

CBSE Class 12 Biology 2025 - Set 57-S-2 - Compartment



Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains 33 questions. All questions are compulsory.
- (ii) Question paper is divided into five sections – Sections A, B, C, D and E.
- (iii) Section A – questions number 1 to 16 are multiple choice type questions. Each question carries 1 mark.
- (iv) Section B – questions number 17 to 21 are very short answer type questions. Each question carries 2 marks.
- (v) Section C – questions number 22 to 28 are short answer type questions. Each question carries 3 marks.
- (vi) Section D – questions number 29 and 30 are case-based questions. Each question carries 4 marks. Each question has subparts with internal choice in one of the subparts.
- (vii) Section E – questions number 31 to 33 are long answer type questions. Each question carries 5 marks.
- (viii) There is no overall choice. However, an internal choice has been provided in Sections B, D and E of the question paper. A candidate has to write answer for only one of the alternatives in such questions.
- (ix) Kindly note that there is a separate question paper for Visually Impaired candidates.
- (x) Wherever necessary, neat and properly labelled diagrams should be drawn.

Section A

1. The enzyme 'Taq Polymerase' used in PCR, has been isolated from bacterium :

- (A) *Agrobacterium tumefaciens* (B) *Thermus aquaticus*
(C) *Streptomyces albus* (D) *Escherichia coli*

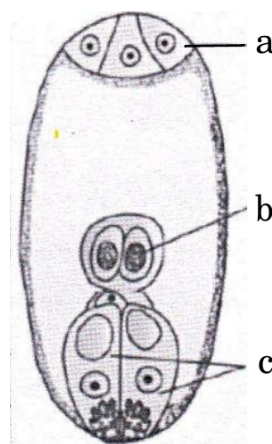
2. A man with a certain disease marries a normal woman. They have four children (three daughters and one son). All the daughters suffer from their father's disease but the son is not affected. Which of the following mode of inheritance do you suggest for this disease ?

- (A) Autosome Linked Recessive (B) Sex-linked Dominant
(C) Autosome Linked Dominant (D) Sex-linked Recessive

3. What would happen if in a gene encoding a polypeptide of 51 amino acids, codon present at 32 position (UAU) is mutated to UGA ? Select the option that indicates the polypeptide with correct number of amino acids formed after mutation.

- (A) A polypeptide of 50 amino acids will be formed. (B) A polypeptide of 32 amino acids will be formed.
(C) Two polypeptides of 20 and 31 amino acids will be formed. (D) A polypeptide of 31 amino acids will be formed.

4. Identify a, b and c in the given figure of an embryo sac.



- (A) a – Antipodals, b – Polar nuclei, c – Synergids (B) a – Antipodals, b – Central cells, c – Egg cells
(C) a – Synergids, b – Polar nuclei, c – Egg cells (D) a – Synergids, b – Egg cells, c – Filiform apparatus

5. Which of the following statements are true in respect of chorionic villi in humans ?

- (i) It appears after implantation of human embryo in the uterus.
(ii) It becomes interdigitated with cervical tissue of female reproductive tract.
(iii) It increases the surface area for exchange of materials.
(iv) It develops from the inner cell mass of blastocyst.

- (A) (i) and (ii) (B) (ii) and (iii)
(C) (i) and (iv) (D) (i) and (iii)

6. Given below are four contraceptive methods and their modes of action. Select the correct match.

Contraceptive methods	Modes of Action
a. Condoms	i. Ovum not able to reach fallopian tube
b. Vasectomy	ii. Prevents ovulation
c. Pill	iii. Prevents sperm reaching the cervix
d. Tubectomy	iv. Semen contains no sperms

- (A) a-i, b-ii, c-iii, d-iv (B) a-ii, b-iii, c-iv, d-i
(C) a-iii, b-iv, c-ii, d-i (D) a-iv, b-i, c-iii, d-ii

7. Which of the following animals exhibit male heterogamety ?

- (i) Fruit fly (ii) Fowl (iii) Human (iv) Honey bee
(A) (i) and (iii) (B) (ii) and (iv)
(C) (ii) and (iii) (D) (i) and (iv)

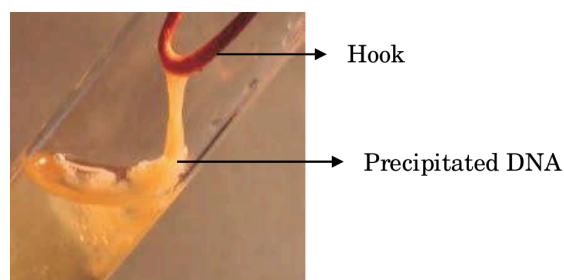
8. *Monascus purpureus* is a yeast used commercially in the production of which of the following ?

