

Class 12 Biology: Previous Year Questions, Chapter-wise

1074 CBSE board exam questions, 2022–2026 · 13 chapters · sorted by question type

Each question shows its exam year and marks. A question repeated across paper sets appears once. Questions that need a figure from the original paper are left out. Questions only, no answers. Chapter headings link to free notes and MCQs for that chapter on studynos.co.in.

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1 Sexual Reproduction in Flowering Plants

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MULTIPLE CHOICE AND ASSERTION-REASON (40)

Q1. CBSE 2026 · 1 mark Identify the plant in which emasculation is not required for artificial hybridization.

- (a) Rice (b) Wheat (c) Pea (d) Papaya

Q2. CBSE 2026 · 1 mark Perisperm present in seed of black pepper is remnant of

- (a) Ovary (b) Nucellus (c) Anther (d) Megaspore

Q3. CBSE 2026 · 1 mark Assertion (A) : Apomixis leads to production of genetically identical offsprings. Reason (R) : Apomixis involves fertilization between two genetically similar plants.

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

Q4. CBSE 2026 · 1 mark Assertion (A) : Pollen grains have a mucilaginous covering on them in most of the water pollinating plants. Reason (R) : Mucilaginous covering help pollen grains to be submerged in water.

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

Q5. CBSE 2026 · 1 mark Self-incompatibility in some flowering plants is a ____ mechanism that prevents self-fertilization.

- (a) Morphological (b) Physiological (c) Anatomical
(d) Genetic

Q6. CBSE 2026 · 1 mark When the wrong type of pollen falls on the stigma of a flower, during the process of pollination, what decision does the pistil take?

- (a) Accepts the pollen (b) Rejects the pollen
(c) Dissolves the pollen (d) Modifies the pollen

Q7. CBSE 2026 · 1 mark Select the correct option for the pair of plants pollinated by water.

- (a) Vallisneria and Hydrilla (b) Zostera and Water lily
(c) Water lily and Parthenium
(d) Water hyacinth and Water lily

Q8. CBSE 2026 · 1 mark Which part of the ovule hardens to form seed coat of a seed ?

- (a) Funicle (b) Chalaza (c) Nucellus (d) Integuments

Q9. CBSE 2026 · 1 mark Assertion (A): Cleistogamous flowers have assured seed set. Reason (R): Cleistogamous flowers are invariably autogamous and do not depend on any pollinating agents.

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

Q10. CBSE 2026 · 1 mark Filiform apparatus in the embryo sac of an angiosperm is present at the micropylar tip of:

- (a) Central cell (b) Egg cell (c) Synergids (d) Antipodals

Q11. CBSE 2026 · 1 mark The cells of endosperm have 24 chromosomes. What will be the number of chromosomes in the gametes?

- (a) 8 (b) 16 (c) 23 (d) 32



Q12. CBSE 2025 · 1 mark Select the statements that are true for a typical dicotyledonous embryo from the given options. (i) It consists of an embryonal axis and scutellum. (ii) The portion of embryonal axis above the level of cotyledon is epicotyl. (iii) The portion of embryonal axis below the level of cotyledon is coleorhiza. (iv) The lower end of the embryo has radicle covered with a root cap. Choose the correct answer:

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

Q13. CBSE 2025 · 1 mark Select the statements that are true for a typical megasporangium of flowering plants. (i) It is attached to the placenta by hilum. (ii) It has a chalazal end that represents the basal part of the ovule. (iii) It has nucellus enclosed by integuments. (iv) Its micropylar end is known as chalaza. Choose the correct answer:

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

Q14. CBSE 2025 · 1 mark Select the statements that are true for outbreeding devices in the flowering plants. (i) They discourage cross-pollination and ensure self-pollination. (ii) They are advantageous as they lead to inbreeding depression. (iii) Self-incompatibility prevents self-pollen from fertilising the ovules. (iv) To prevent self-pollination in some species pollen release and stigma receptivity are not synchronised. Choose the correct answer:

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

Q15. CBSE 2025 · 1 mark Select the statements that are true for pollination mechanism in flowering plants from the given options. (i) In Vallisneria, the female flowers are pollinated by pollen grains inside the water. (ii) In Zostera, pollen grains are released on the surface of water. (iii) In most of the water-pollinated species, pollen grains are covered by a mucilaginous coating. (iv) Pollination by water is quite rare and limited to about 30 genera. Choose the correct answer:

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

Q16. CBSE 2025 · 1 mark Unisexuality of flowers prevents which process ?

- (a) Both Geitonogamy and Xenogamy
(b) Geitonogamy, but not Xenogamy
(c) Autogamy and Geitonogamy
(d) Autogamy, but not Geitonogamy

Q17. CBSE 2025 · 1 mark Select the following statements that are true for insect pollinated flowers from the given options. (i) Majority of these flowers are large, colourful and rich in nectar. (ii) Nectars and seeds are usual floral rewards to attract insects for pollination. (iii) Pollen grains of these flowers are generally mucilaginous so as to stick to the body of the insects. (iv) A foul odour is emitted by some flowers to attract flies and beetles. Choose the correct answer :

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

Q18. CBSE 2025 · 1 mark Select the statements that are true for the seed of angiosperm from the given options : (i) Non-albuminous seeds have no residual endosperm. (ii) Residual, persistent nucellus in wheat is known as perisperm. (iii) Integuments of ovules harden as tough protective seed coat. (iv) Metabolic activity of the embryo slows down in dormancy. Choose the correct option :

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

Q19. CBSE 2025 · 1 mark Select the statements that are true for embryo of the flowering plants from the given options. (i) The zygote forms a proembryo and subsequently heart-shaped, globular and mature embryo. (ii) Most zygotes divide to form embryo only after a certain amount of endosperm is formed. (iii) The embryo develops at the micropylar end of the embryo sac. (iv) A typical dicotyledonous embryo consists of an embryonal axis and a scutellum. Choose the correct option from the following :

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

Q20. CBSE 2025 · 1 mark Assertion (A) : In some species of asteraceae and grasses, seeds are formed without fertilization. Reason (R) : Formation of fruit without fertilization is called parthenocarpy.

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

Q21. CBSE 2025 · 1 mark Select the statements that are true for a typical monocotyledonous embryo from the given options. (i) Scutellum is present towards the centre of the embryonal axis. (ii) Embryonal axis of the lower end has radicle and root cap covered by coleoptile. (iii) The portion of embryonal axis above the level of attachment of scutellum is epicotyl. (iv) Shoot apex and few leaf primordia of embryo are enclosed in a hollow foliar structure. Choose the correct answer from the following :

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

Q22. CBSE 2025 · 1 mark Choose the option that correctly describes the gynoecium of Michelia:

- (a) Multicarpellary, Apocarpous
(b) Bicarpellary, Apocarpous (c) Multicarpellary, Syncarpous
(d) Bicarpellary, Syncarpous

Q23. CBSE 2024 · 1 mark A phenomenon where a male insect mistakenly identified the patterns of an orchid flower as the female insect partner, and tries to copulate and thereby pollinates the flower is said to be:

- (a) Pseudocopulation (b) Pseudopollination
(c) Pseudoparthenocarpy (d) Pseudofertilisation

Q24. CBSE 2024 · 1 mark In which of the following plants are both male and female flowers born on the same plant and the mode of pollination can be geitonogamy or xenogamy ?

- (a) Papaya (b) Date Palm (c) Maize (d) Spinach



Q25. CBSE 2024 · 1 mark An angiosperm embryo sac is located within the :

- (a) Placenta (b) Megasporangium (c) Nucellus (d) Ovary

Q26. CBSE 2024 · 1 mark The functional megaspore of an angiosperm develops into:

- (a) Embryo sac (b) Endosperm (c) Embryo (d) Ovule

Q27. CBSE 2024 · 1 mark The part of the ovule that develops into protective coats of a seed after fertilization in a typical flowering plant is :

- (a) embryo sac (b) nucellus (c) integuments (d) megaspore

Q28. CBSE 2024 · 1 mark In which one of the following floral plants are many embryos formed in the seeds without fertilisation of the egg cell ?

- (a) Black pepper (b) Mustard (c) Groundnut (d) Citrus

Q29. CBSE 2024 · 1 mark The ploidy of the apomictic embryos developing from the integument cells and synergids respectively would be :

- (a) n , $2n$ (b) $2n$, n (c) $3n$, $2n$ (d) $2n$, $3n$

Q30. CBSE 2024 · 1 mark The mechanism to produce seeds without fertilisation has evolved in the given family of the flowering plants :

- (a) Asteraceae (b) Solanaceae (c) Malvaceae (d) Liliaceae

Q31. CBSE 2024 · 1 mark Assertion (A) : The zygote gives rise to heart-shaped embryo and subsequently proembryo in most angiosperms. Reason (R) : The zygote is present at the micropylar end of the embryo sac and develops into an embryo.

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

Q32. CBSE 2024 · 1 mark Embryo formation without fertilization is observed in some species of :

- (a) Maize (b) Rose (c) Mango (d) Rice

Q33. CBSE 2024 · 1 mark The ploidy of apomictic embryos developing from the nucellus and antipodal cells respectively would be :

- (a) $2n$, $3n$ (b) $2n$, n (c) $3n$, $2n$ (d) n , $2n$

Q34. CBSE 2024 · 1 mark In a fertilized ovule of an angiosperm, the cells in which n , $2n$ and $3n$ conditions respectively occur are :

- (a) antipodal, zygote and endosperm
(b) zygote, nucellus and endosperm
(c) endosperm, nucellus and zygote
(d) antipodals, synergids and integuments

Q35. CBSE 2023 · 1 mark Choose the option that gives the correct number of pollen grains that will be formed after 325 microspore mother cells undergo microsporogenesis.

- (a) 325 (b) 650 (c) 1300 (d) 975

Q36. CBSE 2023 · 1 mark Assertion (A): Endosperm is completely consumed during the development of embryo in ex-albuminous seeds. Reason (R): Castor, pea and beans are all examples of ex-albuminous seeds.

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

Q37. CBSE 2023 · 1 mark Which of the following seeds have remained alive for the longest period?

- (a) Phoenix dactylifera (b) Striga asiatica
(c) Mangifera indica (d) Yucca gigantea

Q38. CBSE 2023 · 1 mark Assertion (A): The Mediterranean orchid Ophrys uses sexual deceit to get pollinated by a species of bee. Reason (R): The female bee changes its colour depending on the temperature of the area.

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

Q39. CBSE 2023 · 1 mark Match the correct Structures given in Column I with the Fruit in Column II in the chart given below:
Column I (Structure) Column II (Fruit) P. Perisperm i. Maize Q. Thalamus ii. Black pepper R. Pericarp iii. Strawberry S. Endosperm iv. Mango

- (a) P-i, Q-ii, R-iii, S-ii (b) P-ii, Q-iii, R-iv, S-i
(c) P-iii, Q-i, R-i, S-iii (d) P-iv, Q-i, R-ii, S-iv

Q40. CBSE 2023 · 1 mark Which of the following structures is well-developed in a mature seed of black pepper?

- (a) Perisperm (b) Thalamus (c) Sepals (d) Peduncle

VERY SHORT ANSWER (13)

Q41. CBSE 2026 · 2 marks (a) (i) How does a farmer use dormancy of seed to his advantage? (1 mark) (ii) Differentiate between pea seed and castor seed. (1 mark)

Q42. CBSE 2026 · 2 marks How does a farmer use dormancy of seed to his advantage? Differentiate between pea seed and castor seed.

Q43. CBSE 2026 · 2 marks Write any two advantages of producing plants by micro-propagation.

Q44. CBSE 2026 · 2 marks (a) Write one way by which apomictic seeds can be developed. (b) Why do farmers prefer apomictic seeds over hybrid seeds?

Q45. CBSE 2026 · 2 marks (a) Mention the functions of each of the following: (i) Tassels of Corn Cob (ii) Scutellum

Q46. CBSE 2026 · 2 marks Explain the mutually rewarding relationship between Yucca plant and species of moth.



Q47. CBSE 2025 · 2 marks How is the interaction between Ophrys and its specific bee pollinator one of the best examples of co-evolution ? Explain.

Q48. CBSE 2024 · 2 marks "Farmers prefer apomictic seeds to hybrid seeds." Justify giving two reasons.

Q49. CBSE 2024 · 2 marks Do you think apomixis can be compared to asexual reproduction? Justify your answer. State the benefits of apomixis to the farmers.

Q50. CBSE 2024 · 2 marks Identify A, B, C and D in the table given below :
Terms | Part of the plant it represents
Pericarp | A
Cotyledon in seed of grass family | B
Embryonal axis | C
Remains of nucellus in a seed | D

Q51. CBSE 2024 · 2 marks (b) Name any two outbreeding devices that flowering plants have developed and explain how they help in encouraging cross-pollination.

Q52. CBSE 2023 · 2 marks (a) From which end of the ovule, and how does the pollen tube gain its entry into the embryo sac of a Hibiscus flower? (b) State the fate of the male nuclei present in the pollen tube.

Q53. CBSE 2023 · 2 marks (a) Explain the process of the development of a male gametophyte in an angiosperm. (b) Why is it called a male gametophyte?

SHORT ANSWER (24)

Q54. CBSE 2026 · 3 marks (a) Do all pollen grains remain viable for the same length of time? Support your answer with two suitable examples. (2.5 marks) (b) How are pollen grains stored in pollen banks? (0.5 marks)

Q55. CBSE 2026 · 3 marks Draw a neat diagram of megasporangium of an angiosperm and label any six parts. ($0.5 \times 6 = 3$ marks)

Q56. CBSE 2026 · 3 marks (a) Do all pollen grains remain viable for the same length of time? Support your answer with two suitable examples. (2½ marks) (b) How are pollen grains stored in pollen banks? (½ mark)

Q57. CBSE 2026 · 3 marks Do all pollen grains remain viable for the same length of time? Support your answer with two suitable examples. How are pollen grains stored in pollen banks?

Q58. CBSE 2026 · 3 marks Draw a neat diagram of megasporangium of an angiosperm and label any six parts.

Q59. CBSE 2026 · 3 marks There are limitations of traditional breeding techniques that led to promotion of micro-propagation ? (a) Mention two advantages of micropropagation. (b) Give two examples where it is commercially adopted.

Q60. CBSE 2026 · 3 marks Draw a neat diagram of enlarged view of one microsporangium of a Young anther of an angiosperm. Label the different layers of the wall and write the functions of the outermost and innermost layer.

Q61. CBSE 2026 · 3 marks Chasmogamous flowers remain open and expose their reproductive parts. Explain how this structural feature supports different types of pollination.

Q62. CBSE 2026 · 3 marks Answer the following questions: (a) Where do the Coleoptile and Coleorhiza appear in a monocot seed? (b) What is meant by free nuclear endosperm? Give an example. (c) What are parthenocarpic fruits? Give an example.

Q63. CBSE 2026 · 3 marks (a) Explain the different ways by which apomictic seeds can be developed. (b) Mention one advantage of apomictic seeds for farmers.

Q64. CBSE 2026 · 3 marks Draw a neat diagram of a maize grain showing the internal structure and label any five parts.

Q65. CBSE 2026 · 3 marks Answer the following questions : (a) Explain the different ways by which apomictic seeds can be developed. (b) Mention one advantage of apomictic seeds for farmers.

Q66. CBSE 2026 · 3 marks Differentiate between wind-pollinated and insect-pollinated flowers. Give an example of each type.

Q67. CBSE 2026 · 3 marks List any three outbreeding devices that flowering plants have developed for cross-pollination and explain how they help to encourage cross-pollination.

Q68. CBSE 2025 · 3 marks Many of the flowering plants producing hermaphrodite flowers have developed many devices to discourage self-pollination and to encourage cross-pollination. (a) Explain how the given type of pollination is advantageous to the plant. (b) Can this flowering plant show geitonogamy ? Justify your answer.

Q69. CBSE 2025 · 3 marks Flowering plants with hermaphrodite flowers have developed many reproductive strategies to ensure cross-pollination. Study the given outbreeding devices adopted by certain flowering plants and answer the questions that follow. (a) Name and define the outbreeding device described in the above table. (b) Explain what would have been the disadvantage to the plant in the absence of the given strategy.

Q70. CBSE 2025 · 3 marks (a) Mention any two advantages of micropropagation techniques. (b) Write in brief how the process is carried out in the laboratory. (c) Name any two important food plants grown commercially by this method.

Q71. CBSE 2024 · 3 marks If the cells in the leaves of a maize plant contain 10 chromosomes each, write the number of chromosomes in its endosperm and zygote. Name and explain the process by which an endosperm and a zygote are formed in maize.

Q72. CBSE 2024 · 3 marks State why plant breeders are interested in artificial hybridisation programme. How do they carry out this process ?

Q73. CBSE 2024 · 3 marks (a) Explain how it is ensured that the orchid Ophrys is pollinated by a specific species of bee. (b) Describe co-evolution with the help of this example.

Q74. CBSE 2024 · 3 marks Explain how it is ensured that the orchid Ophrys is pollinated by a specific species of bee. Describe co-evolution with the help of this example.

Q75. CBSE 2024 · 3 marks Draw a longitudinal section of pistil of a flower showing growth of the pollen tube. Label the part : (a) through which the pollen tube moves down. (b) the cell wherein the pollen tube releases its contents.



Q76. CBSE 2024 · 3 marks Draw a T.S. of a mature anther of an angiosperm. Label its any three wall layers and mention their functions.

Q77. CBSE 2024 · 3 marks Draw a well labelled diagram of sectional view of male gametophyte/microspore of an angiosperm and write the functions of any two parts labelled. (Any four labels).

LONG ANSWER (21)

Q78. CBSE 2026 · 5 marks (a) (i) Explain the role of stigma in pollen pistil interaction. (ii) Describe the post pollination events leading to double fertilization in angiosperms starting with 2-celled pollen grain.

Q79. CBSE 2026 · 5 marks Explain the role of stigma in pollen pistil interaction. Describe the post pollination events leading to double fertilization in angiosperms starting with 2-celled pollen grain.

Q80. CBSE 2026 · 5 marks (b) (i) Draw a labelled two-celled structure of male gametophyte of an angiosperm. (ii) Name the three layers that surround the cytoplasm of a male gametophyte starting from innermost to outermost layer. (iii) Which organic material makes the outermost layer? Mention its advantage. (iv) Why is the outermost layer of male gametophyte not continuous?

Q81. CBSE 2026 · 5 marks (b)(i) Draw a diagram of L.S. of maize grain and label its any six parts. (ii) Differentiate between perisperm and endosperm giving one example of each.

Q82. CBSE 2025 · 5 marks Explain how does double fertilisation take place in a flowering plant. Write the fate of the products of double fertilization in these plants.

Q83. CBSE 2025 · 5 marks (a) (i) Explain how does double fertilisation take place in a flowering plant. (ii) Write the fate of the products of double fertilization in these plants.

Q84. CBSE 2025 · 5 marks (a) (i) Explain the structure of a typical monocotyledonous embryo of a flowering plant. (ii) How are multiple embryos formed in a citrus fruit? What is the mechanism known as?

Q85. CBSE 2025 · 5 marks (a) (i) Explain the structure of a typical monocotyledonous embryo of a flowering plant. (ii) How are multiple embryos formed in a citrus fruit? What is the mechanism known as? OR (b) (i) Name and explain the structural organisation of the male sex accessory ducts in the human male reproductive system. (ii) Describe the role of gonadotropin FSH in the regulation of spermatogenesis.

Q86. CBSE 2025 · 5 marks (a) (i) Explain the structure of a mature embryo sac of a typical flowering plant. (ii) How is triple fusion achieved in these plants?

Q87. CBSE 2025 · 5 marks (a) lands on the stigma. A two-celled right type pollen has landed on the stigma. Explain the events taking place till fertilization in angiosperms. Why is pollen pistil interaction said to be dynamic?

Q88. CBSE 2024 · 5 marks (a) (i) Explain the development of male gametophyte in an angiosperm. (ii) Draw a labelled diagram of a three-celled male gametophyte. OR (b) (i) Draw a diagrammatic sectional view of ovary of human female and label the following: (1) Blood vessels (2) Primary follicle (3) Tertiary follicle (4) Ovum (ii) At which stage of life are primary follicles formed in a human female? (iii) Explain the events (both hormonal and structural) that occur at the time of ovulation till the onset of the next menstrual cycle.

Q89. CBSE 2024 · 5 marks (a) (i) Explain the development of male gametophyte in an angiosperm. (ii) Draw a labelled diagram of a three-celled male gametophyte.

Q90. CBSE 2024 · 5 marks (a) (i) Explain the process of double fertilization in an angiosperm starting from the germination of pollen grains on the stigma, mentioning the ploidy of the end products formed at the end. State the role of synergids during the course of the process. (ii) Why does the development of endosperm precede that of the embryo?

Q91. CBSE 2024 · 5 marks (a) (i) Explain the process of double fertilization in an angiosperm starting from the germination of pollen grains on the stigma, mentioning the ploidy of the end products formed at the end. State the role of synergids during the course of the process.

Q92. CBSE 2024 · 5 marks (a) (i) Explain any four devices that flowering plants have developed to encourage cross-pollination. (ii) Why do plants discourage self-pollination? State any one reason.

Q93. CBSE 2024 · 5 marks (a) (i) Explain any four devices that flowering plants have developed to encourage cross-pollination. (ii) Why do plants discourage self-pollination? State any one reason. OR (b) Explain the ovarian and uterine events taking place along with the role of pituitary and ovarian hormones, during menstrual cycle in a normal human female under the following phases: (i) Follicular phase/proliferative phase (ii) Luteal phase/secretory phase (iii) Menstrual phase

Q94. CBSE 2024 · 5 marks (a) (i) State the objective of adopting artificial hybridisation programme in plants. (ii) Describe the steps followed in this technique.

Q95. CBSE 2023 · 5 marks (b) (i) How are the characteristic features of pollen, anther and stigma of a maize plant suited for pollination by wind? (ii) How do you justify that: (1) Pollen grains are recovered from fossils? (2) Micropyle remains as a small pore in the seed coat of a fully developed seed?

Q96. CBSE 2023 · 5 marks (b) You are given a tall pea plant with green seeds. The genotype of this plant is unknown. You are only permitted to carry out self-pollination. Work out all possible crosses and show how you would determine the genotype of the given plant.

Q97. CBSE 2023 · 5 marks (b) (i) Double fertilisation is an event unique to all flowering plants. Explain the process. (ii) Give a reason for the following: (1) A seed of an orange has many embryos. (2) Cashew is a false fruit but Guava is a true fruit.



Q98. CBSE 2023 · 5 marks (a) (i) Describe the arrangement of nuclei and cells in a mature embryo sac of a typical angiosperm. (ii) Explain the devices the flowering plants have developed to prevent the following types of pollination: (1) Prevents both autogamy and geitonogamy (2) Prevents autogamy, but not geitonogamy OR (b) (i) Write the specific location of the following in the testis in humans: (1) Sertoli cells (2) Leydig cells (ii) Explain the coordination between Gonadotropins, Leydig cells and Sertoli cells and their role in spermatogenesis.

2 Human Reproduction

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (30)

Q1. CBSE 2026 · 1 mark Select the option that shows correct statements: (i) Corpus luteum secretes progesterone. (ii) Only FSH attains a peak level in middle of cycle. (iii) LH surge induces rupture of graafian follicle. (iv) Luteal phase of menstrual cycle is also called proliferative phase.

- (a) Only (ii) is correct. (b) (i) and (iii) are correct.
(c) Only (iv) is correct. (d) (ii) and (iv) are correct.

Q2. CBSE 2026 · 1 mark Which connective tissue connects ovary to pelvic wall and uterus?

- (a) Tendons (b) Ligaments (c) Cartilage (d) Bone

Q3. CBSE 2026 · 1 mark The features of some structures of human male reproductive system are given below. Choose the correct option that matches the features with the structures. (i) It opens into the Vasa efferentia through rete testis. (ii) It carries semen as well as urine. (iii) It maintains temperature (2-2.5°C) lower than body temperature for sperm formation. (iv) It leads to vas deferens that ascends to the abdomen.

- (a) Seminal vesicle, Urethra, Scrotum, Seminiferous tubule
(b) Prostate, Scrotum, Testes, Vas Deferens
(c) Seminiferous tubule, Urethra, Scrotum, Epididymis
(d) Seminiferous tubule, Vas Deferens, Urethra, Sertoli cells

Q4. CBSE 2026 · 1 mark If a sperm nucleus is injected into an oocyte then all of the following events are bypassed except

- (a) The swimming of sperm to meet the egg in the oviduct.
(b) The sperm's acquisition of motility in the epididymis.
(c) A sperm comes in contact with the zona pellucida layer of the ovum.
(d) The complex process like cell division and cell differentiation.

Q5. CBSE 2026 · 1 mark Identify the ploidy of primary spermatocytes formed during spermatogenesis. Select the correct option.

- (a) Haploid (b) Diploid (c) Triploid (d) Tetraploid

Q6. CBSE 2026 · 1 mark Foetal ejection reflex in human female triggers the release of which hormone?

- (a) Oxytocin from foetal pituitary gland
(b) hCG from placenta (c) Progesterone from corpus luteum
(d) Oxytocin from maternal pituitary gland

Q7. CBSE 2026 · 1 mark Select the phase of menstrual cycle in which the remaining parts of Graafian follicle transform into the corpus luteum.

- (a) Secretory phase (b) Proliferative phase
(c) Menstrual phase (d) Ovulatory phase

Q8. CBSE 2026 · 1 mark Which of the following groups of cells in the male gonad represent haploid cells?

- (a) Spermatogonial cells (b) Germinal epithelial cells
(c) Secondary spermatocytes (d) Primary spermatocytes

Q9. CBSE 2026 · 1 mark Assertion (A): After implantation, finger-like projections appear on the trophoblast called chorionic villi. Reason (R): Chorionic villi are surrounded by the uterine tissue and the maternal blood.

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

Q10. CBSE 2026 · 1 mark A female undergoing IVF treatment has blocked fallopian tube. The technique by which the embryo with more than 8 blastomeres will be transferred into the female for further development is:

- (a) ZIFT (b) GIFT (c) IUT (d) AI

Q11. CBSE 2026 · 1 mark The first movements of the foetus and appearance of hair on its head are usually observed during which month of pregnancy?

- (a) Fourth month (b) Fifth month (c) Sixth month
(d) Third month

Q12. CBSE 2026 · 1 mark The foetal ejection reflex in human triggers the release of _____ hormone from _____. Fill in the blanks by choosing right option.

- (a) oxytocin, foetal pituitary (b) oxytocin, maternal pituitary
(c) human chorionic gonadotropin, placenta
(d) progesterone, corpus luteum



Q13. CBSE 2026 · 1 mark Assertion (A): The embryo with 8 to 16 blastomeres is called a morula. Reason (R): The morula continues to divide and transform into trophoblast.

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

Q14. CBSE 2026 · 1 mark During different phases of menstrual cycle, hormones are secreted. Choose the option showing the correct sequence of hormones.

- (a) FSH, Progesterone, Estrogen
- (b) Estrogen, FSH, Progesterone
- (c) FSH, Estrogen, Progesterone
- (d) Estrogen, Progesterone, FSH

Q15. CBSE 2026 · 1 mark Assertion (A): The endometrium undergoes cyclic changes during the menstrual cycle. Reason (R): Perimetrium contracts strongly during delivery of the baby.

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

Q16. CBSE 2025 · 1 mark during the initial days of lactation is rich in antibody:

- (a) IgE (b) IgD (c) IgA (d) IgG

Q17. CBSE 2025 · 1 mark During the process of oogenesis in human female, the primary oocyte results in the formation of which of the following?

- (a) Unequal cells - a smaller haploid secondary oocyte and a larger diploid polar body
- (b) Unequal cells - a larger haploid secondary oocyte and a smaller haploid polar body
- (c) Unequal cells - a smaller diploid secondary oocyte and a larger haploid polar body
- (d) Equal cells - a haploid secondary oocyte and a haploid polar body

Q18. CBSE 2025 · 1 mark Assertion (A): Human male is referred to as heterogametic. Reason (R): The male produces millions of sperms of the same kind.

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

Q19. CBSE 2025 · 1 mark Penetration of the sperm in the ovum is followed by:

- (a) Formation of first polar body
- (b) Completion of Meiosis II (c) First Meiosis
- (d) Dissolution of zona pellucida

Q20. CBSE 2024 · 1 mark Which one of the following hormones is secreted by the human placenta that helps in the maintenance of pregnancy ?

- (a) Relaxin (b) Human Chorionic Gonadotropin
- (c) Oxytocin (d) Human Placental Lactogen

Q21. CBSE 2024 · 1 mark Select the option that has the correct sequence of events of human female reproductive cycle: (i) Secretion of FSH (ii) Ovulation (iii) Growth of corpus luteum (iv) Growth of follicle and oogenesis (v) Sudden increase in LH

- (a) iiiivivii (b) iivviii (c) iviviii (d) viiiiv

Q22. CBSE 2024 · 1 mark Select the incorrect match from the following: Human Karyotype - Characters

- (a) 45 + XX - Broad palm with characteristic palm crease
- (b) 44 + XXY - Overall feminine development
- (c) 44 + XO - Sterile females as ovaries are rudimentary
- (d) 44 + XY - Normal male

Q23. CBSE 2024 · 1 mark In humans, the secondary oocyte completes meiotic division when :

- (a) it gets implanted in the uterine endometrium
- (b) it is released from the matured Graafian follicle
- (c) it is penetrated by the sperm cell
- (d) acrosomal enzymes break down the zona pellucida

Q24. CBSE 2024 · 1 mark In the absence of fertilization, corpus luteum:

- (a) degenerates (b) produces more oestrogen
- (c) produces more progesterone
- (d) produces both oestrogen and progesterone in equal amount

Q25. CBSE 2024 · 1 mark Assertion (A) : The zygote gives rise to heart-shaped embryo and subsequently proembryo in most angiosperms. Reason (R) : The zygote is present at the micropylar end of the embryo sac and develops into an embryo.

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

Q26. CBSE 2023 · 1 mark In which one of the following options does the endocrine gland correctly match with its hormonal secretion and its function? Endocrine Gland, Hormone, Function:

- (a) Sertoli cells, Testosterone, Development of secondary sexual characteristics
 - (b) Placenta, Estrogen, Initiates secretion of milk
 - (c) Leydig cells, Androgen, Initiates the production of sperms
 - (d) Ovary, FSH, Stimulates follicular development
- (a) Sertoli cells, Testosterone, Development of secondary sexual characteristics
 - (b) Placenta, Estrogen, Initiates secretion of milk
 - (c) Leydig cells, Androgen, Initiates the production of sperms
 - (d) Ovary, FSH, Stimulates follicular development



Q27. CBSE 2023 · 1 mark Which of the following hormones is not secreted by the human placenta ?

- (a) Progesterone (b) Estrogen
(c) Human Chorionic Gonadotropin (HCG) (d) Relaxin

Q28. CBSE 2023 · 1 mark A human ovum completes its second meiosis:

- (a) at the time of fertilisation
(b) when the sperm touches the zona pellucida
(c) when the sperm gains entry into the cytoplasm of the ovum
(d) when the acrosome of the sperm releases its enzymes on corona radiata

Q29. CBSE 2023 · 1 mark Which of the following options correctly matches the name of the hormone to its site of production in the human body? Name of the Hormone: P. Oxytocin, Q. Relaxin, R. hCG, S. Progesterone; Site of Production: i. Placenta, ii. Corpus Luteum, iii. Pituitary Gland, iv. Ovaries

- (a) P-i, Q-iii, R-ii, S-iv (b) P-i, Q-iv, R-iii, S-ii
(c) P-iii, Q-iv, R-i, S-ii (d) P-ii, Q-iii, R-i, S-iv

Q30. CBSE 2023 · 1 mark Which of the following hormones are active during the ovulatory phase of menstrual cycle in a normal human female?

- (a) FSH and LH (b) LH and Estrogen (c) FSH and Estrogen
(d) Estrogen and Progesterone

VERY SHORT ANSWER (13)

Q31. CBSE 2026 · 2 marks (b) Identify the stage of follicle where primary oocyte undergoes first meiotic division. Also mention the products of this division. (2 marks)

Q32. CBSE 2026 · 2 marks (a) Name the muscular and glandular layers of female uterus. Mention one function of each. (2 marks) OR (b) (i) Why are STI (Sexually Transmitted Infections) not detected in time? (1 mark) (ii) Write two complications caused in later stages. (1 mark)

Q33. CBSE 2026 · 2 marks (a) (i) Name the organ that forms a connection between foetus and the uterus of a pregnant human female. (ii) How does it support both nutrition and hormonal regulation ?

Q34. CBSE 2026 · 2 marks Name the organ that forms a connection between foetus and the uterus of a pregnant human female. How does it support both nutrition and hormonal regulation?

Q35. CBSE 2026 · 2 marks (a) The male reproductive system functions with the help of hormones. How does GnRH affect the male reproductive system? OR (b) Various glands are present in the body and they play vital roles in the functioning of the body. Name any two male accessory glands of the male reproductive system. Write one common function of these accessory glands.

Q36. CBSE 2026 · 2 marks Mention the sites of action of the hormones 'GnRH' and 'FSH' during spermatogenesis. Write one function of each of these hormones.

Q37. CBSE 2026 · 2 marks Draw a labelled diagram of the embryonic stage that gets implanted in the human uterus. State the functions of two labelled parts.

Q38. CBSE 2025 · 2 marks (a) (i) Write the function of each of the following: (I) Seminal Plasma (II) Acrosome of human sperm (ii) Differentiate between menarche and menopause.

Q39. CBSE 2025 · 2 marks (a) (i) Explain why the milk produced by the mother during the initial days of lactation is considered to be very essential for the newborn infant. (ii) What is the term used for the milk produced during the initial days of lactation ?

