

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. The RNA triplet UAG acts as a stop codon which terminates the synthesis of a polypeptide. Below is given a strand of DNA which codes for four amino acids.

In which position will an insertion of a thymine nucleotide result in the termination of translation?

DNA strand: 3'TCCACCCGATGC5'

- | | |
|--|--|
| (A) Position A (between TCC and ACCCGATGC) | (B) Position B (between TCCACC and CGATGC) |
| (C) Position C (between TCCACCCG and ATGC) | (D) Position D (between TCCACCCGAT and GC) |

2. Which of the following conditions correctly describes the manner of determining the sex in the given options?

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|--|---|
| (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 <i>Drosophila</i> . |

3. Which one of the following is not the product of transgenic experiments?

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|---------------------------------|---|
| (A) Pest-resistant crop variety | (B) High nutritional value in grains |
| (C) Drought-resistant crops | (D) Production of insulin by rDNA technique |

4. 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 |

5. India has only 2.4% of the world's land area but its share of the global species diversity is:

- | | |
|----------|-----------|
| (A) 8.1% | (B) 12.9% |
| (C) 7.3% | (D) 5.1% |

6. 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 - <i>Meloidegyne Incognita</i> |

7. 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) P = 53%, p = 47% | (B) P = 47%, p = 53% |
| (C) P = 40%, p = 46% | (D) P = 22%, p = 16% |

8. 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

9. Choose the option that correctly describes the gynoecium of *Michelia*:

- (A) Multicarpellary, Apocarpous
- (B) Bicarpellary, Apocarpous
- (C) Multicarpellary, Syncarpous
- (D) Bicarpellary, Syncarpous

10. Read the passage given below and answer the question.

Food chains 'P' and 'Q' form an interconnection. 'P' initiates with wheat grass whose population supports a few grasshoppers, frogs and snakes. 'Q' starts with dead decaying leaves of wheat grass which are eaten by earthworms and then food chain is continued with frog of food chain 'P'.

Identify the types of food chains 'P' and 'Q':

- (A) P - Detritus; Q - Grazing
- (B) P - Grazing; Q - Detritus
- (C) P - Detritus; Q - Detritus
- (D) P - Grazing; Q - Grazing

11. 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.

12. 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.

13. Assertion (A): A male individual always inherits haemophilia from his mother.

Reason (R): The gene for haemophilia lies on X-chromosome.

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| (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. |
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14. 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.

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|--|---|
| (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): A piece of DNA inserted into an alien organism generally does not replicate, if not inserted into a chromosome.

Reason (R): Chromosomes have specific sequences called 'ori' region, where DNA replication is initiated.

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|--|---|
| (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. |
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16. Assertion (A): Swiss cheese is characterized by large holes due to CO₂ production.

Reason (R): It is ripened by growing a specific fungi.

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|--|---|
| (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. |
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Section B

17(a). How is DNA isolated in purified form from a bacterial cell?

OR

17(b). Explain how human functional insulin was produced by using recombinant DNA (rDNA) technology.

18. 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:

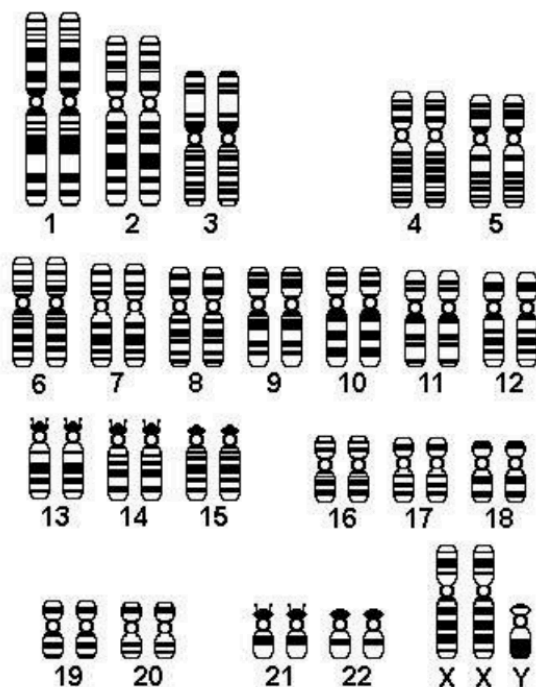
(a) Name one primate about 15 mya.

(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.