- (A) Ethanol (B) Streptokinase for removing clots from blood vessels
(C) Citric acid (D) Blood-cholesterol lowering statins

9. The chronological order of evolution of modern man from man-like primates is given below. Choose the option that indicates the evolution of man in correct order from early to recent times :

- (A) Australopithecines → Ramapithecus → Homo habilis → Homo erectus → Homo sapiens
(B) Ramapithecus → Australopithecines → Homo habilis → Homo erectus → Homo sapiens
(C) Ramapithecus → Homo habilis → Australopithecines → Homo erectus → Homo sapiens
(D) Australopithecines → Homo habilis → Homo sapiens → Ramapithecus → Homo erectus

10. Identify the material that helps in the precipitation of purified DNA during the process of isolation of DNA as shown in the given diagram.



- (A) Protease (B) Lysozyme
(C) Cellulase (D) Chilled ethanol

11. Golden rice is a promising transgenic crop. When released for cultivation, it will help in :

- (A) Producing a petrol-like fuel from rice (B) Enrichment of Vitamin A
(C) Pest resistance (D) Herbicide tolerance

12. In *Antirrhinum*, RR is a phenotypically red flower, rr is white and Rr is pink. Select the correct phenotypic ratio in F_1 generation, when a cross is performed between $RR \times Rr$:

- (A) 1 Red : 2 Pink : 1 White (B) 2 Pink : 2 White
(C) 2 Red : 2 Pink (D) 2 Red : 1 Pink : 1 White

13. Assertion (A) : All the events starting from pollen landing on stigma till pollen tube entering the ovule are included in pollen-pistil interaction.

Reason (R) : Pollen-pistil interaction ensures that only suitable pollens germinate on the stigma.

- (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.

14. Assertion (A) : DNA chemically is less reactive and structurally more stable when compared to RNA.

Reason (R) : DNA has 2'–OH group present at every nucleotide, which makes it more stable than RNA.

- (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.

15. Assertion (A) : Verhulst-Pearl logistic growth curve is sigmoid in nature.

Reason (R) : A population growing in a habitat with limited resources shows initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote.

- (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.

16. Assertion (A) : In bioreactors, raw materials are biologically converted into desired products.

Reason (R) : In bioreactors, optimum growth conditions for microbes such as temperature, pH, substrate, salts, etc. are available.

- (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.

Section B

17(a). How many meiotic divisions will a wheat plant undergo in order to produce 100 zygotes /100 grains ? Calculate and give explanation.

OR

17(b). How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 35 microspore mother cells and 35 megaspore mother cells respectively ?

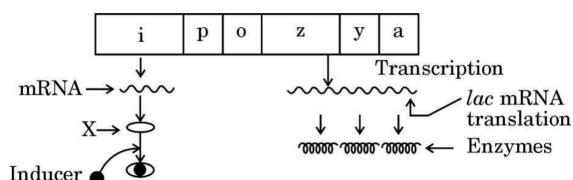
18(a). A couple believed that hospital authorities have exchanged babies and they have been given another baby by them. The wife is blood group 'A', her husband is blood group 'B' and the child is blood group 'O'.

- (i) Could the baby be theirs ?
- (ii) Justify your answer with the help of a cross.

OR

18(b)(i). Observe the diagram given below and answer the following questions.

Name the molecule 'X' synthesized by 'i' gene.



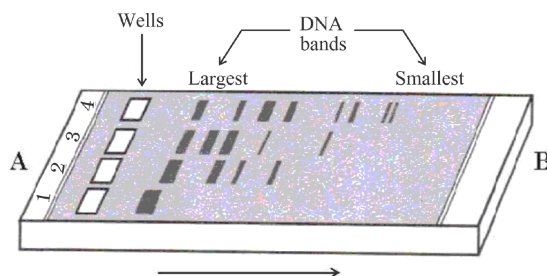
18(b)(ii). Observe the diagram given below and answer the following questions.

Which one of the structural genes codes for β -galactosidase ?

18(b)(iii). Observe the diagram given below and answer the following questions.

When will the transcription of this gene stop ?