Q40. CBSE 2025 · 2 marks Expand PID. Name any two common viral infections transmitted through sexual contact in human females.

Q41. CBSE 2025 · 2 marks Give reasons for the following: (i) Why can a woman generally not conceive a child after 50 years of age? (ii) Polar bodies are formed during oogenesis and not during spermatogenesis.

Q42. CBSE 2024 · 2 marks Write the basic steps followed in the Assisted Reproductive Technologies (ART) programme to help childless couples. Why is it also known as test tube baby programme ?

Q43. CBSE 2024 · 2 marks What is artificial insemination in ART ? Under what conditions is the person medically advised to go for it ?

SHORT ANSWER (14)

Q44. CBSE 2026 · 3 marks Give the schematic representation of oogenesis in human female. Indicate chromosome number also.

Q45. CBSE 2026 · 3 marks Answer the following questions: (a) Write the specific location of vasa efferentia and vas deferens in the male reproductive system. (b) What is a polar body which is formed during oogenesis process in females? When is it first produced? (c) Write the fate of the Graafian follicle after ovulation.

Q46. CBSE 2026 · 3 marks In vitro fertilization (IVF) is a popular method these days that is helping childless couples to bear a child. (a) Write the different steps that are carried out in this technique. (b) Would you consider gamete intra fallopian transfer as a type of IVF? Justify your answer.

Q47. CBSE 2026 · 3 marks (a) Draw a diagram of human ovum prior to fertilization. Label any four parts. (b) Explain how polyspermy is avoided during fertilization.

Q48. CBSE 2026 · 3 marks Draw a sectional view of seminiferous tubule of a human. Label the following cells in the seminiferous tubule: (i) Cells that divide by mitosis to increase their number (ii) Cells that undergo meiosis I (iii) Cells that undergo meiosis II (iv) Cells that help in the process of spermiogenesis. Mention the role of Leydig cells.

Q49. CBSE 2025 · 3 marks Explain the process of formation of placenta in a human female after the implantation of the blastocyst in the endometrium of the uterus.

Q50. CBSE 2025 · 3 marks Explain the neuroendocrine mechanism involved in the process of parturition in a human female leading to the expulsion of the baby out of the uterus through the birth canal.

Q51. CBSE 2025 · 3 marks (a) Name and explain the role of inner and middle walls of the human female uterus. (b) Write the location and function of fimbriae in human female.



Q52. CBSE 2024 · 3 marks (a) "Mother's milk is considered very essential for the new born infant." Justify. (b) What is a 'vaccine' ? Explain the principle on which it works.

Q53. CBSE 2024 · 3 marks Describe any three assisted reproductive techniques practised to treat infertility.

Q54. CBSE 2024 · 3 marks (a) Draw a diagram of a human sperm. Label the following parts in it: (i) Which helps in the motility of the sperm (ii) Which helps in penetrating through the corona radiata and zona pellucida (iii) Which enters into the cytoplasm of the human egg (b) Mention how is polyspermy prevented during the course of fertilization in humans.

Q55. CBSE 2024 · 3 marks Differentiate between spermatogenesis and oogenesis in humans on the basis of the following : (a) When the process is initiated. (b) Number of functional gametes produced per primary spermatocyte/oocyte. (c) Specific site at which meiosis II is completed.

Q56. CBSE 2023 · 3 marks Trace the journey of a zygote from the isthmus of the fallopian tube up to its implantation in the uterus of a human female. Highlight the changes the zygote undergoes during the course of its journey up to implantation.

Q57. CBSE 2022 · 2 marks How is immunity response in humans different from that by antitoxin response? Explain with two reasons.

LONG ANSWER (21)

Q58. CBSE 2026 · 5 marks (a) Trace the events from fertilization till implantation of blastocyst in human female. Also mention the site where fertilization takes place. (5 marks)

Q59. CBSE 2026 · 5 marks Trace the events from fertilization till implantation of blastocyst in human female. Also mention the site where fertilization takes place.

Q60. CBSE 2026 · 5 marks (b) (i) Explain menstrual phase in the menstrual cycle of human female. (ii) Why is follicular phase also called proliferative phase ? (iii) Explain the events that occur in Graafian follicle at the time of ovulation and thereafter. (iv) Draw a Graafian follicle and label – Antrum and secondary oocyte.

Q61. CBSE 2026 · 5 marks Explain menstrual phase in the menstrual cycle of human female. Why is follicular phase also called proliferative phase? Explain the events that occur in Graafian follicle at the time of ovulation and thereafter. Draw a Graafian follicle and label – Antrum and secondary oocyte.

Q62. CBSE 2026 · 5 marks (a) Oogenesis is a discontinuous process that begins before birth and is completed after puberty. (i) Trace the development of a gamete mother cell till its release from the ovary during ovulation. (ii) Name the two pituitary hormones that play an important role in the process.

Q63. CBSE 2026 · 5 marks (a) (i) Draw a neat sectional view of seminiferous tubule of a human testes showing spermatogenesis. Label any five stages. (ii) Explain the hormonal regulation of spermatogenesis process in humans.

Q64. CBSE 2026 · 5 marks (a) Briefly explain the events of fertilisation and implantation in an adult human female.

Q65. CBSE 2025 · 5 marks Explain the structure of testicular lobules in human male reproductive system. Name the two types of cells present in the seminiferous tubules and state their role. Describe the role of hypothalamic hormone GnRH in spermatogenesis.

Q66. CBSE 2025 · 5 marks (b) (i) Name and explain the structural organisation of the male sex accessory ducts in the human male reproductive system. (ii) Describe the role of gonadotropin FSH in the regulation of spermatogenesis.

Q67. CBSE 2025 · 5 marks (b) Describe the changes in the ovary and the uterus as induced by the changes in the level of pituitary and ovarian hormones during menstrual cycle in a human female.

Q68. CBSE 2025 · 5 marks (b) (i) Mention where in the cell these events take place. (ii) Mention why these are needed.

Q69. CBSE 2025 · 5 marks (b)(i) Give the schematic representation of oogenesis in human female indicating chromosome number at each step. (ii) In which part of the female reproductive system do the following events take place? I. Formation of corpus luteum II. Maturation of tertiary follicle III. Fertilisation IV. Implantation

Q70. CBSE 2024 · 5 marks (a) (i) Draw a diagram of a human sperm. Label any four parts and write their functions. (4 marks) (ii) In a human female, probability of an ovum to get fertilized by more than one sperm is impossible. Give reason. (1 mark)

Q71. CBSE 2024 · 5 marks (a) (i) Describe the events of spermatogenesis with the help of a schematic diagram. (ii) Explain the role of hormones in spermatogenesis.

Q72. CBSE 2024 · 4 marks (a) Draw a diagram of a human sperm. Label any four parts and write their functions.

Q73. CBSE 2024 · 5 marks (b) (i) Draw a diagrammatic sectional view of ovary of human female and label the following: (1) Blood vessels (2) Primary follicle (3) Tertiary follicle (4) Ovum (ii) At which stage of life are primary follicles formed in a human female? (iii) Explain the events (both hormonal and structural) that occur at the time of ovulation till the onset of the next menstrual cycle.

Q74. CBSE 2024 · 5 marks Draw a labelled diagram of the embryonic stage that gets implanted in the human female leading to pregnancy. Explain the changes that the different parts of the embryo undergo after implantation up till (1) Placenta formation and (2) formation of three germ layers. Mention the role of the following : (1) Placenta (2) Three germ layers

Q75. CBSE 2024 · 5 marks (b) (i) Mention the site where fertilisation of the ovum occurs in a human female. Explain the process of fertilization and mention how polyspermy is prevented. (ii) Name the embryonic stage that gets implanted in the uterus. Explain the process of implantation in a human female.

Q76. CBSE 2024 · 5 marks (b) (i) Mention the site where fertilisation of the ovum occurs in a human female. Explain the process of fertilization and mention how polyspermy is prevented.



Q77. CBSE 2024 · 5 marks (b) Explain the ovarian and uterine events taking place along with the role of pituitary and ovarian hormones, during menstrual cycle in a normal human female under the following phases : (i) Follicular phase/proliferative phase (ii) Luteal phase/secretory phase (iii) Menstrual phase

Q78. CBSE 2024 · 5 marks (a) (i) Explain the following phases in the menstrual cycle of a human female: (1) Menstruation (2) Follicular phase (3) Luteal phase (ii) 'A proper understanding of the menstrual cycle can help immensely in family planning.' Do you agree with the statement ? Provide reasons for your answer.

CASE-BASED (1)

CASE STUDY · CBSE 2024

Spermatogenesis is an important primary sex characteristic in humans and all other vertebrates. The process is coordinated and controlled under the influence of hormones. It starts with the onset of puberty in humans and thereafter continues. The primordial cells within the embryonic testis which differentiate into spermatogonia are the precursors of the sperms. These are located at the outer walls of the seminiferous tubules where the process of spermatogenesis proceeds.

Q79. CBSE 2024 · 4 marks (a) State the site of action of FSH in the testes and describe its action thereafter.

3 Reproductive Health

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (17)

Q1. CBSE 2026 · 1 mark How many of the following features are related to Nirodh – a popular brand of condoms ? (i) Prevention of sexually transmitted infections. (ii) Phagocytosis of sperms. (iii) Male contraceptive device. (iv) Acts as chemical barrier. (v) Physiological changes in cervical mucus.

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

Q2. CBSE 2026 · 1 mark The method of contraception that is hormone-based and prevents ovulation is :

- (a) Oral Pills (b) Copper-T (c) Condom (d) Lippes loop

Q3. CBSE 2026 · 1 mark A female undergoing IVF treatment has blocked fallopian tube. The technique by which the embryo with more than 8 blastomeres will be transferred into the female for further development is:

- (a) ZIFT (b) GIFT (c) IUT (d) AI

Q4. CBSE 2026 · 1 mark A man is found to have a sperm count of less than 20 million/mL and his wife is diagnosed with blockage in the oviduct. This couple would be advised to go for which of the following techniques? (i) ZIFT (ii) AI (iii) IUT (iv) ICSI (v) GIFT

- (a) (i) and (iii) (b) (ii) and (iii) (c) (iii) and (iv) (d) (iv) and (v)

Q5. CBSE 2026 · 1 mark Match the IUDs in Column I with suitable example in Column II. Column I: a. Non-medicated, b. Copper releasing, c. Hormone releasing. Column II: i. Lippes loop, ii. LNG-20, iii. Multiload 375.

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

Q6. CBSE 2025 · 1 mark Assertion (A): Copper-T increases phagocytosis of sperms. Reason (R): It is a non-steroidal preparation.

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

Q7. CBSE 2025 · 1 mark Assertion (A): increases phagocytosis of sperms. Reason (R): It is a non-steroidal preparation. Select the correct answer to these questions from the codes (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

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

Q8. CBSE 2025 · 1 mark Assertion (A): It is possible to obtain virus-free plants from an infected plant. Reason (R): If the plant is infected with a virus, the roots and the stems are free of virus. Select the correct answer.

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

Q9. CBSE 2025 · 1 mark Assertion (A): Estrogen increases phagocytosis of sperms. Reason (R): It is a non-steroidal preparation. Select the correct answer.

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



Q10. CBSE 2025 · 1 mark Assertion (A): Cu-T, Cu-7 and LNG-20 are the most widely used copper-releasing IUDs. Reason (R): Cu-ions in IUDs effectively suppress sperm motility and the fertilising capacity of sperms.

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

Q11. CBSE 2025 · 1 mark Assertion (A) : Mode of action of pills and implants/injectables is similar. Reason (R) : The effective period of pills is much longer as compared to implants/injectables.

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

Q12. CBSE 2025 · 1 mark Assertion (A) : avoiding chances of ovum and sperm meeting. Reason (R) : It is made of thin rubber/latex sheath and is used to cover the penis before coitus.

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

Q13. CBSE 2024 · 1 mark The source of 'Smack' is:

- (a) Leaves of Cannabis sativa (b) Flowers of Datura
- (c) Fruits of Erythroxylum coca
- (d) Latex of Papaver somniferum

Q14. CBSE 2024 · 1 mark The periodic abstinence by a couple for family planning should be from :

- (a) Day 5 to 10 of menstrual cycle
- (b) Day 13 to 15 of menstrual cycle
- (c) Day 10 to 17 of menstrual cycle
- (d) Day 16 to 20 of menstrual cycle

Q15. CBSE 2024 · 1 mark Assertion (A): The laws of our country permit legal adoption and it is as yet, one of the best methods for childless couples looking for parenthood. Reason (R): Emotional, religious and social factors are no deterrents to the legal adoption of orphaned and destitute children in India.

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

Q16. CBSE 2023 · 1 mark Which of the following sexually transmitted disease is not caused by a virus ?

- (a) Genital herpes (b) Gonorrhoea (c) Genital warts
- (d) Hepatitis-B

Q17. CBSE 2023 · 1 mark Assertion (A) : Breast-feeding is advised by the doctor as it is essential for the new borns. Reason (R) : Colostrum secreted by the mother during initial days of lactation has abundant antibodies containing IgE and IgG.

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

VERY SHORT ANSWER (19)

Q18. CBSE 2026 · 2 marks (b) A girl develops sneezing, watery eyes and difficulty in breathing every time she visits a flower garden. (i) Identify the condition. (ii) Name the immune component responsible for this condition. (iii) Name the chemical released. (iv) State one medicine used to treat such a condition.

Q19. CBSE 2026 · 2 marks How do 'implants' act as an effective method of contraception in human females? Mention one advantage of implants over contraceptive pills.

Q20. CBSE 2026 · 2 marks Define the term 'amniocentesis'. Why has the government imposed a statutory ban in spite of its importance in the medical field?

Q21. CBSE 2025 · 2 marks Explain what is meant by the term MTP. What was the main reason to legalize MTP by the Government of India?

Q22. CBSE 2025 · 2 marks Write two features of an ideal contraceptive. Explain any one natural contraceptive method that makes the chances of conception almost nil.

Q23. CBSE 2025 · 2 marks (b) Other than public awareness and counselling, enlist four measures taken up by NACO, WHO and other NGOs to prevent the spread of HIV infection in the society.

Q24. CBSE 2025 · 2 marks (a) Explain what is meant by the term amniocentesis. How is this technique misused in India?

Q25. CBSE 2025 · 2 marks (a) Explain what is meant by the term amniocentesis. How is this technique misused in India ? OR (b) Name any two VD's which might occur in a human female. State any two complications in a female if it is left untreated.

Q26. CBSE 2025 · 2 marks (a) Why are restrictions imposed on MTP in India ? Up to how many weeks or trimesters, is MTP considered relatively safe for a female, if necessary to perform, by a medical practitioner ?

Q27. CBSE 2024 · 2 marks A farmer while working on his farm was bitten by a poisonous snake. He was rushed to a nearby health centre where the doctor gave him an injection to save his life. (i) What did the doctor inject and why? (ii) Name the kind of immunity provided by this injection.

Q28. CBSE 2024 · 2 marks Write the basic steps followed in the Assisted Reproductive Technologies (ART) programme to help childless couples. Why is it also known as test tube baby programme ?

Q29. CBSE 2024 · 2 marks (a) Name any two copper releasing intra-uterine devices. State two reasons that make them effective contraceptives.



Q30. CBSE 2024 · 2 marks Oral contraceptives are widely accepted for controlling the increasing rate of population. Name the two important components of oral contraceptives used by women ?

Q31. CBSE 2024 · 2 marks What is a vaccine ? Write the basis on which it acts when administered in the body.

Q32. CBSE 2024 · 2 marks State the procedure followed in the technique of amniocentesis. List any two advantages of this technique.

Q33. CBSE 2024 · 2 marks Amniocentesis is a very useful and important technique, but due to some reason there is a statutory ban on amniocentesis. Justify this statement.

Q34. CBSE 2024 · 2 marks (a) Intensely lactating mothers generally do not conceive. Why ? (b) Our government has intentionally imposed strict conditions for MTP. Why ?

Q35. CBSE 2023 · 2 marks (a) Explain the Intrauterine Insemination method. OR (b) Explain how recombinant DNA technology is used to detect a disease even before any clinical symptom appears.

Q36. CBSE 2022 · 2 marks State the mode of action of cocaine on human body. Write the scientific name of the source plant it is obtained from.

SHORT ANSWER (11)

Q37. CBSE 2025 · 3 marks A village health worker was taking a session with women. She tells them that one has to be careful while using oral pills as a method of birth control. Wrong usage can actually promote conception. (a) Analyse the above statement and compare the merits and demerits of using oral pills and surgical methods of birth control. (b) Village women are confused as to how a thin metallic copper loop can provide protection against pregnancy. Explain the mode of action of IUDs. Give two points.

Q38. CBSE 2024 · 3 marks (a) What is an in vitro fertilization (IVF) and write its importance. (b) Distinguish between GIFT and ZIFT.

Q39. CBSE 2024 · 3 marks Explain the IUI and IUT methods of assisted reproductive technologies.

Q40. CBSE 2024 · 3 marks Explain the mode of action of contraceptive pills taken by human females. Mention the schedule to be followed for effective outcome.

Q41. CBSE 2024 · 3 marks (b) In case of any dispute, a very small sample of tissue or even a drop of blood can help us to determine the paternity of a child. Provide a scientific explanation to substantiate the statement.

Q42. CBSE 2024 · 3 marks (a) State the importance of IVF. (b) Distinguish between GIFT and ZIFT.

Q43. CBSE 2023 · 3 marks (a) (i) Expand the abbreviations given below, used for different modes of assisted reproductive technologies : (1) ZIFT (2) ICSI (3) IUT (4) GIFT (ii) Which one of them cannot be considered as a procedure of IVF ? Give reasons in support of your answer.

Q44. CBSE 2023 · 3 marks (a) (i) Expand the abbreviations given below, used for different modes of assisted reproductive technologies: (1) ZIFT (2) ICSI (3) IUT (4) GIFT (ii) Which one of them cannot be considered as a procedure of IVF? Give reasons in support of your answer. OR (b) Differentiate between the following: (i) Perisperm and Pericarp (ii) Syncarpous pistil and Apocarpous pistil (iii) Plumule and Radicle

Q45. CBSE 2023 · 3 marks Expand and explain the following techniques used in human reproduction: (a) GIFT (b) ZIFT (c) IUI

Q46. CBSE 2023 · 3 marks Expand and explain the following techniques used in assisted reproduction: (a) GIFT (b) ZIFT (c) IUI

Q47. CBSE 2023 · 3 marks Expand and explain the following techniques used in test tube baby programme: (a) GIFT (b) ZIFT (c) IUI

LONG ANSWER (3)

Q48. CBSE 2026 · 5 marks (b) (i) Case studies of some couples are given below. They were not able to have kids even though the parents were not taking any precautions. They also do not wish to adopt a child or take the help of donors. Study these cases and suggest an appropriate Assisted Reproductive Technology that could help them. Case I – Female – Normal Reports / Male – Normal sperms but no connection between epididymis and vas deferens. (1 mark) Case II – Female – Normal eggs but Fallopian tube blocked. / Male – Normal sperms. Male reports are normal. (1 mark) Case III – Female – Normal Reports. / Male – Low sperm count with less motility. (1 mark) (ii) Copper releasing intrauterine devices are very effective and popular contraceptive devices. Name any two copper releasing IUDs. Write two reasons that make them effective contraceptives. (2 marks)

Q49. CBSE 2026 · 5 marks (a) (i) What is the 'RCH' programme and what is its motive? (ii) Make a list of five steps to implement the programme and to create awareness among the people about reproduction-related aspects. (iii) Which test in this field is meant for useful study but is misused by people? Write the importance of this test. OR (b) (i) Write the average duration of human pregnancy. By what name is this period known as? (ii) Explain the terms Menarche and Menopause. (iii) Name and explain the sterilisation methods in males and females.

Q50. CBSE 2026 · 5 marks (b) Medical Termination of Pregnancy (MTP) plays an important role in reproductive health. (i) What is MTP ? (ii) Under what conditions is it legally permitted in India ? Mention any two points. (iii) In which stage of pregnancy is MTP considered legally and medically safe ? (iv) Explain any two risks/concerns associated with this process.



4 Principles of Inheritance and Variation

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (59)

Q1. CBSE 2026 · 1 mark In a dihybrid cross, 2400 individuals are produced in F₂ generation. Approximately how many will be phenotypically similar to parents?

- (a) 2000 (b) 1500 (c) 580 (d) 450

Q2. CBSE 2026 · 1 mark A woman having genes for haemophilia on one X chromosome and a gene for colour blindness on another X chromosome marries a normal man. The progeny will show

- (a) 50% haemophilic and colour-blind sons, 50% normal sons.
(b) 50% haemophilic carrier daughter, 50% colour-blind carrier daughters.
(c) All sons and daughters colour-blind and haemophilic.
(d) Only haemophilic and colour-blind daughters.

Q3. CBSE 2026 · 1 mark Which of the following traits studied by Mendel in pea plant is a recessive trait?

- (a) Tall stem (b) Green pod (c) Green seed
(d) Violet flower

Q4. CBSE 2026 · 1 mark When glutamic acid changes to valine at the 6th position of the beta globin chain of haemoglobin, it results in a genetic disorder. Choose the option that indicates the correct disorder.

- (a) Thalassemia (b) Phenylketonuria (c) Sickle cell anaemia
(d) Haemophilia

Q5. CBSE 2026 · 1 mark A person has a short stature with small round head, furrowed tongue and partially open mouth. Select the option indicating the chromosomal disorder.

- (a) Turner's syndrome (b) Klinefelter's syndrome
(c) Down's syndrome (d) Dwarfism

Q6. CBSE 2026 · 1 mark What would be the minimum possibility of a dominant trait being expressed in an offspring after a monohybrid test cross?

- (a) 25% (b) 50% (c) 75% (d) 100%

Q7. CBSE 2026 · 1 mark Select the correct statement. All genes located on the same chromosome:

- (a) form different groups depending upon their relative distance.
(b) form one linkage group.
(c) will not form linkage groups.
(d) form interactive groups that affect the phenotype.

Q8. CBSE 2026 · 1 mark Assertion (A): The human blood group 'AB' exemplifies co-dominance. Reason (R): The gene for human blood group trait exists in three allelic forms I^A, I^B and i.

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

Q9. CBSE 2026 · 1 mark Which one of the following statements is correct?

- (a) Homozygous sex chromosomes (ZZ) determine female sex in birds.
(b) XO type of sex chromosomes determine male sex in grasshoppers.
(c) XXY condition in humans is found in Turner's syndrome.
(d) Homozygous sex chromosomes (XX) produce males in *Drosophila*.

Q10. CBSE 2026 · 1 mark In *Pisum sativum*, the flower colour may be violet (V) or white (v). What proportion of the offspring in a cross of 'VV' × 'vv' would be expected to be violet?

- (a) 25% (b) 50% (c) 75% (d) 100%

Q11. CBSE 2026 · 1 mark If a genetic disease is transferred from a phenotypically normal but carrier female to only some of the male progeny, the disease is:

- (a) autosomal dominant (b) autosomal recessive
(c) sex-linked dominant (d) sex-linked recessive

Q12. CBSE 2025 · 1 mark In a pea plant (*Pisum sativum*) inflated pod shape is dominant over constricted pod shape. The expected ratio of phenotypes of the offspring in a cross between both the parents with heterozygous inflated pod shape will be:

- (a) 1 : 0 (b) 1 : 1 (c) 2 : 1 (d) 3 : 1

Q13. CBSE 2025 · 1 mark Assertion (A): ABO blood grouping in humans is an example of multiple allelism. Reason (R): More than two genes in a population govern the same character in ABO blood grouping in humans.

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

Q14. CBSE 2025 · 1 mark A colourblind man marries a woman with normal sight who has no history of colourblindness in her family. What is the probability of their son being colourblind?

- (a) 0.5 (b) 1 (c) Nil (d) 0.25

Q15. CBSE 2025 · 1 mark In pea plant (*Pisum sativum*) axial flower position is dominant over terminal flower position. The expected ratio of phenotypes of the offspring in a cross between both the parents with heterozygous axial flower will be:

- (a) 3 : 1 (b) 2 : 1 (c) 1 : 1 (d) 1 : 0



Q16. CBSE 2025 · 1 mark Assertion (A): ABO blood grouping in humans is an example of multiple allelism. Reason (R): More than two genes in a population govern the same character in ABO blood grouping in humans. Select the correct answer to these questions from the codes (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

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

Q17. CBSE 2025 · 1 mark Thalassaemia and Sickle Cell Anaemia are both caused due to problem in globin molecule synthesis. Select the correct statement:

- (a) Both are due to a quantitative defect in globin chain synthesis.
- (b) Thalassaemia is due to less synthesis of globin molecules.
- (c) Sickle cell anaemia is due to a quantitative problem of globin molecules.
- (d) Both are due to qualitative defect in globin chain synthesis.

Q18. CBSE 2025 · 1 mark In a pea plant (*Pisum sativum*) green pod colour is dominant over yellow pod colour. The expected ratio of phenotypes of the first generation offspring in a cross between both the parents with heterozygous green pod colour will be:

- (a) 0 : 1 (b) 1 : 1 (c) 2 : 1 (d) 3 : 1

Q19. CBSE 2025 · 1 mark Assertion (A): ABO blood grouping in humans is an example of multiple allelism. Reason (R): More than two genes in a population govern the same character in ABO blood grouping in humans. Select the correct answer.

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

Q20. CBSE 2025 · 1 mark Assertion (A): Gene pairs present on the same chromosome may be tightly linked or loosely linked. Reason (R): Frequency of recombination between gene pairs on different chromosomes as a measure of the distance the chromosomes.

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

Q21. CBSE 2025 · 1 mark Match the terms in Column-I with their description in Column-II and choose the correct option. Column-I (Terms): a. Dominance, b. Codominance, c. Pleiotropy, d. Polygenic inheritance. Column-II (Descriptions): (i) Many genes govern a single character. (ii) In a heterozygote organism, only one allele expresses itself. (iii) In a heterozygous organism, both alleles express themselves fully. (iv) A single gene influences many characters.

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

Q22. CBSE 2025 · 1 mark In a pea plant (*Pisum sativum*), green pod colour is dominant over yellow pod colour. The expected ratio of the phenotypes of the offsprings (F1) in a cross between parents with heterozygous green pod colour and homozygous yellow pod will be :

- (a) 1 : 1 (b) 2 : 1 (c) 3 : 1 (d) 4 : 1

Q23. CBSE 2025 · 1 mark Which of the following do not follow the law of independent assortment ?

- (a) Genes on non-homologous chromosomes and absence of linkage
- (b) Two or more genes on homologous chromosomes
- (c) Linked genes located on the same chromosomes
- (d) Two or more distant genes present on the same chromosome

Q24. CBSE 2025 · 1 mark Assertion (A) : In dihybrid crosses involving sex-linked genes in *Drosophila* generation of non-parental gene combinations are observed. Reason (R) : Two genes present on different chromosomes show linkage and recombination in *Drosophila*.

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

Q25. CBSE 2025 · 1 mark When a pure tall pea plant (*Pisum sativum*) with green pod is crossed with dwarf pea plant with yellow pod, how many dwarf pea plants, out of 16, will be produced in F2 generation ?

- (a) 9 (b) 3 (c) 4 (d) 1

Q26. CBSE 2025 · 1 mark Inheritance of which of the following traits is shown in the cross given below ? XY (Normal man) × XX (Carrier woman) → XX (Carrier daughter) × XX (Normal daughter) → XY (Normal son) × XCY Genetic disorders (Diseased son)

- (a) Autosomal recessive trait (b) X-linked dominant trait
- (c) X-linked recessive trait (d) Autosomal dominant trait

Q27. CBSE 2025 · 1 mark In a pedigree chart, if two unaffected individuals have a child with the trait, what is the most likely mode of inheritance for this trait ?

- (a) Autosomal dominant (b) Autosomal recessive
- (c) X-linked dominant (d) X-linked recessive



Q28. CBSE 2025 · 1 mark A normal couple produces half the sons as haemophilic and half the daughters as carriers. Choose the option that correctly indicates the chromosome on which the gene for this trait is located.

- (a) X-chromosome of father (b) Y-chromosome of father
- (c) One X-chromosome of mother
- (d) Both the X-chromosomes of the mother

Q29. CBSE 2025 · 1 mark Which of the following conditions correctly describes the manner of determining the sex in the given options?

- (a) Homozygous sex chromosomes (ZZ) determine female sex in birds.
- (b) XO type of chromosomes determine male sex in grasshoppers.
- (c) XO condition in humans determines female sex.
- (d) Homozygous sex chromosomes (XX) produce male in *Drosophila*.

Q30. CBSE 2025 · 1 mark Assertion (A): A male individual always inherits haemophilia from his mother. Reason (R): The gene for haemophilia lies on X-chromosome.

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

Q31. CBSE 2025 · 1 mark A dwarf pea plant was treated with gibberellic acid and it becomes as tall as a tall pea plant. If these treated pea plants are crossed with pure tall pea plants, the phenotypic ratio in F₁ generation will be:

- (a) All tall (b) 50% tall, 50% dwarf (c) 75% tall, 25% dwarf
- (d) 25% tall, 75% dwarf

Q32. CBSE 2025 · 1 mark In a certain population, the frequency of three genotypes is as follows: Genotypes: PP Pp pp Frequency: 22% 62% 16%. Choose the option that shows the frequency of P and p alleles correctly:

- (a) 53% 47% (b) 47% 53% (c) 40% 46% (d) 22% 16%

Q33. CBSE 2024 · 1 mark A single gene that controls the expression of more than one trait is said to show

- (a) Multiple allelism (b) Polygenic inheritance
- (c) Incomplete dominance (d) Pleiotropism

Q34. CBSE 2024 · 1 mark A person with trisomy of 21st chromosome shows

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

Q35. CBSE 2024 · 1 mark If both the parents are carriers for thalassaemia, the chances of an afflicted child to be born to them is:

- (a) 25% (b) 50% (c) 75% (d) 100%

Q36. CBSE 2024 · 1 mark Assertion (A): In birds the sex of the offspring is determined by males. Reason (R): Males are homogametic while females are heterogametic.

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

Q37. CBSE 2024 · 1 mark Which one of the following chromosomal event will not result in genetic variation amongst the offsprings ?

- (a) Independent assortment (b) Crossing over (c) Linkage
- (d) Mutation

Q38. CBSE 2024 · 1 mark The human chromosome with the highest and least number of genes in them are respectively:

- (a) Chromosome 21 and Y. (b) Chromosome 1 and X.
- (c) Chromosome 1 and Y. (d) Chromosome X and Y.

Q39. CBSE 2024 · 1 mark Select the incorrect match from the following: Human Karyotype and Characters

- (a) 45 + XX — Broad palm with characteristic palm crease
- (b) 44 + XXY — Overall feminine development
- (c) 44 + XO — Sterile females as ovaries are rudimentary
- (d) 44 + XY — Normal male

Q40. CBSE 2024 · 1 mark Assertion (A): Linked genes do not show dihybrid F₂ ratio 9 : 3 : 3 : 1. Reason (R): Linked genes do not undergo independent assortment.

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

Q41. CBSE 2024 · 1 mark Select the incorrect match from the following : Human Karyotype | Characters

- (a) 45 + XX | Broad palm with characteristic palm crease
- (b) 44 + XXY | Overall feminine development
- (c) 44 + XO | Sterile females as ovaries are rudimentary
- (d) 44 + XY | Normal male

Q42. CBSE 2024 · 1 mark Match the items in Column I with those in Column II and select the correctly matched option from those given below : Column I Cross Column II Phenotypic Ratio 1. Mendelian monohybrid (i) 1 : 2 : 1 (F₂) 2. Mendelian dihybrid (ii) 1 : 1 3. Incomplete dominance (iii) 3 : 1 (F₂) 4. Test cross (monohybrid) (iv) 9 : 3 : 3 : 1 (F₂)

- (a) 1(ii), 2(iv), 3(i), 4(iii) (b) 1(iii), 2(i), 3(iv), 4(ii)
- (c) 1(iii), 2(iv), 3(i), 4(ii) (d) 1(ii), 2(i), 3(iv), 4(iii)

Q43. CBSE 2024 · 1 mark A woman with normal vision has a colour blind father. She marries a man with normal vision. The percentage chance of their progeny being colour blind is :

- (a) 25% (b) 50% (c) 75% (d) 100%



Q44. CBSE 2024 · 1 mark The expected phenotypic ratio amongst the progeny of 60 individuals, obtained from a cross between heterozygous tall pea plant and dwarf pea plant is:

- (a) 45 tall and 15 dwarf (b) 40 tall and 20 dwarf
(c) 30 tall and 30 dwarf (d) 35 tall and 25 dwarf

Q45. CBSE 2024 · 1 mark A Snapdragon plant bearing pink colour flowers is crossed with a Snapdragon plant bearing white colour flowers. The expected phenotypic percentage of the offspring is :

- (a) 50% Red : 50% White
(b) 25% Red : 50% Pink : 25% White
(c) 50% Pink : 50% White
(d) 25% Pink : 50% Red : 25% White

Q46. CBSE 2024 · 1 mark In which of the given chromosomal disorders does the individual have tall stature with feminised character ?

- (a) Noonan syndrome (b) Down syndrome
(c) Turner syndrome (d) Edwards syndrome

Q47. CBSE 2024 · 1 mark A Snapdragon plant bearing red colour flowers was crossed with a Snapdragon plant bearing white colour flowers. The F₁ progeny on selfing produced the progeny in the ratio of :

- (a) 50% Red : 50% White
(b) 25% Pink : 50% White : 25% Red (c) 50% Red : 50% Pink
(d) 25% Red : 50% Pink : 25% White

Q48. CBSE 2024 · 1 mark In which of the following chromosomal disorders do individuals have short stature, underdeveloped feminine character and sterile ovaries ?

