

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) Section A: Questions 1 to 16 carry 1 mark each.
- (iii) Section B: Questions 17 to 21 carry 2 marks each.
- (iv) Section C: Questions 22 to 28 carry 3 marks each.
- (v) Section D: Questions 29 to 30 carry 4 marks each.
- (vi) Section E: Questions 31 to 33 carry 5 marks each.
- (vii) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (viii) Draw neat, properly labelled diagrams wherever necessary.

Section A

1. In a human, the average gene consists of (i) ___ bases and the largest known human gene contains (ii) ___ bases.

Select the correct option to fill in the blanks (i) and (ii):

- | | |
|--------------------------------|--------------------------------|
| (A) (i) 800; (ii) 1.6 million | (B) (i) 300; (ii) 2400 million |
| (C) (i) 8000; (ii) 1.2 million | (D) (i) 3000; (ii) 2.4 million |

2. Which of the following is a carrier for the disease Amoebiasis?

- | | |
|--------------------|-------------------------------|
| (A) Culex mosquito | (B) Female Anopheles mosquito |
| (C) Snail | (D) Housefly |

3. 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 S ₂ of bacterium. |
| (C) Only one enzyme can be used to digest a plasmid from S ₂ strain. | (D) Only one restriction enzyme has been isolated from this bacteria. |

4. 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 |

5. 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.

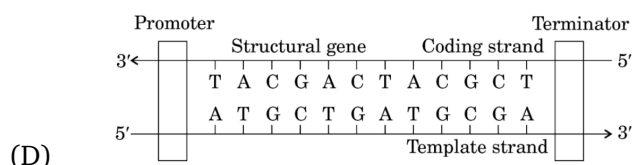
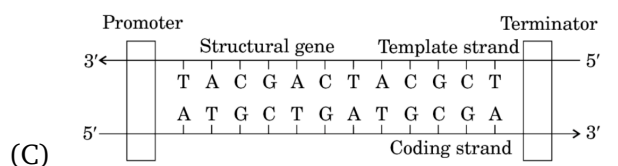
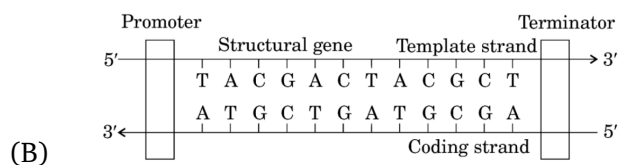
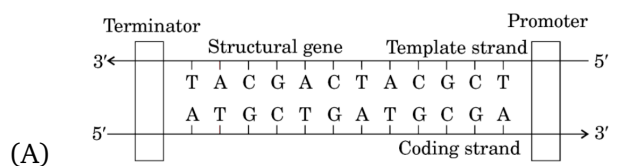
Choose the option with correct statement(s).

- | | |
|--|--|
| (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 |

6. 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% |

7. Four different transcription units are shown below. Choose the option with the correct image.



8. 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

9. 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

10. A gene having non-coding introns and coding exons is known as:

- (A) Pseudogene (B) Structural gene
(C) Split gene (D) Oncogene

11. 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

12. Which of the following is not a symptom of Ascariasis?

- (A) Intestinal blockage (B) Muscular pain and fever
(C) Anaemia (D) Skin ulcers

13. For Questions 13 to 16, two statements are given - one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer from the codes below.

(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.

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.

14. 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.

15. 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.

16. Assertion (A): DNA cannot pass through cell membrane of a bacterial cell.

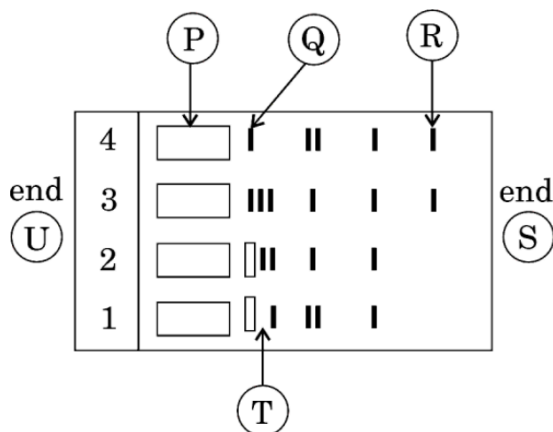
Reason (R): DNA is a hydrophilic molecule.