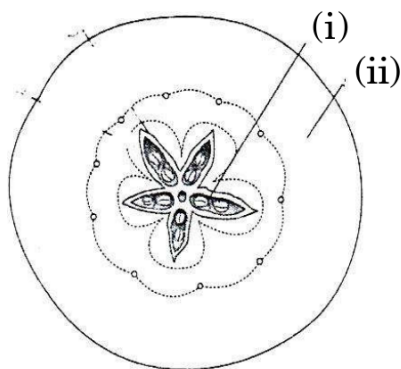
19(a). Given below is the diagram representing the observation made for separating DNA fragments by gel electrophoresis. Observe the illustration and answer the questions that follow :
DNA fragments move in the direction A $\rightarrow$ B.
Explain.



19(b). Given below is the diagram representing the observation made for separating DNA fragments by gel electrophoresis. Observe the illustration and answer the questions that follow :
Name the matrix used and its role in gel electrophoresis.

19(c). Given below is the diagram representing the observation made for separating DNA fragments by gel electrophoresis. Observe the illustration and answer the questions that follow :
Mention how the separated fragments can be visualized for further technical use.

20. Given below is a transverse sectional view of an apple. Label the following parts (i) and (ii) and write down their functions.



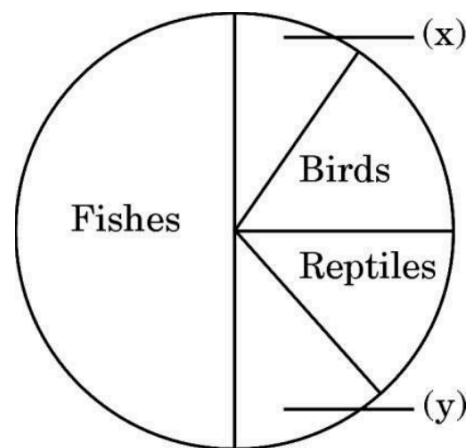
21(a)(i). Draw a pyramid of numbers where a large number of insects are feeding on the leaves of a tree. What is the shape of this pyramid ?

21(a)(ii). Will the pyramid of energy also be of the same shape in this situation ? Give reason for your response.

OR

21(b)(i). What could be the reason for the fast rate of decomposition in the tropics ?

21(b)(ii). Identify 'x' and 'y' in the figure given below representing proportionate number of major vertebrate taxa.



Section C

22. (a) Why do sportspersons often fall victim to cocaine addiction ? Name the plant from which this drug is derived. Also write down the mode of action of this drug.

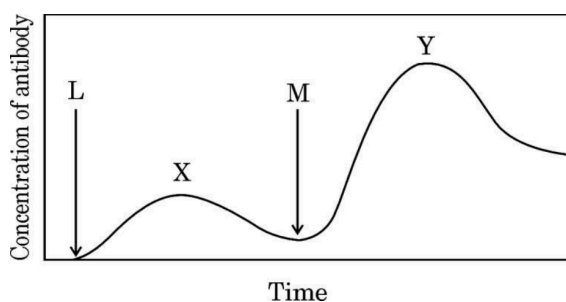
(b) Name one drug and its harmful effect obtained from latex of Poppy plant.

23. Biotechnology has helped farmers to get pest-resistant cotton crops. Explain the technique adopted along with its mode of action.

24(a). After a brief medical examination, a couple came to know that both of them are unable to produce children and should look for Assisted Reproductive Technologies (ART). Name the ART and the procedure involved that you can suggest to them to help them bear a child.

24(b). Justify the statutory ban on Amniocentesis.

25. The graph given below indicates the administration of the first (L) and second dose (M) of a vaccine. The corresponding response of the body is indicated by X and Y. Interpret the graph and explain the reason for such a response shown by the body.



26. (a) How does the Mediterranean orchid 'Ophrys' ensure its pollination by bees without offering any floral rewards ?

(b) Name the type of interaction seen in each of the following examples :

(i) *Ascaris* worms living in the intestine of humans.

(ii) Clown fish living amongst the tentacles of sea anemone.

27(a). State whether each of these statements given below is true or false. Justify your answer.

Plasmids with a single recognition site are preferred over those with multiple sites for the same restriction enzyme during cloning process.

27(b). State whether each of these statements given below is true or false. Justify your answer.

The tumor inducing (Ti) plasmid can be extracted from *Agrobacterium tumefaciens* cells and can be used for cloning of foreign gene without any modifications.

28. Draw a labelled schematic sketch of replication fork of DNA. Explain the role of any two enzymes involved in DNA replication.

29(a). Read the following passage and answer the questions that follow.

The chromosome number is fixed for all normal organisms leading to species specification, whereas any abnormality in the chromosome number of an organism results into abnormal individuals. Sometimes an error may occur during meiosis of cell cycle, where the sister chromatids fail to segregate, called non-disjunction, leading to the production of abnormal gametes with altered chromosome number. On fertilization, such gametes develop into abnormal individuals.