- (a) Down syndrome (b) Turner syndrome
(c) Klinefelter syndrome (d) Patau syndrome

Q49. CBSE 2024 · 1 mark In which of the following chromosomal disorders do the individuals have short stature, small head, furrowed tongue and partially open mouth ?

- (a) Turner syndrome (b) Down syndrome
(c) Klinefelter syndrome (d) Edwards syndrome

Q50. CBSE 2024 · 1 mark A Snapdragon plant bearing pink colour flowers is crossed with a Snapdragon plant bearing white colour flowers. Their F₁ progeny will show :

- (a) 25% Red : 50% Pink : 25% White
(b) 50% Red : 50% White (c) 50% Pink : 50% White
(d) 25% Pink : 50% Red : 25% White

Q51. CBSE 2024 · 1 mark Turner's syndrome in humans occurs due to

- (a) Aneuploidy (b) Euploidy (c) Polyploidy
(d) Autosomal abnormality

Q52. CBSE 2024 · 1 mark Which of the chromosome in a human possesses the least number of genes ?

- (a) 21st chromosome (b) 16th chromosome
(c) X-chromosome (d) Y-chromosome

Q53. CBSE 2023 · 1 mark Which one of the following processes results in the production of recombinants in future generations? (i) Mutation (ii) Independent assortment during meiosis I (iii) Independent assortment during meiosis II (iv) Crossing over of bivalents

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

Q54. CBSE 2023 · 1 mark Assertion (A): Birds like pigeon have heterogametic females whereas the males are homogametic. Reason (R): In pigeons, females have Z and W sex chromosomes whereas males have ZZ sex chromosomes.

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

Q55. CBSE 2023 · 1 mark Choose the set of sex determining chromosomes that indicates the correct sex of the respective organism.

- (a) Homozygous sex chromosomes (ZZ) determine female sex in birds
(b) XO type of sex chromosomes determine male sex in grasshoppers
(c) XXY condition in humans, as found in Turner Syndrome, determines male sex
(d) Homozygous sex chromosomes (XX) produce male sex in Drosophila

Q56. CBSE 2023 · 1 mark DNA profiles of the child and three individuals 1, 2 and 3 who claim to be the parents of the child are given below. Select the option that shows the correct actual parent/parents of the child.

- (a) Individual 1 and 3 (b) Individual 1 and 2
(c) Individual 2 and 3
(d) Individual 1 is the only parent of the child amongst 1, 2 and 3

Q57. CBSE 2023 · 1 mark Assertion (A): In humans the genotype with all the dominant alleles (AABBCC) will have the darkest skin colour. Reason (R): In a polygenic trait, phenotype reflects the contribution of each allele.

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

Q58. CBSE 2023 · 1 mark Which of the following statements are true about the males in a colony of honey bees? (i) They have 16 chromosomes per cell. (ii) They produce sperms by meiosis. (iii) They have a grandfather but no father. (iv) All males in the colony are haploid except one.

- (a) (i) and (iii) only (b) (ii) and (iii) only (c) (iii) and (iv) only
(d) (ii) and (iv) only



Q59. CBSE 2023 · 1 mark Assertion (A) : In a monohybrid cross between tall plants and dwarf plants, the F₂ generation showed tall and dwarf plants in the ratio of 3 : 1. Reason (R) : There is no blending of traits/characters in the F₂ generation.

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

VERY SHORT ANSWER (10)

Q60. CBSE 2026 · 2 marks (a) Analyse the following two cases of sex determination in different organisms: Case I: Males have (XO) sex chromosomes and females have two copies of same sex chromosome (XX). Case II: Females have two different sex chromosomes (ZW) and males have two copies of same sex chromosome (ZZ). Identify the type of heterogamety in each case, giving one example of each. (1 + 1 marks)

Q61. CBSE 2026 · 2 marks (a) Analyse the following two cases of sex determination in different organisms: Case I: Males have (XO) sex chromosomes and females have two copies of same sex chromosome (XX). Case II: Females have two different sex chromosomes (ZW) and males have two copies of same sex chromosome (ZZ). Identify the type of heterogamety in each case, giving one example of each. (1+1 marks) OR (b) (i) Differentiate between a DNA and RNA nucleotide. (1 mark) (ii) Name the two types of bonds present within a single nucleotide. (1 mark)

Q62. CBSE 2026 · 2 marks Mendel published his work on inheritance in 1865, but it remained unnoticed for over three decades. State the reasons why his work was not recognised during his life time. (4 points)

Q63. CBSE 2026 · 2 marks Is it possible for a trait to be inherited by an organism but not expressed in its phenotype? Justify and illustrate your answer with a suitable Mendelian Cross.

Q64. CBSE 2026 · 2 marks (a) Explain the mechanism of sex-determination in insects like *Drosophila* and Grasshopper. OR (b) How does a chromosomal disorder differ from a Mendelian disorder? Name any two chromosomal disorders.

Q65. CBSE 2026 · 2 marks What did Henking observe in his experiments on insects that led to the discovery of sex chromosome? How did his observation contribute to our understanding of sex determination?

Q66. CBSE 2026 · 2 marks State any four reasons why Mendel succeeded in his genetic hybridisation experiments on garden peas.

Q67. CBSE 2025 · 2 marks (a) Write the scientific name of the fruit fly. (b) Why did Morgan prefer to work with fruit flies for his experiments? State two reasons.

Q68. CBSE 2024 · 2 marks If the base adenine constitutes 31% of an isolated DNA fragment, then write what will be the expected percentage of the base cytosine in it. Explain how did you arrive at the answer given.

Q69. CBSE 2024 · 2 marks Although Haemophilia and sickle cell anemia are two blood related Mendelian disorders, yet, they differ in their pattern of inheritance. State any two differences.

SHORT ANSWER (24)

Q70. CBSE 2026 · 3 marks (a) Give the scientific name of the organism used by Morgan to study sex-linked traits. (b) Write any four reasons why this organism made it an ideal experimental model.

Q71. CBSE 2026 · 3 marks Give the scientific name of the organism used by Morgan to study sex-linked traits. Write any four reasons why this organism made it an ideal experimental model.

Q72. CBSE 2026 · 3 marks (a) Describe the experiment conducted by T.H. Morgan on *Drosophila melanogaster* involving eye colour and body colour. (b) How did the results deviate from Mendelian inheritance pattern? (c) Explain the two genetic terms used by Morgan for his observations.

Q73. CBSE 2026 · 3 marks Explain the polygenic inheritance pattern with the help of a suitable example.

Q74. CBSE 2025 · 3 marks Gregor Mendel conducted hybridisation experiments in garden pea for seven years and proposed the law of inheritance. (a) Why was he successful in his hybridisation experiments? Give two reasons. (b) State the law of independent assortment as proposed by Mendel after his dihybrid crosses.

Q75. CBSE 2025 · 3 marks Thomas Hunt Morgan carried out several dihybrid crosses in *Drosophila melanogaster* to study genes that were sex linked. (a) Give four major reasons for using the tiny fruit flies by Morgan for his experiments. (b) How did Morgan and his group explain the physical association of the two genes on a chromosome to the frequency of recombination between gene pairs on the same chromosome?

Q76. CBSE 2025 · 3 marks Gregor Mendel used true-breeding pea lines to conduct his hybridisation experiments in garden pea. (a) Explain what is meant by true-breeding pea lines. (b) State the three important points of law of dominance as proposed by Gregor Mendel.

Q77. CBSE 2025 · 3 marks During a medical investigation, an infant was found to possess an extra copy of chromosome no. 21. Identify the disorder the child is suffering from. Describe the symptoms the child is likely to develop later in life.

Q78. CBSE 2025 · 3 marks Name a blood related autosomal Mendelian disorder. Why is it called as Mendelian disorder? How is the disorder transmitted from parents to offspring?

Q79. CBSE 2025 · 3 marks Name one commonly occurring genetic disorder in humans which is caused due to monosomy (one chromosome less than the normal number of chromosomes) of sex chromosome. Give its two symptoms.



Q80. CBSE 2025 · 3 marks Answer the following questions with respect to the sex determining mechanism observed in honey bee. (a) Name the type of sex determination system observed in honey bee. (b) Fill in the blanks (i), (ii) and (iii) in the given question. Parent Male: Type of cell division involved during gamete formation in males (i) _____, Number of chromosomes in the gametes (ii) _____, Number of chromosomes in the diploid cell of the progeny (iii) _____. (c) What will be the sex and chromosome number of the progeny formed from the unfertilised eggs of honey bee ?

Q81. CBSE 2025 · 3 marks Answer the following questions with respect to the sex determining mechanism observed in honey bee. (a) What is the type of cell division involved in the formation of gametes in a female bee and a male bee respectively ? (b) Name the type of sex determination system observed in honey bee. (c) What is the sex of honey bee formed from the unfertilised eggs ? Write the number of chromosomes present in it.

Q82. CBSE 2024 · 3 marks Expression of different genes for different traits may show dominance, incomplete dominance or co-dominance. Write about expression of such genes with the help of one example each.

Q83. CBSE 2024 · 3 marks In a family, the father, the daughter and the son are colour blind, whereas the mother has normal vision. Do you think the son and the daughter have inherited the disease from their father ? Work out a cross to justify your answer.

Q84. CBSE 2024 · 3 marks (a) (i) Write the karyotype and the genetic disorder of an individual who has XXY sperm fertilizing an X egg. (ii) Mention any two symptoms of this genetic disorder. (iii) Write the possible reason that leads to the formation of this type of aneuploidy.

Q85. CBSE 2024 · 3 marks Explain the mechanism of haplo-diploid pattern of sex determination with the help of a suitable example. Why is this pattern so called?

Q86. CBSE 2024 · 3 marks Human blood group (ABO group) inheritance is a good example of multiple allelism and co-dominance. Justify the statement.

Q87. CBSE 2024 · 3 marks (a) (i) Write the karyotype and the genetic disorder of an individual who has XXY (fertile Y). (ii) Mention any two symptoms of this genetic disorder. (iii) Write the possible reason that leads to the formation of this condition.

Q88. CBSE 2024 · 3 marks Three crosses were carried out in pea plants with respect to flower colour violet/white (V/v) and flower position axial/terminal (A/a). Study in the table the crosses 1, 2 and 3 where parental phenotypes and F1 progeny phenotypes are given. Parental plants (Phenotypes) | F1 Progeny (Phenotypes) (a) Violet, axial × white, axial | 6/16 white, axial; 2/16 white, terminal; 6/16 violet, axial; 2/16 violet, axial (b) Violet, axial × white, terminal | 1/4 violet, axial; 1/4 violet, terminal; 1/4 white, axial; 1/4 white, terminal (c) Violet, axial × violet, axial | 3/4 violet, axial; 1/4 white, axial Work out the genotypes of each parent in each cross.

Q89. CBSE 2024 · 3 marks Three crosses were carried out in pea plants with respect to flower colour violet/white (V/v) and flower position axial/terminal (A/a). Study in the table the crosses and F1 progeny phenotypes are given. Parental plants (Phenotypes) and F1 Progeny (Phenotypes) are given. For each cross and F1 progeny, decipher the genotype of the parent and F1 generation (Find out).

Q90. CBSE 2024 · 3 marks Three crosses were carried out in pea plants with respect to flower colour violet/white (V/v) and flower position axial/terminal (A/a). Study in the table the crosses 1 and 2 where parental plants phenotypes and F1 progeny phenotypes are given. Find the genotypes of each cross.

Q91. CBSE 2024 · 3 marks (a) A man with blood group 'A' marries a woman with blood group 'AB'. The first child born to them has blood group 'B'. Work out a cross to find the genotype of the father. Give the possible blood groups and their genotypes of the children that could be born to this couple. (Use a Punnet square). (b) State the basis of 'ABO' blood grouping in humans.

Q92. CBSE 2024 · 3 marks With reference to flower colour two independent crosses were made, one between true breeding garden pea plants and another between true breeding Antirrhinum plants. Write the phenotypes of their F1-progeny. Justify your answer giving reason.

Q93. CBSE 2024 · 3 marks A pea plant with purple flowers, when crossed with a plant with white, produced 50 plants with only purple flowers. On selfing these plants produced 482 plants with purple flower and 162 with white flowers. Explain the pattern of inheritance with the help of Punnet square.

LONG ANSWER (19)

Q94. CBSE 2026 · 5 marks (b) In a particular cattle, the coat colour red and white are controlled by single pair of alleles. A calf that receives allele for red coat from mother and allele for white coat from father shows equal number of red and white hairs on its coat. (i) Is this an example of Co-dominance or incomplete dominance. Give a reason for your answer. (ii) With the help of a genetic cross upto F 2 generation, explain what will be the consequent phenotype of calf when (1) Red is dominant over white, (2) Red is incompletely dominant.

Q95. CBSE 2026 · 5 marks How would you find out whether a given tall garden pea plant is homozygous or heterozygous? Substantiate your answer with the help of Punnet square.

Q96. CBSE 2026 · 5 marks (b) The following questions are based on haemophilia. (i) Work out the crosses between: (I) Normal female and Haemophilic male (II) Carrier female and Normal male (III) Carrier female and Haemophilic male (ii) Write the conclusions you draw from these crosses. Comment on the type of inheritance of the disease. (Use: X – Normal, Xh – Haemophilic)

Q97. CBSE 2026 · 5 marks (b) (i) What are multiple alleles ? How do they differ from simple dominant-recessive allele pairs ? (ii) Explain the concept of multiple alleles with the help of a human trait studied by you. (iii) Mention all possible genotypes with their corresponding phenotypes of the human trait as explained by you. (iv) Comment on the type of inheritance pattern involved in the example explained by you.



Q98. CBSE 2026 · 5 marks (a) Write the types and locations of the genes causing thalassemia in humans. State the cause and symptoms of the disease. How is sickle-cell anemia different from this disease?

Q99. CBSE 2026 · 5 marks (a) Work out separate monohybrid crosses up to F₂ generation between two pea plants and two Antirrhinum plants, both having contrasting traits with respect to the colour of the flower. Comment on the patterns of inheritance in the crosses carried out in such two cases.

Q100. CBSE 2025 · 5 marks Differentiate between the following: (i) Polygenic Inheritance and Pleiotropy (ii) Dominance, Codominance and Incomplete dominance

Q101. CBSE 2025 · 5 marks (a) (i) What is a test cross? How can we find out the zygosity of a plant by the use of test cross?

Q102. CBSE 2024 · 5 marks (a) Work out a dihybrid cross upto F₂ generation between pea plants bearing violet coloured axial flowers and white coloured terminal flowers using Punnett's square. Give their F₂ phenotypic ratio. State the Mendel's law of inheritance that was derived from such a cross.

Q103. CBSE 2024 · 5 marks (a) Many patterns of inheritance deviate considerably from the pattern of inheritance as explained by Mendel. List any four such inheritance patterns and explain any three with the help of an example each.

Q104. CBSE 2024 · 5 marks Stability, as one of the properties of genetic material, was very evident in one of the very early experiments in genetics. Name the scientist and describe his experiment. State the conclusion he arrived at.

Q105. CBSE 2024 · 5 marks (a) (i) Compare the pattern of inheritance of flower colour in garden pea plant (violet/white) with snapdragon plant (red/white) on the basis of the following : (1) F₁ phenotypic expression; (2) expected phenotypic and genotypic expression of F₂ generation; (3) the conclusion you reached at the end of the comparison made. (ii) List any two characteristics of pattern of inheritance of human blood group ABO.

Q106. CBSE 2024 · 5 marks (a) (i) State the law of independent assortment. (ii) Explain this law by taking the example of a cross between two heterozygous parents of pea plants with respect to flower colour and flower position using Punnett Square.

Q107. CBSE 2024 · 5 marks (a) Explain codominance with reference to ABO blood group in humans.

Q108. CBSE 2024 · 5 marks (a) In a heterozygous condition, the effect of both alleles is exhibited clearly in codominance. Explain the statement using the example of ABO blood group in humans. OR (b) (i) In the promoter region (operon) a group of genes are regulated and expressed as a single unit. Explain the procedure/process of initiation of the activity of structural genes of lac operon (lac switch-on). (ii) lac operon is said to be under negative regulation. Explain with reason.

Q109. CBSE 2024 · 5 marks (a) In heterozygous condition, the effect of both alleles is observed manifested in codominance. Explain the statement with the help of human ABO blood group in humans. OR (b) In prokaryotes, a group of genes are regulated and expressed together as a unit in lac operon. (i) Explain the mechanism of switching on (ON state) of the structural genes of lac operon. (ii) The regulation of lac operon is called as negative regulation. Why ?

Q110. CBSE 2023 · 5 marks (b) (i) A true breeding tall pea plant with round seeds is crossed with a recessive dwarf pea plant having wrinkled seeds. Work out the cross up to F₂ generation giving the phenotypic ratios of F₁ and F₂ generation respectively. (ii) State the Mendelian principle that can be derived only with the help of such a cross.

Q111. CBSE 2023 · 5 marks (b) You are given a tall pea plant and asked to determine its genotype. Name and explain the cross that you will carry out to find the possible genotype of the given tall pea plant.

Q112. CBSE 2023 · 5 marks (b) A homozygous tall pea plant with green seeds is crossed with a homozygous dwarf pea plant with yellow seeds. (i) Write the possible phenotype and genotype of F₁ generation. (ii) State the laws of Mendel that are proved true by the F₁ generation. (iii) Mention the F₂ phenotypic ratio along with their possible phenotypes. (iv) Write the genotypes of the male and female gametes produced by F₁ progeny.

5 Molecular Basis of Inheritance

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (76)

Q1. CBSE 2026 · 1 mark Which of the following statements about plasmids is incorrect?

- (a) Plasmids have the ability to replicate within the bacterial cell.
- (b) Their replication is controlled by chromosomal DNA.
- (c) They are autonomously replicating circular extra-chromosomal DNA.
- (d) They often carry antibiotic resistant genes.

Q2. CBSE 2026 · 1 mark Messelson and Stahl's experiment carried out centrifugation in CsCl₂ density gradient to separate:

- (a) DNA from RNA (b) DNA from protein
- (c) RNA from protein (d) Normal DNA from heavy DNA

Q3. CBSE 2026 · 1 mark A DNA molecule is 140 base pairs long. It has 20% thymine. How many guanine bases are present in the molecule?

- (a) 64 (b) 84 (c) 32 (d) 56

Q4. CBSE 2026 · 1 mark To separate repetitive DNA from bulk genomic DNA, which of the following method is used ?

- (a) Elution (b) Southern Blotting
- (c) Polymerase Chain Reaction
- (d) Density Gradient Centrifugation



Q5. CBSE 2026 · 1 mark A bacterium having radioactive thymidine in its DNA is allowed to multiply in a medium having non-radioactive thymidine for two generations. What percentage of bacteria will have radioactive thymidine in its DNA ?

- (a) 100 (b) 50 (c) 75 (d) 25

Q6. CBSE 2026 · 1 mark Two plants whose DNA has been sequenced are

- (a) Rice and Wheat (b) Wheat and Maize
(c) Maize and Barley (d) Rice and Arabidopsis

Q7. CBSE 2026 · 1 mark Which of the following is used to visualize DNA bands under UV light after gel electrophoresis?

- (a) Acetocarmine (b) Safranin (c) Ethidium Bromide
(d) Potassium Iodide

Q8. CBSE 2026 · 1 mark Assertion (A): DNA Ligase is used to join DNA fragments. Reason (R): It catalyses the formation of glycosidic bonds between nucleotides.

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

Q9. CBSE 2026 · 1 mark Which one of the following options is the work of Oswald Avery, Colin MacLeod and Maclyn McCarty?

- (a) The genetic material is a protein
(b) They discovered that DNA alone could transform S-Bacteria to R-Bacteria
(c) Proteases affected transformation
(d) RNases affected transformation

Q10. CBSE 2026 · 1 mark Which one of the following combinations of base pair is present only in RNA?

- (a) Adenine and Thymine (b) Guanine and Cytosine
(c) Uracil and Adenine (d) Thymine and Guanine

Q11. CBSE 2026 · 1 mark In the lac operon, which gene is responsible for the production of permease enzyme?

- (a) i gene (b) z gene (c) y gene (d) a gene

Q12. CBSE 2026 · 1 mark If a double-stranded DNA has 30% of cytosine, what will be the percentage of adenine in it?

- (a) 20% (b) 40% (c) 30% (d) 60%

Q13. CBSE 2026 · 1 mark Assertion (A): Eukaryotic mRNA requires post-transcription processing for formation of functional mRNA. Reason (R): Eukaryotic transcripts possess extra non-functional segments called introns.

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

Q14. CBSE 2026 · 1 mark The smallest part of DNA molecule that can be changed by point mutation is:

- (a) Oligonucleotide (b) Codon (c) Gene (d) Nucleotide

Q15. CBSE 2026 · 1 mark Assertion (A): DNA cannot pass through cell membrane of a bacterial cell. Reason (R): DNA is a hydrophilic molecule.

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

Q16. CBSE 2026 · 1 mark Assertion (A): Repetitive sequences are stretches of DNA sequences that are thought to have no direct coding functions. Reason (R): They shed light on chromosome structure, dynamics and evolution.

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

Q17. CBSE 2026 · 1 mark Taylor and colleagues performed an experiment on which of the following organisms to provide proof for semi-conservative replication of DNA in chromosomes ?

- (a) Garden pea (b) Escherichia coli (c) Vicia faba
(d) Drosophila

Q18. CBSE 2026 · 1 mark A gene having non-coding introns and coding exons is known as :

- (a) Pseudogene (b) Structural gene (c) Split gene
(d) Oncogene

Q19. CBSE 2026 · 1 mark Choose the correct statements: (i) Polycistronic mRNA is generally found in eukaryotes. (ii) The RNA polymerase II transcribes precursor of mRNA, the hnRNA. (iii) The process of translation of mRNA begins when the mRNA encounters the large subunit of ribosomes. (iv) Stop codons do not have any tRNAs.

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

Q20. CBSE 2026 · 1 mark A DNA molecule is 160 base pairs long. It has 30% Guanine. How many Adenine bases are present in this DNA molecule?

- (a) 48 (b) 64 (c) 96 (d) 192

Q21. CBSE 2026 · 1 mark Assertion (A): Repetitive sequences make up a very large portion of human genome. Reason (R): Repetitive sequences do not have direct coding functions in the genome.

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



Q22. CBSE 2026 · 1 mark Given below is the restriction site of a restriction endonuclease Pst I and the cleavage sites on a DNA molecule. 5 C — T — G — C — A — G 3 / 3 G — A — C — G — T — C 5. Choose the option that gives the correct resultant fragments.

- (a) 5 C — T — G C — A — G 3 / 3 G — A — C — G — T C 5
- (b) 5 C — T G — C — A — G 3 / 3 G — A — C — G T — C 5
- (c) 5 C — T — G — C A — G 3 / 3 G — A — C — G T — C 5
- (d) 5 C — T — G — C — A G 3 / 3 G A — C — G — T — C 5

Q23. CBSE 2025 · 1 mark Beads-on-string represent:

- (a) Linker DNA (b) Histone proteins (c) Nucleosomes
- (d) NHC proteins

Q24. CBSE 2025 · 1 mark The substrate used during DNA replication by the enzyme DNA-dependent DNA polymerase is:

- (a) Deoxyribonucleotide triphosphate
- (b) Deoxyribonucleoside triphosphate
- (c) Ribonucleotide triphosphate
- (d) Ribonucleoside triphosphate

Q25. CBSE 2025 · 1 mark Use the given information to select the amino acid attached to the 3' end of tRNA during the process of translation, if the coding strand of the structural gene being transcribed has the nucleotide sequence TAC. Codons for the amino acids: AUC - Isoleucine, AUG - Methionine, UAC - Tyrosine, GUA - Valine

- (a) Isoleucine (b) Methionine (c) Tyrosine (d) Valine

Q26. CBSE 2025 · 1 mark A nucleosome is composed of:

- (a) Histones and linker DNA
- (b) Histones and about 200 bp of DNA
- (c) NHC proteins and linker DNA
- (d) NHC proteins and about 200 bp of DNA

Q27. CBSE 2025 · 1 mark The simplest definition of a gene in eukaryotes is A unit of DNA that has information to mainly specify the synthesis of:

- (a) Single polypeptide chain and mRNA only
- (b) Many polypeptide chains and mRNA only
- (c) Single polypeptide chain and functional RNA only
- (d) Many polypeptide chains and functional RNA only

Q28. CBSE 2025 · 1 mark Use the given information to select the amino acid attached to the 3' end of tRNA during the process of translation, if the coding strand of the DNA is: Codons for the amino acids: UAU Tyrosine, AUG Methionine, AUA Isoleucine, AGU Serine

- (a) Isoleucine (b) Methionine (c) Tyrosine (d) Serine

Q29. CBSE 2025 · 1 mark Which of the following is the basic repeating unit of chromatin that consists of DNA wrapped around histone proteins?

- (a) Linker DNA (b) Histones (c) NHC proteins
- (d) 200 bp of proteins

Q30. CBSE 2025 · 1 mark Use the given information to select the amino acid attached to the 3' end of tRNA during the process of translation, if the coding strand of the DNA is TCCAGGGTTGATCGGCAAGCGAG. Codons for the amino acids: AGG = Arginine, AAG = Lysine, UCC = Serine, GGA = Glycine.

- (a) Arginine (b) Lysine (c) Serine (d) Glycine

Q31. CBSE 2025 · 1 mark The histone core in a nucleosome of chromatin thread is a/an :

- (a) pentamer (b) hexamer (c) heptomer (d) octamer

Q32. CBSE 2025 · 1 mark During the process of transcription, after binding to a promoter, RNA polymerase catalyses and makes the bases in the template strand of DNA available for base pairing, with the bases of:

- (a) Deoxyribonucleotide triphosphate
- (b) Deoxyribonucleoside triphosphate
- (c) Ribonucleotide triphosphate
- (d) Ribonucleoside triphosphate

Q33. CBSE 2025 · 1 mark What would happen if a gene encoding a polypeptide of 50 amino acids, 25th codon is UAU and is mutated to UAA?

- (a) A polypeptide of 49 amino acids will be formed.
- (b) A polypeptide of 25 amino acids will be formed.
- (c) A polypeptide of 24 amino acids will be formed.
- (d) A polypeptide of 50 amino acids will be formed.

Q34. CBSE 2025 · 1 mark The correct depiction of the centrifugation step of the experiment conducted by Alfred Hershey and Martha Chase on using radioactive labelled phages to prove that DNA is the genetic material is:

- (a) No Radioactive (35S) detected in cells + Radioactive (35S) detected in supernatant; Radioactive (32P) detected in cells + No Radioactivity detected in supernatant
- (b) Radioactive (35S) detected in cells + Radioactive (35S) detected in supernatant; No Radioactive (32P) detected in cells + No Radioactivity detected in supernatant
- (c) No Radioactive (35S) detected in cells + No Radioactivity detected in supernatant; Radioactive (32P) detected in cells + Radioactive (35S) detected in supernatant
- (d) Radioactive (35S) detected in cells + No Radioactivity detected in supernatant; No Radioactive (32P) detected in cells + Radioactive (35S) detected in supernatant

Q35. CBSE 2025 · 1 mark The region of chromatin that are actively transcribed are thought to be :

- (a) Heterochromatin (b) Euchromatin
- (c) Scaffold chromatin (d) Solenoid chromatin

Q36. CBSE 2025 · 1 mark The approach of sequencing the whole set of genome, including all the coding and non-coding sequences in HGP is :

- (a) Expressed Sequence Tags (b) Bioinformatics
- (c) Sequence Annotation (d) DNA Polymorphism



Q37. CBSE 2025 · 1 mark In lac-operon, the enzyme that is not needed for the metabolism of lactose is :

- (a) Transacetylase (b) Lactose permease
- (c) β -galactosidase
- (d) Lactose permease and transacetylase

Q38. CBSE 2025 · 1 mark In a DNA, percentage of thymine is 20. What is the percentage of Guanine ?

- (a) 20% (b) 30% (c) 40% (d) 60%

Q39. CBSE 2025 · 1 mark In E. coli, a DNA sequence that specifies where RNA polymerase will bind and initiate transcription of a gene is :

- (a) Start codon (b) Stop codon (c) Terminator
- (d) Promoter

Q40. CBSE 2025 · 1 mark The approach used in HGP of identifying all the genes that are expressed as RNA is referred to as :

- (a) SNPs (b) YACs (c) ESTs (d) BACs

Q41. CBSE 2025 · 1 mark If the DNA strand has the sequence 5'-TCCATAGCGTA-3', what will be the corresponding sequence of the transcribed mRNA ?

- (a) AGGUAUCGCAU (b) ACCUAUGCGAU
- (c) UGGTUTC GCAT (d) UCCAUAGCGUA

Q42. CBSE 2025 · 1 mark Removal of RNA polymerase-III from nucleoplasm of a eukaryotic cell will affect the transcription of which of the following ?

- (a) tRNA (b) hnRNA (c) mRNA (d) rRNA

Q43. CBSE 2025 · 1 mark The process of splicing in eukaryotes represents the dominance of the :

- (a) DNA world (b) RNA world (c) Protein world
- (d) Lipid world

Q44. CBSE 2025 · 1 mark Regulation of lac operon by repressor is referred to as :

- (a) Inducible regulation (b) Repressible regulation
- (c) Negative regulation (d) Positive regulation

Q45. CBSE 2025 · 1 mark SNPs in Human Genome Project refers to :

- (a) Polymorphism in repetitive sequences.
- (b) Single-base DNA differences.
- (c) Single changes in nucleotide of mRNA.
- (d) Loss or gain of a gene function.

Q46. CBSE 2025 · 1 mark Choose the correct option that indicates the enzyme, ribozyme in bacteria that acts as a catalyst.

- (a) 28S rRNA (b) 5-8S rRNA (c) 26S rRNA (d) 23S rRNA

Q47. CBSE 2025 · 1 mark Some of the important goals of HGP are given below. Choose the correct goal of HGP.

- (a) Identify approximately 20,000 – 30,000 genes in human DNA.
- (b) Determine the sequence of two billion chemical base pairs of human DNA.
- (c) Trace human history and disease associated sequences.
- (d) Address the ethical, legal and social issues that may arise from the project.

Q48. CBSE 2025 · 1 mark In a DNA, the percentage of thymine is 20. What is the percentage of guanine in it ?

- (a) 20% (b) 40% (c) 30% (d) 60%

Q49. CBSE 2025 · 1 mark Cistron is a segment of DNA coding for a :

- (a) Polypeptide only (b) mRNA only
- (c) Polypeptide, tRNA and rRNA (d) mRNA, tRNA and rRNA

Q50. CBSE 2025 · 1 mark If the sequence of bases in DNA is ATTCGATG, then the sequence of bases in the transcript will be :

- (a) CAUCGAU (b) UAAGCUAC (c) AUUCGAUG
- (d) GUAGCUUA

Q51. CBSE 2025 · 1 mark In a translational unit UTRs are present at :

- (a) 5' end (after start codon) and 3' end (after stop codon).
- (b) 5' end (before start codon) and 3' end (before stop codon).
- (c) 5' end (after start codon) and 3' end (before stop codon).
- (d) 5' end (before start codon) and 3' end (after stop codon).

Q52. CBSE 2025 · 1 mark What are minisatellites?

- (a) 10-40 bp sized small sequences within the genes.
- (b) Short coding repetitive sequences region on the eukaryotic genome.
- (c) Short non-coding repetitive sequences forming a large portion of eukaryotic genome.
- (d) Regions of coding strand of DNA.

Q53. CBSE 2025 · 1 mark Assertion (A): Replication of DNA takes place in S phase of the cell cycle. Reason (R): DNA replication and cell division cycle should be highly coordinated.

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

Q54. CBSE 2025 · 1 mark Assertion (A): A piece of DNA inserted into an alien organism generally does not replicate, if not inserted into a chromosome. Reason (R): ori is where DNA replication is initiated.

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

Q55. CBSE 2024 · 1 mark Match the following genes of the lac operon listed in column 'A' with their respective products listed in column 'B'

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

Q56. CBSE 2024 · 1 mark If the sequence of nitrogen bases of the coding strand in a transcription unit is 5' – ATGAATG – 3', the sequence of bases in its RNA transcript would be

- (a) 5' – AUGAUG – 3' (b) 5' – UACUAC – 3'
- (c) 5' – CAUUCU – 3' (d) 5' – GUAAGUA – 3'



Q57. CBSE 2024 · 1 mark How many base pairs will be there in 20 nucleosomes in a DNA double helix?

- (a) 4000 (b) 40 (c) 20 (d) 2000

Q58. CBSE 2024 · 1 mark Assertion (A): The sugar-phosphate backbone of two chains in DNA double helix show anti-parallel polarity. Reason (R): The phosphor-diester bonds in one strand go from a 3' carbon of one nucleotide to a 5' carbon of adjacent nucleotide, whereas those in complementary strand go vice versa.

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

Q59. CBSE 2024 · 1 mark You know that there are twenty different types of naturally occurring amino acids and four different types of bases in the DNA. A combination of 3 such bases code for a specific amino acid. If instead there are 96 different amino acids and 12 different bases in the DNA, then the minimum number of combination of bases required to form a codon is :

- (a) 6 (b) 8 (c) 2 (d) 4

Q60. CBSE 2024 · 1 mark Listed below are some amino acids and their corresponding mRNA codons: Amino acid mRNA codons - Phenylalanine UUU, Lysine AAG, Arginine CGA, Alanine GCA. Select the DNA sequence that would code for the following polypeptide sequence: Polypeptide - Alanine, Arginine, Lysine, Phenylalanine

- (a) CGT GCT TTC AAA (b) CGT GCT TTC TTT
(c) CGU GCU UUC AAA (d) CGU GCU UUC TTT

Q61. CBSE 2024 · 1 mark In the double helical structure of DNA molecule, the strands are :

- (a) identical and complementary
(b) identical and non-complementary
(c) anti-parallel and complementary
(d) anti-parallel and non-complementary

Q62. CBSE 2024 · 1 mark In a transcription unit the terminator is located towards the :

- (a) 3' end of the template strand
(b) 5' end of the template strand
(c) 5' end of the coding strand
(d) 3' end of the coding strand

Q63. CBSE 2024 · 1 mark Assertion (A) : RNA is unstable and can mutate at a faster rate. Reason (R) : The presence of 2' OH group in every nucleotide of RNA makes it labile and easily degradable.