(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.

Section B

17(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?

OR

17(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.

18(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

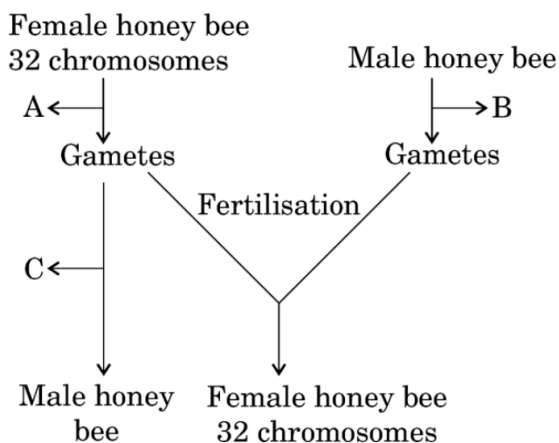
- (ii) Which one of the above:
 (I) had the largest brain size?
 (II) ate fruits?

OR

18(b). (i) What is natural selection?

- (ii) Explain the type of natural selection that promotes evolutionary change. Give an example.

19. Study the schematic cross between male and female honey bee given below and answer the questions that follow.



- Identify the cell division 'A' and 'B' that leads to gamete formation.
- Name the process 'C' that leads to development of honey bee.
- What type of sex-determination pattern is this?

20(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.

- Identify the disease.
- Name its two causative agents.
- Mention its mode of transmission.

OR

20(b). A girl develops sneezing, watery eyes and difficulty in breathing every time she visits a flower garden.

- Identify the condition.
- Name the immune component responsible for this condition.
- Name the chemical released.
- State one medicine used to treat such a condition.

21. A child is born with a genetic disorder due to the deletion of a gene.

- Name such a gene studied by you. Explain how gene therapy can help in treating such a condition.
- Mention one challenge associated with this therapy.

Section C

22. Draw a neat diagram of a maize grain showing the internal structure and label any five parts.

23. 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.

24. (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.

25. 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.

26. (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.

27. 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?

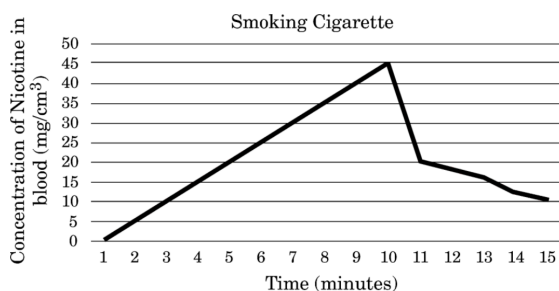
28. (a) What is the carrying capacity of a species in a habitat?

(b) Explain the growth curve that takes this capacity into account.

Section D

29(a)(i). Read the following passage and answer the question that follow:

The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/minute.

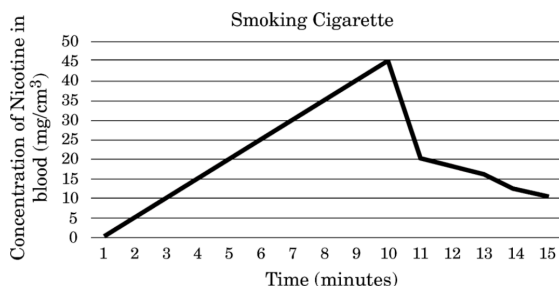


With reference to the above graph, explain the concentration of nicotine in the blood at 10 minutes.

OR

29(a)(ii). Read the following passage and answer the question that follow:

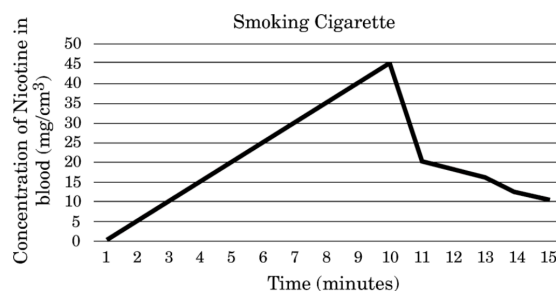
The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/minute.



How will this affect the concentration of carbon monoxide and haem-bound oxygen at 10 minutes?