State what is aneuploidy.

29(b). Read the following passage and answer the questions that follow.

The chromosome number is fixed for all normal organisms leading to species specification, whereas any abnormality in the chromosome number of an organism results into abnormal individuals. Sometimes an error may occur during meiosis of cell cycle, where the sister chromatids fail to segregate, called non-disjunction, leading to the production of abnormal gametes with altered chromosome number. On fertilization, such gametes develop into abnormal individuals.

A normal human sperm ($22 + Y$) fertilizes an ovum with karyotype ($22 + XX$). Name the disorder of the offspring thus produced and write any two symptoms of the disorder.

29(c)(i). Read the following passage and answer the questions that follow.

The chromosome number is fixed for all normal organisms leading to species specification, whereas any abnormality in the chromosome number of an organism results into abnormal individuals. Sometimes an error may occur during meiosis of cell cycle, where the sister chromatids fail to segregate, called non-disjunction, leading to the production of abnormal gametes with altered chromosome number. On fertilization, such gametes develop into abnormal individuals.

What is meant by trisomy ? Mention the chromosome number that shows trisomy in Down's syndrome.

OR

29(c)(ii). Read the following passage and answer the questions that follow.

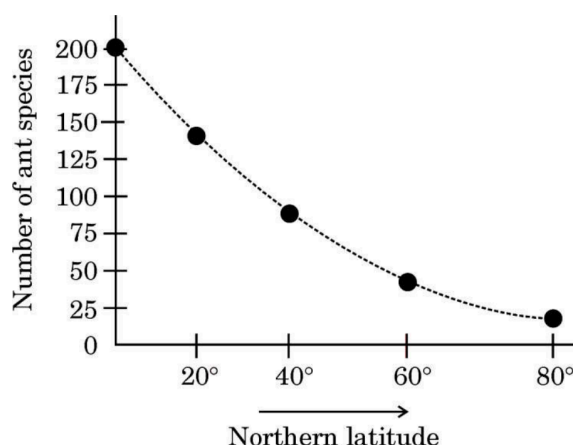
The chromosome number is fixed for all normal organisms leading to species specification, whereas any abnormality in the chromosome number of an organism results into abnormal individuals. Sometimes an error may occur during meiosis of cell cycle, where the sister chromatids fail to segregate, called non-disjunction, leading to the production of abnormal gametes with altered chromosome number. On fertilization, such gametes develop into abnormal individuals.

Write any two symptoms of Down's syndrome.

30(a). Biodiversity shows latitudinal and altitudinal gradients. There is little biodiversity at poles. It increases in temperate areas but reaches the maximum in tropics (latitudinal range of 23.5° N to 23.5° S). It is because the tropical rainforests have favourable environmental conditions not only for speciation, but also for supporting both variety and number of organisms. Harsh conditions exist in temperate areas during the cold season only. Number of vascular species is 118 – 236/0.1 ha in tropical forests and 21 – 48 species/0.1 ha in temperate forests. Their number would be 0.0 – 10.0 species/0.1 ha in arctic regions. Such a correlation occurs also in case of other taxonomic groups like ants, butterflies, birds, etc.

Based on the above information and graph, answer the following questions :

What does the graph depict ?



30(b). Biodiversity shows latitudinal and altitudinal gradients. There is little biodiversity at poles. It increases in temperate areas but reaches the maximum in tropics (latitudinal range of 23.5° N to 23.5° S). It is because the tropical rainforests have favourable environmental conditions not only for speciation, but also for supporting both variety and number of organisms. Harsh conditions exist in temperate areas during the cold season only. Number of vascular species is 118 – 236/0.1 ha in tropical forests and 21 – 48 species/0.1 ha in temperate forests. Their number would be 0.0 – 10.0 species/0.1 ha in arctic regions. Such a correlation occurs also in case of other taxonomic groups like ants, butterflies, birds, etc.

Based on the above information and graph, answer the following questions :

With the help of graph, show the species-area relationship for a wide variety of taxa in a forest. Write an equation that shows this relationship on a logarithm scale.

30(c)(i). Biodiversity shows latitudinal and altitudinal gradients. There is little biodiversity at poles. It increases in temperate areas but reaches the maximum in tropics (latitudinal range of 23.5° N to 23.5° S). It is because the tropical rainforests have favourable environmental conditions not only for speciation, but also for supporting both variety and number of organisms. Harsh conditions exist in temperate areas during the cold season only. Number of vascular species is 118 – 236/0.1 ha in tropical forests and 21 – 48 species/0.1 ha in temperate forests. Their number would be 0.0 – 10.0 species/0.1 ha in arctic regions. Such a correlation occurs also in case of other taxonomic groups like ants, butterflies, birds, etc.