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

Q64. CBSE 2024 · 1 mark A DNA fragment has 2000 nucleotides, out of which 140 are Adenine. How many bases does this DNA segment possess that have triple hydrogen bonds between them ?

- (a) 280 (b) 860 (c) 1720 (d) 1860

Q65. CBSE 2024 · 1 mark In an experiment, E. coli is grown in a medium containing $^{14}\text{NH}_4\text{Cl}$. (^{14}N is the light isotope of Nitrogen) followed by growing it for six generations in a medium having heavy isotope of nitrogen (^{15}N). After six generations, their DNA was extracted and subjected to CsCl density gradient centrifugation. Identify the correct density (Light/Hybrid/Heavy) and ratio of the bands of DNA in CsCl density gradient centrifugation.

- (a) Hybrid : Heavy, 1 : 16 (b) Light : Heavy, 1 : 31
(c) Hybrid : Heavy, 1 : 31 (d) Light : Heavy, 1 : 05

Q66. CBSE 2024 · 1 mark Assertion (A) : Primary transcripts in eukaryotes are subjected to splicing to remove the introns. Reason (R) : Primary transcripts contain both exons and introns and the introns are non-functional in eukaryotes.

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

Q67. CBSE 2024 · 1 mark A DNA fragment has 2500 nucleotides, out of which 240 are Guanine. How many bases having double hydrogen bonds between them does this DNA fragment possess ?

- (a) 480 (b) 720 (c) 1010 (d) 2020

Q68. CBSE 2024 · 1 mark A DNA fragment has 3000 nucleotides, out of which 160 are Guanine. How many bases having double hydrogen bonds between them does this DNA fragment possess ?

- (a) 160 (b) 320 (c) 1340 (d) 2680

Q69. CBSE 2024 · 1 mark Which was the last of the 24 human chromosome to be completely sequenced ?

- (a) Chromosome – 1 (b) Chromosome – 11
(c) Chromosome – 21 (d) Chromosome – X

Q70. CBSE 2024 · 1 mark Assertion (A): Plasmids are autonomously replicating circular extra-chromosomal DNA. Reason (R): Plasmids are usually present in Eukaryotic cells.

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



Q71. CBSE 2023 · 1 mark Assertion (A) : In an operon, the regulator and operator genes are not associated with the constitutive genes. Reason (R) : Constitutive genes need not be repressed.

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

Q72. CBSE 2023 · 1 mark Assertion (A): For sequencing, the total DNA from a cell is isolated and converted into random fragments. Reason (R): DNA is a very long polymer.

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

Q73. CBSE 2023 · 1 mark Given below is a list of steps Meselson and Stahl carried out in their experiment to prove that DNA replication is semi-conservative. Select the option that gives the correct sequence of steps followed by them. (i) Bacteria transferred to a N14 medium and sampled every 20 minutes. (ii) All bacteria contain hybrid DNA (N14 DNA and N15 DNA). (iii) Bacteria grown in N15 medium for many generations. (iv) All bacteria contain N15 DNA. (v) Bacteria contain either all N14 DNA or all hybrid DNA.

- (a) (ii) → (iv) → (iii) → (i) → (v) (b) (i) → (ii) → (v) → (iv) → (iii)
 (c) (iii) → (iv) → (i) → (ii) → (v) (d) (iv) → (iii) → (ii) → (v) → (i)

Q74. CBSE 2023 · 1 mark DNA profiles of the child and three individuals 1, 2 and 3 who claim to be the parents of the child are given below. Select the option that shows the correct actual parent/parents of the child.

- (a) Individual 1 and 3 (b) Individual 1 and 2
 (c) Individual 2 and 3
 (d) Individual 1 is the only parent of the child amongst 1, 2 and 3

Q75. CBSE 2023 · 1 mark Identify the element used by Hershey and Chase to label the protein in their experiment, from the following options:

- (a) P32 (b) S32 (c) S35 (d) P35

Q76. CBSE 2023 · 1 mark Assertion (A): For DNA sequencing, the total DNA from a cell is isolated and converted into random fragments of relatively smaller sizes. Reason (R): Human genome is said to have approximately 3×10^9 bp and the total estimated cost for sequencing is very high.

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

VERY SHORT ANSWER (10)

Q77. CBSE 2026 · 2 marks (b) (i) Differentiate between a DNA and RNA nucleotide. (1 mark) (ii) Name the two types of bonds present within a single nucleotide. (1 mark)

Q78. CBSE 2026 · 2 marks Explain the two major approaches used while sequencing the total DNA from a cell.

Q79. CBSE 2026 · 2 marks (a) (i) Given below is the schematic representation of the process of electrophoresis. Identify the alphabets representing the: (I) Anode end, and (II) Lightest/Smallest DNA in matrix. (ii) What is Agarose gel and why is it used in this process?

Q80. CBSE 2026 · 2 marks One of the salient features of the genetic code is that it is nearly universal from bacteria to humans. Mention two exceptions to this rule. Why are some codes said to be degenerates?

Q81. CBSE 2025 · 2 marks Assume that the given mRNA (start site is not depicted) is theoretically translated in two reading frames. Frame 1: 5' CUCGCUUGCCGAUCAAGGGUUA 3' and Frame 2: 5' GUGGCACUCAGUCCUUAUGGCG 3'. How many amino acids will be specified in case (a) and case (b) on translation? Justify your answer.

Q82. CBSE 2025 · 2 marks Assume that the given mRNA (start site is not depicted) is theoretically translated in two reading frames. Frame 1: 5' CUCGCUUGCCGAUCAAGGGUUA 3' Frame 2: 5' GUGGCACUCAGUCCUUAUGGCG 3' How many amino acids will be specified in case (a) and case (b) on translation? Justify your answer.

Q83. CBSE 2025 · 2 marks How many amino acids will be specified in case (a) and case (b) on translation? Justify your answer. Frame 1: 5' CUCGCUUGCCGAUCAAGGGUUA 3' Frame 2: 5' GUGGCACUCAGUCCUUAUGGCG 3'

Q84. CBSE 2024 · 2 marks If the base adenine constitutes 31% of an isolated DNA fragment, then write what will be the expected percentage of the base cytosine in it. Explain how did you arrive at the answer given.

Q85. CBSE 2024 · 2 marks Consider the given data of a hypothetical small portion of mRNA that codes for a functional polypeptide chain and answer the questions that follow: mRNA 5' UCAUUACCACGAUUCUUUAAAAGA 3' (a) How many amino acids will be formed from the given codons, if substitution of U by C takes place at the 5th codon? Explain your answer. (b) Write the number of amino acids that would be in the polypeptide synthesised by a similar mRNA as above, where in the fourth

Q86. CBSE 2024 · 2 marks Consider the given data of a hypothetical small portion of mRNA that codes for a functional polypeptide chain and answer the questions that follow : mRNA 5' UCAUUACCACGAUUCUUUAAAAGA 3' (a) How many amino acids will be formed from the given codons, if substitution of U by C takes place at the 5th codon? Explain your answer. (b) Write the number of amino acids that would be in the polypeptide synthesised by a similar mRNA as above, where in the fourth codon if U is replaced by C.



SHORT ANSWER (16)

Q87. CBSE 2026 · 3 marks (a) What is a genetic code ? (b) Why did scientists feel the need to propose a genetic code ? (c) Genetic code is said to be 'Universal'. Why ?

Q88. CBSE 2026 · 3 marks What is a genetic code? Why did scientists feel the need to propose a genetic code? Genetic code is said to be 'Universal'. Why?

Q89. CBSE 2026 · 3 marks (a) State the dual role of deoxyribonucleoside triphosphates during DNA replication. (b) In which phase of the cell cycle does replication of DNA occur in eukaryotes? What would happen if cell division is not followed after DNA replication?

Q90. CBSE 2026 · 3 marks Describe the process of translation in protein synthesis.

Q91. CBSE 2026 · 3 marks (a) What is meant by translation in protein synthesis? (b) Explain charging of tRNA (aminoacylation of tRNA) and mention its importance in the process of translation.

Q92. CBSE 2026 · 3 marks (a) Construct a complete transcription unit with promoter and terminator on the basis of the hypothetical coding strand given below: A T G C A T G C A T A G (b) Write the RNA strand transcribed from the above transcription unit along with its polarity.

Q93. CBSE 2026 · 3 marks Draw a labelled diagram of a 'replicating fork' showing the polarity. Why does DNA replication occur within such 'fork'?

Q94. CBSE 2025 · 3 marks Explain how the addition of lactose in the medium regulates the switching on of the lac operon in bacteria.

Q95. CBSE 2025 · 3 marks oligopeptide with the amino acids, Lysine - Serine - Proline - Tyrosine. (a) Write the codons in correct sequence for the four amino acids. (b) If first adenine in DNA is substituted by guanine, what will be the sequence of amino acids in the new oligopeptide? (c) Write the anticodons for these amino acids.

Q96. CBSE 2025 · 3 marks The base sequence in one of the strands of DNA is: (a) Give the base sequence of its complementary strand. (b) How are these base pairs held together in DNA molecule? (c) Explain the base complementarity rule. Name the scientist who framed this rule.

Q97. CBSE 2024 · 3 marks (a) Why does DNA replication occur within a replication fork and not in its entire length simultaneously? (b) "DNA replication is continuous and discontinuous on the two strands within the replication fork." Explain with the help of a schematic representation.

Q98. CBSE 2024 · 3 marks Explain the processing of heterogeneous nuclear RNA (hnRNA) into a fully functional mRNA in eukaryotes. Where does this processing occur in the cell?

Q99. CBSE 2024 · 3 marks (a) Name and write two characteristics of the type of DNA that forms the basis of DNA fingerprinting technique. (b) Mention any two applications of this technique.

Q100. CBSE 2024 · 3 marks (a) Explain the process by which amino acid gets attached to the tRNA molecule during translation process. (b) How does the translation process get terminated ? (c) Expand UTR. Where are they located ?

Q101. CBSE 2023 · 3 marks (a) (i) How many types of RNA polymerases are there in a eukaryote cell? Mention which one of them transcribes hnRNA. (ii) Write the changes that hnRNA undergoes before it leaves the nucleus as mRNA. OR (b) The length of DNA in any cell is far greater than the dimension of its nucleus. Explain how this enormous DNA is packaged in a eukaryotic cell.

Q102. CBSE 2023 · 3 marks (a) (i) How many types of RNA polymerases are there in an eukaryote cell ? Mention which one of them transcribes hnRNA. (ii) Write the changes that hnRNA undergoes before it leaves the nucleus as mRNA. OR (b) The length of DNA in any cell is far greater than the dimension of its nucleus. Explain how this enormous DNA is packaged in a eukaryotic cell.

LONG ANSWER (16)

Q103. CBSE 2026 · 5 marks (a) (i) Watson and Crick's discovery of double helical structure was based on which two findings. Also mention the name of the scientists associated with these findings. (2 marks) (ii) Write down the salient features of double helix structure of DNA (any three points). (3 marks)

Q104. CBSE 2026 · 5 marks (a) (i) Watson and Crick's discovery of double helical structure was based on which two findings. Also mention the name of the scientists associated with these findings. (2 marks) (ii) Write down the salient features of double helix structure of DNA (any three points). (3 marks) OR (b) Given below is a stretch of DNA showing the coding strand of structural gene of transcription unit. 5' - ATG ACC GTA TTT TCT GTA GTG CCC GTA CTT CAG GCA TTA 3' (i) Write the corresponding template strand and m-RNA strand that will be transcribed along with its polarity. (2 marks) (ii) If GUA of transcribed mRNA is an intron, then depict the sequence involved in formation of mRNA / mature / processed hnRNA strand: (1) In a bacterium (1 mark) (2) In humans (1 mark) (iii) How many amino acids the resulting polypeptide will have after the process of translation in humans? (1 mark)

Q105. CBSE 2026 · 5 marks Describe how the lac operon operates both in the presence and absence of an inducer in E.coli.

Q106. CBSE 2026 · 5 marks (a) (i) Describe the series of experiments conducted by Frederick Griffith. Comment on the significance of the result obtained. (ii) State the contribution of Avery, MacLeod and McCarty.

Q107. CBSE 2026 · 5 marks (a) The following questions are based on the classic experiment conducted by Hershey and Chase. (i) Why were bacteriophages chosen by the scientists ? (ii) Name the radioactive isotopes used and state the reason for using them. (iii) Describe the steps of the experiment. (iv) Why is this experiment considered a major breakthrough in the field of molecular biology ?



Q108. CBSE 2026 · 5 marks (b)(i) Enlist any four prime goals of the Human Genome Project (HGP). (ii) List the two methodologies which were involved in the human genome project. Mention how they were used. (iii) Expand 'YAC' and mention what it was used for.

Q109. CBSE 2025 · 5 marks Write the features a molecule should have to act as a genetic material. In the light of the above features, evaluate and justify the suitability of the molecule that is preferred as an ideal genetic material.

Q110. CBSE 2024 · 5 marks (a) Stability, as one of the properties of genetic material, was very evident in one of the very early experiments in genetics. Name the scientist and describe his experiment. State the conclusion he arrived at. OR (b) A tall pea plant bearing violet flowers with unknown genotype is given. Find the genotype by working out different crosses only by selfing the plants. Write the genotypic and phenotypic ratios of each cross shown by you.

Q111. CBSE 2024 · 5 marks (b) (i) Draw a schematic, self-explanatory labelled diagram of lac operon in switched on condition. (ii) Why is regulation of lac operon referred to as negative regulation?

Q112. CBSE 2024 · 5 marks (b) Explain the experiment performed by Griffith for the search of genetic material and write the conclusion he arrived at. How did Avery, MacLeod and McCarty establish the biochemical nature of the genetic material identified by Griffith?

Q113. CBSE 2024 · 5 marks (a) (i) Why did they use radioactive sulphur ^{35}S and radioactive phosphorus ^{32}P in their respective culture media for growing *E. coli* population which subsequently were infected by bacteriophage? (ii) State the purpose of their using the following: (1) Blender (2) Centrifuge (iii) Write the observations they made during the course of their experiment. (iv) Based on the results, write the conclusion they arrived at the end of their experiment. Answer the following questions that are based on Hershey and Chase experiment using *E. coli* and bacteriophage.

Q114. CBSE 2024 · 5 marks (b) (i) Explain the role of lac repressor genes of lac operon. (ii) lac operon is called an inducible operon. State reason.

Q115. CBSE 2023 · 5 marks (a) Meselson and Stahl carried out an experiment to prove the nature of DNA replication. Recall the experiment and answer the following questions. (i) Which two types of nitrogen were used by them in their experiment and why? (ii) Why did they take samples of *E. coli* at definite time intervals for their observation? (iii) State the role of caesium chloride density gradient in their experiment. (iv) Write the conclusions they arrived at.

Q116. CBSE 2023 · 5 marks (a) Protein synthesis requires the services of all three types of RNAs, namely t-RNA, m-RNA and r-RNA. Explain the role of each of them during the process of protein synthesis in prokaryotes.

Q117. CBSE 2023 · 5 marks (a) (i) Draw a labelled diagram of a replication fork in a prokaryote indicating the process of DNA replication. (ii) Differentiate between the two newly synthesised DNA strands within the fork. (iii) Name the enzymes involved in the process of DNA replication. (iv) Name the eukaryote where the semi-conservative mode of replication was experimentally proved.

Q118. CBSE 2023 · 5 marks (a) Protein synthesis requires the services of all three types of RNAs, namely t-RNA, m-RNA and r-RNA. Explain the role of each of them during the process of protein synthesis in prokaryotes. OR (b) A homozygous tall pea plant with green seeds is crossed with a homozygous dwarf pea plant with yellow seeds. (i) Write the possible phenotype and genotype of F₁ generation. (ii) State the laws of Mendel that are proved true by the F₁ generation. (iii) Mention the F₂ phenotypic ratio along with their possible phenotypes. (iv) Write the genotypes of the male and female gametes produced by F₁ progeny.

CASE-BASED (5)

CASE STUDY · CBSE 2026

There was a massive fire in a market place. As a result many people were injured and burnt beyond recognition.

Q119. CBSE 2026 · 4 marks (a) When does a requirement like DNA techniques arise? Which technique may be suggested in the given situation?

CASE STUDY · CBSE 2026

Gene expresses itself in a cell system as a protein/enzyme. How an expression of gene occurs in a cell system, when it needs to occur and how the gene expression is regulated in prokaryotic cell system was studied by the combined efforts of Francois Jacob, a geneticist and Jacques Monod, a biochemist. For their work on lactose metabolism in *E. coli* and introducing the concept of 'lac operon', they were awarded the Nobel Prize in 1965.

Q120. CBSE 2026 · 4 marks (a) It is said that 'lac operon' has to be operational at a very low level in the bacterial cell all the time. Justify.

CASE STUDY · CBSE 2026

The process of copying genetic information from template strand of DNA into RNA is called transcription. It is mediated by RNA polymerase. Transcription takes place in the nucleus of eukaryotic cells. In transcription, only a segment of DNA and only one of the strands is copied into RNA.

Q121. CBSE 2026 · 1 mark (a) Why is the strand of DNA with 3' → 5' polarity transcribed and not the other strand of 5' → 3' polarity?

CASE STUDY · CBSE 2024



Generally, in eukaryotic cells the average length of a transcription unit along a DNA molecule is about 8,000 nucleotides, so the RNA product of the transcription is also that long. But it only takes about 1200 nucleotides from the above RNA product to translate average sized polypeptide of 400 Amino acids.

Q122. CBSE 2024 · 4 marks (a) Name this RNA product transcribed from the DNA that subsequently translates into a polypeptide of 400 amino acids. Mention the enzyme responsible for transcribing this type of RNA from the DNA.

CASE STUDY · CBSE 2023

Gene expresses itself in a cell system as a protein/enzyme. How does an expression of gene occur in a cell system and when does it need to occur, and how the gene expression is regulated in a prokaryote cell system was studied by the combined efforts of Jacques Monod, the biochemist and Francois Jacob, the geneticist. For their work on lactose metabolism in *E. coli* lac operon they were awarded the Nobel Prize in 1965.

Q123. CBSE 2023 · 4 marks (a) Why is lac operon said to be a transcriptionally regulated system?

6 Evolution

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (47)

Q1. CBSE 2026 · 1 mark Assertion (A) : Hardy-Weinberg principle says that allele frequencies in a population are stable. Reason (R) : Hardy-Weinberg principle is applicable only when genetic drift does not occur.

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

Q2. CBSE 2026 · 1 mark The idea of use and disuse of organs for evolution of organism was proposed by

- (a) Charles Darwin (b) Thomas Malthus (c) Hugo De Vries (d) Lamarck

Q3. CBSE 2026 · 1 mark Assertion (A): The population of melanized moths increased in industrial areas after Industrial Revolution. Reason (R): In Industrial environment lichen covered trees were replaced by soot-covered trees offering better camouflage to dark coloured moths.

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

Q4. CBSE 2026 · 1 mark Assertion (A): When we see stars, we are apparently peeping into the past. Reason (R): What we see today is an object whose emitted light started its journey millions of years back reaching our eyes now.

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

Q5. CBSE 2026 · 1 mark Which one of the following evidences does not support Darwin's theory of natural selection?

- (a) Branching Descent (b) Small & directional variations (c) Appearance of new traits by mutations (d) Survival of the fittest

Q6. CBSE 2026 · 1 mark Assertion (A): Fossils provide direct evidence for evolution. Reason (R): Fossils help to trace evolutionary relationships among organisms over time.

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

Q7. CBSE 2026 · 1 mark What conclusion can be drawn if the forelimbs of an aquatic animal and a terrestrial animal have similar anatomical structure ?

- (a) Live in same habitat (b) Share common ancestors (c) Forelimbs perform same functions (d) Forelimbs are analogous

Q8. CBSE 2026 · 1 mark Assertion (A): Under a particular set of selection pressure, organisms evolve towards the most efficient reproductive strategy. Reason (R): Populations evolve to maximise their reproductive fitness in the habitat where they live.

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

Q9. CBSE 2026 · 1 mark Which one of the following reasons is correct for divergent evolution to happen?

- (a) Adaptation to different needs (b) Predator-Prey inter-relationship (c) Selection of similar habitat (d) Different structures evolving for the same function



Q10. CBSE 2026 · 1 mark Appearance of antibiotic-resistant bacteria is an example of evolution due to:

- (a) Adaptive radiation (b) Divergent evolution
(c) Artificial selection (d) Anthropogenic action

Q11. CBSE 2026 · 1 mark Identify the statements that correctly describe Darwin's Theory of Evolution. (i) Overproduction of organisms leads to competition. (ii) Variation is inherited and causes evolution. (iii) Acquired characters are inherited. (iv) Survival depends on favourable traits. (v) New species arise due to accumulation of favourable variations. Choose the correct option.

- (a) (i), (ii), (iv) and (v) are correct
(b) (ii), (iii) and (iv) are correct (c) All are correct
(d) Only (i) and (iv) are correct

Q12. CBSE 2026 · 1 mark Name the extinct ancestor of humans who ate only fruits and hunted with stone weapons.

- (a) Ramapithecus (b) Australopithecus (c) Dryopithecus
(d) Homo erectus

Q13. CBSE 2026 · 1 mark Thorns of Bougainvillea and tendrils of Cucurbita are examples of:

- (a) Analogous organs (b) Convergent evolution
(c) Homologous organs (d) Vestigial organs

Q14. CBSE 2026 · 1 mark Arrange the following in the correct sequence of their evolution and select the correct option: (i) Seaweed (ii) Invertebrates (iii) Jawless fish

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

Q15. CBSE 2026 · 1 mark Select the odd option in the context of convergent evolution.

- (a) Eyes of Octopus and Mammals
(b) Flippers of Penguins and Dolphins
(c) Flying Squirrel and Flying Phalanger
(d) Thorns of Bougainvillea and Tendrils of Cucurbita

Q16. CBSE 2026 · 1 mark Which type of selection is industrial melanism observed in moth, Biston betularia?

- (a) Stabilising (b) Directional (c) Disruptive (d) Artificial

Q17. CBSE 2025 · 1 mark If a natural population with 50 individuals is in Hardy-Weinberg equilibrium for a gene with two alleles A and a, with the gene frequency of allele A of 0.6, the genotype frequency of Aa will be :

- (a) 0.16 (b) 0.36 (c) 0.24 (d) 0.48

Q18. CBSE 2025 · 1 mark If a natural population of 60 individuals is in Hardy-Weinberg equilibrium for a gene with two alleles B and b, with the gene frequency of allele B of 0.7, the genotype frequency of Bb will be :

- (a) 0.21 (b) 0.42 (c) 0.48 (d) 0.56

Q19. CBSE 2025 · 1 mark If a natural population with 200 individuals is in Hardy-Weinberg equilibrium for a gene with two alleles A and a, with the gene frequency of allele A of 0.8, the genotype frequency of Aa will be :

- (a) 0.8 (b) 0.16 (c) 0.32 (d) 0.64

Q20. CBSE 2025 · 1 mark About 15 mya during human evolution, the primates which used to walk like gorillas and chimpanzees were:

- (a) Australopithecine and Neanderthal
(b) Dryopithecus and Ramapithecus
(c) Homo erectus and Homo sapiens
(d) Homo habilis and Homo erectus

Q21. CBSE 2025 · 1 mark The primates that probably lived in East Africa grasslands about two mya were:

- (a) Dryopithecus (b) Ramapithecus (c) Australopithecines
(d) Neanderthal

Q22. CBSE 2025 · 1 mark The first human-like hominid evolved during human evolution is supposed to be:

- (a) Neanderthal man (b) Homo habilis (c) Homo erectus
(d) Homo sapiens

Q23. CBSE 2025 · 1 mark Which of the following combinations is a correct example of convergent evolution in Australian marsupials and Placental mammals?

- (a) Lemur and Spotted cuscus
(b) Tasmanian tiger cat and Anteater (c) Bobcat and Lemur
(d) Numbat and Anteater

Q24. CBSE 2025 · 1 mark Which of the following combinations is a correct example of convergent evolution in Placental mammals and Australian marsupials ?

- (a) Anteater and Lemur (b) Numbat and Bobcat
(c) Tasmanian tiger cat and Anteater
(d) Lemur and Spotted cuscus

Q25. CBSE 2025 · 1 mark In his observations of small black birds in the Galapagos Islands, Darwin found that all the finches arose from the original ancestor :

- (a) Insect-eating finches (b) Seed-eating finches
(c) Cactus-eating finches (d) Fruit-eating finches

Q26. CBSE 2025 · 1 mark The animals that evolved into the first amphibians during evolutionary history were :

- (a) Archaeopteryx (b) Salamander (c) Coelacanth
(d) Lobefins

Q27. CBSE 2025 · 1 mark Land reptiles which went back into water about 200 mya to evolve into fish-like reptiles were :

- (a) Ichthyosaurus (b) Tyrannosaurus (c) Stegosaurus
(d) Brachiosaurus

Q28. CBSE 2024 · 1 mark A population is in genetic equilibrium/Hardy-Weinberg equilibrium for a gene with two alleles (dominant allele and recessive allele). If the frequency of allele a is 0.6, then the frequency of genotype Aa is :

- (a) 0.21 (b) 0.42 (c) 0.48 (d) 0.32

Q29. CBSE 2024 · 1 mark A population is in genetic equilibrium/Hardy-Weinberg equilibrium for a gene with two alleles (dominant and recessive). If the frequency of the recessive allele is 0.6, then the frequency of genotype Aa is:

- (a) 0.21 (b) 0.42 (c) 0.48 (d) 0.32



Q30. CBSE 2024 · 1 mark Single step large mutation leading to speciation is also called

- (a) founder effect (b) saltation (c) branching descent
(d) natural selection

Q31. CBSE 2024 · 1 mark The scientist who proposed that embryos of all vertebrates including humans develop a row of vestigial gill slits behind the head but it is a functional organ only in fish and replaced by lungs in all other vertebrates

- (a) Darwin (b) Lamarck (c) Ernst Haeckel (d) Mendel

Q32. CBSE 2024 · 1 mark Assertion (A) : Gene flow increases genetic variations. Reason (R) : The random introduction of new alleles into a recipient population and their removal from donor population affects allele frequency.

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

Q33. CBSE 2024 · 1 mark Which one of the following statements is not true ?

- (a) Flippers of whales and dolphins are homologous organs
(b) Homologous organs have similar anatomical structure, but perform different functions
(c) Homology indicates common ancestry
(d) Homologous structures are a result of convergent evolution

Q34. CBSE 2024 · 1 mark Homologous organs indicate:

- (a) Convergent Evolution (b) Divergent Evolution
(c) Adaptive Radiation (d) Natural Selection

Q35. CBSE 2024 · 1 mark During the 1850s in the pre-industrialisation era in England, the expected effect of natural selection on the number of dark-winged moths as compared to white-winged moths was :

- (a) more in number (b) less in number
(c) both were equal in number (d) both were less in number

Q36. CBSE 2024 · 1 mark S.L. Miller in 1953, to support the theory of chemical evolution, created conditions in the closed flask that included :

- (a) CH₃, O₂, NH₃, H₂O vapour at 1800C
(b) CH₄, H₂, NH₃, H₂O vapour at 800C
(c) CH₄, CO₂, H₂, H₂O vapour at 1800C
(d) CH₄, NH₄, SO₂, H₂O vapour at 800C

Q37. CBSE 2024 · 1 mark After the 1850s in the post-industrialization era in England, the expected effect of natural selection on the number of white-winged moths as compared to the dark-winged moths was :

- (a) Less in number (b) More in number
(c) Both were less in number (d) Both were more in number

Q38. CBSE 2024 · 1 mark The origin of life according to the early Greek philosophers was transfer of unit of life from outer space to the different planets in the form of :

- (a) seeds (b) spores (c) gemmules (d) gametes

Q39. CBSE 2024 · 1 mark After the 1850s in the post-industrialisation era in England, the expected effect of natural selection on the number of white-winged moths as compared to the dark-winged moths was :

- (a) Less in number (b) More in number
(c) Both were less in number (d) Both were more in number

Q40. CBSE 2024 · 1 mark Who proposed the mutation theory in favour of organic evolution ?

- (a) Weisman (b) Louis Pasteur (c) Darwin
(d) Hugo de Vries

Q41. CBSE 2024 · 1 mark Hugo de Vries proposed the mutation theory of organic evolution after his experiments on

- (a) Garden pea (b) Evening primrose (c) Fruit fly
(d) Four O' clock plant

Q42. CBSE 2023 · 1 mark Select the option that gives the correct description of the process of Natural Selection with respect to the length of the neck of giraffe.

- (a) Stabilising selection as giraffes with longer neck lengths are selected further.
(b) Disruptive selection as giraffes with smaller and longer neck lengths are selected.
(c) Directional selection as giraffes with longer neck lengths are selected.
(d) Stabilising selection as giraffes with medium neck lengths are selected.

Q43. CBSE 2023 · 1 mark Assertion (A): Darwin showed how even a slow growing animal like an elephant could reach enormous numbers. Reason (R): When resources in the habitat are unlimited, each species has the ability to realise its innate potential fully.

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

Q44. CBSE 2023 · 1 mark Assertion (A): The number of white winged moths decreased drastically after industrialisation in England. Reason (R): Effects of industrialisation were more marked in rural areas of England.

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



Q45. CBSE 2023 · 1 mark Assertion (A) : Homo sapiens have evolved from chimpanzee-like ancestors. Reason (R) : There is no difference between the two in the amino acid sequence of the protein Cytochrome-C.

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

Q46. CBSE 2023 · 1 mark Assertion (A) : The Monarch butterfly is highly distasteful to the predators. Reason (R) : The butterfly has a very rough skin which is not palatable.

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

Q47. CBSE 2023 · 1 mark Which one of the following was not present during the Mesozoic Era of the geological time scale?

- (a) Ferns (b) Horsetails (c) Ginkgos (d) Bryophytes

VERY SHORT ANSWER (6)

Q48. CBSE 2026 · 2 marks (b) The allele for brown eyes (B) is dominant over blue eyes (b). In a population, 36% of individuals have blue eyes. Assuming Hardy-Weinberg equilibrium, calculate: (i) Frequency of allele B (ii) Percentage of heterozygous individuals (iii) Percentage of individuals that are homozygous dominant (Working to be shown)

Q49. CBSE 2026 · 2 marks (a) (i) Mention any two characteristics of Neanderthal man that lived near East and Central Asia. (ii) Identify the following hominids with respect to human evolution: (I) Brain capacity 900 cc, probably ate meat. (II) First human-like with brain capacity 650 – 800 cc.

Q50. CBSE 2026 · 2 marks (a) (i) Rearrange the following in correct order of their appearance on Earth between 2 million years and 40,000 years ago: Homo Neanderthalensis, Australopithecus, Homo erectus, Homo habilis. (ii) Which one of the above: (I) had the largest brain size? (II) ate fruits?

Q51. CBSE 2025 · 2 marks A few stages and their respective time period in the evolutionary history of human beings are mentioned in the flowchart given below: 15 mya - Primates walking like gorillas and chimpanzees existed. (a) 3-4 mya - Man-like primates walked in Eastern Africa. Fossils of their bones were discovered. (b) 2 mya - This ancestor lived in the East African grasslands and ate fruits. (c) 1.5 mya - This hominid had a brain size of 900 cc and probably ate meat. (d) Based on the above information, answer the following questions: (a) Name one primate about 15 mya. (b) Name one place where fossils of primates were discovered in Eastern Africa. (c) Name the ancestor that lived in the East African grasslands about 2 mya. (d) Name the hominid that was found around 1.5 mya.

Q52. CBSE 2025 · 2 marks A few stages and their respective time period in the evolutionary history of human beings are mentioned in the flowchart given below: 15 mya - Primates walking like gorillas and chimpanzees existed. 3-4 mya - Man-like primates walked in Eastern Africa. Fossils of their bones were discovered. 2 mya - This ancestor lived in the East African grasslands and ate fruits. 1.5 mya - This hominid had a brain size of 900 cc and probably ate meat. Based on the above information, answer the following questions: (a) Name one primate about 15 mya. (b) Name one place where fossils of primates were discovered in Eastern Africa. (c) Name the ancestor that lived in the East African grasslands about 2 mya. (d) Name the hominid that was found around 1.5 mya.

Q53. CBSE 2024 · 2 marks Given below is an illustration of the experiment performed by Louis Pasteur. Explain the experiment and its conclusion.

SHORT ANSWER (13)

Q54. CBSE 2026 · 3 marks (a) How is Hardy-Weinberg expression ($p^2 + 2pq + q^2 = 1$) derived? (2 marks) (b) List any two factors that disturb the genetic equilibrium. (1 mark)

Q55. CBSE 2026 · 3 marks How is Hardy-Weinberg expression ($p^2 + 2pq + q^2 = 1$) derived? List any two factors that disturb the genetic equilibrium.

Q56. CBSE 2026 · 3 marks S.L. Miller conducted an experiment in 1953 to simulate the conditions of early earth in a laboratory setup. Answer the following questions based on the experiment : (a) What was the aim of his experiment ? (b) Name the gases used and the source of energy.

Q57. CBSE 2026 · 3 marks (a) Compare homologous and analogous organs by giving any one point of difference. (b) Mention the type of evolution each represents and give one example of each from plants and animals.

Q58. CBSE 2026 · 3 marks Explain the three different ways in which natural selection operates. Explain with the help of graphs.