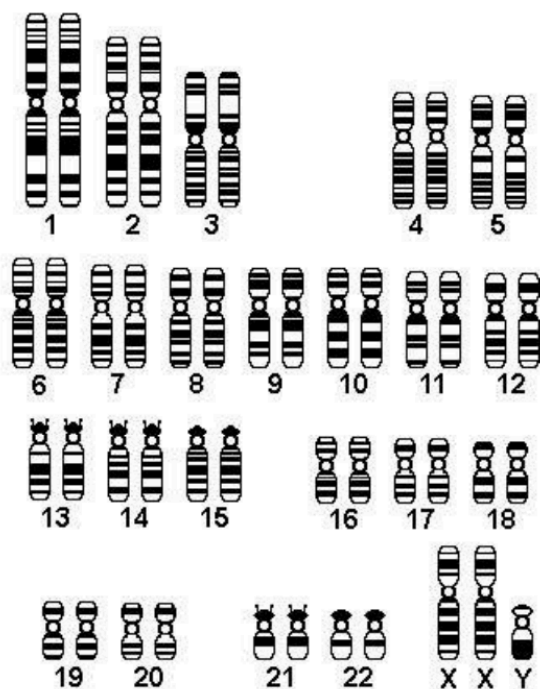
(d) Name the hominid that was found around 1.5 mya.

19(a). A karyotype of a human suffering from a certain disorder is given below:



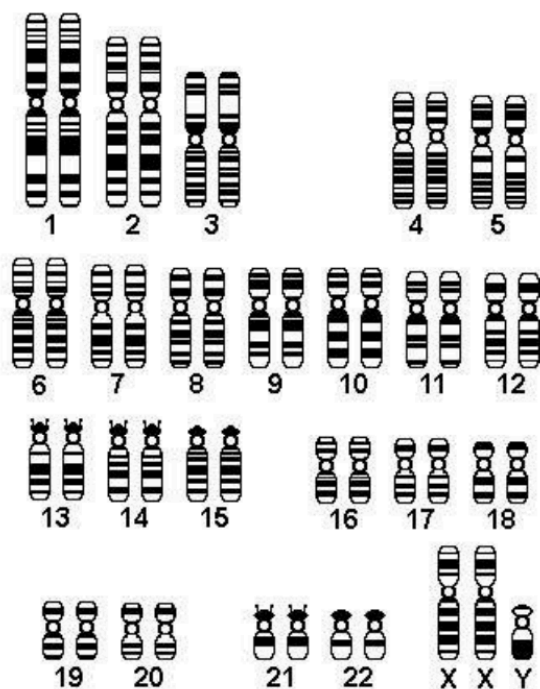
Identify the disorder.

19(b). A karyotype of a human suffering from a certain disorder is given below:



Write the symptoms of the disorder.

19(c). A karyotype of a human suffering from a certain disorder is given below:



Give reason for such a disorder.

20(a). 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.

OR

20(b). (i) How do secondary lymphoid organs provide immunity?

(ii) Highlight the role of spleen as an organ that provides immunity.

21(a). "A fully developed foetus initiates its delivery from the mother's womb." Explain.

OR

21(b). Give reasons for the following:

(i) Why can a woman generally not conceive a child after 50 years of age?

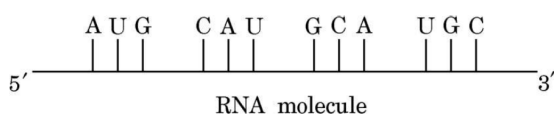
(ii) Polar bodies are formed during oogenesis and not during spermatogenesis.

Section C

22. Gene therapy can be used to treat an ADA deficient patient. Explain. Is it a permanent cure? How can ADA be cured permanently?

23. 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.

24. Construct and label a transcription unit from which the RNA segment given below has been transcribed. Write the complete name of the enzyme that transcribed this RNA.



25. 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.

26. (a) "The process of evolution of different species in a given geographical area starts from a point and literally radiates to other geographical areas." Explain it with an example.

(b) Cite an example where more than one adaptive radiation has occurred in an isolated geographical area. Name the type of evolution your example depicts.

27. (a) Why are transgenic animals so called?

(b) With the help of an example each, explain the role of transgenic animals in the following:

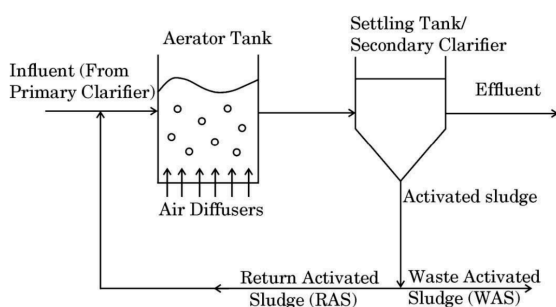
(i) Vaccine safety

(ii) Biological products

28. A person is suffering from high grade fever. Which symptoms will help to identify if he/she is suffering from Typhoid, Pneumonia or Malaria?

