E)]$
Where:
- N_t = population at time t
- B = number of births
- I = number of immigrants
- D = number of deaths
- E = number of emigrants

Now, the term (B+I) represents the inputs (factors increasing population), and the term (D+E) represents the outputs (factors decreasing population).
Thus, B+I will inversely proportional to D+E.

30. Amniocentesis is legally used to determine _____.

(A) Sex of the foetus
(B) Presence of genetic disorders
(C) Massive child immunisation
(D) Survivability of the fetus

Choose the **correct** answer from the options given below:

(1) (A), (C) and (D) only. **(2)** (B), (C) and (D) only.
(3) (B) and (D) only. **(4)** (A), (B) and (C) only.

Ans. Option (3) is correct.

Explanation: Amniocentesis is used to detect chromosomal abnormalities and genetic disorders in the fetus such as Down syndrome, cystic fibrosis, etc. Information gathered from amniocentesis can help access the overall health and maturity of the fetus lungs, which can be an indicator of survivability, particularly in case of premature birth. While it can also determine the sex of the fetus, its legal use for this purpose is restricted in many countries to prevent sex -selective absorption. Thus, the correct options are (B) and (D) only.

31. The composition of biogas is -

(1) CH_4, H_2S and N_2 **(2)** CH_4, H_2 and O_2
(3) CH_4, H_2S and CO_2 **(4)** CH_4, SO_2 and CO_2

Ans. Option (3) is correct.

Explanation: Biogas is a mixture of gases produced by the breakdown of organic matter in the absence of oxygen. The primary components of biogas are methane (CH_4), carbon dioxide (CO_2) and hydrogen sulphide (H_2S).

32. Bioactive molecule, cyclosporin A, that is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus:

(1) *Glomus*
(2) *Monascus purpureus*
(3) *Streptococcus*
(4) *Trichoderma polysporum*

Ans. Option (4) is correct.

Explanation: The bioactive molecule cyclosporin A, used as an immunosuppressive agent in organ transplant patient, is produced by the fungus *Trichoderma polysporum*.

33. Which one of the following techniques is most appropriate where the female cannot produce an ovum but can provide the environment for the development of embryo?

(1) ICSI **(2)** Al
(3) GIFT **(4)** IUI

Ans. Option (3) is correct.

Explanation: GIFT or gamete intrafallopian transfer is a technique where in donor's ovum is transfered directly into the fallopian tube, thereby allowing fertilisation to occur naturally within the female body. This is appropriate when the female can provide the environment for embryo development but cannot produce an ovum, as donor eggs can be used.

34. The typical test cross is performed between:

(1) An organism showing a dominant phenotype and the recessive parent
(2) An organism showing a dominant phenotype and the dominant parent
(3) An organism showing a dominant genotype and the dominant parent
(4) An organism showing a recessive phenotype and the dominant parent

Ans. Option (1) is correct.

Explanation: A cross between an organism showing a dominant phenotype and the recessive parent accurately describes a test cross, where the dominant phenotype individual's genotype is being tested by crossing it with a known homozygous recessive individual.

35. Chronologically arrange the names of scientists who contributed to the study of genetics.

(A) Alfred Sturtevent
(B) Gregor Mendel
(C) Thomas Hunt Morgan
(D) Sutton and Boveri

Choose the **correct** answer from the options given below:

(1) (A), (B), (C), (D) **(2)** (A), (C), (B), (D)
(3) (B), (D), (C), (A) **(4)** (C), (B), (D), (A)

Ans. Option (3) is correct.

Explanation: Gregor Mendel is considered the father of modern genetics for his work on pea plants in the mid-19th century, establishing the fundamental principle of heredity. Sutton and Boveri independently proposed the chromosomal theory of inheritance around 1902, linking Mendel's law to the behaviour of chromosomes during cell division. Thomas Hunt Morgan conducted ground-breaking research on fruit flies in the early 20th century, confirming the chromosomal theory and demonstrating gene linkage and crossing over. Alfred Sturtevant, a student of Morgan, created the first genetic linkage map in 1913, pioneering the field of gene mapping.

36. First meiotic division of primary follicles completes in the -

(1) Fetal ovary **(2)** Tertiary follicle
(3) Graafian follicle **(4)** Before puberty

Ans. Option (3) is correct.

Explanation: Oogenesis is a process of formation of oocyte. Oogenesis begins before birth and the ovaries before birth comprises many primary oocytes. At birth, these oocytes are surrounded by follicular cells and form a primary follicle. These remain in the ovary till puberty. As puberty is attained, one oocyte completes its cycle. At the beginning, the primary oocyte within primary follicle begins its meiosis-I and is arrested at prophase-I. Then, it develops into secondary and further into tertiary follicle; however, the follicle remains in the arrested prophase-I phase. When a tertiary follicle is formed, the primary follicle outside finally completes its meiosis-I and forms a secondary oocyte and the first polar body. Thereafter, the tertiary follicle forms the Graafian follicle.