Q59. CBSE 2026 · 3 marks Define adaptive radiation. How did Darwin explain adaptive radiation?

Q60. CBSE 2024 · 3 marks (a) Explain the significance of the experiment carried out by S.L. Miller. Name the scientists whose hypothesis prompted him to carry out this experiment. (b) How does meteorite analysis favour this hypothesis ?

Q61. CBSE 2024 · 3 marks Explain the significance of the experiment carried out by S.L. Miller. Name the scientists whose hypothesis prompted him to carry out this experiment.

Q62. CBSE 2024 · 3 marks (a) List the specific features of Darwin's concept of natural selection. (b) Microbes have proved to be suitable examples to study evolution by natural selection. Justify giving reasons.

Q63. CBSE 2023 · 3 marks (a) Name the two primate ancestors of the present day humans, who existed approximately about 15 million years ago. (b) According to geological records, when and where did Australopithecines live? (c) Give two differences between Homo habilis and Homo erectus.



Q64. CBSE 2023 · 3 marks (a) Darwin's theory of natural selection is widely accepted in general, but modern biologists have identified some limitations. Mention the limitations identified. (b) Name and state the most accepted theory of evolution in modern times. (c) Mention any two ways the limitations of Darwin's theory of evolution are explained in modern biology.

Q65. CBSE 2023 · 3 marks (a) Natural selection theory is widely accepted but some limitations have been identified by modern biologists. Mention the limitations identified. (b) Name and state the most accepted theory of evolution in modern times. (c) Mention any two ways the limitations identified in Darwin's theory of evolution are explained in modern biology.

Q66. CBSE 2023 · 3 marks (a) Darwin's theory of natural selection has been widely accepted, but modern biologists have identified some limitations. Mention the limitations identified. (b) Name and state the most accepted theory of evolution in modern times. (c) Mention any two ways by which the limitations of Darwin's theory of evolution are explained in modern biology.

LONG ANSWER (1)

Q67. CBSE 2023 · 5 marks (a) (i) Describe the phenomenon of adaptive radiation as explained by Darwin. (ii) Is human evolution an example of adaptive radiation? Give reason in support of your answer.

CASE-BASED (2)

CASE STUDY · CBSE 2025

Highly conserved proteins such as Haemoglobin and Cytochrome-C provide the best biochemical evidences to trace evolutionary relationships between different groups. Cytochrome-C is formed of 104 amino acids. Cytochrome-C is the respiratory pigment present in all eukaryotic cells. It has evolved at a constant rate during evolution. In chimpanzees and humans, Cytochrome-C genes are identical. The given data shows the evolution of the Cytochrome-C gene in different mammals: Groups - Nucleotide substitution in the gene of Cytochrome-C - Millions of years ago: Human/Kangaroo - 100-125 mya, Human/Cow - 75-120 mya, Human/Rodent - 60-75 mya

Q68. CBSE 2025 · 4 marks (a) Select the correct option for the time of separation of two groups and the number of nucleotide substitutions in the gene of Cytochrome-C : Options: (i) Lesser, Greater (ii) Greater, Lesser (iii) Greater, Greater

Q69. CBSE 2025 · 4 marks (a) Select the correct option for the time of separation of two groups and the number of nucleotide substitutions in the gene of Cytochrome-C : Options (i) Lesser time of separation, Greater nucleotide substitutions (ii) Greater time of separation, Lesser nucleotide substitutions (iii) Greater time of separation, Greater nucleotide substitutions

7 Human Health and Disease

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (49)

Q1. CBSE 2026 · 1 mark Some statements regarding drugs and alcohol are given below : (i) Adolescents are more vulnerable to peer pressure. (ii) Drug addiction leads to increased tolerance level of the receptors present in our body. (iii) Alcohol affects the central nervous system. (iv) Excessive use of drugs helps to increase energy. (v) Anabolic steroids decrease aggressiveness. Choose the option with correct statement(s).

- (a) Statements (i), (iv) and (v) are correct
- (b) Statements (i), (ii) and (iii) are correct
- (c) Only statements (i) and (v) are correct
- (d) Only statement (iii) is correct

Q2. CBSE 2026 · 1 mark Which of the following is not a component of immune system?

- (a) Lymphocytes (b) Plasma Proteins (c) Red Blood Cells
- (d) Bone Marrow

Q3. CBSE 2026 · 1 mark Interferons are most effective in making non-infected cells resistant against the spread of which of the following diseases?

- (a) Malaria (b) Ascariasis (c) Pneumonia (d) Cancer

Q4. CBSE 2026 · 1 mark What is the role of histamine released by mast cells ?

- (a) Lowers blood pressure (b) Causes allergic symptoms
- (c) Stimulates antibody formation (d) Destroys pathogens

Q5. CBSE 2026 · 1 mark Antivenom injection is an example of
(a) Natural Active Immunity (b) Artificial Active Immunity
(c) Natural Passive Immunity (d) Artificial Passive Immunity

Q6. CBSE 2026 · 1 mark If any organ fails to function satisfactorily, transplantation is the only remedy to enable the patient to live a normal life. All of the following are true w.r.t. transplantation except -

- (a) Tissue matching is essential before undertaking any graft.
- (b) T-lymphocytes play an important role in graft rejection.
- (c) Patient takes immuno-suppressants for first few weeks only after transplantation.
- (d) Blood group matching is important before transplantation.

Q7. CBSE 2026 · 1 mark Which of the following is not a symptom of Ascariasis?

- (a) Intestinal blockage (b) Muscular pain and fever
- (c) Anaemia (d) Skin ulcers

Q8. CBSE 2026 · 1 mark Consider the following statements and choose the correct option : Statement I : Using vaccination and immunization programmes, we have been able to eradicate smallpox. Statement II : Vaccines are available for diphtheria and polio.

- (a) Both Statements I and II are false.
- (b) Both Statements I and II are true.
- (c) Only Statement I is true. (d) Only Statement II is true.



Q9. CBSE 2026 · 1 mark Which cells are responsible for producing antibodies in a human body ?

- (a) Macrophages (b) Helper T-Lymphocytes
(c) Cytotoxic T-Cells (d) B-Lymphocytes

Q10. CBSE 2026 · 1 mark Which of the following is a carrier for the disease Amoebiasis ?

- (a) Culex mosquito (b) Female Anopheles mosquito
(c) Snail (d) Housefly

Q11. CBSE 2026 · 1 mark Nicotine affects blood pressure and heart rate due to release of certain adrenal hormones. Following are some of the adrenal hormones: (i) Adrenaline (ii) Cortisol (iii) Noradrenaline (iv) Aldosterone. Select the correct option:

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

Q12. CBSE 2026 · 1 mark Internal bleeding, muscular pain, blockage of the intestinal passage and anaemia are some of the symptoms caused due to infection by:

- (a) Ascaris (b) Wuchereria (c) Plasmodium
(d) Trichophyton

Q13. CBSE 2026 · 1 mark S is the stimulant of central nervous system and interferes with the transport of T, a neurotransmitter. Identify S and T and choose the correct option.

- (a) S – Cocaine, T – Dopamine
(b) S – Heroin, T – Acetylcholine
(c) S – Heroin, T – Dopamine
(d) S – Cocaine, T – Acetylcholine

Q14. CBSE 2026 · 1 mark A doctor identifies symptoms of nasal congestion, headache, sore throat, hoarseness and cough in a patient. The conclusion is that the patient is infected by a pathogen:

- (a) Plasmodium (b) Adenovirus (c) Salmonella
(d) Rhinovirus

Q15. CBSE 2025 · 1 mark In which of the following human diseases does the body's defence mechanism attack self-cells?

- (a) Thalassemia (b) Phenylketonuria (c) Filariasis
(d) Rheumatoid arthritis

Q16. CBSE 2025 · 1 mark The technique for the early detection of a disease based on the principle of antigen-antibody interaction is:

- (a) RNAi (b) EST (c) PCR (d) ELISA

Q17. CBSE 2025 · 1 mark Assertion (A): A person infected with malaria suffers from chill and high fever, recurring every three or four days. Reason (R): The parasite attacks the RBC resulting in their rupture and release of haemozoin.

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

Q18. CBSE 2025 · 1 mark The type of antibodies produced during an immune response to allergens as dust and pollen grains in a person is:

- (a) IgE (b) IgA (c) IgG (d) IgD

Q19. CBSE 2025 · 1 mark Early detection of HIV in suspected AIDS patients can be done using the diagnostic technique of:

- (a) ELISA (b) PCR (c) EST (d) RNAi

Q20. CBSE 2025 · 1 mark Assertion (A): A person infected with malaria suffers from chill and high fever, recurring every three or four days. Reason (R): The parasite attacks the RBC resulting in their rupture and release of haemozoin. Select the correct answer to these questions from the codes (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

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

Q21. CBSE 2025 · 1 mark Allergy in humans is a result of release of the following chemicals from the mast cells:

- (a) Histamine and Serotonin
(b) Adrenaline and Acetylcholine
(c) Dopamine and Nor-adrenalin (d) Endorphins and GABA

Q22. CBSE 2025 · 1 mark Assertion (A): A person infected with malaria suffers from chill and high fever, recurring every three or four days. Reason (R): The parasite attacks the RBC resulting in their rupture and release of haemozoin. Select the correct answer.

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

Q23. CBSE 2025 · 1 mark The lobed organ located near the heart and beneath the breast bone in humans is :

- (a) Liver (b) Spleen (c) Thymus (d) Lungs

Q24. CBSE 2025 · 1 mark Assertion (A): Lymphocytes arise from bone marrow and present in the blood and lymph and serve as natural killer cells. Reason (R): Lymphocytes migrate to thymus, where they develop into T-cells and begin to mature.

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

Q25. CBSE 2025 · 1 mark The large bean-shaped organ acting as a filter of the blood in humans is :

- (a) Liver (b) Thymus (c) Spleen (d) Heart



Q26. CBSE 2025 · 1 mark A characteristic property that distinguishes a malignant tumor from a benign tumor is :

- (a) Metamorphosis (b) Metastasis (c) Metabolism
(d) Metagenesis

Q27. CBSE 2025 · 1 mark Assertion (A) : In humans, filariasis is characterised by inflammation in the lower limbs. Reason (R) : Filarial worm usually lives in the lymphatic vessels of the lower limbs.

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

Q28. CBSE 2025 · 1 mark Human Immunodeficiency Virus is a member of the group of viruses known as :

- (a) Adenovirus (b) Retrovirus (c) Rhinovirus
(d) Nucleopolyhedrovirus

Q29. CBSE 2025 · 1 mark The lymphoid organ located within the lining of respiratory, digestive and urinogenital tract is :

- (a) GEAC (b) MALT (c) NACO (d) RCH

Q30. CBSE 2025 · 1 mark Assertion (A) : An antibody is a protein molecule made by the lymphocytes. Reason (R) : An antibody binds to a specific foreign antigen and neutralizes its odd effects.

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

Q31. CBSE 2025 · 1 mark The following information is about drugs and tobacco. Select the correct statement from the options given below.

- (a) Cocaine is given to patients after surgery as it stimulates recovery.
(b) Chewing tobacco lowers blood pressure and heart rate.
(c) Barbiturates when given to criminals makes them tell the truth.
(d) Morphine is often given to persons who have undergone surgery as a painkiller.

Q32. CBSE 2025 · 1 mark Which one of the following immune system components does not correctly match with its respective role?

- (a) Interferons - Secreted by virus-infected cells and protect non-infected cells from further viral infection.
(b) Macrophages - Mucus-secreting cells that trap microbes entering into the body.
(c) B-Lymphocytes - Produce antibodies in response to pathogens into blood to fight with them.
(d) IgA - Present in colostrum in early days of lactation to protect infants from diseases.

Q33. CBSE 2025 · 1 mark Study the items of columns I and II where drugs and their effects are given and match them correctly.
Column-I: a. Heroin b. Marijuana c. Cocaine d. Morphine
Column-II: i. Affects cardiovascular system ii. Slows down body functions iii. Painkiller iv. Interferes with transport of dopamine
Choose the correct answer from the options given below:

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

Q34. CBSE 2024 · 1 mark Assertion (A) : The chronic use of alcohol by a person leads to cirrhosis. Reason (R) : Alcohol addiction at times becomes the cause of mental and financial distress to the entire family of the addicted person.

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

Q35. CBSE 2024 · 1 mark Interferons are proteins secreted by

- (a) RBC (b) WBC (c) Bacteria infected cell
(d) Virus infected cell

Q36. CBSE 2024 · 1 mark Assertion (A): AIDS is a syndrome caused by HIV. Reason (R): HIV is a virus that damages the immune system with DNA as its genetic material.

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

Q37. CBSE 2024 · 1 mark In which of the following conditions/diseases is there a substantial increase in the activity of mast cells observed in the human body ?

- (a) Typhoid (b) Allergy (c) Ascariasis (d) AIDS

Q38. CBSE 2024 · 1 mark During an allergic reaction, the binding of antigen to IgE antibodies initiates release of :

- (a) Interferon (b) Histamine (c) Heparin (d) Acetylamine

Q39. CBSE 2024 · 1 mark The vector for dengue fever is :

- (a) Female Aedes mosquito
(b) Female Anopheles mosquito (c) Male Aedes mosquito
(d) Female Culex mosquito

Q40. CBSE 2024 · 1 mark Assertion (A) : Virus-infected cells produce interferons. Reason (R) : Interferons can cause inflammation of virus-infected cells.

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

Q41. CBSE 2024 · 1 mark Allergic reactions are countered by the administration of:

- (a) Glucagon (b) Insulin (c) Antihistamine (d) Oxytocin



Q42. CBSE 2024 · 1 mark Which disease is the patient suffering from who is showing symptoms such as sustained high fever (39°C to 40°C), stomach pain, constipation, headache, loss of appetite and weakness?

- (a) Pneumonia (b) Malaria (c) Typhoid (d) Amoebiasis

Q43. CBSE 2024 · 1 mark A patient is suffering from fever, chills, cough, headache and bluish finger nails and lips. These symptoms are of the disease:

- (a) Malaria (b) Typhoid (c) Common cold (d) Pneumonia

Q44. CBSE 2024 · 1 mark A patient is suffering from the infection of the alveoli of lungs and is showing the symptoms of fever, chills, cough, headache and bluish coloured lips and finger nails. The patient was diagnosed to be suffering from the infection of:

- (a) Epidermophyton (b) Entamoeba histolytica
(c) Haemophilus influenzae (d) Salmonella typhi

Q45. CBSE 2024 · 1 mark ELISA technique is based on the principle of

- (a) DNA replication (b) antigen-antibody interaction
(c) pathogen – antigen interaction
(d) antigen – protein interaction

Q46. CBSE 2023 · 1 mark Select the options which is/are incorrect statement(s) with respect to T-lymphocytes in the human body. (i) They are a type of white blood cells. (ii) They are produced in bone marrow. (iii) They remain active at all times in the body. (iv) They mature in the bone marrow.

- (a) (i) and (iv) only (b) (iii) only (c) (iv) only
(d) (iii) and (iv) only

Q47. CBSE 2023 · 1 mark Assertion (A): More and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the environment. Reason (R): Modern day lifestyle and a protected environment in early life has resulted in lowering the immunity.

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

Q48. CBSE 2023 · 1 mark Assertion (A): The Covid-19 virus has a shorter life-span and evolves into new strains at a fast speed. Reason (R): RNA being unstable, mutates at a faster rate.

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

Q49. CBSE 2023 · 1 mark Assertion (A): Mary Mallon continued to spread typhoid for many years. Reason (R): Salmonella typhi generally enters the small intestine through food and water contaminated with it.

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

VERY SHORT ANSWER (24)

Q50. CBSE 2026 · 2 marks Differentiate between opioids and cannabinoids on the basis of their (a) Receptor site in human body. (b) Mode of action in human body.

Q51. CBSE 2026 · 2 marks (a) Define Humoral immune response. (1 mark) (b) Name any two types of antibodies found to give humoral immune response in humans. (1 mark)

Q52. CBSE 2026 · 2 marks A health officer visiting two different regions reported the following symptoms in patients: Region A – Sustained high fever with stomach pain, constipation and loss of appetite. Region B – Inflammation in the lower limbs and genital organs. Name the diseases likely affecting the patients in regions A and B. Write the scientific name of the causative organisms in both the cases.

Q53. CBSE 2026 · 2 marks There are many methods to control diseases that are spread by insect vectors. (a) Name any two diseases spread in this manner. (b) What is the function of fishes like Gambusia to control the above diseases?

Q54. CBSE 2026 · 2 marks (a) A person complains of persistent itching in the groin region and scalp. The person also shows dry and scaly lesions on skin, nails, etc. (i) Identify the disease. (ii) Name its two causative agents. (iii) Mention its mode of transmission.

Q55. CBSE 2026 · 2 marks (a) A patient reports a high fever, chills and sweating. His blood shows the presence of a toxic substance. (i) Identify the disease and the causative organism. (ii) Explain why this disease shows recurring pattern of fever.

Q56. CBSE 2026 · 2 marks Name the lymphoid organ that acts as a large reservoir of erythrocytes. Explain its role as a lymphoid organ.

Q57. CBSE 2026 · 2 marks State the role of thymus as a lymphoid organ. Name the cells that are released from it and mention their functions.

Q58. CBSE 2025 · 2 marks (a) Explain how the immunity of a person is affected if there is atrophy (degeneration) of the thymus gland at an early stage of life.

Q59. CBSE 2025 · 2 marks (a) Give an account of the generalised structure of an antibody molecule produced by B-lymphocytes in response to the pathogen.



Q60. CBSE 2025 · 2 marks (a) Give an account of the generalised structure of an antibody molecule produced by B-lymphocytes in response to the pathogen. OR (b) Other than public awareness and counselling, enlist four measures taken up by NACO, WHO and other NGOs to prevent the spread of HIV infection in the society.

Q61. CBSE 2025 · 2 marks Expand PID. Name any two common viral infections transmitted through sexual contact in human females.

Q62. CBSE 2025 · 2 marks Many children in the metro cities are suffering from a very common exaggerated response of the immune system to certain weak antigens in air. (i) What is the term used for the above mentioned disease ? (ii) Name the main type of antibody produced by the immune system in response to this disease. (iii) Which two main inflammation-causing chemicals are produced by the mast cells in such an immune response ?

Q63. CBSE 2025 · 2 marks How does a human body respond when vaccine is introduced into it? It is said that vaccinations are a must for a healthy society. Justify.

Q64. CBSE 2025 · 2 marks Explain any two molecular diagnostic techniques that help to detect pathogens from suspected patient.

Q65. CBSE 2025 · 2 marks (i) How do secondary lymphoid organs provide immunity? (ii) Highlight the role of spleen as an organ that provides immunity.

Q66. CBSE 2024 · 2 marks Identify A, B, C and D in the following table: Scientific name of the plant | Drug | Effect on the human body/human system (a) *Papaver somniferum* | A | Depressant/slows down body function (b) *Cannabis sativa* | Cannabinoids | B (c) *Erythroxylum coca* | C | D

Q67. CBSE 2024 · 2 marks A farmer while working on his farm was bitten by a poisonous snake. He was rushed to a nearby health centre where the doctor gave him an injection to save his life. (i) What did the doctor inject and why ? (ii) Name the kind of immunity provided by this injection.

Q68. CBSE 2024 · 2 marks What is a vaccine ? Write the basis on which it acts when administered in the body.

Q69. CBSE 2024 · 2 marks (a) Mention any two ways by which HIV and Hepatitis-B can be transmitted to a healthy person. (b) Why is an early detection of these diseases essential ?

Q70. CBSE 2022 · 2 marks What are Interferons? State their role in the treatment of cancer.

Q71. CBSE 2022 · 2 marks How is the immune response in humans different from the anti-toxin response? Explain with two reasons.

Q72. CBSE 2022 · 2 marks Ringworm is one of the most common infectious fungal disease in humans. Name any two genera of fungi which cause ringworm and state any of its two symptoms.

Q73. CBSE 2022 · 2 marks State the mode of action of cocaine on human body. Write the scientific name of the source plant it is obtained from.

SHORT ANSWER (28)

Q74. CBSE 2026 · 3 marks (a) Mention the scientific name of the source plant and the part from which opioids are extracted. (1 mark) (b) How are morphine and heroin related? Mention the effect each one of them has on human body. (2 marks)

Q75. CBSE 2026 · 3 marks Study the following cases: Case I: A person bitten by a rabid dog is immediately given an injection of antitoxin for rabies. Case II: A child is given rabies vaccine as a preventive measure. (a) Identify the type of immunity provided in both the cases. (b) Differentiate between the two types of immunity. (c) What is a vaccine ? How does it help in preventing a disease ?

Q76. CBSE 2026 · 3 marks (a) A person inhales dust and pathogens but does not always fall sick. Explain how the body protects against such infections. (b) Name and describe any two barriers involved in this protection.

Q77. CBSE 2026 · 3 marks A person inhales dust and pathogens but does not always fall sick. Explain how the body protects against such infections. Name and describe any two barriers involved in this protection.

Q78. CBSE 2026 · 3 marks (a) How do some viruses cause cancer in humans? (b) How do benign tumours turn malignant? How do malignant tumours harm the human body?

Q79. CBSE 2026 · 3 marks (a) Name the cells of the human body attacked by HIV first, when it gains entry into a human body. How does this virus replicate further to cause immunodeficiency in the body? OR (b) Show with the help of a flow chart only, the life-cycle of malarial parasite in human.

Q80. CBSE 2026 · 3 marks Mention the scientific name of the source plant and the part from which opioids are extracted. How are morphine and heroin related? Mention the effect each one of them has on human body.

Q81. CBSE 2025 · 3 marks A person is suffering from high grade fever. Which symptoms will help to identify if he/she is suffering from Typhoid, Pneumonia or Malaria?

Q82. CBSE 2024 · 3 marks (a) Differentiate between humoral immune response and cell-mediated immune response. (b) Draw a schematic diagram of an antibody molecule and label any four parts.

Q83. CBSE 2023 · 3 marks (a) Differentiate between malignant and benign tumours. (b) Name and explain the most feared property of a malignant tumour.

Q84. CBSE 2023 · 3 marks (a) Write the scientific name of the nematode that infests the tobacco plants and the part that it infests. (b) How is *Agrobacterium* used to protect tobacco plant from this attack?

Q85. CBSE 2022 · 3 marks (a) Name and explain the type of immunity which acts as a biological barrier against several infections during foetal development in the womb. (b) A large proportion of infants remain free from potent infections at least three months after birth, or even longer if breast fed. Explain, giving suitable reasons.



Q86. CBSE 2022 · 2 marks Though filariasis is not fatal, but the disease in humans is responsible for considerable suffering, gross deformities and disability. Write the scientific name of any two helminth worms causing the disease and state two chronic manifestations of filariasis.

Q87. CBSE 2022 · 2 marks (a) A person suffering from AIDS dies of opportunistic infections (infections that could have been otherwise overcome). (i) Why does an AIDS patient suffer from opportunistic infections? Give one reason. (ii) Give the scientific name of one bacterium and one parasite which mainly attack a person suffering from AIDS. (iii) Write the full form of the name of the widely used diagnostic test for AIDS.

Q88. CBSE 2022 · 3 marks When Plasmodium sp. (malarial parasite) enters the human body, it reproduces asexually and increases its number. During this course, the affected person suffers from malaria. After a number of asexual cycles, the parasite, in order to complete its life cycle, enters the sexual phase of its life. Trace the sexual stages in the life cycle of Plasmodium in a female Anopheles mosquito, when it bites an infected person, up to the formation of mature infective stages of the parasite.

Q89. CBSE 2022 · 2 marks A person suffering from AIDS dies of opportunistic infections (ARC) i.e., infections that could have been otherwise overcome. (i) When does an HIV-infected person suffer from AIDS? Give one reason. (ii) Give the scientific name of one bacterium and one parasite which mainly attack a person suffering from AIDS. (iii) Write the full form of the name of the widely used diagnostic test for AIDS.

Q90. CBSE 2022 · 3 marks Over the last century, vaccination has been the most effective medical strategy to control infectious diseases. Explain the principle on which vaccination works.

Q91. CBSE 2022 · 2 marks A person suffering from AIDS dies of opportunistic infections (ARC) i.e., infections that could have been otherwise overcome. (i) At which stage of HIV infection is a person suffering from AIDS?

Q92. CBSE 2022 · 3 marks Explain how a humoral immunity system gets into action when a foreign antigen enters into a human body.

Q93. CBSE 2022 · 3 marks Explain the roles of (i) primary, and (ii) secondary lymphoid organs that are responsible for developing defence to combat the action of pathogens/foreign antigens which enter our body. (b) Doctors generally advise not to undergo surgery of tonsils. Why?

Q94. CBSE 2022 · 3 marks Causative agents of HIV-AIDS and COVID-19 belong to the same group of viruses. To diagnose and amplify the genetic material for further study of COVID-19, RT-PCR test is performed. (a) What does PCR stand for? (b) Explain the various steps of PCR technique.

Q95. CBSE 2022 · 2 marks How does Human Immuno deficiency Virus cause immuno deficiency in the human body?

Q96. CBSE 2022 · 2 marks How is immune response different from antibody response? Explain by giving two reasons.

Q97. CBSE 2022 · 3 marks Explain the roles of (i) primary, and (ii) secondary lymphoid organs that are responsible for developing defence to combat the action of pathogens/foreign antigens which enter our body.

Q98. CBSE 2022 · 3 marks An HIV patient normally doesn't die of 'AIDS', but death is caused due to many other infections. Do you agree with the statement? Give explanatory reasons in support of your answer.

Q99. CBSE 2022 · 3 marks Why do doctors have to carry many tests for selecting a person to be a suitable donor for someone who is going for an organ transplant and not take the organ from just anybody? Explain giving reason.

Q100. CBSE 2022 · 3 marks Different types of antibodies are produced in our body by the B-lymphocytes in response to a pathogen that enters in our blood. Name any two antibodies produced and draw a schematic representation of an antibody molecule and label its four parts.

Q101. CBSE 2022 · 3 marks Many people experience allergic symptoms of sneezing or wheezing on exposure to certain substances in the environment. Give two examples of such substances. Which type of antibodies are produced by the body in response to these substances? Mention the role of mast cells in this kind of allergic response.

LONG ANSWER (12)

Q102. CBSE 2026 · 5 marks (a) (i) Name the protozoan species that is responsible for causing the most serious and even fatal malarial disease. (0.5 marks) (ii) Name the host in which the parasite completes its sexual stages and explain the changes taking place. (2 marks) (iii) How does the parasite damage the human body after entering the blood stream? (1.5 marks) (iv) Suggest two effective preventive measures to control the spread of this disease in endemic regions. (1 mark)

Q103. CBSE 2026 · 5 marks (a) (i) Name the protozoan species that is responsible for causing the most serious and even fatal malarial disease. (½ mark) (ii) Name the host in which the parasite completes its sexual stages and explain the changes taking place. (2 marks) (iii) How does the parasite damage the human body after entering the blood stream? (1½ marks) (iv) Suggest two effective preventive measures to control the spread of this disease in endemic regions. (1 mark) OR (b) (i) What are bio-fertilizers? (1 mark) (ii) Name the different types of microorganisms used as bio-fertilizers in organic farming and explain how each contributes to soil fertility. (3 marks) (iii) Write two advantages of using bio-fertilizers over chemical fertilizers. (1 mark)

Q104. CBSE 2026 · 5 marks Name the protozoan species that is responsible for causing the most serious and even fatal malarial disease. Name the host in which the parasite completes its sexual stages and explain the changes taking place. How does the parasite damage the human body after entering the blood stream? Suggest two effective preventive measures to control the spread of this disease in endemic regions.



Q105. CBSE 2026 · 5 marks (a) A 30 year old man was admitted to a hospital with recurrent infections, weight loss, prolonged fever. His blood report showed a decline in count of T-Lymphocytes thus affecting immune system. (i) Identify the disease and its causative agent. (ii) How did the pathogen affect the immune system once it entered the body? Explain. (iii) Mention two major modes of its transmission.

Q106. CBSE 2026 · 5 marks A 30 year old man was admitted to a hospital with recurrent infections, weight loss, prolonged fever. His blood report showed a decline in count of T-Lymphocytes thus affecting immune system. Identify the disease and its causative agent. How did the pathogen affect the immune system once it entered the body? Explain. Mention two major modes of its transmission.

Q107. CBSE 2026 · 5 marks (a)(i) Draw the structure of an antibody molecule and label any four of its parts. (ii) Differentiate between active and passive immunity. Write any three differences.

Q108. CBSE 2024 · 5 marks (a) (i) Describe the life cycle of Plasmodium from the time it enters the human body till a female Anopheles mosquito bites an infected person. (ii) Mention the two events of Plasmodium life cycle that occur within the female Anopheles body. OR (b) (i) Write two differences between malignant tumor and benign tumor. (ii) Explain any three diagnostic techniques for the detection of cancer.

Q109. CBSE 2024 · 5 marks (a) (i) Name and explain the property present in normal cells but is lost in cancer cells. (ii) All normal human cells have genes that may become cancerous under certain conditions. Name them and explain how. (iii) State the role of the following techniques in detection and diagnosis of cancer: (1) Biopsy and Histopathology (2) Magnetic Resonance Imaging

Q110. CBSE 2024 · 5 marks Name and explain the property present in normal cells but is lost in cancer cells. All normal human cells have genes that may become cancerous under certain conditions. Name them and explain how. State the role of the following techniques in detection and diagnosis of cancer : (1) Biopsy and Histopathology (2) Magnetic Resonance Imaging

Q111. CBSE 2024 · 5 marks (a) (i) Describe the life cycle of Plasmodium from the time it enters the human body till a female Anopheles mosquito bites an infected person. (ii) Mention the two events of Plasmodium life cycle that occur within the female Anopheles body.

Q112. CBSE 2024 · 5 marks (a) Describe the life cycle of HIV from the time of its entry into the human body till full blown AIDS sets in.

Q113. CBSE 2023 · 5 marks (b) (i) What is smack? Why is the consumption of smack considered as an abuse? (ii) Name the source plant and one effect of the following drugs on the human body: (1) Marijuana (2) Cocaine (3) Morphine

CASE-BASED (16)

CASE STUDY · CBSE 2026

It is said that early screening is the key to boosting survival rates in cancer patients.

Q114. CBSE 2026 · 4 marks (a) Why is early screening so crucial?

CASE STUDY · CBSE 2026

Immunity in our body is of two types (i) Innate immunity, and (ii) Acquired immunity. Innate immunity is a non-specific defence mechanism, whereas Acquired immunity is pathogen specific. Acquired immunity is characterised by memory. Antibodies are specific to antigens and there are four types of antibodies produced in our body — IgA, IgE, IgG and IgM. It shows primary response where it encounters the pathogen for the first time and secondary response during the subsequent encounters with the same antigen/pathogen. These immune responses are carried out with the help of two special types of lymphocytes present in the blood.

Q115. CBSE 2026 · 4 marks (a) Name the two types of specialised cells which carry out the primary and secondary responses.

CASE STUDY · CBSE 2025

A 2021 UNODC report states that 15-16 year-olds worldwide (13.5 million individuals) had used Cannabis in the past year. The adolescent brain is still developing and drug use can have long-term negative effects. Early drug use initiation can lead to faster development of dependence than in adults and other problems in adulthood. Parts of the Amazon Basin are at the intersection of multiple forms of organised crimes that are accelerating devastation, with severe implications for the security, health and well-being of the population across the region. The direct impact of coca cultivation on deforestation is minimal, but diversion of drug trafficking profits into land speculation etc. is posing a growing threat.

Q116. CBSE 2025 · 4 marks (a) Which age group or period of growth people are more vulnerable to drug abuse?

Q117. CBSE 2025 · 4 marks (c) (i) From which part of the plant are cannabinoids mainly obtained? Mention any one negative effect of this drug on adolescents. OR (c) (ii) State the scientific name of the plant from which coca alkaloids are derived and state one negative impact of use of excessive dosage of cocaine.

CASE STUDY · CBSE 2025

Prevention is the frontline response to drug use. Effective interventions address the underlying conditions contributing to drug use, such as a lack of connection to family or community, instability, insecurity, trauma, mental health issues, etc. When addressed, these factors can effectively prevent the initiation of drug use and the progression to drug use disorders. Study the few key figures of drug use given below and answer the questions that follow. People with drug use disorders, 2022 (in millions) - 292 million people. People who use drugs 2022 - 20% over 10 years, 3% (over 5 years 2018 – 2022). 1 in 11 in treatment. 1 in 18 - 13.9 million people (among women who inject drugs in treatment). 1.6 million living with HIV (among men in treatment) - 1 in 7. 1.4 million living with HIV & Hepatitis C.



Q118. CBSE 2025 - 4 marks (a) What do you infer from the figures in Table No. 1 about the people with drug use disorders, 2022 (in million) ? State any two of your observations.

CASE STUDY - CBSE 2025

Deaths related to the use of drugs were estimated at about 5,00,000 in 2019, 175 percent more than in 2009. Liver diseases attributed to Hepatitis B are a major cause of drug-related deaths, according to UNODC, accounting for more than half of the total number of deaths attributed to the use of drugs. Drug overdoses account for a quarter of drug-related deaths. Opioids contribute to account for the most severe drug-related harm, including fatal overdoses, when used non-medically. At the global level, two-third of direct drug-related deaths are due to opioids, and in some sub-regions the proportion can be as high as three-quarters of such deaths.

Q119. CBSE 2025 - 4 marks Why are people taking opioids more prone to liver diseases attributed to Hepatitis B?

CASE STUDY - CBSE 2025

-year-olds worldwide (13.5 million individuals) had used Cannabis in the past year according to UNODC. The adolescent brain is still developing and drug use can have long-term negative effects. Early drug use initiation can lead to faster development of dependence than in adults and other problems in adulthood. Parts of the Amazon Basin are at the intersection of multiple forms of organised crimes that are accelerating devastation, with severe implications for the security, health and well-being of the population across the region. The direct impact of coca cultivation on deforestation is minimal, but -of drug trafficking profits into land speculation etc. is posing a growing .