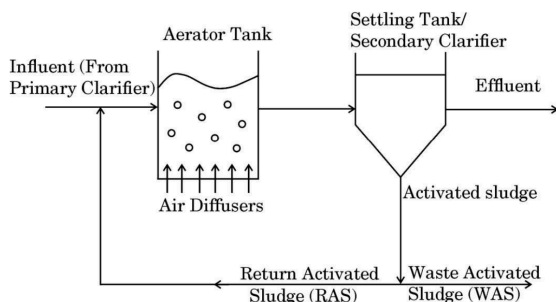
Section D

29(a). Study the figure given below and answer the questions that follow.



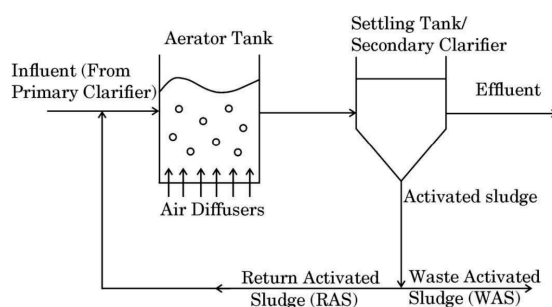
Identify the figure and state its importance.

29(b). Study the figure given below and answer the questions that follow.



Why is air diffused into the aerator tank? Explain.

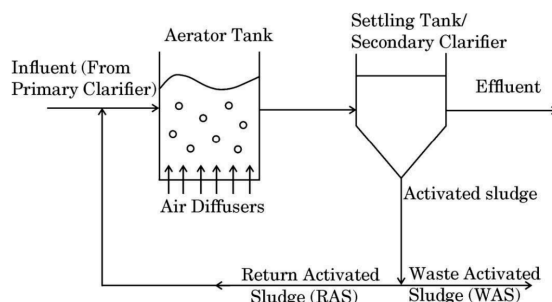
29(c)(i). Study the figure given below and answer the questions that follow.



What changes take place in the settling tank?

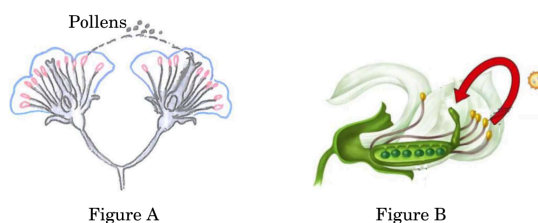
OR

29(c)(ii). Study the figure given below and answer the questions that follow.



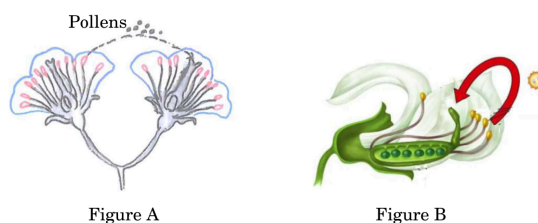
How is BOD related to organic matter present in the water?

30(a). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



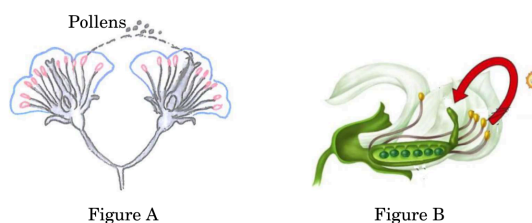
Give the scientific terms for the processes taking place in Figures A and B respectively.

30(b). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



Mention two conditions necessary for the process occurring in Figure B.

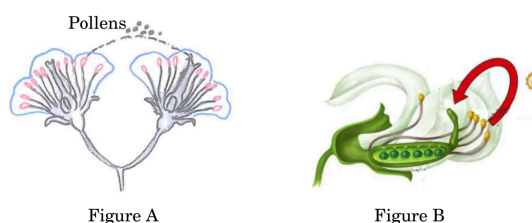
30(c)(i). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



State one advantage and one disadvantage of the process occurring in Figure B.

OR

30(c)(ii). The following question is based on pollination. Study the figures carefully and answer the questions that follow.



Name one plant where, in some flowers only, the process in Figure B takes place and give the reason responsible for it.

Section E

31(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.

OR

31(b). (i) Write an equation for Verhulst-Pearl Logistic Growth Curve where :

N = Population density at time '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.

32(a). What is meant by 'right' and 'wrong' type of pollen when pollen 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?

OR

32(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

33(a). 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.

OR

33(b). Differentiate between the following:

- (i) Polygenic Inheritance and Pleiotropy
- (ii) Dominance, Codominance and Incomplete dominance

- End of Question Paper -