37. Match **List-I** with **List-II.**

List-I (Population interaction)		**List-II (Example)**	
A.	Parasitism	**I.**	Herbivores and plants
B.	Commensalism	**II.**	Human liver fluke
C.	Mutualism	**III.**	Egret and grazing cattle
D.	Competition	**IV.**	Lichens

Choose the **correct** answer from the options given below:

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

Ans. Option (2) is correct.

Explanation: Parasitism is a relationship where one organism lives on another organism and benefits by driving nutrients at the expense of host. The human liver fluke is a parasite that lives in humans. Commensalism is an interaction where one species benefits, and the other species is neither harmed nor benefited. Egrets benefit by eating insect stirred up by grazing cattle, while the cattle are largely unaffected. Mutualism is an interaction where both participating species benefit from the relationship. Lichen is a classic example of mutualism. Competition occurs when two or more species require the same limited

resources. Herbivores and plants can be in a competitive relationship for resources like space, light or water, particularly if the herbivores are overgrazing.

38. The basic steps involved in the genetic modification of an organism inlcude -

(A) Identification of DNA with desirable genes
(B) Production and clinical trial of drugs
(C) Introduction of the identified DNA into the host
(D) Maintenance of introduced DNA in the host and transfer of the DNA to its progeny

Choose the **most appropriate** combination from the options given below.

(1) (A), (B) and (C) only **(2)** (B), (C) and (D) only
(3) (A), (C) and (D) only **(4)** (B) and (D) only

Ans. Option (3) is correct.

Explanation: The basic steps involved in the genetic modification of an organism include identification of DNA with desirable gene, which is the first crucial step as it involves pinpointing the specific gene sequence that will confer the desired trait (A).
The desired gene then introduced into the host DNA (C). For the genetic modification to be stable and heritable, the introduced DNA must be maintained in the host and passed on to its progeny (D).

39. Statins are produced by the yeast:

(1) *Monascus purpureus*
(2) *Trichoderma polysporum*
(3) *Acetobacter aceti*
(4) *Saccharomyces cerevisiae*

Ans. Option (1) is correct.

Explanation: Statins are commercially used as blood cholesterol-lowering agents and are produced by the yeast *Monascus purpureus*.

40. Which of the following are autosomal recessive gene disorders?

(A) Thalassemia **(B)** Phenylketonuria
(C) Haemophilia **(D)** Sickle cell anemia

Choose the **correct** answer from the options given below:

(1) (C) and (A) only **(2)** (B) and (D) only
(3) (A), (B) and (D) only **(4)** (B) and (C) only

Ans. Option (3) is correct.

Explanation: Thalassemia, Phenylketonuria and Sickle cell anaemia are autosomal recessive disorder. Further, haemophilia is an X-linked recessive disorder. Phenylketonuria is a rare metabolic disorder that caused by a mutation that leads to the accumulation of the amino acid phenylalanine in the body. Thalassemia and Sickle cell anaemia are caused by mutations that affect haemoglobin. Thalassemia affects haemoglobin quantitatively, while Sickle Cell Anaemia affects it qualitatively due to a point mutation in the β-globin gene.

Read the passage carefully to answer the questions given below

Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). In *Bacillus thuringiensis* the toxin is coded by a gene crylAc named cry. There are a number of them, for example, the proteins encoded by the genes crylAc and cryllAb control the cotton bollworms, that of crylAb controls corn borer. Using conventional methods of diagnosis (serum and urine analysis, etc.) early detection is not possible. Recombinant DNA technology, Polymerase Chain Reaction (PCR) and Enzyme Linked Immunosorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis. The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency. This enzyme is crucial for the immune system to function. The disorder is caused due to the deletion of the gene for adenosine deaminase. RNAi takes place in all eukaryotic organisms as a method of cellular defense. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA.

41. Some strains of *Bacillus thuringiensis* produce proteins that do not kill ceratin organisms -

(1) Crustaceans **(2)** Dipterans
(3) Lepidopterans **(4)** Coleopterans

Ans. Option (1) is correct.

Explanation: *Bacillus thuringiensis* is a bacterium known for producing insecticidal proteins that are toxic to specific insect orders such as dipterans, lepidopterans and coleopterans. Therefore, crustaceans are the organisms from the given options that are not killed by the insecticidal proteins produced by some strains of *Bacillus thuringiensis*.

42. The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency. This disorder is caused due to the deletion of the gene for -

(1) Adenosine decarboxylase
(2) Adenosine dehydrogenase
(3) Adenosine deaminase
(4) Adenosine deacetylase

Ans. Option (3) is correct.

Explanation: Adenosine Deaminase (ADA) deficiency disorder is caused due to the deletion of the gene for adenosine deaminase enzyme.

43. Which of the following technique is not used for early diagnosis of diseases?

(1) Recombinant DNA technology
(2) Polymerase chain reaction
(3) Serum analysis
(4) Enzyme linked immuno-sorbent assay

Ans. Option (3) is correct.