Q120. CBSE 2025 - 4 marks (a) Which age group or period of growth people are more vulnerable to drug abuse?

CASE STUDY - CBSE 2025

According to UNODC, 15-year-olds worldwide (13.5 million individuals) had used Cannabis in the past year. The adolescent brain is still developing and drug use can have long-term negative effects. Early drug use initiation can lead to faster development of dependence than in adults and other problems in adulthood. Parts of the Amazon Basin are at the intersection of multiple forms of organised crimes that are accelerating devastation, with severe implications for the security, health and well-being of the population across the region. The direct impact of coca cultivation on deforestation is minimal, but of drug trafficking profits into land speculation etc. is posing a growing threat.

Q121. CBSE 2025 - 4 marks (a) Which age group or period of growth people are more vulnerable to drug abuse ?

CASE STUDY - CBSE 2024

Mosquitoes are drastically affecting the human health in almost all the developing tropical countries. Different species of mosquitoes cause very fatal diseases so much so that many humans loose their life and if they survive, are unable to put in productive hours to sustain their life. With the result the health index of the country goes down.

Q122. CBSE 2024 - 4 marks (a) Name the form in which Plasmodium gains entry into (i) human body (ii) the female Anopheles body. (1 mark)

Q123. CBSE 2024 - 4 marks (a) Name the form in which Plasmodium gains entry into (1) human body (2) the female Anopheles body.

Q124. CBSE 2024 - 1 mark (a) Name the form in which Plasmodium gains entry into (i) human body (ii) the female Anopheles body.

CASE STUDY - CBSE 2024

In 1981, the health workers of United States of America had become aware of the increase in rate of Kaposi's sarcoma, cancer of the skin and blood vessels and another disease pneumocystis pneumonia, a respiratory infection caused by a protozoan. Both these diseases were very rare in the general population, but occurred frequently in more severely immunosuppressed individuals. This led to the recognition of the immune system disorder that was named Acquired Immune Deficiency Syndrome (AIDS). In 1983, virologists working in the USA and France had identified a causative virus (HIV). the disease.

Q125. CBSE 2024 - 1 mark (a) Name the group of cells the HIV attacks after gaining entry into the human body and write the various events that occur within this cell.

CASE STUDY - CBSE 2024

In 1981, the health workers of United States of America had become aware of Kaposi's sarcoma, cancer of the skin and blood vessels and another disease pneumocystis pneumonia, a respiratory infection caused by a protozoan. Both these diseases were very rare in the general population, but occurred frequently in more severely immunosuppressed individuals. This led to the recognition of the immune system disorder that was named Acquired Immune Deficiency Syndrome (AIDS). In 1983, virologists working in the USA and France had identified a causative Virus (HIV). HIV sets path to attack the human body to cause the disease.

Q126. CBSE 2024 - 4 marks (a) Name the group of cells the HIV attacks after gaining entry into the human body and write the various events that occur within this cell.

CASE STUDY - CBSE 2023

The diagram shows the life cycle of a pathogenic protozoan.

Q127. CBSE 2023 - 1 mark (i) Name the parasite that transfers from the mosquito host to the human parasitic host.



Q128. CBSE 2023 · 1 mark Name the parasite that is transferred from the vector to the host.

Q129. CBSE 2023 · 1 mark Name the parasitic stage that transfers from infected mosquito to uninfected mosquito.

8 Microbes in Human Welfare

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (36)

Q1. CBSE 2026 · 1 mark Assertion (A): Flocs are masses of bacteria associated with fungal filaments in secondary treatment of sewage. Reason (R): Flocs help in digestion of solid waste by anaerobic respiration.

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

Q2. CBSE 2026 · 1 mark Microbes commonly used in kitchen are
(a) Lactobacillus and Yeast (b) Penicillium and Yeast
(c) Microspora and E.coli (d) Rhizopus and Lactobacillus

Q3. CBSE 2026 · 1 mark Assertion (A) : Microbes are used for commercial production of alcohol and beverages. Reason (R) : Yeast converts glucose into ethanol and carbon dioxide during fermentation.

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

Q4. CBSE 2026 · 1 mark Caenorhabditis elegans is a nematode which is

- (a) Free living and non-pathogenic
- (b) Endoparasitic and pathogenic
- (c) Free living and pathogenic
- (d) Ecto-parasitic and non-pathogenic

Q5. CBSE 2026 · 1 mark Inoculum used for curd formation is rich in which one of the following components?

- (a) Vitamin B12 (b) Lactic acid bacteria (c) Carbon dioxide
- (d) Cheese

Q6. CBSE 2026 · 1 mark Name one item from the following which involves the use of bacteria:

- (a) Wine (b) Penicillin (c) Citric acid (d) Curd

Q7. CBSE 2026 · 1 mark Assertion (A): Activated sludge contains large population of bacteria. Reason (R): These bacteria help in anaerobic digestion of human waste in biogas plant.

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

Q8. CBSE 2026 · 1 mark Microbes used for biocontrol of pest butterfly caterpillars is:

- (a) Saccharomyces cerevisiae (b) Bacillus thuringiensis
- (c) Streptococcus sp. (d) Trichoderma

Q9. CBSE 2026 · 1 mark Assertion (A): Nucleopolyhedrovirus are useful as they are good biocontrol agents. Reason (R): They are species-specific, narrow spectrum bioinsecticides.

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

Q10. CBSE 2026 · 1 mark Some cyanobacteria in aquatic and terrestrial environment that enrich the soil by fixing nitrogen are:

- (a) Rhizobium and Azotobacter
- (b) Azospirillum and Glomus (c) Anabaena and Nostoc
- (d) Azospirillum and Azotobacter

Q11. CBSE 2026 · 1 mark Assertion (A): Nucleopolyhedrovirus are useful, as they are good biological control agents. Reason (R): They are species-specific narrow spectrum bioinsecticides.

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

Q12. CBSE 2026 · 1 mark Monascus purpureus is a yeast used commercially in the production of which one of the following?

- (a) Ethanol (b) Streptokinase (c) Citric acid (d) Statins

Q13. CBSE 2026 · 1 mark Assertion (A): Trichoderma species are free living fungi that are very common in the root ecosystems. Reason (R): They are effective bio-control agents of several plant pathogens.

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



Q14. CBSE 2026 · 1 mark Assertion (A): Besides curdling of milk, LAB also improves its nutritional quality by increasing Vitamin B12. Reason (R): LAB, when present in the stomach checks disease-causing microbes.

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

Q15. CBSE 2026 · 1 mark Assertion (A): An increase in BOD indicates that the water is fit for consumption. Reason (R): BOD is a measure of the organic matter present in water.

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

Q16. CBSE 2025 · 1 mark Bioactive molecule Cyclosporin A used for human welfare is derived from:

- (a) *Propionibacterium sharmanii* (b) *Monascus purpureus*
- (c) *Trichoderma polysporum* (d) *Aspergillus niger*

Q17. CBSE 2025 · 1 mark Bioactive molecule statins used for human welfare are derived from:

- (a) *Trichoderma polysporum* (b) *Monascus purpureus*
- (c) *Propionibacterium shermanii* (d) *Aspergillus niger*

Q18. CBSE 2025 · 1 mark Large scale industrial production of Butyric acid for human welfare is done using the microbe:

- (a) *Aspergillus* sp. (b) *Streptococcus* sp. (c) *Clostridium* sp.
- (d) *Trichoderma* sp.

Q19. CBSE 2025 · 1 mark Assertion (A): Biogas plants are more often built in rural areas. Reason (R): The excreta or gober of cattle is rich in *Methanobacterium*.

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

Q20. CBSE 2025 · 1 mark Large scale industrial production of citric acid for human welfare is done using the microbe :

- (a) *Streptococcus* sp. (b) *Aspergillus* sp. (c) *Clostridium* sp.
- (d) *Trichoderma* sp.

Q21. CBSE 2025 · 1 mark Large scale industrial production of streptokinase for human welfare is done using the microbe :

- (a) *Streptomyces* (b) *Streptococcus* (c) *Streptobacilli*
- (d) *Streptopneumoniae*

Q22. CBSE 2025 · 1 mark Bottled fruit juices are clearer as compared to those made at home, as they are clarified by the use of :

- (a) Lipases and pectinases (b) Pectinases and proteases
- (c) Proteases and cellulases (d) Nucleases and lipases

Q23. CBSE 2025 · 1 mark Bacteria growing anaerobically on cellulosic material produce large amounts of which gases ? Select the correct option.

- (a) CH₄, CO₂, H₂ (b) H₂, NH₃, CH₄ (c) H₂O, Cl₂, H₂S
- (d) O₂, CH₄, H₂

Q24. CBSE 2025 · 1 mark Certain viruses used as biological control agents belong to the genus :

- (a) Nucleopolyhedrovirus (b) Adenovirus
- (c) Tobacco Mosaic Virus (d) Rhinovirus

Q25. CBSE 2025 · 1 mark Assertion (A): Swiss cheese is characterized by large holes due to CO₂ production. Reason (R): It is ripened by growing a specific fungi.

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

Q26. CBSE 2025 · 1 mark Name the microbe that is used as biocontrol agent for controlling pest butterfly caterpillars:

- (a) *Streptococcus* spp. (b) *Trichoderma* spp.
- (c) *Bacillus thuringiensis* (d) *Saccharomyces cerevisiae*

Q27. CBSE 2024 · 1 mark During biological treatment of sewage, the masses of bacteria held together by fungal filaments to form mesh like structures are called

- (a) primary sludge (b) flocs (c) activated sludge
- (d) anaerobic sludge

Q28. CBSE 2024 · 1 mark The first antibiotic was discovered accidentally by A while working on B. 'A' and 'B' are

- (a) A – Waksman; B – *Streptococcus*
- (b) A – Fleming; B – *Penicillium notatum*
- (c) A – Waksman; B – *Bacillus brevis*
- (d) A – Fleming; B – *Staphylococci*

Q29. CBSE 2024 · 1 mark *Lactobacillus* that sets milk into curd is categorised as :

- (a) Cyanobacteria (b) Archaeobacteria
- (c) Chemosynthetic bacteria (d) Heterotrophic bacteria

Q30. CBSE 2024 · 1 mark Which one of the following pairs is not correctly matched ?

- (a) *Clostridium butylicum* - Butyric acid
- (b) *Trichoderma polysporum* - Cyclosporin A
- (c) *Monascus purpureus* - Citric Acid
- (d) *Streptococcus* - Streptokinase



Q31. CBSE 2024 · 1 mark Louis Pasteur dismissed the theory of spontaneous generation by his experiments using pre-sterilised flasks and :

- (a) Live yeast (b) Killed yeast (c) Live bacteria
(d) Killed bacteria

Q32. CBSE 2024 · 1 mark Given below is a list of some commercially important products in column A, whereas in column B are names of source organisms. Select the option where the product and their source organisms are correctly matched.

- (a) A – (i), B – (ii), C – (iii), D – (iv)
(b) A – (iii), B – (ii), C – (iv), D – (i)
(c) A – (iv), B – (iii), C – (iv), D – (i)
(d) A – (ii), B – (iv), C – (i), D – (iii)

Q33. CBSE 2024 · 1 mark A list of organisms is given in column 'R', whereas in column 'S' a list of products produced by them. Select the option where the organisms are correctly matched with the product. Column 'R' (Organisms): (A) Lactobacillus (B) Saccharomyces cerevisiae (C) Aspergillus niger (D) Acetobacter aceti. Column 'S' (Products): (i) Cheese (ii) Curd (iii) Citric acid (iv) Bread (v) Acetic acid

- (a) (A)-(ii), (B)-(i), (C)-(iii), (D)-(v)
(b) (A)-(ii), (B)-(iv), (C)-(v), (D)-(iii)
(c) (A)-(ii), (B)-(iv), (C)-(iii), (D)-(v)
(d) (A)-(iii), (B)-(iv), (C)-(v), (D)-(i)

Q34. CBSE 2023 · 1 mark Which one among the following biofertilizers does not fix atmospheric nitrogen?

- (a) Oscillatoria (b) Rhizobium (c) Azospirillum (d) Glomus

Q35. CBSE 2023 · 1 mark Which one of the following fixes the atmospheric nitrogen but is not an autotroph?

- (a) Oscillatoria (b) Rhizobium (c) Anabaena (d) Nostoc

Q36. CBSE 2023 · 1 mark Identify the yeast that is famous for Fort Cheese production.

- (a) Saccharomyces cerevisiae
(b) Propionibacterium sharmanii (c) Monascus purpureus
(d) Penicillium notatum

VERY SHORT ANSWER (15)

Q37. CBSE 2026 · 2 marks A laboratory assistant collected three water samples, namely river water, untreated sewage water and secondary effluent discharged from a sewage treatment plant. But the laboratory attendant did not note which was which. The samples were labelled A, B and C and subjected to a BOD test. The BOD values of the three samples A, B and C were recorded as 30 mg/L, 8 mg/L and 400 mg/L respectively. (a) Which sample of the water is most polluted? (b) Can you assign the correct label to each, assuming the river water is relatively clean?

Q38. CBSE 2026 · 2 marks (a) What is the role of LAB (Lactic Acid Bacteria) in preparation of curd? (1 mark) (b) Mention two health benefits of consuming curd. (1 mark)

Q39. CBSE 2026 · 2 marks After significant reduction of BOD during secondary treatment of sewage, what further processes are carried out? Mention any one important outcome of these processes.

Q40. CBSE 2026 · 2 marks (b) Give the microbial source and mode of action of the following bioactive molecules : (i) Cyclosporin-A (ii) Streptokinase

Q41. CBSE 2025 · 2 marks Ravi lives in a village where he suggested to the local farmers to introduce a fungus as biofertilizer into their crop fields. State the benefits provided by the fungus to the crop.

Q42. CBSE 2024 · 2 marks List the events that reduce the Biochemical Oxygen Demand (BOD) of a primary effluent during sewage treatment.

Q43. CBSE 2024 · 2 marks Different varieties of cheese are known by their characteristic texture, flavour and taste, the specificity coming from the microbes used. Support this statement with the help of two suitable examples.

Q44. CBSE 2023 · 2 marks (a) Why should antibiotics not be taken indiscriminately? Give any two reasons. (b) It is advisable to complete the course of antibiotics as prescribed by the doctor. Justify.

Q45. CBSE 2023 · 2 marks (a) Write the first step the primary effluent undergoes when it enters the secondary treatment plant and state the purpose. (b) What is the level of B.O.D indicative of in the secondary treatment plant? Mention its significance.

Q46. CBSE 2023 · 2 marks Explain the role of microorganisms in the following: (a) Reducing the sugar content in grape juice (b) Production of a fuel

Q47. CBSE 2023 · 2 marks (a) Name the two institutes which developed the technology of biogas production in India. (b) Explain the main principle used in this technology.

Q48. CBSE 2022 · 2 marks A patient who has undergone an organ transplant is put on immunosuppressants. Name this immunosuppressant and write the name of its source organism.

Q49. CBSE 2022 · 2 marks Can we use slurry of human excreta instead of cowdung slurry to produce biogas in a typical biogas plant? Support your answer giving reasons.

Q50. CBSE 2022 · 2 marks State the most important contribution of the following microbes for human welfare: (a) Monascus purpureus (b) Trichoderma Polysporum

Q51. CBSE 2022 · 2 marks What would be the best method to measure the total population density of a dense bacterial culture in a petridish and why?

SHORT ANSWER (19)

Q52. CBSE 2026 · 3 marks Explain how Bacillus thuringiensis acts as a microbial biocontrol agent.

Q53. CBSE 2026 · 3 marks Cow dung and water are mixed and fed into a biogas plant to allow digestion of biowastes. The person performing this process says that there is no need to provide an inoculum. (a) Do you agree with him? Justify your answer. (b) What happens to the biowaste inside the digester? (c) Name the useful by-products obtained from this process and mention how they are used.



Q54. CBSE 2026 · 3 marks (a) Who discovered Penicillin and how? Explain. (b) Why is this discovery considered accidental? (c) In what way did it prove to be a 'milestone' in the field of medicine?

Q55. CBSE 2026 · 3 marks Mention a product of human welfare obtained with the help of each one of the following: (a) *Saccharomyces cerevisiae* (b) *Propionibacterium shermanii* (c) *Aspergillus niger* (d) *Trichoderma polysporum* (e) *Acetobacter aceti* (f) *Streptococcus*

Q56. CBSE 2026 · 3 marks Explain how the following microbes act as biocontrol agents: (a) *Bacillus thuringiensis* (b) Nucleopolyhedrovirus

Q57. CBSE 2025 · 3 marks Explain the biological treatment of primary effluent when passed into the large aeration tanks in a sewage treatment plant (STP).

Q58. CBSE 2025 · 3 marks Enlist one advantage and two disadvantages of green revolution.

Q59. CBSE 2025 · 3 marks (a) What do you mean by activated sludge in an STP? (b) Explain the biological treatment of the major part of the sludge transferred from the large aeration tank into the anaerobic sludge digesters before its final release into the natural water bodies.

Q60. CBSE 2025 · 3 marks (a) Write the full form of BOD. (b) Define BOD. Explain how it is a measure of the organic matter present in the water body.

Q61. CBSE 2024 · 3 marks Identify a, b, c, d, e and f in the table given below: Sl. No. | Organism | Bioactive Molecule | Use 1. | *Monascus purpureus* | a | b 2. | c | d | Antibiotic 3. | e | Cyclosporin A | f

Q62. CBSE 2024 · 3 marks (a) (i) List two major reasons for using cow-dung in a biogas plant instead of using domestic sewage. (ii) Mention one use of the unspent slurry of the biogas plant. OR (b) Name the bioactive molecule and its microbial source generally used by physicians to treat the patients for: (i) Myocardial infarction (ii) High blood cholesterol level (iii) Organ transplantation

Q63. CBSE 2024 · 3 marks Explain the role of the following during the sewage treatment: (a) flocs (b) anaerobic sludge digester

Q64. CBSE 2024 · 3 marks How do the following organisms act as bio-fertilisers? Explain. (a) Mycorrhiza (b) *Anabaena* (c) *Rhizobium*

Q65. CBSE 2023 · 3 marks Treatment of wastewater is done in a sewage treatment plant to make it less polluting. Explain the following with reference to this treatment process: (a) Primary sludge (b) Activated sludge (c) Anaerobic sludge digesters

Q66. CBSE 2023 · 3 marks (a) Write the scientific name of the nematode that infests the tobacco plants and the part that it infests. (b) How is *Agrobacterium* used to protect tobacco plant from this attack?

Q67. CBSE 2022 · 2 marks Lactic Acid Bacteria (LAB) sets milk into curd and also plays a very beneficial role for human health. Give any two suitable reasons.

Q68. CBSE 2022 · 2 marks Mention the common bacterium found in the anaerobic sludge during sewage treatment and also in the rumen of cattle. How is this bacterium commercially useful?

Q69. CBSE 2022 · 2 marks Different species belonging to genus *Trichoderma* are useful to humans as well as to plants. Justify their roles by giving one instance of each.

Q70. CBSE 2022 · 2 marks Some of the microbes used as biofertilizers are prokaryotes. Name the taxonomic group they come under. With the help of an example, mention how they act as biofertilizers.

LONG ANSWER (3)

Q71. CBSE 2026 · 5 marks (b) (i) What are bio-fertilizers? (1 mark) (ii) Name the different types of microorganisms used as bio-fertilizers in organic farming and explain how each contributes to soil fertility. (3 marks) (iii) Write two advantages of using bio-fertilizers over chemical fertilizers. (1 mark)

Q72. CBSE 2026 · 5 marks (b) (i) Why are microbes considered effective biocontrol agents in sustainable agriculture? (ii) Explain the role of the following as biocontrol agents naming the pests or diseases they help to control: (1) A Bacterium (2) A Fungus (3) Virus

Q73. CBSE 2026 · 5 marks Why are microbes considered effective biocontrol agents in sustainable agriculture? Explain the role of the following as biocontrol agents naming the pests or diseases they help to control: (1) A Bacterium (2) A Fungus (3) Virus

9 Biotechnology: Principles and Processes

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (50)

Q1. CBSE 2026 · 1 mark Pomato was produced by fusing protoplasts of

- (a) Tomato and Potato (b) Pomegranate and Tomato
(c) Pomegranate and Potato
(d) Pomegranate, Potato and Tomato

Q2. CBSE 2026 · 1 mark Match Column-I with Column-II and choose the correct option: Column-I: a. Biolistic gun, b. Chitinase, c. Ti, d. Ca^{++} | Column-II: i. Bacterial cell, ii. Tumour inducing, iii. Animal cell, iv. Fungal cell, v. Plant cell

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

Q3. CBSE 2026 · 1 mark Match Column-I with Column-II and choose the correct option: a. Biolistic gun, b. Chitinase, c. Ti, d. Ca^{++} with i. Bacterial cell, ii. Tumour inducing, iii. Animal cell, iv. Fungal cell, v. Plant cell

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

Q4. CBSE 2026 · 1 mark Which one of the following is not a component required for Polymerase Chain Reaction (PCR)?

- (a) Template DNA (b) Primers (c) DNA Ligase
(d) DNA Polymerase



Q5. CBSE 2026 · 1 mark Which of the following statements about plasmids is incorrect?

- (a) Plasmids have the ability to replicate within the bacterial cell.
- (b) Their replication is controlled by chromosomal DNA.
- (c) They are autonomously replicating circular extra-chromosomal DNA.
- (d) They often carry antibiotic resistant genes.

Q6. CBSE 2026 · 1 mark Expression of a particular gene helps to identify transformants. What is this gene known as?

- (a) Plasmid (b) Structural gene (c) Selectable marker
- (d) Intron

Q7. CBSE 2026 · 1 mark Which of the following is used to visualize DNA bands under UV light after gel electrophoresis ?

- (a) Acetocarmine (b) Safranin (c) Ethidium Bromide
- (d) Potassium Iodide

Q8. CBSE 2026 · 1 mark Assertion (A) : DNA Ligase is used to join DNA fragments. Reason (R) : It catalyses the formation of glycosidic bonds between nucleotides.

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

Q9. CBSE 2026 · 1 mark To separate repetitive DNA from bulk genomic DNA, which of the following method is used?

- (a) Elution (b) Southern Blotting
- (c) Polymerase Chain Reaction
- (d) Density Gradient Centrifugation

Q10. CBSE 2026 · 1 mark Genetically modified tobacco plants were produced using Agrobacterium vectors. Which property of Agrobacterium helps in carrying nematode specific genes into the host plant?

- (a) Infectious for monocot plant; has Ti plasmid
- (b) Infectious for dicot plant; has Ti plasmid
- (c) Infectious for plants and animals; has Ti plasmids
- (d) Infectious for monocot and dicot plants; has cry gene

Q11. CBSE 2026 · 1 mark Restriction enzymes cut the DNA strand at specific recognition sites to form sticky ends. Select the option that describes the sticky ends correctly.

- (a) Long double-stranded stretches of DNA which hang loosely on both sides.
- (b) They are over-hanging stretches of RNA.
- (c) They form hydrogen bonds with their complementary cut counterparts.
- (d) They are sticky at their ends and hence prevent enzyme action.

Q12. CBSE 2026 · 1 mark Assertion (A): To isolate DNA from plant cell enzyme chitinase is used. Reason (R): Chitinase breaks down the plant cell wall.

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

Q13. CBSE 2026 · 1 mark Match Column I with Column II and select the correct option: Column I: a. Primers, b. Insertional inactivation, c. Bioreactor, d. Downstream processing Column II: i. β -galactosidase, ii. To separate and purify products, iii. Chemically synthesized oligonucleotides, iv. Large scale production of specific product of activity of microbes

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

Q14. CBSE 2026 · 1 mark Assertion (A) : DNA cannot pass through cell membrane of a bacterial cell. Reason (R) : DNA is a hydrophilic molecule.

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

Q15. CBSE 2026 · 1 mark What does I in restriction enzyme Hind S2I indicate ?

- (a) It cuts after the first nucleotide in the restriction site.
- (b) It is the first enzyme isolated from strain S2 of bacterium.
- (c) Only one enzyme can be used to digest a plasmid from S2 strain.
- (d) Only one restriction enzyme has been isolated from this bacteria.

Q16. CBSE 2026 · 1 mark Elution means:

- (a) making the DNA bands visible under UV radiations.
- (b) separation of DNA fragments on agarose gel.
- (c) isolating alien DNA from the choice organism.
- (d) cutting and extraction of DNA bands from the agarose gel.

Q17. CBSE 2026 · 1 mark The construction of the first recombinant DNA was done by using the native plasmid of:

- (a) E. coli (b) Salmonella typhimurium (c) B. thuringiensis
- (d) Agrobacterium

Q18. CBSE 2026 · 1 mark Bacillus thuringiensis is used to control which one of the following pathogens/pests?

- (a) Bacterial pathogen (b) Fungal pathogen
- (c) Nematodes (d) Insect pests

Q19. CBSE 2026 · 1 mark In pBR322, tetracycline resistance gene (tet R) has recognition site for which of the following restriction endonuclease?

- (a) Hind III (b) BamH I (c) EcoR I (d) Pst I



Q20. CBSE 2026 · 1 mark Assertion (A): The use of chitinase enzyme is necessary for the separation of DNA from yeast cells but not in the case of Spirogyra. Reason (R): Fungal cell wall is made up of fungal chitin.

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

Q21. CBSE 2025 · 1 mark Isolation of DNA from a fungal cell can be achieved by using:

- (a) Cellulase (b) Chitinase (c) Lysozyme (d) Protease

Q22. CBSE 2025 · 1 mark Isolation of DNA from a bacterial cell can be achieved by using :

- (a) Cellulase (b) Lysozyme (c) Protease (d) Ribonuclease

Q23. CBSE 2025 · 1 mark Isolation of DNA from a plant cell can be achieved by using :

- (a) Chitinase (b) Lysozyme (c) Cellulase (d) Pectinase

Q24. CBSE 2025 · 1 mark The cloning site present in the tetracycline resistance gene of E. coli cloning vector pBR322 is :

- (a) EcoR I (b) Pvu II (c) Sal I (d) Pst I

Q25. CBSE 2025 · 1 mark Assertion (A) : Isolated single cells can be fused to produce somatic hybrids. Reason (R) : Cells selected for somatic hybridisation have desirable characters.

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

Q26. CBSE 2025 · 1 mark The cloning site present in the rop site of E. coli cloning vector pBR322 is :

- (a) Pvu II (b) Pst I (c) EcoR I (d) BamH I

Q27. CBSE 2025 · 1 mark The cloning site present in the ampicillin resistance gene of E. coli cloning vector pBR322 is :

- (a) BamH I (b) EcoR I (c) Pst I (d) Sal I

Q28. CBSE 2025 · 1 mark Identify the incorrect statement regarding PCR.

- (a) Two sets of primers are required during polymerisation.
- (b) The process of replication is repeated multiple times to produce one billion copies.
- (c) Thermostable DNA polymerase is used for extension of primers.
- (d) Annealing is required to separate both the strands of template DNA.

Q29. CBSE 2025 · 1 mark Assertion (A): A piece of DNA inserted into an alien organism generally does not replicate, if not inserted into a chromosome. Reason (R): ori is where DNA replication is initiated.

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

Q30. CBSE 2025 · 1 mark pBR which is frequently used as a vector for cloning gene in E. coli is a/an:

- (a) Original bacterial plasmid (b) Modified bacterial plasmid
- (c) Viral genome (d) Transposon

Q31. CBSE 2024 · 1 mark Which one of the following statements is correct in the context of observing DNA separation by agarose gel electrophoresis?

- (a) DNA can be seen in visible light.
- (b) DNA can be seen without staining in visible light.
- (c) Ethidium bromide stained DNA can be seen in visible light
- (d) Ethidium bromide stained DNA can be seen under UV light.

Q32. CBSE 2024 · 1 mark Which one of the following enzymes a fungal cell should be treated with to get the DNA along with other macro molecules released from it?

- (a) Isozymes (b) Cellulose (c) Ribonuclease (d) Chitinase

Q33. CBSE 2024 · 1 mark Restriction Endonuclease Hind II always cuts DNA molecules at a particular point by recognising a specific sequence of :

- (a) Six base pairs (b) Four base pairs (c) Seven base pairs
- (d) Three base pairs

Q34. CBSE 2024 · 1 mark Using a DNA template, how many new DNA molecules would be generated after 10 cycles of amplification in PCR?

- (a) 512 (b) 1024 (c) 2048 (d) 256

Q35. CBSE 2024 · 1 mark Which one of the following bacteria were used by Stanley Cohen and Herbert Boyer to accomplish the construction of the first rDNA ?

- (a) Agrobacterium tumefaciens (b) Mycobacterium sp.
- (c) E. coli (d) Salmonella typhimurium

Q36. CBSE 2024 · 1 mark Which one of the following is not a feature of plasmids ?

- (a) Circular (b) Self-replicating (c) Single stranded
- (d) Extra-chromosomal



Q37. CBSE 2024 · 1 mark Assertion (A) : Specific enzymes are used to degrade the cell wall in organisms to isolate the DNA from the cell. Reason (R) : Fungal cell wall is degraded by the enzyme cellulase.

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

Q38. CBSE 2024 · 1 mark Which one of the following is not used as a vector for rDNA technology?

- (a) Plasmid (b) Bacterial cell (c) Bacteriophage
- (d) Retrovirus

Q39. CBSE 2024 · 1 mark Which native plasmid did Stanley Cohen and Herbert Boyer use for the construction of the first recombinant DNA ?

- (a) Salmonella typhimurium (b) Streptococcus pneumoniae
- (c) Escherichia coli (d) Haemophilus influenzae

Q40. CBSE 2024 · 1 mark Assertion (A) : The stirrer facilitates the even mixing of oxygen availability in a bioreactor. Reason (R) : Stirred-tank bioreactors generally have a flat base.

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

Q41. CBSE 2024 · 1 mark For the replication of the first recombinant DNA, Stanley Cohen and Herbert Boyer used the DNA polymerase of :

- (a) Thermus aquaticus (b) Salmonella typhimurium
- (c) Escherichia coli (d) Haemophilus influenzae

Q42. CBSE 2024 · 1 mark The linking of the antibiotic resistance gene with the plasmid vector of Salmonella typhimurium by Stanley Cohen and Herbert Boyer was made possible by the enzyme :

- (a) Taq polymerase (b) DNA ligase
- (c) Restriction endonuclease (d) β -galactosidase

Q43. CBSE 2024 · 1 mark Study the following list of bioactive substances and their action: Select the option in which the bioactive substances are correctly matched with their action.

- (a) A – II, B – III, C – I, D – IV (b) A – III, B – IV, C – II, D – I
- (c) A – IV, B – I, C – II, D – III (d) A – IV, B – II, C – I, D – III

Q44. CBSE 2024 · 1 mark The 'molecular scissors' fall in the category of :

- (a) Cleaving enzyme (b) Endonuclease (c) Exonuclease
- (d) Restriction enzymes

Q45. CBSE 2024 · 1 mark The commonly used vector for human genome sequencing was/were:

- (a) Retrovirus (b) T-DNA (c) BAC and YAC
- (d) Plasmid Vector

Q46. CBSE 2024 · 1 mark Assertion (A): Agrobacterium tumefaciens is a pathogen of several monocot plants. Reason (R): It is able to deliver a piece of DNA known as T-DNA to transform normal plant cells into a tumor.

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

Q47. CBSE 2024 · 1 mark Assertion (A): In genetic engineering, antibiotic genes are used as selectable markers. Reason (R): Selectable markers help us to identify transformants from non-transformants.

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

Q48. CBSE 2024 · 1 mark Assertion (A): A recombinant DNA which is inserted within the coding sequence of β -galactosidase does not produce blue coloured colonies when treated with a chromogenic substrate. Reason (R): Insertional inactivation occurs when a recombinant DNA is introduced in the coding sequence of the enzyme.

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

Q49. CBSE 2023 · 1 mark The organism used in construction of the first artificial recombinant DNA by Cohen and Boyer in 1972 was:

- (a) E. coli (b) Salmonella typhimurium
- (c) Agrobacterium tumefaciens (d) Bacillus thuringiensis

Q50. CBSE 2023 · 1 mark Assertion (A): In order to cut the DNA with a restriction enzyme, it needs to be released from the membrane which encloses it. Reason (R): A plant cell was treated with chitinase to achieve this.

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

VERY SHORT ANSWER (21)

Q51. CBSE 2026 · 2 marks Write the importance of following in biotechnology: (a) Ori (Origin of Replication) (1 mark) (b) Enzyme Polymerase used in Polymerase Chain Reaction (1 mark)

Q52. CBSE 2026 · 2 marks How do scientists use microinjection and gene gun in biotechnology ?



Q53. CBSE 2026 · 2 marks Briefly describe the process of DNA extraction from a fungal cell. Name the chemicals used in the process.

Q54. CBSE 2026 · 2 marks Mention the key tools of Recombinant DNA technology. Write a line about any four of them, giving their function.

Q55. CBSE 2026 · 2 marks (b) After performing gel electrophoresis, a student observes that DNA fragments are not visible. (i) Suggest a reason for this and explain how fragments can be made visible. (ii) Also explain how a specific DNA fragment can be collected from the gel for further use.

Q56. CBSE 2026 · 2 marks (a) Given below is the schematic representation of the process of electrophoresis. Identify the alphabets representing the : (I) Anode end, and (II) Lightest/Smallest DNA in matrix. (ii) What is Agarose gel and why is it used in this process ?

Q57. CBSE 2026 · 2 marks Write the role of 'ori' and 'restriction' site in a cloning vector pBR322.

Q58. CBSE 2026 · 2 marks Why and how can bacteria be made 'competent'?