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

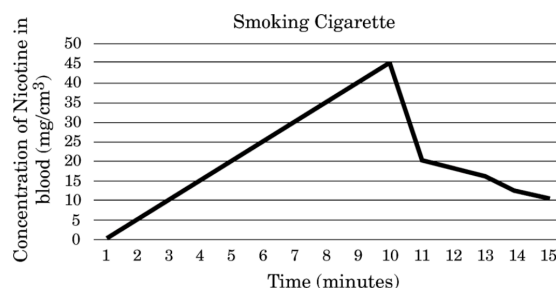
The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/minute.



How does cigarette smoking result in high blood pressure and increase in heart rate?

29(c). Read the following passage and answer the question that follow:

The data below shows the concentration of nicotine smoked by a smoker taking 10 puffs/minute.

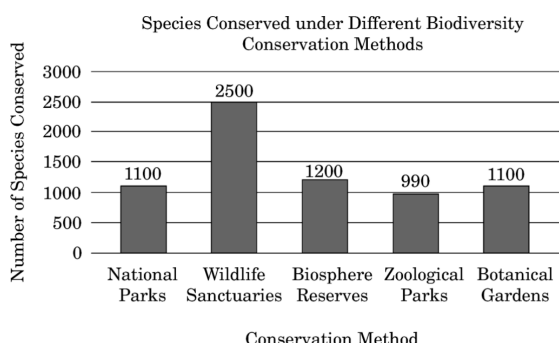


To which class of compounds does nicotine belong? Name one other drug from the same class.

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

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.

The following bar graph shows the number of species conserved under different biodiversity conservation methods.



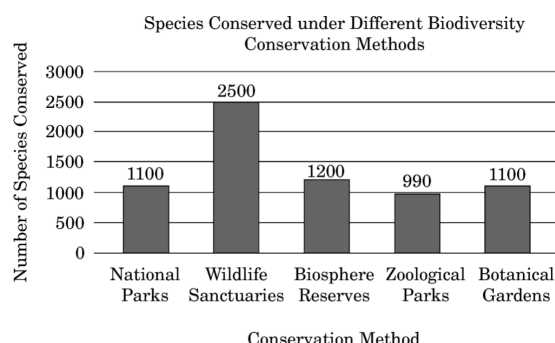
Study the graph and answer the questions.

Which method conserves the highest number of species? Is it ex situ or in situ conservation?

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

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.

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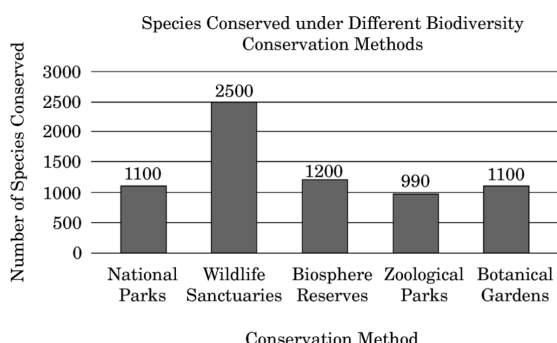
Study the graph and answer the questions.

Which other methods shown in the diagram are opposite to the one identified by you in question (a)? How are these two conservation approaches different?

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

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.

The following bar graph shows the number of species conserved under different biodiversity conservation methods.



Study the graph and answer the questions.

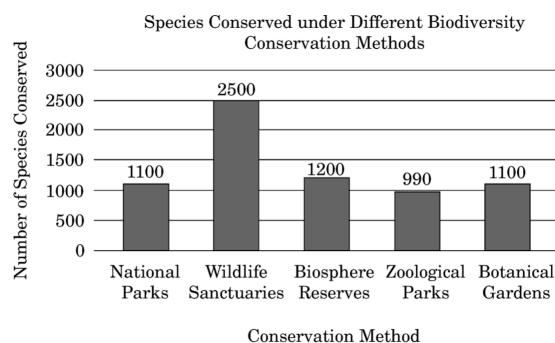
Write two features of Biodiversity hotspots.

OR

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

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.

The following bar graph shows the number of species conserved under different biodiversity conservation methods.



Study the graph and answer the questions.

To which category do sacred groves belong and how do they help in bio-conservation?

Section E

31(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.

OR

31(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.

32(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.

OR

32(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, X^h - Haemophilic)

33(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.

OR

33(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.

- End of Question Paper -