Explanation: Recombinant DNA technology, PCR and Enzyme Linked Immunosorbent Assay (ELISA), is used for the early detection of diseases. The early detection of diseases is not be possible using conventional methods such as serum and urine analysis.

44. RNAi involves silencing of a specific mRNA due to a complementary _____ molecule that binds to and prevents translation of the mRNA.

(1) dsRNA **(2)** ssRNA
(3) dsDNA **(4)** ssDNA

Ans. Option (1) is correct.

Explanation: RNA interference (RNAi) is a biological process wherein RNA molecules inhibit gene expression or translation by neutralising targeted mRNA molecules. This silencing is achieved by a complementary dsRNA molecule that binds to the mRNA and prevents its translation.

45. Which of the following Bt toxin gene controls the corn borer?

(1) *CryIAc* **(2)** *CryIIAc*
(3) *CryIAb* **(4)** *CryIIAb*

Ans. Option (3) is correct.

Explanation: The *cryIAb* gene is a well-known Bt toxin gene that has been specifically engineered into corn to provide resistance against the European corn borer and other lepidopteran pest like the southwestern corn borer.

Read the passage carefully and answer the questions given along

Our immune system plays the major role in preventing diseases when we are exposed to disease-causing agents. Immunity is of two types: (i) Innate immunity and (ii) Acquired immunity. The human immune system consists of lymphoid organs, tissues, cells and soluble molecules like antibodies. The immune system also plays an important role in allergic reactions, auto-immune diseases and organ transplantation. The primary lymphoid organs are bone marrow and thymus. The secondary lymphoid organs are spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix. There is lymphoid tissue also located within the lining of the major tracts (respiratory, digestive and urogenital tracts) called mucosa associated lymphoid tissue (MALT). It is important to note that HIV/AIDS is not spread by mere touch or physical contact; it spreads only through body fluids. AIDS has no cure, prevention is the best option. Adolescence is accompanied by several biological and behavioural changes and surveys and statistics show that use of drugs and alcohol has been on the rise especially among the youth. Factors associated with drug and alcohol abuse among adolescents are a child's natural curiosity, stress, the perception among youth that it is 'cool' or progressive to smoke, media exposure and an unstable or unsupportive family structures and peer pressure. It is best to identify the situations that may push an adolescent towards use of drugs or alcohol, and to take remedial measures well in time.

46. Find the **incorrect** statement about human health and disease.

(1) Allergens are antigens.
(2) Most pathogens are parasites.
(3) AIDS is a congenital disease.
(4) Bone marrow and thymus are primary lymphoid organs.

Ans. Option (3) is correct.

Explanation: Congenital diseases are conditions present at birth, often due to genetic factors or environmental influences during prenatal development. AIDS is caused by the human immunodeficiency virus (HIV). It is an acquired disease, meaning it is contracted after birth, typically through the transmission of HIV via bodily fluids. It is not inherited or present at birth due to genetic factors.

47. Which one of the following structures is not an example of a cellular barrier in innate immunity?

(1) Protein interferon **(2)** PMNL neutrophils
(3) Lymphocytes **(4)** Macrophages

Ans. Option (1) is correct.

Explanation: Protein interferon are proteins produced by cells in response to viral infections or other stimuli. They play a crucial role in innate immunity by inhibiting viral replication and activating immune cells; however, they are only proteins and not cellular structures and therefore not considered cellular barriers themselves.

48. Mucosa associated lymphoid tissue is absent in the -

(1) Respiratory tract **(2)** Urogenital system
(3) Digestive tract **(4)** Skeletal system

Ans. Option (4) is correct.

Explanation: Mucosa-associated lymphoid tissue (MALT) is a crucial part of the immune system, found in various mucosal lining throughout the body, providing protection against pathogens. It is present in areas exposed to the external environment or where pathogens are likely to enter such as the respiratory track, urogenital system and digestive tract.

49. Which one of the following can never be over estimated when it comes to the complete well-being of adolescents?

(1) Drugs **(2)** Environment
(3) Biology **(4)** Alcohol

Ans. Option (2) is correct.

Explanation: An environment encompasses various factors like family, school, community, peer influence and access to resources, all of which significantly impact an adolescent's complete well-being. A positive and supportive environment is crucial for healthy development and cannot be over emphasised.

50. Active immunisation is most suitable method for :

(1) Exposure to snake venom
(2) Natural infection
(3) Deadly microbe infection
(4) Protection of fetus in the womb

Ans. Option (3) is correct.

Explanation: Active immunisation involves administering a vaccine containing weakened or inactivated pathogens or their components to stimulate the immune system to produce antibodies and memory cells.
This provides long-term protection and is ideal for preventing deadly microbial infections such as measles, polio, or hepatitis B. Exposure to snake venom requires passive immunisation. Natural infection can lead to active immunity; however, it is not a safe or controlled method of immunisation. Protection of the fetus in the womb is usually achieved through passive immunity when maternal antibodies are transferred to the fetus.

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