Q59. CBSE 2026 · 2 marks (b) In order to force bacteria to take up the recombinant DNA, they must be made competent. Explain how it can be achieved.

Q60. CBSE 2026 · 2 marks Suggest how a virus-free healthy plant can be obtained from a diseased sugarcane plant.

Q61. CBSE 2026 · 2 marks Explain any two methods of vectorless gene transfer.

Q62. CBSE 2025 · 2 marks Name the enzyme used in Step-1 to join the cut plasmid and alien DNA. State the technical term used for Step-3. Justify the use of same Restriction Enzyme EcoR I to cut both the vector DNA and the alien DNA.

Q63. CBSE 2025 · 2 marks (a) Name the enzyme used in Step-1 to join the cut plasmid and alien DNA. (b) State the technical term used for Step-3. (c) Justify the use of same Restriction Enzyme EcoR I to cut both the vector DNA and the alien DNA. The basic scheme of the essential steps involved in the process of recombinant DNA technology is summarized below in the form of a flow diagram. Step-1: Vector DNA (cut using Restriction Enzyme EcoR I) + Alien DNA (cut using Restriction Enzyme EcoR I) → Enzyme A → Step-2: Recombinant DNA molecule → Step-3 → Transfer of recombinant DNA molecule in E. coli (Host) → Step-4: Replication of recombinant DNA molecule in E. coli

Q64. CBSE 2025 · 2 marks (a) Name the specific enzyme that might have been used to make the multiple copies of foreign DNA before undergoing Step-1 of the process.

Q65. CBSE 2025 · 2 marks The basic scheme of the essential steps involved in the process of recombinant DNA technology is summarised below in the form of a flow diagram. Step 1: Vector DNA (Plasmid) + Alien DNA (cut using Restriction Enzyme). Step 2: Recombinant DNA molecule. Step 3: Transfer of recombinant DNA molecule in E. coli (Host). Step 4: Replication of the recombinant DNA molecule in E. coli to form multiple copies of the alien gene. (a) What is the technical term used for Step 4 in the above process ?

Q66. CBSE 2025 · 2 marks How is DNA isolated in purified form from a bacterial cell?

Q67. CBSE 2024 · 2 marks State the role of ori and restriction site in pBR322.

Q68. CBSE 2024 · 2 marks How is a restriction endonuclease named? Explain with the help of a suitable example.

Q69. CBSE 2024 · 2 marks How is Ti plasmid of Agrobacterium tumefaciens modified to act as a cloning vector?

Q70. CBSE 2023 · 2 marks (a) Vectors are DNA molecules that can carry a foreign DNA segment into the host cell. (i) Write the characteristics of vectors. (ii) Give one example each of vectors used for cloning genes in plants and animals.

Q71. CBSE 2023 · 2 marks (a) Restriction enzyme is an important tool to detect recombinant DNA. Explain the method. OR (b) Explain how recombinant DNA technology is used to detect a disease even before any clinical symptom appears.

SHORT ANSWER (12)

Q72. CBSE 2026 · 3 marks There are limitations of traditional breeding techniques that led to promotion of micro-propagation? (a) Mention two advantages of micropropagation. (b) Give two examples where it is commercially adopted.

Q73. CBSE 2024 · 3 marks (a) Why must a cell be made 'competent' in biotechnology experiments? How does calcium ion help in doing so? (b) State the role of "biolistic gun" in biotechnology experiments.

Q74. CBSE 2024 · 3 marks Draw a schematic diagram of the E.coli vector pBR 322 and mark the following in it: (a) ori (b) rop (c) ampicillin resistant gene (d) tetracycline-resistant gene (e) restriction site Bam HI (f) restriction site EcoRI

Q75. CBSE 2023 · 3 marks With the help of a schematic diagram only, show in three steps, the formation of recombinant DNA by the action of restriction endonuclease EcoRI and DNA ligase.

Q76. CBSE 2022 · 3 marks With the advent of sophisticated techniques of genetic engineering, we can now readily purify and isolate DNA. Name and explain the different steps involved in the separation and isolation of DNA fragments once cut by restriction endonucleases.

Q77. CBSE 2022 · 3 marks (a) Draw a labelled diagram of a simple stirred-tank bioreactor. (b) State why a simple-stirred tank bioreactor generally has a curved base.

Q78. CBSE 2022 · 3 marks With the help of a storyboard or a flowchart only, explain all the stages of how human insulin is produced through r-DNA technology.



Q79. CBSE 2022 · 3 marks Explain the various steps of PCR technique.

Q80. CBSE 2022 · 3 marks Only with the help of a labelled diagram, show the steps of formation of recombinant DNA by the action of restriction endonuclease enzyme EcoR I.

Q81. CBSE 2022 · 3 marks A cell free method of amplifying DNA first developed in the mid 1980's revolutionized the field of biotechnology. Name the method and explain the basic steps of the technique involved.

Q82. CBSE 2022 · 3 marks A host cell must be made competent, before it is able to receive an rDNA. Justify.

Q83. CBSE 2022 · 3 marks Non viral and non vector methods are sometimes used to transfer genes or alien DNA into a plant cell. Explain one such method used in genetic engineering.

LONG ANSWER (16)

Q84. CBSE 2026 · 5 marks (a) Describe the steps involved in Recombinant DNA technology in a specific sequence. OR (b) (i) In Recombinant DNA technology, it is essential to first make the bacterial cells 'competent'. How is this process carried out? (ii) Name and explain the methods by which an alien DNA can be made to enter: (I) a plant cell, (II) an animal cell.

Q85. CBSE 2026 · 5 marks (a) (i) Explain any two basic principles/core techniques on which biotechnology is based. (ii) Describe any three key tools used in Recombinant DNA technology.

Q86. CBSE 2026 · 5 marks (a)(i) EcoR I has played a very important role in rDNA technology. (I) Explain the convention for naming EcoR I. (II) Write the recognition site of this endonuclease restriction enzyme. (ii) Name the overhanging stretches of DNA produced by these restriction enzymes. Describe their role in the formation of rDNA.

Q87. CBSE 2026 · 5 marks (a)(i) EcoR I has played a very important role in rDNA technology. (I) Explain the convention for naming EcoR I. (II) Write the recognition site of this restriction endonuclease enzyme. (ii) Name the overhanging stretches of DNA produced by these restriction enzymes. Describe their role in the formation of rDNA.

Q88. CBSE 2026 · 5 marks (b)(i) Insertional inactivation is a method to detect the recombinant DNA. Explain this method. (ii) Name the commonly used vector for transferring genes in plants from bacteria. (iii) How is this able to transform a normal plant cell into a tumour?

Q89. CBSE 2025 · 5 marks Explain the amplification of gene of interest using the technique of Polymerase chain reaction (PCR).

Q90. CBSE 2025 · 5 marks (b) Describe the structure and working of a sparged stirred-tank bioreactor.

Q91. CBSE 2025 · 5 marks (a) (i) Explain how some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as lepidopterans but do not kill the *Bacillus*. (ii) How is the above mechanism exploited for the production of Bt cotton plant by biotechnologists?

Q92. CBSE 2025 · 5 marks (b) Describe the technique of a typical agarose gel electrophoresis used for the separation and isolation of DNA fragments.

Q93. CBSE 2025 · 5 marks (b) (i) Explain the working of a simple stirred-tank bioreactor. (ii) Describe what is meant by downstream processing.

Q94. CBSE 2024 · 5 marks (a) (i) Draw a schematic diagram of the cloning vector pBR 322 and label (1) Bam HI site (2) gene for ampicillin resistance (3) 'ori' (4) 'rop' gene. (ii) State the role of 'rop' gene. (iii) A cloning vector does not have a selectable marker. How will it affect the process of cloning? (iv) Why is insertional inactivation preferred over the use of selectable markers in cloning vectors?

Q95. CBSE 2024 · 5 marks (a) (i) Why should a cell be made competent to take up an alien DNA? How can a bacterial cell be made competent using calcium ions? Explain. (ii) (1) State the importance of gel electrophoresis in biotechnology. (2) Explain the principle on which this technique works. (3) Mention why ethidium bromide is used in this technique.

Q96. CBSE 2024 · 5 marks (a) (i) Why should a cell be made competent to take up an alien DNA? How can a bacterial cell be made competent using calcium ions? Explain.

Q97. CBSE 2023 · 5 marks (a) Answer the following questions with respect to recombinant DNA technology: (i) Why is plasmid considered to be an important tool in rDNA technology? From where can plasmids be isolated? (Any two sources) (ii) Explain the role of restriction endonuclease and DNA ligase as a vector. (iii) Prove that recombinant DNA technology cannot proceed without restriction endonuclease enzyme.

Q98. CBSE 2023 · 5 marks (a) Answer the following questions with respect to recombinant DNA technology: (i) Why is plasmid considered to be an important tool in rDNA technology? From where can plasmids be isolated? (Any two sources) (ii) Define the term expression vector. (iii) Justify that rDNA technology cannot proceed without restriction endonuclease.

Q99. CBSE 2023 · 5 marks (a) Answer the following questions with respect to recombinant DNA technology: (i) Why is plasmid considered to be an important tool in rDNA technology? From where can plasmids be isolated? (Any two sources) (ii) Write the significance of restriction endonuclease and DNA ligase as a vector. (iii) Justify the statement that rDNA technology cannot proceed without restriction endonucleases. OR (b) Answer the following questions based on Bt-crops: (i) Why do farmers prefer to grow Bt cotton crop than genetically unmodified cotton crops? (ii) Name any two insects that are killed by Bt toxin. (iii) Explain the mechanism by which Bt toxin kills the insects but not the bacterium which possesses the toxin.

CASE-BASED (7)

CASE STUDY · CBSE 2026

Gene manipulation is a fast emerging science. It started with the development of recombinant DNA molecules. This technology which mostly involves cutting and pasting of desired DNA fragments is based on two most important discoveries in bacteria – presence of plasmid and restriction endonucleases.



The science of r-DNA technology took birth when Cohen and Boyer (1973) were able to produce a piece of gene containing foreign DNA introduced into plasmid of E.coli.

Q100. CBSE 2026 · 4 marks (a) Name one core technique of biotechnology that alters the genetic material.

Q101. CBSE 2026 · 4 marks Gene manipulation is a fast emerging science. It started with the development of recombinant DNA molecules. This technology which mostly involves cutting and pasting of desired DNA fragments is based on two most important discoveries in bacteria – presence of plasmid and restriction endonucleases. The science of r-DNA technology took birth when Cohen and Boyer (1973) were able to produce a piece of gene containing foreign DNA introduced into plasmid of E.coli. Name one core technique of biotechnology that alters the genetic material.

CASE STUDY · CBSE 2024

In recombinant DNA technology, restriction enzymes are used as they recognize and cut DNA within a specific recognition sequence. BamH I is one such restriction enzyme which binds at the recognition sequence 5' G-G-A-T-C-C 3' and cleaves this sequence between G and G on each strand, whereas Alu I binds at the recognition sequence 5' A-G-C-T 3' and cleaves these sequences between G and C on each strand.

Q102. CBSE 2024 · 1 mark (a) If Alu I is used to cut the given DNA strand, how many DNA fragments would be formed? Write the sequence of each fragment formed with its polarity.

CASE STUDY · CBSE 2022

Gene of interest/alien gene is introduced by a cloning vector into a host cell to bring about a desired phenotypic expression in a host cell. The cloning vectors used are plasmid and bacteriophages. Biotechnologists in their labs, for desired results engineered specialised cloning vectors. One such vector is pBR322.

Q103. CBSE 2022 · 5 marks Name the restriction enzymes (EcoR I, BamH I and Hind III) that are involved and describe their functions.

Q104. CBSE 2022 · 5 marks (i) Name the restriction enzymes EcoR I, BamH I and Hind III. What are their functions?

CASE STUDY · CBSE 2022

Cloning of genes, play a very significant role in genetic engineering, helping the transfer of desirable foreign genes into different hosts. The scientists, to make this process easier and effective are creating engineered vectors in such a way that they help easy linking of foreign DNA and selection of recombinants from non recombinants. 'pBR322' is one such engineered vectors developed by scientists.

Q105. CBSE 2022 · 5 marks Name the host for this cloning vector pBR322.

Q106. CBSE 2022 · 5 marks (i) Name the host for this cloning vector.

10 Biotechnology and its Applications

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (36)

Q1. CBSE 2026 · 1 mark C-peptide of human insulin is:

- (a) a part of mature insulin molecule
- (b) responsible for formation of disulphide bridges
- (c) removed during maturation of pro-insulin to insulin
- (d) responsible for its biological activity

Q2. CBSE 2026 · 1 mark Assertion (A): The milk produced by transgenic cow 'Rosie' was nutritionally more balanced product for human babies than natural cow milk. Reason (R): It was human protein enriched milk containing human alpha lactalbumin.

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

Q3. CBSE 2026 · 1 mark Pomato was produced by fusing protoplasts of

- (a) Tomato and Potato
- (b) Pomegranate and Tomato
- (c) Pomegranate and Potato
- (d) Pomegranate, Potato and Tomato

Q4. CBSE 2026 · 1 mark Genetically modified tobacco plants were produced using Agrobacterium vectors. Which property of Agrobacterium helps in carrying nematode specific genes into the host plant?

- (a) Infectious for monocot plant ; has Ti plasmid
- (b) Infectious for dicot plant ; has Ti plasmid
- (c) Infectious for plants and animals ; has Ti plasmids
- (d) Infectious for monocot and dicot plants ; has cry gene

Q5. CBSE 2026 · 1 mark Assertion (A): Organisations like GEAC are necessary to monitor GM researches and to test the safety of introducing Genetically Modified organisms for public services. Reason (R): GM researches can have unpredictable results which can even be disastrous, when Genetically Modified organisms are introduced into the ecosystem.

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



Q6. CBSE 2026 · 1 mark Golden rice is a promising transgenic crop. When released for cultivation, it will help in:

- (a) Producing petrol-like fuel
- (b) Reduction of Vitamin A deficiency in humans
- (c) Pest resistance (d) Herbicide tolerance

Q7. CBSE 2026 · 1 mark In RNAi, genes are silenced using which of the following biomolecules?

- (a) ssDNA (b) dsDNA (c) dsRNA (d) ssRNA

Q8. CBSE 2026 · 1 mark Protein encoded by gene Cry-I Ab controls the infestation of which of the following?

- (a) Cotton bollworms (b) Mosquitoes (c) Corn borer
- (d) Agrobacterium

Q9. CBSE 2026 · 1 mark The recombinant protein obtained from transgenic animals that could be used to treat emphysema is:

- (a) Humulin (b) α -lactalbumin (c) α -1-antitrypsin
- (d) Iodothyronine

Q10. CBSE 2026 · 1 mark Transgenic animals have their genetic material manipulated. Select the correct option in reference to transgenic animals.

- (a) Foreign DNA and RNA are present in their cells.
- (b) Foreign RNA is present in all of their cells.
- (c) Foreign DNA is present in all of its cells.
- (d) Foreign RNA is present in some of its cells.

Q11. CBSE 2026 · 1 mark Bt-toxin genes have been expressed in plants in order to provide resistance against: (i) lepidopterans and fungi (ii) animals and bacteria (iii) coleopterans and dipterans (iv) lepidopterans

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

Q12. CBSE 2026 · 1 mark Assertion (A): Genetically modified microbes help in crop protection. Reason (R): Bacillus thuringiensis (Bt) bacteria control insects by producing protoxins.

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

Q13. CBSE 2025 · 1 mark Assertion (A): Virus-free plants can be obtained in vitro from an infected plant. Reason (R): If the plant is infected with a virus, the roots and the stems are free of virus.

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

Q14. CBSE 2025 · 1 mark Assertion (A): in vitro-free plants from an infected plant. Reason (R): If the plant is infected with a virus, the roots and the stems are free of virus. Select the correct answer to these questions from the codes (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

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

Q15. CBSE 2025 · 1 mark The most widely used transgenic animal for testing the safety of vaccine before they are used in humans is:

- (a) Rabbits (b) Pigs (c) Sheep (d) Mice

Q16. CBSE 2025 · 1 mark Assertion (A): To generate only a part of the plant from a cell is totipotency. Reason (R): Suitable special nutrient media and sterile conditions are required in r conditions for the division of cells in explants.

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

Q17. CBSE 2025 · 1 mark Assertion (A): To generate only a part of the plant from a cell is totipotency. Reason (R): Suitable special nutrient media and sterile conditions are required in conditions for the division of cells in explants.

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

Q18. CBSE 2025 · 1 mark Assertion (A) : Isolated single cells can be fused to produce somatic hybrids. Reason (R) : Cells selected for somatic hybridisation have desirable characters.

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

Q19. CBSE 2025 · 1 mark Which one of the following is not the product of transgenic experiments?

- (a) Pest-resistant crop variety
- (b) High nutritional value in grains
- (c) Drought-resistant crops
- (d) Production of insulin by rDNA technique



Q20. CBSE 2025 · 1 mark Out of the following, select the correct match:

- (a) Transgenic cow milk - Human beta-lactalbumin protein
- (b) ELISA - Antigen antibody interaction
- (c) Corn Borer - Cry II Ab gene
- (d) Cotton plant - Meloidegyny Incognitia

Q21. CBSE 2025 · 1 mark Assertion (A): Biotechnology produces transgenic microorganisms that function as microfactories for proteins. Reason (R): Transgenic microorganisms can be developed to produce proteins of human use, like insulin.

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

Q22. CBSE 2024 · 1 mark Assertion (A): In molecular diagnosis, single stranded DNA or RNA tagged with radioactive molecule is called a probe. Reason (R): A probe always searches and hybridises with its complementary DNA in a clone of cells.

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

Q23. CBSE 2024 · 1 mark ELISA technique is based on the principle of

- (a) DNA replication
- (b) antigen-antibody interaction
- (c) pathogen – antigen interaction
- (d) antigen – protein interaction

Q24. CBSE 2024 · 1 mark Which one of the following transgenic animals is being used to test the safety of the polio vaccine ?

- (a) Sheep
- (b) Goat
- (c) Pig
- (d) Mice

Q25. CBSE 2024 · 1 mark The improved trait that is found in the genetically modified transgenic crop Golden rice is :

- (a) High lysine content
- (b) Insect resistant
- (c) High protein content
- (d) High vitamin-A content

Q26. CBSE 2024 · 1 mark Assertion (A): Indian Government has set up an organisation known as GEAC to decide the validity of GM research. Reason (R): Genetic modification of organisms has no effect when such organisms are introduced in the ecosystem.

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

Q27. CBSE 2024 · 1 mark The specific Bt toxin genes which protect the cotton plants against the cotton bollworms are:

- (a) Cry-I Ac and Cry-II Ab
- (b) Cry-I Ab and Cry-I Bc
- (c) Cry-II Ac and Cry-I Ac
- (d) Cry-II Ab and Cry-I Ab

Q28. CBSE 2024 · 1 mark Assertion (A): Functional ADA cDNA genes must be inserted in the lymphocytes at the early embryonic stage in gene therapy for ADA deficiency. Reason (R): Cells in the embryonic stage are immortal, differentiated and easy to manipulate.

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

Q29. CBSE 2024 · 1 mark Assertion (A): Patents are granted by government to an inventor. Reason (R): Patents prevents others from commercial use of an invention.

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

Q30. CBSE 2023 · 1 mark Which of the following is used to inactivate the desired gene during the RNAi process?

- (a) dsDNA
- (b) dsRNA
- (c) rDNA
- (d) DNA polymerase

Q31. CBSE 2023 · 1 mark Who among the following challenged the patent right granted to the Mississippi University for the healing properties of Turmeric?

- (a) Mr. Ajay Phadke
- (b) Ms. Vandana Shiva
- (c) Dr. Venugopalan
- (d) Dr. R.A. Mashelkar

Q32. CBSE 2023 · 1 mark Assertion (A): A patient of ADA deficiency undergoing treatment for gene therapy requires periodic infusion of genetically engineered lymphocytes. Reason (R): Lymphocytes are immortal.

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

Q33. CBSE 2023 · 1 mark Which one of the following products was produced as a result of DNA engineering (gene transfer) in cow ?

- (a) α -1-antitrypsin
- (b) β -lactalbumin
- (c) β -lactglucose
- (d) ADA-deaminase

Q34. CBSE 2023 · 1 mark After the completion of biosynthetic stage in a bioreactor, the product undergoes a series of processes before it is ready for marketing. List of the processes is given below. Identify the option that gives the correct sequence of the processes carried out : (i) Purification of product (ii) Formulation with suitable preservative (iii) Separation of product (iv) Clinical trial of product

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



Q35. CBSE 2023 · 1 mark Assertion (A) : Crystal protein Bt toxin does not kill the Bacillus but kills the insects. Reason (R) : Bt toxin exists in inactive form in Bacillus but when ingested by the insect, the acidic pH of its gut changes it into an active form.

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

Q36. CBSE 2023 · 1 mark The first gene-sequenced crop is:

- (a) Wheat (b) Tobacco (c) Rice (d) Cotton

VERY SHORT ANSWER (11)

Q37. CBSE 2026 · 2 marks A patient with Type I diabetes is unable to produce sufficient insulin. (a) How has recombinant DNA technology helped in addressing this problem? (b) Mention its advantage over animal derived insulin.

Q38. CBSE 2026 · 2 marks GEAC is a regulatory body under the Ministry of Environment, Forest and Climate Change in India. (a) Write the full form of GEAC. (b) Mention two of its important functions related to biotechnology.

Q39. CBSE 2026 · 2 marks A foreign company patented the medicinal use of turmeric already known to Indian households. (a) Name and define this unethical practice. (b) What has the Indian Government done to check this ?

Q40. CBSE 2026 · 2 marks A child is born with a genetic disorder due to the deletion of a gene. (a) Name such a gene studied by you. Explain how gene therapy can help in treating such a condition. (b) Mention one challenge associated with this therapy.

Q41. CBSE 2026 · 2 marks (a) Suggest how a virus-free healthy plant can be obtained from a diseased sugarcane plant.

Q42. CBSE 2025 · 2 marks Name the Indian crop variety for which, in 1997, an American company got patent rights through the US Patent and Trademark Office. This is considered a case of Biopiracy. Justify.

Q43. CBSE 2025 · 2 marks Biotechnology has helped farmers to get pest-resistant cotton plants. Explain the technique adopted along with its mode of action.

Q44. CBSE 2025 · 2 marks Explain how human functional insulin was produced by using recombinant DNA (rDNA) technology.

Q45. CBSE 2024 · 2 marks (a) Name the source from which insulin was extracted in earlier times. Why is this insulin no more in use by the diabetic patients ? (b) Why does the insulin synthesised in the human body undergo processing whereas the insulin produced by Eli Lilly company does not need to undergo any processing ? Explain.

Q46. CBSE 2024 · 2 marks Why does a patient of ADA – deficiency require repeated infusions of genetically engineered lymphocytes ? Suggest a possible permanent remedy.

Q47. CBSE 2024 · 2 marks (a) Name the first developed transgenic cow. (b) Explain the improvement in the quality of the milk produced by it.

SHORT ANSWER (31)

Q48. CBSE 2026 · 3 marks Expand the term 'ELISA'. On which principle is the 'ELISA' test based? Explain the process.

Q49. CBSE 2026 · 3 marks A farmer grew two varieties of corn crop in field A and B. He grew normal corn crops in field A and GM corn crops in field B. He observed that corn borers attacked only in field A. To control it, spores of Bt were sprayed on field A. (a) Name the gene in the spores responsible for control of pest. (0.5 marks) (b) What effect will the spores of Bt have on insect pest? (1.5 marks) (c) How has corn plants of field B developed resistance against this pest? Explain. (1 mark)

Q50. CBSE 2026 · 3 marks A farmer grew two varieties of corn crop in field A and B. He grew normal corn crops in field A and GM corn crops in field B. He observed that corn borers attacked only in field A. To control it, spores of Bt were sprayed on field A. (a) Name the gene in the spores responsible for control of pest. (½ mark) (b) What effect will the spores of Bt have on insect pest? (1½ marks) (c) How has corn plants of field B developed resistance against this pest? Explain. (1 mark)

Q51. CBSE 2026 · 3 marks Suggest and describe a technique through which a healthy sugarcane plant can be obtained from virus infected sugarcane plant.

Q52. CBSE 2026 · 3 marks There are limitations of traditional breeding techniques that led to promotion of micro-propagation. Mention two advantages of micropropagation. Give two examples where it is commercially adopted.

Q53. CBSE 2026 · 3 marks (a) How is insulin different from proinsulin? (b) Explain all the stages of how human insulin is produced through rDNA technology.

Q54. CBSE 2026 · 3 marks Transgenic animals are produced by man. Explain any three ways in which such animals can be beneficial to humans.

Q55. CBSE 2026 · 3 marks Write the scientific name of the nematode that infects tobacco plants. Also name the part of the plant that it infects. How is Agrobacterium used to protect tobacco plants from attack by this pest?

Q56. CBSE 2025 · 3 marks Enlist three advantages of genetically modified plants.

Q57. CBSE 2025 · 3 marks Explain the beneficial role of the following, produced as a result of the processes of biotechnology, to mankind : (a) Cow named Rosie (b) α -1-antitrypsin

Q58. CBSE 2025 · 3 marks (a) Why are transgenic animals so called? (b) With the help of an example each, explain the role of transgenic animals in the following: (i) Vaccine safety (ii) Biological products

Q59. CBSE 2025 · 3 marks Name the process involved in the production of nematode-resistant tobacco plants, using genetic engineering. Explain the strategy adopted to develop such plants.



Q60. CBSE 2025 · 3 marks Gene therapy can be used to treat an ADA deficient patient. Explain. Is it a permanent cure? How can ADA be cured permanently?

Q61. CBSE 2024 · 3 marks The first clinical gene therapy was given in 1990 to a 4-year-old girl with ADA deficiency. (a) Mention the cause of this disorder. (b) List the possible treatments available for this disorder. (c) How can this disorder be cured permanently?

Q62. CBSE 2024 · 3 marks What are transgenic animals? Name the first transgenic cow and state its importance.

Q63. CBSE 2024 · 3 marks (a) What are transgenic animals? (b) Name the transgenic animal having the largest number amongst all the existing transgenic animals. (c) State any 3 reasons for which these types of animals are being produced.

Q64. CBSE 2024 · 3 marks (a) (i) What are transgenic animals? (ii) Name the first transgenic cow and state its importance. OR (b) (i) Explain the convention for naming EcoRI. (ii) With the help of an illustration only, show the action of EcoRI on a DNA Polynucleotide.

Q65. CBSE 2024 · 3 marks (a) (i) What are transgenic animals? (ii) Name the first transgenic cow and state its importance.

Q66. CBSE 2024 · 3 marks (a) Give the scientific name of the bacteria widely used in biotechnology to create a GM cotton crop resistant to bollworm attacks. (b) Explain how GM cotton crop is able to resist insect attacks.

Q67. CBSE 2024 · 3 marks (a) Mention the advantages of ART. (b) Explain the ICH and AI methods of assisted reproductive technologies.

Q68. CBSE 2024 · 3 marks Explain the role of transgenic animals in: (a) Production of Biological products (b) Studying diseases (c) Chemical safety testing

Q69. CBSE 2024 · 3 marks How has the use of Agrobacterium as vector helped in controlling Meloidogyne incognita infestation in tobacco plants? Explain in correct sequence.

Q70. CBSE 2023 · 3 marks (a) Define stem cells. (b) From where can one obtain stem cells in humans? (c) State any two applications of stem cells in curing human diseases.

Q71. CBSE 2023 · 3 marks (a) Give characteristic features of stem cells. (b) From where can one obtain stem cells in humans? (c) State any two applications of stem cells in curing human diseases.

Q72. CBSE 2022 · 3 marks An application of biotechnology in agriculture involves production of Bt crops. Name the organism from which the gene has been isolated. Explain that this gene is dominant for the organism itself, but it is not lethal to it.

Q73. CBSE 2022 · 3 marks Development of recombinant DNA technology has made it possible to express foreign genes in heterologous systems/bacteria or any other organism. Give an example of a vaccine developed by such a technology and the host used.

Q74. CBSE 2022 · 3 marks An application of biotechnology in agriculture involves production of pest resistant Bt corn using *Bacillus thuringiensis*. (a) Proteins coded by which specific Bt toxin genes control corn borer?

Q75. CBSE 2022 · 3 marks *Bacillus thuringiensis* plays an important role in Integrated Pest Management strategy. Explain how. Name any two crops that are protected efficiently from pests.

Q76. CBSE 2022 · 3 marks Genetically modified transgenic plants are considered superior to conventional plants. Explain by giving three reasons.

Q77. CBSE 2022 · 3 marks How does a gene therapy involving direct modification of the cells, in order to achieve a therapeutic goal is used in the treatment of ADA deficiency? Explain.

Q78. CBSE 2022 · 3 marks Explain how recombinant human insulin was prepared in 1983 by Eli Lilly an American company.

LONG ANSWER (12)

Q79. CBSE 2026 · 5 marks (b) "Early and accurate diagnosis of diseases is vital in medical technology." (i) Name the conventional methods of diagnosis and their disadvantages. (ii) Which three diagnostic techniques have been developed through Biotechnology? Explain how each one helps in detecting diseases.

Q80. CBSE 2025 · 5 marks Name and explain the biotechnological strategy wherein the infection by the nematode *Meloidogyne incognita* can be prevented using *Agrobacterium* vectors in the roots of tobacco plant by RNA interference.

Q81. CBSE 2025 · 5 marks (a) (i) Name the two genes encoding for the Bt toxin protein used in biotechnology for the control of cotton bollworms. (ii) How does the expression of Bt toxin gene in Bt cotton plant help in providing resistance to cotton bollworms? Explain.

Q82. CBSE 2025 · 5 marks (a) (i) ELISA test is based on which principle? (ii) Describe all the methods used to treat or cure Adenosine deaminase deficiency in humans.

Q83. CBSE 2025 · 5 marks (a) Define transgenic animals. Explain in detail any four areas where they can be used for human benefit.

Q84. CBSE 2025 · 5 marks (a) (i) Explain why the insecticidal protein producing by *Bacillus thuringiensis* does not kill the bacteria itself. (ii) How has man exploited this protein to produce cotton bollworm resistant Bt cotton plant?

Q85. CBSE 2025 · 5 marks (a) Explain how the process of RNA interference technology is used effectively to prevent infestation of the roots of tobacco plant by the nematode *Meloidogyne incognita*. OR (b) Explain how more than a billion copies of a fragment of DNA are formed using the technique of PCR.

Q86. CBSE 2025 · 5 marks (a) (i) Describe the approach of gene therapy used for the treatment of a 4-year-old girl suffering from Adenosine Deaminase Deficiency. (ii) What is meant by micropropagation? Name any two important food plants grown commercially (on a large scale) by this method.



Q87. CBSE 2025 · 5 marks (a) (i) Explain how human pro-insulin is processed in the cell to become a fully mature functional insulin. (ii) Describe how human insulin is produced using the techniques of genetic engineering.

Q88. CBSE 2024 · 5 marks (b) Bt cotton, the genetically modified crop, has greatly helped the cotton farmers to increase their crop yield. (i) How was Bt cotton plant made resistant to bollworm? Explain. (ii) Describe the mechanism that leads to the death of bollworms feeding on Bt cotton plants.

Q89. CBSE 2024 · 5 marks (b) Bt cotton, the genetically modified crop, has greatly helped the cotton farmers to increase their crop yield. (i) How was Bt cotton plant made resistant to bollworm? Explain.

Q90. CBSE 2023 · 5 marks (b) Answer the following questions based on Bt-crops: (i) Why do farmers prefer to grow Bt cotton crop than genetically unmodified cotton crops? (ii) Name any two insects that are killed by Bt toxin. (iii) Explain the mechanism by which Bt toxin kills the insects but not the bacterium which possesses the toxin.

CASE-BASED (1)

CASE STUDY · CBSE 2022

RNA interference (RNAi) holds great potential as a therapeutic agent for the treatment of human diseases and as biocontrol agents in controlling pests in the field of agriculture. An experiment was carried to study the use of 'RNAi' for the potential treatment of disorders of cholesterol metabolism. Some people possess genetic mutations with elevated levels of ApoB gene which predisposes them to coronary artery diseases. Lowering the amount of ApoB can reduce the number of lipoproteins and lower the blood cholesterol. Tracy Zimmerman and her colleagues used RNAi in 2006 to reduce the level of ApoB in non human primates Cynomolgus monkeys. One group of monkeys were given RNAi treatment (small interfering RNAs, siRNAs) (doses 1 mg/kg siRNAs), second group of monkeys were given RNAi treatment (doses 2.5 mg/kg siRNAs) and third group of monkeys were injected with saline.

Q91. CBSE 2022 · 5 marks How does the treatment with 2.5 mg/kg brings an effect on cholesterol metabolism when compared from 24 hours and 144 hours?

11 Organisms and Populations

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (11)

Q1. CBSE 2026 · 1 mark Which of the following is an important parameter for assessing the impact of any biotic or abiotic factor on population growth?

- (a) Birth rate (b) K-carrying capacity (c) Death rate
- (d) r-Intrinsic rate of natural increase

Q2. CBSE 2026 · 1 mark Connell's elegant field experiments on the rocky seacoast of Scotland, found that larger barnacles *Balanus* dominated the intertidal area and removed the smaller barnacles *Chthamalus*. This happened due to:

- (a) Parasitism (b) Predation (c) Mutualism
- (d) Competition

Q3. CBSE 2026 · 1 mark Assertion (A): The interaction between a whale and the small barnacles on its back is considered as commensalism. Reason (R): In the above association, neither of the species is benefitted.

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

Q4. CBSE 2026 · 1 mark Choose a correct option that shows an interaction in which one species benefits while the other is neither harmed nor benefitted.