Based on the above information and graph, answer the following questions :

Explain the correlation between latitudinal gradient and number of plant species.

30(c)(ii). Biodiversity shows latitudinal and altitudinal gradients. There is little biodiversity at poles. It increases in temperate areas but reaches the maximum in tropics (latitudinal range of 23.5° N to 23.5° S). It is because the tropical rainforests have favourable environmental conditions not only for speciation, but also for supporting both variety and number of organisms. Harsh conditions exist in temperate areas during the cold season only. Number of vascular species is 118 – 236/0.1 ha in tropical forests and 21 – 48 species/0.1 ha in temperate forests. Their number would be 0.0 – 10.0 species/0.1 ha in arctic regions. Such a correlation occurs also in case of other taxonomic groups like ants, butterflies, birds, etc.

Based on the above information and graph, answer the following questions :

Tropics are considered to be more stable where species continue to flourish and evolve undisturbed for millions of years. Give any two reasons.

Section E

31(a). (i) Draw a diagram of an enlarged view of transverse section (T.S.) of one microsporangium of an angiosperm and label the following parts :

(I) Tapetum

(II) Middle layers

(III) Endothecium

(IV) Microspore mother cell

(ii) Write the function of Tapetum.

(iii) Explain the following giving reasons :

(I) Pollen grains are well-preserved as fossils.

(II) Pollen tablets are in use by people these days.

OR

31(b)(i). Where does spermatogenesis occur in human testes ? Describe the process of spermatogenesis up to the formation of spermatozoa.

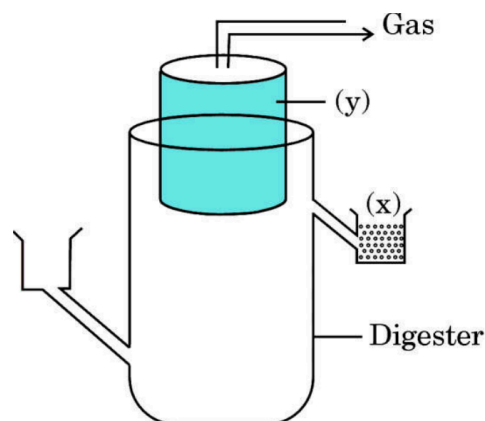
31(b)(ii). Trace the path of movement of spermatozoa from the testes upto the ejaculatory duct.

32(a). (i) Identify the disease in which the body cells of the patient lose the property of contact inhibition. State its possible causes (any three). Also name any two methods to detect and to diagnose this disease.

(ii) Your classmate complains of headache and cough. The doctor confirms that he is suffering from pneumonia and not common cold, on the basis of certain symptoms. List these symptoms and write any two precautions to be followed to prevent the spread of this disease.

OR

32(b). Study the diagram of a typical biogas plant and answer the following questions :



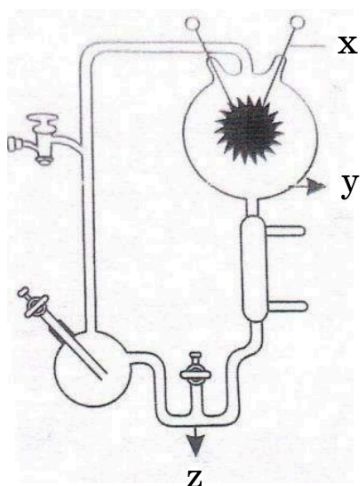
(i) Identify 'x' and 'y'.

(ii) Write three components of biogas. Name one microorganism which is involved in biogas production.

(iii) Name two institutes which developed the technology of biogas production in India.

33. (a) The figure given below represents Miller's apparatus used for his experiment :

- (i) Write the purpose of 'x' in his set-up.
 - (ii) Name the chemical found in the sample drawn from 'z'.
 - (iii) Write the conclusion the scientist arrived at.
- (b) What is adaptive radiation ? When can adaptive radiation be referred to as convergent evolution ? Give an example.



OR

33. (i) The average length of a DNA double helix in a typical mammalian cell is approximately 2.2 metres and the dimension of nucleus is 10^{-6} m. How is it possible that such long DNA polymers are packed within a very small nucleus ? Explain.
- (ii) Differentiate between Euchromatin and Heterochromatin.

- End of Question Paper -