- (a) Mycorrhizal associations between fungi and roots of higher plants
- (b) Sea anemone and clownfish
- (c) Abingdon tortoises and goats in the Galapagos Island
- (d) *Cuscuta* on hedge plants

Q5. CBSE 2025 · 1 mark A biologist studied the population of rats in a granary. He found the average natality was 280, average mortality was 200, immigration was 40 and emigration was 50. The net increase in population is:

- (a) 80 (b) 70 (c) 10 (d) 90

Q6. CBSE 2024 · 1 mark Assertion (A): A given fig species can be pollinated only by its partner' wasp. Reason (R): The wasp pollinates the fig inflorescence while searching for suitable egg laying sites.

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

Q7. CBSE 2024 · 1 mark Assertion (A): Communities that comprise of more species tend to be more stable. Reason (R): A higher number of species results in less year to year variation in total biomass.

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



Q8. CBSE 2023 · 1 mark Assertion (A): A cattle egret and grazing cattle in close association is a classic example of commensalism. Reason (R): As grazing cattle move through the field, they stir up and flush out insects from the vegetation that otherwise might be difficult for egrets to find and catch.

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

Q9. CBSE 2023 · 1 mark Examples that show commensalism are: (i) An orchid growing on mango tree (ii) Cuckoo bird and crow (iii) Cuscuta growing on Nerium tree (iv) Barnacles growing on a whale

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

Q10. CBSE 2023 · 1 mark Assertion (A): A species of wasp and a fig species cannot complete their life cycle without each other. Reason (R): While visiting wasps come to lay eggs in the fig inflorescence, the flower of wasp gets pollinated in return.

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

Q11. CBSE 2023 · 1 mark Identify the option that does not exhibit a parasitic relationship.

- (a) Head lice in humans (b) Cuscuta on a mango tree
- (c) Female Anopheles (d) Ticks on dogs

VERY SHORT ANSWER (7)

Q12. CBSE 2026 · 2 marks (a) In some cases, measuring population density by counting individuals may not be feasible. Mention two other parameters that can be used and justify their use with suitable examples.

Q13. CBSE 2026 · 2 marks (a) Explain the type of interaction between: (i) Egret and Cattle (ii) Cuckoo and Crow

Q14. CBSE 2025 · 2 marks Explain how the interaction between sea anemone and clownfish is one of the best examples of commensalism in nature.

Q15. CBSE 2025 · 2 marks (a) Explain how the interaction between a fig tree and its tight one-to-one relationship with the pollinator species of wasp is one of the best examples of mutualism.

Q16. CBSE 2024 · 2 marks Explain how are plants benefitted by their association with "Glomus species".

Q17. CBSE 2023 · 2 marks List and explain any two factors that lead to a decrease in the population density of an area.

Q18. CBSE 2022 · 2 marks When tourists go to places of high altitude like Rohtang Pass or Mansarovar, they are advised not to venture out for two days at least to get acclimatized to the prevailing conditions there. Explain how they get acclimatized.

SHORT ANSWER (14)

Q19. CBSE 2026 · 3 marks Answer the following questions: (a) Name the type of interaction seen between fig tree and wasps. (b) Mention the benefits that the female wasps desire from the fig tree from such an interaction. (c) Give one example where animal-plant interaction involves 'co-evolution' other than the relationship between fig tree and wasps.

Q20. CBSE 2026 · 3 marks (a) What is the carrying capacity of a species in a habitat? (b) Explain the growth curve that takes this capacity into account.

Q21. CBSE 2026 · 3 marks Explain Gause's 'Competitive Exclusion Principle' with the help of a suitable example.

Q22. CBSE 2026 · 3 marks Given below is an equation describing the growth pattern of a population: $\frac{dN}{dt} = rN$ (a) Mention the type of growth model or growth pattern of the population described by the given equation. (b) What does 'r' in the equation signify? (c) Mention the type of growth curve that will be obtained if the population density (N) is plotted against time (t). (d) According to you, will the resource availability be limited or unlimited for this type of growth in the given population?

Q23. CBSE 2024 · 3 marks Describe how fig tree and wasp relationship is a spectacular example of mutualism.

Q24. CBSE 2023 · 3 marks Explain the following population interactions with the help of one example each: (a) Brood Parasitism (b) Co-evolution of mutualists

Q25. CBSE 2022 · 2 marks Explain the two physiological attributes which enable a kangaroo rat to survive in desert conditions.

Q26. CBSE 2022 · 2 marks State two morphological attributes observed in the leaves of desert plants that enable them to survive in extreme conditions in the desert.

Q27. CBSE 2022 · 2 marks To survive unfavourable conditions, some organisms hibernate and others go into aestivation. How is hibernation different from aestivation? Give one example of each.

Q28. CBSE 2022 · 2 marks Write the best method to measure the population density of a single Banyan tree in comparison to 20 Parthenium weeds in a forest by an ecologist. Explain and justify your answer.

Q29. CBSE 2022 · 2 marks Write the observations made at the end of Connell's field experiment on barnacles on the rocky sea coasts of Scotland.

Q30. CBSE 2022 · 2 marks (i) Write the observations made at the end of Connell's field experiment on barnacles on the rocky sea coasts of Scotland. (ii) Name any two categories of organisms that in general are adversely affected by competition.

Q31. CBSE 2022 · 2 marks Many members of genus Glomus form a mycorrhizal association with plants. Elaborate how is this association beneficial to the plants.

Q32. CBSE 2022 · 2 marks What would be the best method to measure the total population density of the number of fishes in river and why?



LONG ANSWER (8)

Q33. CBSE 2025 · 5 marks Describe the population growth curve applicable in a population of any species in nature that has limited resources at its disposal. Give the equation of this growth curve. Name the growth curve and depict a graphical plot for this type of population growth.

Q34. CBSE 2025 · 5 marks (a) (i) Describe the population growth curve applicable in a population of any species in nature that has limited resources at its disposal. (ii) Give the equation of this growth curve. (iii) Name the growth curve and depict a graphical plot for this type of population growth.

Q35. CBSE 2025 · 5 marks (a) (i) Describe the population growth curve applicable in a population of any species in nature that has unlimited resources at its disposal. (ii) Explain the equation of this growth curve. (iii) Name the growth curve and depict a graphical plot for this type of population growth.

Q36. CBSE 2025 · 5 marks (a) (i) Describe the population growth curve applicable in a population of any species in nature that has unlimited resources at its disposal. (ii) Explain the equation of this growth curve. (iii) Name the growth curve and depict a graphical plot for this type of population growth. OR (b) (i) Explain the conclusion drawn by Alexander von Humboldt during his extensive explorations in the wilderness of South American jungles. (ii) Give the equation of the Species-Area relationship. (iii) Draw a graphical representation of the relation between species richness and area for a wide variety of taxa such as birds, bats, etc.

Q37. CBSE 2025 · 5 marks (b) (i) Describe the logistic population growth curve with the help of a suitable graphical representation. (ii) Write the equation of Verhulst-Pearl logistic growth curve.

Q38. CBSE 2025 · 5 marks (b) (i) Describe the logistic population growth curve with the help of a suitable graphical representation. (ii) Write the equation of Verhulst-Pearl logistic growth curve K

Q39. CBSE 2025 · 5 marks Write an equation for Verhulst-Pearl Logistic Growth Curve where: N = Population density at t , r = Intrinsic rate of natural increase. Draw a graph for a population whose population density has reached carrying capacity. Draw a growth curve where resources are non-limiting to growth of population. Which growth curve is considered more realistic and why? Explain.

Q40. CBSE 2025 · 5 marks (b) (i) Write an equation for Verhulst-Pearl Logistic Growth Curve where N = Population density at t , r = Intrinsic rate of natural increase. (ii) Draw a graph for a population whose population density has reached carrying capacity. (iii) Draw a growth curve where resources are non-limiting to growth of population. (iv) Which growth curve is considered more realistic and why? Explain.

CASE-BASED (1)**CASE STUDY · CBSE 2024**

Populations evolve to maximise their reproductive fitness in the habitat in which they live. Ecologists suggest, the life history of organisms have evolved in relations to the constraints imposed by the biotic and abiotic components of the habitat in which they live. This gets reflected in the population growth pattern of all organisms including humans.

Q41. CBSE 2024 · 4 marks (a) Identify the growth curves 'A' and 'B'.

12 Ecosystem

Notes & MCQs →

MULTIPLE CHOICE AND ASSERTION-REASON (20)

Q1. CBSE 2026 · 1 mark In an ecosystem, different species occupy different levels and vertical distribution of species is found. This is called _____.

- (a) Stratification (b) Layering (c) Fragmentation
(d) Population

Q2. CBSE 2026 · 1 mark Assertion (A): In terrestrial ecosystem much larger fraction of energy flows through grazing food chain. Reason (R): Grazing food chain may be connected to Detritus food chain at some levels.

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

Q3. CBSE 2026 · 1 mark Which of the following is not a component of detritus food chain?

- (a) Dead Leaves (b) Bacteria (c) Fungi (d) Zooplankton

Q4. CBSE 2026 · 1 mark Which of the following is not a functional unit of an ecosystem?

- (a) Energy flow (b) Decomposition (c) Stratification
(d) Productivity

Q5. CBSE 2026 · 1 mark Every trophic level has a certain mass of living material at a particular time. What is it called?

- (a) Standing crop (b) Primary productivity
(c) Standing state (d) Ecological efficiency

Q6. CBSE 2026 · 1 mark Assertion (A): Ecosystems require a constant supply of energy to synthesize the molecules they require. Reason (R): This is to counteract the universal tendency towards increasing disorderliness as per Second Law of Thermodynamics.

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



Q7. CBSE 2026 · 1 mark Which of the following is a secondary consumer ?

- (a) Grasshopper (b) Cow (c) Fish (d) Hawk

Q8. CBSE 2026 · 1 mark Match the items given in Column I with Column II and select the correct option. Column I: a. Earthworm b. Zooplankton c. Phytoplankton d. Inverted pyramid. Column II: i. Aquatic Ecosystem ii. Detritivore iii. Pyramid of Biomass in Sea iv. Primary Producer

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

Q9. CBSE 2026 · 1 mark Assertion (A) : Net Primary Productivity (NPP) is always less than Gross Primary Productivity (GPP). Reason (R) : A portion of Gross Primary Productivity (GPP) is used by plants for respiration.

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

Q10. CBSE 2026 · 1 mark Assertion (A): The pyramid of biomass in a pond aquatic ecosystem is always inverted. Reason (R): The biomass of consumers like fishes far exceeds that of the producers like phytoplanktons.

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

Q11. CBSE 2026 · 1 mark Assertion (A): Decomposition process is slower, if detritus is rich in lignin and cutin. Reason (R): Decomposition is largely an oxygen-requiring process.

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

Q12. CBSE 2026 · 1 mark The biomass available in plants for consumption by herbivores and decomposers, is called:

- (a) Gross primary productivity (b) Net primary productivity
(c) Standing crop (d) Secondary productivity

Q13. CBSE 2026 · 1 mark Which of the following ecosystem is most productive in terms of net primary productivity?

- (a) Desert (b) Tropical rainforests (c) Oceans (d) Estuaries

Q14. CBSE 2026 · 1 mark Cattle or goats are never seen browsing on the weed, Calotropis. Select the correct option for the reason.

- (a) The plant produces highly poisonous tannins
(b) The plant produces quinine, which is bitter in taste
(c) The plant produces the poisonous chemical, cardiac glycoside
(d) The plant bears prickles

Q15. CBSE 2024 · 1 mark Which one of the following is not a characteristic feature of "humus" that is formed during decomposition of detritus?

- (a) amorphous, colloidal, dark coloured substance
(b) amorphous, colloidal, light coloured substance
(c) substance resistant to microbial action
(d) colloidal substance

Q16. CBSE 2024 · 1 mark The rate of formation of new organic matter by consumers, and the biomass available for consumption of herbivores as well as decomposers are referred to as :

- (a) Gross primary productivity and Net primary productivity
(b) Net primary productivity and Secondary productivity
(c) Secondary productivity and Net primary productivity
(d) Secondary productivity and Gross primary productivity

Q17. CBSE 2024 · 1 mark Read the four statements given below and select the option having two correct statements: (i) A lion eating a deer and a sparrow feeding on grains are ecologically similar in being consumers. (ii) Predator starfish *Pisaster* helps in maintaining species diversity of some invertebrates. (iii) Predators ultimately lead to extinction of prey species. (iv) Production of chemicals nicotine and strychnine by plants are metabolic disorders.

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

Q18. CBSE 2024 · 1 mark The organism that occupies more than one trophic level in a pond ecosystem is :

- (a) Fish (b) Frog (c) Zooplankton (d) Phytoplankton

Q19. CBSE 2024 · 1 mark The pyramid of biomass in sea is generally inverted because in sea :

- (a) Biomass of fishes exceeds that of phytoplankton
(b) Number of phytoplanktons is more
(c) Number of phytoplanktons is less
(d) Large fishes feed on small fishes

Q20. CBSE 2024 · 1 mark Assertion (A): Some aquatic ecosystems have inverted biomass pyramids. Reason (R): More energy is required by the organisms occupying higher trophic levels.

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

VERY SHORT ANSWER (14)

Q21. CBSE 2026 · 2 marks What is primary productivity of an ecosystem and how is it expressed? Explain the equation given below: $NPP = GPP - R$

Q22. CBSE 2026 · 2 marks (a) (i) Which organisms capture energy that sustains the entire living world? What is the source of this energy? (ii) How do ecosystems comply with the Second Law of Thermodynamics? OR (b) "Alien species are highly invasive and are a threat to indigenous species." Substantiate this statement with the help of any two examples.



Q23. CBSE 2025 · 2 marks Correctly depict (also indicate the trophic level) and describe the ecological pyramid of biomass in sea with 40 standing crop of phytoplankton supporting 90 standing crop of zooplankton which further supports 120 small fishes.

Q24. CBSE 2025 · 2 marks (b) Correctly depict (also indicate the trophic level) and describe the ecological pyramid of number with 32 birds dependent on 20 insects feeding on one banyan tree.

Q25. CBSE 2025 · 2 marks (a) Explain how the interaction between a fig tree and its tight one-to-one relationship with the pollinator species of wasp is one of the best examples of mutualism. OR (b) Correctly depict (also indicate the trophic level) and describe the ecological pyramid of number with 32 birds dependent on 20 insects feeding on one banyan tree.

Q26. CBSE 2025 · 2 marks Arrange the given important steps of decomposition in their correct order of occurrence in the breakdown of complex organic matter and explain the fourth step in the process. Catabolism, Leaching, Fragmentation, Mineralisation, Humification

Q27. CBSE 2024 · 2 marks How is the rate of decomposition affected by the nature of detritus and temperature ?

Q28. CBSE 2024 · 2 marks (a) Write the key characteristics of the humus formed during the decomposition cycle in a terrestrial ecosystem. OR (b) (i) Graphically represent the relationship between species richness and area on a log-log scale for bats and fishes. (ii) Write the equation for the relationship as on a logarithmic scale.

Q29. CBSE 2024 · 2 marks (a) List the important characteristics of humus formed during the decomposition cycle in a terrestrial ecosystem. OR (b) (i) Graphically represent the relationship between species richness and area on a log-log scale for bats and fishes. (ii) Write the equation for the relationship as on a logarithmic scale.

Q30. CBSE 2024 · 2 marks (a) Describe the important aspects of humus formation during the decomposition cycle in a terrestrial ecosystem. OR (b) (i) Graphically represent the relationship between species richness and area on a log-log scale for bats and fishes. (ii) Write the equation for the relationship on a logarithmic scale.

Q31. CBSE 2024 · 2 marks (a) Differentiate between grazing food chain and detritus food chain.

Q32. CBSE 2023 · 2 marks Ecological pyramids give important information about the ecological system, but do have some limitations. List any two limitations of ecological pyramids.

Q33. CBSE 2023 · 2 marks Plants capture only 2–10 percent of the photosynthetically active radiation of the Sun and this small amount of energy is able to sustain the entire living world. During this process, ecosystems are in consonance with the two laws of thermodynamics. Explain.

Q34. CBSE 2023 · 2 marks On August 22 in the year 2022, 3358 fires were detected in the Amazon rainforests. Write one short-term and one long-term effect of this event on the biotic and abiotic components of the environment.

SHORT ANSWER (9)

Q35. CBSE 2026 · 3 marks (a) What is primary productivity? Why does it vary in different types of ecosystems? (b) Why is the assimilation of energy at the herbivore level called secondary productivity?

Q36. CBSE 2025 · 3 marks Enlist one advantage and two disadvantages of green revolution.

Q37. CBSE 2025 · 3 marks Name the type of food chains responsible for the flow of larger fraction of energy in an aquatic ecosystem and a terrestrial ecosystem, respectively. Mention any two differences between the two food chains.

Q38. CBSE 2024 · 3 marks (a) How is the grazing food chain different from the detritus food chain? (b) "The detritus food chain may be connected to the grazing food chain at some levels in an ecosystem." Give an example in support of the statement.

Q39. CBSE 2024 · 3 marks (a) Construct a pyramid of biomass in sea with phytoplankton and fishes. Explain giving reasons about the characteristic of the constructed pyramid. (b) In which condition will the pyramid remain always upright ?

Q40. CBSE 2024 · 3 marks (a) State what is primary productivity and mention its units. (b) Some ecologists observed that primary productivity of a place in Rajasthan was low as compared to a particular place in Kerala. Explain why.

Q41. CBSE 2024 · 3 marks Predation is referred to as a detrimental interaction. Explain any three positive roles, supported by an example each, that a predator plays in an ecosystem.

Q42. CBSE 2024 · 3 marks Describe the mutualistic relationship that exists between the Mediterranean orchid *Ophrys* and a bee species.

Q43. CBSE 2024 · 3 marks Explain any three roles of predation in an ecosystem with the help of suitable examples.

LONG ANSWER (1)

Q44. CBSE 2026 · 5 marks (a) (i) What is meant by 'Stable Community'? (ii) What are its characteristics? (iii) Name the ecologist who carried out experiments on the above to provide a tentative answer and also write his findings. OR (b) (i) Write the role of detritivores and give one example also. (ii) Explain 'Catabolism' and 'Humification' – steps of decomposition. (iii) Compare the grazing food chain and detritus food chain in the aspect of their: (I) origin, and (II) energy status.

13 Biodiversity and Conservation

Notes & MCQs →



MULTIPLE CHOICE AND ASSERTION-REASON (17)**Q1.** CBSE 2026 · 1 mark Select the mismatched pair:

- (a) Mega diversity countries in the world – 12
- (b) Genetically different strains of rice in India – Less than 1000
- (c) Robert Mays estimation on global species diversity – 7 million species worldwide
- (d) Zoological parks – Ex-situ conservation

Q2. CBSE 2026 · 1 mark Which of the following sacred groves is found in Meghalaya?

- (a) Jaintia hills (b) Bastar (c) Chanda (d) Sarguja

Q3. CBSE 2026 · 1 mark Exploration of molecular, genetic and species level diversity for gaining products of economic importance is called

- (a) Exploitation (b) Bio-prospecting (c) Bio-patenting
- (d) Bio-piracy

Q4. CBSE 2026 · 1 mark Select the correct option :

- (a) Tropics between 23.5° N – 23.5° S — Higher biodiversity than temperate areas
- (b) Columbia — 105 bird species
- (c) New York — 1400 bird species
- (d) India — 2000 bird species

Q5. CBSE 2026 · 1 mark What could be the reason of extinction of Abingdon Tortoise from Galapagos Islands ?

- (a) Intraspecific Competition (b) Predation (c) Parasitism
- (d) Interspecific Competition

Q6. CBSE 2026 · 1 mark Assertion (A) : IUCN Red List helps in identifying and protecting endangered species worldwide.
Reason (R) : The list includes the species facing risk of extinction.

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

Q7. CBSE 2026 · 1 mark If A = species richness and B = Endemism then biodiversity hotspots have

- (a) low degree of A and low degree of B.
- (b) low degree of A and high degree of B.
- (c) high degree of A and low degree of B.
- (d) high degree of A and high degree of B.

Q8. CBSE 2026 · 1 mark Current percentage of tropical rainforests covering the Earth's land surface is

- (a) 14% (b) 6% (c) 8% (d) 15%

Q9. CBSE 2026 · 1 mark Which of the following fish led to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in Lake Victoria of East Africa?

- (a) Catla Catla (b) Dogfish (c) Nile Perch
- (d) African Catfish

Q10. CBSE 2026 · 1 mark According to IUCN, some of the extinctions include: (i) Dodo (ii) Indian gazelle (iii) Thylacine (iv) Steller's Sea Cow

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

Q11. CBSE 2024 · 1 mark Assertion (A): Communities that comprise of more species tend to be more stable. Reason (R): A higher number of species results in less year to year variation in total biomass.

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

Q12. CBSE 2024 · 1 mark Assertion (A): "Biodiversity hotspots" are the regions which possess high levels of species richness, high degree of endemism. Reason (R): Total number of biodiversity hotspots in the world is 22 with two of these hotspots found in India.

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

Q13. CBSE 2024 · 1 mark Assertion (A) : Loss of biodiversity can occur due to overexploitation of resources. Reason (R) : Introduction of *Clarias gariepinus* in Indian rivers has led to a decline in native Indian fishes.

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

Q14. CBSE 2023 · 1 mark Assertion (A) : Cattle and goats are never seen browsing on *Calotropis* growing in abandoned fields. Reason (R) : Cattle and goats avoid grazing on *Calotropis* because of the offensive smell of its flowers.

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

Q15. CBSE 2023 · 1 mark Human settlement often leads to habitat loss which leads to fragmentation, forming smaller patches of habitats. Select the statements that describe how a small patch differs from a large patch of the same habitat. (i) Invasive species will never be seen here. (ii) Population of large animals decreases. (iii) Biodiversity decreases. (iv) Competition from surrounding habitats increases.

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



Q16. CBSE 2023 · 1 mark Which one among the following regions is not a hotspot of biodiversity?

- (a) The Indo-Burma Region (b) Jaintia Hills in Meghalaya
(c) The Western Ghats and Sri Lanka (d) The Himalayas

Q17. CBSE 2023 · 1 mark Assertion (A): Biologists are sure about how many prokaryotic species are living now. Reason (R): The conventional taxonomic methods are not suitable for identifying microbial species.

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

VERY SHORT ANSWER (10)

Q18. CBSE 2026 · 2 marks (b) In an ecosystem there was loss of biodiversity due to some project in that area. (i) How will biodiversity be affected? (2 points) (1 mark) (ii) List two major causes of loss of biodiversity. (1 mark)

Q19. CBSE 2026 · 2 marks (b) What factors contribute to the Amazonian rain forests in South America being the most biodiverse regions on Earth ?

Q20. CBSE 2026 · 2 marks (a) Biodiversity must be conserved as it plays an important role in many ecosystem services that nature provides. Explain any two ecosystem services.

Q21. CBSE 2026 · 2 marks (a) Biodiversity must be conserved as it plays an important role in many ecosystem services that nature provides. Explain any two ecosystem services. OR (b) (i) State, what does 'standing crop' of a trophic level represent. (ii) List any two ways of measuring the standing crop of a trophic level.

Q22. CBSE 2025 · 2 marks How is the interaction between Ophrys and its specific bee pollinator one of the best examples of co-evolution ? Explain.

Q23. CBSE 2024 · 2 marks A specific plant species was introduced into Australia in 1920 and later it became invasive spreading over millions of hectares of rangeland. (a) Name the plant that was introduced into Australia and mention the reason for its uncontrollable growth. (b) State how its spread was eventually brought under control.

Q24. CBSE 2024 · 2 marks (a) Biodiversity hotspots cover less than 2% of Earth's land area. Strict protection of these areas can reduce the rate of ongoing extinctions. Explain. (b) Name any two hotspots in India.

Q25. CBSE 2023 · 2 marks India is the seventh largest country in the world in terms of total land area including land and water. Write the value of the land area of our country (in terms of percentage) of the world. Mention then, what makes India one of the 12 mega diversity countries of the world.

Q26. CBSE 2023 · 2 marks (a) Mention the main objective of the Ramsar Convention. (b) Name any two sites in India that are important in the Ramsar Convention.

Q27. CBSE 2023 · 2 marks Illustrate with the help of an example how introduction of an alien species turns invasive and causes decline of an indigenous species.

SHORT ANSWER (21)

Q28. CBSE 2026 · 3 marks There are many animals, which have become extinct in the wild, but continue to be maintained in zoological parks. Answer the questions that follow: (a) What type of bio-diversity conservation is observed in this case? (b) Explain any other two ways which help in this type of conservation. (c) Besides zoological parks, mention one place that serves this purpose.

Q29. CBSE 2026 · 3 marks Explain the level of biodiversity at genetic, species and ecological levels with the help of one example each.

Q30. CBSE 2025 · 3 marks The survival of rare species in Mudumalai Tiger Reserve (MTR) was found to be a small, beautiful flower, Lantana camara, a tropical American shrub. A Lantana weed eradication drive helped to restore the dying MTR thereby also reducing human-wildlife conflicts. MTR is home to 25 species of grasses and legumes. (a) Explain how did the removal of Lantana help in restoring the dying Mudumalai Tiger Reserve. (b) Why is the invasion of Lantana camara a cause of concern in MTR.

Q31. CBSE 2025 · 3 marks In a case study of species diversity and restoration of survival in Mudumalai Tiger Reserve (MTR) was found to be a small, beautiful flower, Lantana camara, a tropical American shrub, that Lantana weed eradication drive helped to restore the dying MTR thereby also reducing human-wildlife conflicts. MTR is home to 25 species of grasses and legumes. (a) Explain how did the removal of Lantana help in restoring the dying Mudumalai Tiger Reserve. (b) Why is the invasion of Lantana camara a cause of concern in MTR.

Q32. CBSE 2025 · 3 marks In Mudumalai Tiger Reserve (MTR), a survival threat to tiger was posed by Lantana camara, a tropical American shrub. A Lantana weed eradication drive helped to restore the dying MTR thereby also reducing human-wildlife conflicts. MTR is home to 25 species of grasses and legumes. (a) Explain how did the removal of Lantana help in restoring the dying Mudumalai Tiger Reserve. (b) Why is the invasion of Lantana camara a cause of concern in MTR.

Q33. CBSE 2025 · 3 marks Explain how the loss of habitat and fragmentation drives plants and animals to extinction with the help of an example of habitat loss in the Tropical Rain Forest. Also write the effect of fragmentation of a habitat on the population decline.

Q34. CBSE 2025 · 3 marks (a) Alien species are highly invasive and are a threat to indigenous species. Substantiate this statement with the help of any two examples. (b) State any two criteria for determining biodiversity hotspots.

Q35. CBSE 2024 · 3 marks Tropical regions harbour more species than the temperate regions. How have biologists tried to explain this in their own ways? Explain.

Q36. CBSE 2024 · 3 marks The world is facing accelerated rates of species extinction largely due to human activities. Explain any three human activities responsible for accelerated rates of species extinction.



Q37. CBSE 2022 · 3 marks In an ecosystem, some species exert greater influence in driving the key functions of the ecosystem compared to other species. How did Paul Ehrlich explain this with his rivets popper hypothesis?

Q38. CBSE 2022 · 2 marks (b) (i) When prickly pear cactus was introduced into Australia in early 1920s, it caused havoc and ecosystem instability by achieving very high population densities. Explain the reason for its rapid spread into millions of hectares of rangeland. (ii) State the ecological importance of predator-prey relationship in a habitat.

Q39. CBSE 2022 · 3 marks (a) In any ecosystem, some species influence the key functions of the ecosystem more than others. How did Paul Ehrlich explain this through his 'Rivet Popper Hypothesis'?

Q40. CBSE 2022 · 2 marks When prickly pear cactus was introduced into Australia in early 1920s, it caused havoc and ecosystem instability by achieving very high population densities. Explain the reason for its rapid spread into millions of hectares of rangeland.

Q41. CBSE 2022 · 3 marks In an ecosystem, some species play an important role in driving the key functions of the ecosystem than other species. How has Paul Ehrlich explained this concept through his Rivets Popper hypothesis?

Q42. CBSE 2022 · 3 marks What are the consequences of loss of biodiversity in a region? Explain.

Q43. CBSE 2022 · 3 marks Explain with three examples the logical argument for conservation of biodiversity.

Q44. CBSE 2022 · 3 marks How are the advanced ex-situ techniques helping in conserving threatened species? Give three examples.

Q45. CBSE 2022 · 3 marks Given below is an equation describing the Species-Area relationship between species richness and area for a wide variety of taxa as angiosperm plants, birds, bats etc. $S = CAZ$. Give a graphical representation of the given equation showing Species-Area relationship.

Q46. CBSE 2022 · 3 marks Enlist two criteria that are used to identify a region for maximum protection as 'Biodiversity hotspots'.

Q47. CBSE 2022 · 3 marks (a) Enlist two criteria that are used to identify a region for maximum protection as 'Biodiversity hotspots'. (b) Name any two "hotspot" regions in our country.

Q48. CBSE 2022 · 3 marks (a) Given below is an equation describing the Species-Area relationship between species richness and area for a wide variety of taxa as angiosperm plants, birds, bats etc. (i) Give a graphical representation of the given equation showing Species-Area relationship. (ii) What does 'S' represent in the given equation? (iii) What is the value of 'Z' (regression coefficient) for frugivorous birds and mammals in the tropical forests of different continents? $S = CAZ$

LONG ANSWER (7)

Q49. CBSE 2025 · 5 marks (a) (i) Describe the Species-Area relationship as observed by Alexander von Humboldt, for a wide variety of taxa in nature. (ii) Draw the graph showing Species-Area relationship for $S = CAZ$ Species-Area relationship ?

Q50. CBSE 2025 · 5 marks Explain the Species-Area relationship within a natural forest and also predict the nature of graph when species richness is plotted against the area for a wide variety of taxa. Depict the graphical relationship between species richness and area. Give the equation of the Species-Area relationship for a wide variety of taxa on a logarithmic scale.

Q51. CBSE 2025 · 5 marks (b) (i) Explain the conclusion drawn by Alexander von Humboldt during his extensive explorations in the wilderness of South American jungles. (ii) Give the equation of the Species-Area relationship. (iii) Draw a graphical representation of the relation between species richness and area for a wide variety of taxa such as birds, bats, etc.

Q52. CBSE 2025 · 5 marks (a) (i) Describe the Species-Area relationship as observed by Alexander von Humboldt, for a wide variety of taxa in nature. (ii) Draw the graph showing Species-Area relationship for $S = CAZ$. What does the equation $S = CAZ$ represent ?

Q53. CBSE 2025 · 5 marks How does alien species invasion cause a decline in biodiversity? Explain. How have the following contributed to biodiversity loss? I. Nile Perch II. Lantana and Eichhornia III. Clarias gariepinus. Why have certain regions been declared as biodiversity hotspots by environmentalists of the world? Name any two such regions in India.

Q54. CBSE 2025 · 5 marks (a) (i) How does alien species invasion cause a decline in biodiversity? Explain. How have the following contributed to biodiversity loss? I. Nile Perch II. Lantana and Eichhornia III. Clarias gariepinus

Q55. CBSE 2025 · 5 marks (a)(i) How does alien species invasion cause a decline in biodiversity? Explain. How have the following contributed to biodiversity loss? I. Nile Perch II. Lantana and Eichhornia III. Clarias gariepinus (ii) Why have certain regions been declared as biodiversity hotspots by environmentalists of the world? Name any two such regions in India.

CASE-BASED (4)

CASE STUDY · CBSE 2026

India is one of the megadiverse countries housing around 8-1 per cent of global species diversity, although its land area is only 2-4 per cent of the world's land area. Many of the species are highly threatened due to human activities like deforestation, mining and habitat fragmentation. Laws like Wildlife (Protection) Act, 1972 were enacted by the Government of India to preserve our biological wealth. Various conservation measures are being implemented to save the threatened species.

Q56. CBSE 2026 · 4 marks (a) Which method conserves the highest number of species? Is it ex situ or in situ conservation?

CASE STUDY · CBSE 2025

-year-olds worldwide (13.5 million individuals) had used Cannabis in the past year according to UNODC. The adolescent brain is still developing and drug use can have long-term negative effects. Early drug use initiation can lead to faster



development of dependence than in adults and other problems in adulthood. Parts of the Amazon Basin are at the intersection of multiple forms of organised crimes that are accelerating devastation, with severe implications for the security, health and well-being of the population across the region. The direct impact of coca cultivation on deforestation is minimal, but –of drug trafficking profits into land speculation etc. is posing a growing threat.

Q57. CBSE 2025 · 4 marks (b) Which country is home to the world's largest rainforest?

CASE STUDY · CBSE 2025

According to UNODC, 15-year-olds worldwide (13.5 million individuals) had used Cannabis in the past year. The adolescent brain is still developing and drug use can have long-term negative effects. Early drug use initiation can lead to faster development of dependence than in adults and other problems in adulthood. Parts of the Amazon Basin are at the intersection of multiple forms of organised crimes that are accelerating devastation, with severe implications for the security, health and well-being of the population across the region. The direct

impact of coca cultivation on deforestation is minimal, but of drug trafficking profits into land speculation etc. is posing a growing threat.

Q58. CBSE 2025 · 4 marks (b) What is the status of the Amazon, the world's largest rainforest ?

CASE STUDY · CBSE 2025

A 2021 UNODC report states that 15-16 year-olds worldwide (13.5 million individuals) had used Cannabis in the past year. The adolescent brain is still developing and drug use can have long-term negative effects. Early drug use initiation can lead to faster development of dependence than in adults and other problems in adulthood. Parts of the Amazon Basin are at the intersection of multiple forms of organised crimes that are accelerating devastation, with severe implications for the security, health and well-being of the population across the region. The direct impact of coca cultivation on deforestation is minimal, but diversion of drug trafficking profits into land speculation etc. is posing a growing threat.

Q59. CBSE 2025 · 4 marks (b) Name the largest rainforest.

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